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SAE J2450 Supplemental Training Document

RATIONALE

This document contains training material that presents relevant examples for translation-quality metrics.

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FOREWORD

The SAE J2450 Translation Quality Metric includes detailed explanation of the rules and instructions for scoring documents. However, SAE J2450 is a reference document, not a training document.

This Supplemental Training Document addresses practical application of the Translation Quality Metric. The objectives of this document are as follows:

- To present experiences of some clients who have used SAE J2450 as part of their translation process.
- To describe the skills of and the resources available to an ideal evaluator.
- To demonstrate application of SAE J2450 through detailed examples and commentary.
- To capture some frequently asked questions and answers.

TABLE OF CONTENTS

1.	SCOPE.....	2
2.	REFERENCES.....	2
2.1	Applicable Publications	2
2.1.1	SAE Publication	2
3.	HOW TO USE THIS DOCUMENT	3
4.	TECHNICAL REQUIREMENTS / CONTENT	3
4.1	Overview for Clients	3
4.1.1	Experiences of Companies that have Used SAE J2450	3
4.1.2	Practical Application	3
4.1.3	Setting Requirements	4
4.2	Overview for Evaluators	5
4.2.1	Materials Required	5
4.2.2	Qualifications	5
4.3	Training for Evaluators	6
4.3.1	General Comments	6
4.3.2	Quiz	6
4.3.3	Demonstration	7
4.3.4	Exercise	11
4.4	FAQ	11
5.	NOTES	13
5.1	Marginal Indicia	13
APPENDIX A	PRACTICE TEXTS	14
A.1	ENGLISH – CANADIAN FRENCH	15
A.2	ENGLISH – EUROPEAN FRENCH	35
A.3	ENGLISH – EUROPEAN SPANISH	59
A.4	ENGLISH – MEXICAN SPANISH	81
A.5	ENGLISH – DUTCH	98
A.6	ENGLISH – GERMAN	119

1. SCOPE

This supplement, which is a living document, is meant to provide both clients and translation suppliers with some suggestions for integrating SAE J2450 into their business practices. It is intended for the use of clients, trainers who wish to develop new evaluators, and those who wish to self-train.

2. REFERENCES

2.1 Applicable Publications

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest version of SAE publications shall apply.

2.1.1 SAE Publication

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J2450 Translation Quality Metric

3. HOW TO USE THIS DOCUMENT

The *Overview for Clients* section gives background information and suggests strategies for translation clients who use SAE J2450 as part of their quality assurance process. The *Overview for Evaluators* section advises evaluators and their trainers on the materials and skills needed to use the metric. The *Training for Evaluators* section demonstrates the application of the metric in detail.

Questions of general interest are addressed in the *FAQ*. Trainees can try their hand at scoring documents by using the practice texts in the *Appendix*.

4. TECHNICAL REQUIREMENTS / CONTENT

4.1 Overview for Clients

4.1.1 Experiences of Companies that have Used SAE J2450

The experiences of two automotive companies that have made extensive use of SAE J2450 are recounted in the following articles:

Don Sirena. Mission Impossible: Improve Quality, Time and Speed At the Same Time (Using SAE J2450 to Do the Impossible).

Nestor Rychtyckyj. An Assessment of Machine Translation for Vehicle Assembly Process Planning at Ford Motor Company.

4.1.2 Practical Application

Each client must decide how best to apply SAE J2450 and how to use the information that it yields. The following scenarios demonstrate a few possible methods.

- One client company has used SAE J2450 in order to review both the quality of translation and the efficiency of the translation process. The company translates millions of words of service information into six target languages. It was decided to evaluate small samples of each deliverable, and to pay more attention to high-level trends of scores than to scores of individual projects.

The translation process for each language pair allowed for draft and final translation phases; samples were evaluated at each phase.

The following benefits were reaped:

- The client was able to chart linguistic quality improvement for each language pair, predicting how long it would take a provider to meet quality expectations for new target languages.
- As quality scores at the two phases grew closer for each language pair, the client and provider were able to confidently strike the edit phase from the process. This cut time off the process without sacrificing quality.
- Taking the other extreme, a company might decide to evaluate each file of a deliverable in its entirety, and issue a pass/fail status to each.
- The pass/fail could be based upon the overall document score, or on the types of errors. For example, a client who was particularly concerned about consistent terminology might decide not to publish files that contain 'Wrong Term' errors. Such files would be corrected before publication.
- One project issued machine-translated service information text that was post-edited by human translators before publication. The client instructed the translation provider to correct only errors that fell into the SAE J2450 categories. This instruction made the role of the post-editor very clear. The final product was free of linguistic errors, and the lean process of machine translation was not encumbered by unnecessarily time-consuming editing.

A client might also see benefits in modifying their application of SAE J2450.

- A client may stipulate that specific errors always receive a predetermined categorization. For example, many languages have equivalent terms. A client could require that violation of the glossary always be categorized as a Wrong Term – Serious, even if a translated term is perfectly comprehensible in the target language.
- A client might ask evaluators to provide comments along with the markups (this is out of the scope of SAE J2450, as written).
- In very specialized situations where the authoring and translation of text occur in the same system, and SAE J2450 evaluators are familiar with both phases, a client might graft causal analysis into the quality evaluation process. This could be done with tags or meta-rules that additionally classify errors according to their cause. For example, in systems that have built-in bilingual glossaries, it could be noted that a source term was mapped to an incorrect target term. (This, too, is out of the scope of SAE J2450, as written.)

The purpose of this Supplemental Training Document is to support SAE J2450 as it is written.

4.1.3 Setting Requirements

A client company that chooses to make SAE J2450 evaluation part of its business practice must determine how best to do so. Experienced translation providers can certainly advise a client, but it is ultimately the responsibility of the client to set the following requirements:

- Which texts require evaluation, and for which target languages.
- Whether evaluation should be conducted on samples or entire deliverables. If samples are to be evaluated, a client must decide on a meaningful sample size.
- If a deliverable contains translated segments from more than one source (e.g., human translation, machine translation, and translation memory), the client must decide whether these segments should be considered separately.
- The point in the translation process at which evaluation will occur.
- Reporting methods and timing.
- Acceptable scores for each deliverable type and language pair. The client must also determine what action will be taken for scores that are not acceptable.
- Any special requirements.

It is also recommended that the client provide a glossary, if one is available, and inform the translation provider of any preferred published glossaries or dictionaries.

Please note: The Wrong Term category is the only error category in SAE J2450 that instructs an evaluator to refer to an external reference source. A robust glossary, whether client-defined or not, can contribute greatly to consistency and accuracy in text. Coupled with such a glossary, the WT error category can be a powerful tool for ensuring consistent use of approved terminology. (Such an application is outside the scope of the metric, which measures quality rather than prescribing corrections to errors. However, it is worth mentioning.)

It is recommended that the evaluator remain anonymous to the team and, in turn, that the identity of the individual translators is not known to the evaluator. These steps help to ensure objectivity in scoring and independence on the part of the evaluator. There may, however, be process advantages to incorporating the evaluation into process steps, such as the edit or proofread process and these options could be explored by either client or translation provider depending on needs. Regardless of the scenario employed, results from the evaluation should be shared with the translators in such a way as to improve performance and increase learning.

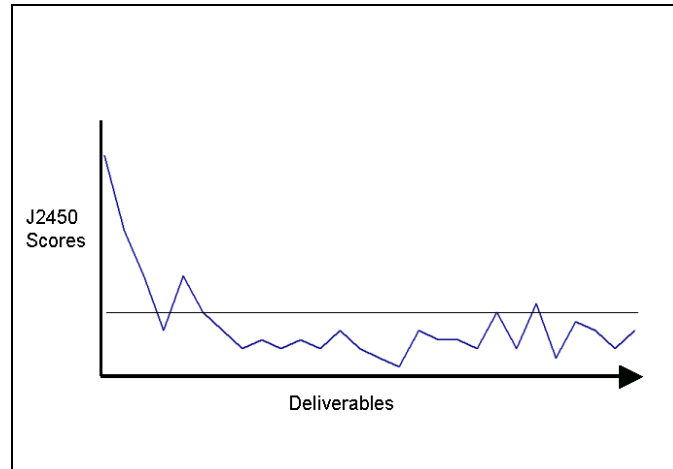


FIGURE 1 – ACCEPTABLE THRESHOLD

Figure 1 illustrates two features of possible trends in translation quality, as measured by SAE J2450: progressively lower scores and a tendency of scores to remain under a client's acceptable threshold.

SAE does not provide certification of SAE J2450 evaluators, nor does SAE regulate the use of the metric in client-provider relationships. Any requirements of providers in regards to SAE J2450 are contractual matters between clients and providers.

4.2 Overview for Evaluators

4.2.1 Materials Required

Evaluators must have the following items at hand in order to conduct an SAE J2450 evaluation:

- SAE J2450 Translation Quality Metric.
- Source and target language versions of the files.
- The client's glossary and/or any other agreed-upon glossaries, if available. The evaluator must be sure to use the same glossary and reference documentation used by the translation team.
- Any special instructions set by the client.

4.2.2 Qualifications

SAE J2450 states that an evaluator should have thorough knowledge of the metric, including the general comments as well as the categories.

An experienced translation company suggests these additional qualifications, which it seeks in new evaluators:

- Thorough knowledge of the source language and native fluency in the target language.
- Experience in evaluating translation work.
- Technical training and more than 5 years of experience as a specialized automotive translator.
- The ability to be objective and fair.

4.3 Training for Evaluators

4.3.1 General Comments

Refer to section 4.2 of SAE J2450, Guidelines for Evaluators, for detailed instructions on identifying and marking errors in text, and for scoring documents.

Experienced evaluators add these comments:

Essentially, the metric takes a functional approach. It measures the effect of a translation on the end user, in the intended environment. The metric measures linguistic errors only. It is designed for evaluation of translated service information, where style, tone and register are not as important as they might be for owner's manuals or marketing material.

One of the distinguishing features of this metric is the meta-rules. They ensure that all evaluators follow the same practice when an arbitrary choice is necessary, thus achieving greater consistency overall.

The two sub-categories – serious and minor – can suggest the effect of an error on the end user. If following incorrectly translated instructions could cause injury to a user, then the errors in question should be marked as “serious.” If the meaning of the text is substantially changed or obscured by a translation error, then the error is probably serious.

Remember at all times that, as an evaluator, you are not meant to hide, correct, or approve of errors. The goal of SAE J2450 is nothing more than to give a score to a translation. Deciding whether a translation is good or bad, or assessing the reason for errors, is beyond the task of an evaluator.

4.3.2 Quiz

This quiz offers evaluators an opportunity to test their knowledge of the error categories before looking at the Demonstration.

To which error category does each of the following descriptions refer?

- _____ 1. A graphic which contains source language text has been deleted from the target language deliverable.
- _____ 2. There is a superfluous or ‘extra’ block of text that has no relevance to the source text.
- _____ 3. A term is inconsistent with other translations of the source language term in the same document or type of document (unless the context for the source language term justifies the use of a different target language term).
- _____ 4. The target language text contains an error according to the punctuation rules for that language.
- _____ 5. A target language term is written in an incorrect or inappropriate writing system for the target language.
- _____ 6. The target language words are correct, but in the wrong linear order according to the syntactic rules of the target language.
- _____ 7. A translation denotes a concept in the target language that is different from the concept denoted by the source language.

1 – OM, 2 – ME, 3 – WT, 4 – PE, 5 – SP, 6 – SE, 7 – WM

4.3.3 Demonstration

The following pages are an illustration of the instructions given in section 4.2 of SAE J2450.

A typical repair procedure is considered. For the sake of simplicity, the text is presented in English only. Please consider the version “Mode Actuator Replacement – Correct” a flawless target-language rendering of this service procedure (for the purpose of this illustration, the source language is not relevant). The second version, “Mode Actuator Replacement – With Errors” is a target-language rendering that contains linguistic errors.

The section “Comments on errors” explains the rationale of the evaluator.

Finally, the Translation Metric Score Sheet (SAE J2450 Appendix A) is filled out, and the score of the document calculated.

4.3.3.1 Sample Text

Mode Actuator Replacement – Correct

Removal Procedure

1. Remove the knee bolster from the instrument panel. Refer to Knee Bolster Replacement in Instrument Panel, Gages and Console.

Important: Disconnect the I/P wiring harness clip from the I/P support bracket to help access the mode actuator screws.

2. Disconnect the I/P wiring harness clip from the I/P support bracket.
3. Disconnect the mode actuator electrical connector.

Important: Count the number of threads showing from the tip of the mode actuator push rod to the end of the retainer clip.

4. Open the mode actuator push rod retainer clip (1) with a small flat-bladed screwdriver.
5. Disconnect the mode actuator push rod (2) from the retainer clip (1).
6. Remove the mode actuator mounting screws.
7. Remove the mode door actuator.

Installation Procedure

1. Install the mode actuator.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the mode actuator mounting screws.

Tighten

Tighten the screws to 1.6 N·m (14 lb in).

Important: Align the counted number of threads on the mode actuator push rod (2) with the tip of the retainer clip (1).

3. Connect the mode actuator push rod (2) to the retainer clip (1).
4. Close the push rod retainer clip (1).
5. Connect the mode actuator electrical connector.
6. Connect the I/P wiring harness clip to the I/P support bracket.
7. Install the knee bolster. Refer to Knee Bolster Replacement in Instrument Panel, Gages and Console.
8. Recalibrate the actuators. Refer to Re-Calibrating Actuators.

Mode Actuator Replacement – With Errors

Removal Procedure

1. Remove the bolster (WT-m) from the instrument panel. Refer to Knee Bolster Replacement in Instrument Panel, Gauges and Console.

Important: Disconnect the I/P wiring harness clip from the I/P support bracket to help access the mode actuator screws.

2. Disconnect the I/P wiring harness clip from the I/P support bracket.
3. Disconnect the mode actuator electrical connector.

Important: Count the number of threads showing from the tip of the mode actuator push rod to the end of the retainer clip.

4. Open the mode actuator push rod retainer clip (1)____(OM-s).
5. Disconnect the mode actuator push rod (2) from the retainer clip (1).
6. Remove the mode actuator mounting screws.
7. Remove the the (ME-m) mode door actuator.

Installation Procedure

1. Install mode actuator.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant is (SE-s) identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the mode actuator mounting screws_(PE – m)

Tighten

Tighten the screws to 1.6 N·m (14 lb in).

Important: Count the number of aligned threads from the mode actuator push rod (2) to the tip of the retainer clip (1). (WM-s)

3. Connect the mode actuator push rod (2) to the retainer clip (1).
4. Close the push rod retainer clip (1).
5. Connect the mode actuator electrical connector.
6. Connect the I/P wiring harness clip to the I/P support bracket.
7. Install the knee bolster. Refer to Knee Bolster Replacement in Instrument Panel, Gauges (SP-m) and Console.
8. Recalibrate the actuators. Refer to Re-Calibrating Actuators.

Comments on Errors

bolster (WT-m): The correct term is “knee bolster.” The evaluator was uncertain whether this should be an Omission error or a Wrong Term error. In compliance to the meta-rule, the higher error category (WT) was chosen.

Open the mode actuator push rod retainer clip (1)___ (OM-s): The end of the sentence, “with a small flat-bladed screwdriver.” is missing. The evaluator felt that this omission of this detail would compromise a technician’s ability to perform the action, and chose a Serious weight.

the (ME-m): The repetition of “the” fits the Miscellaneous Error definition of superfluous text. The evaluator felt that this error did not obstruct meaning, and chose a Minor weight.

Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant is (SE-s) identified in the service procedure: The verb “is” does not agree with the plural subject, “fasteners.” The evaluator felt that this obscured the meaning, and chose a Serious weight.

_(PE – m): A period is omitted; the evaluator considered this Minor.

Count the number of aligned threads from the mode actuator push rod (2) to the tip of the retainer clip (1). (WM-s): The correct version instructs the technician to position the push rod, then count the threads. This version instructs the technician to count the threads without giving instructions on how to position the pushrod. The use of “aligned” in this version does not make sense. The evaluator felt that there was no way to glean the correct instruction from this version of the sentence, and chose a Serious weight.

Gauges (SP-m): The client glossary spells the term as “Gages.”

4.3.3.2 Translation Metric Score Sheet

Error Type	Num * Serious		Num * Minor	Category Weighted Score
Wrong Term Score WT	<u> </u> x 5	+	<u>1</u> x <u>2</u>	= 2
Wrong Meaning Score WM	<u>1</u> x 5	+	<u> </u> x 2	= 5
Omission Score OM	<u>1</u> x 4	+	<u> </u> x 2	= 4
Structural Error Score SE	<u>1</u> x 4	+	<u> </u> x 2	= 4
Misspelling Score SP	<u> </u> x 3	+	<u>1</u> x <u>1</u>	= 1
Punctuation Error Score PE	<u> </u> x 2	+	<u>1</u> x <u>1</u>	= 1
Miscellaneous Error Score ME	<u> </u> x 3	+	<u>1</u> x <u>1</u>	= 1

Document Score: (sum of weighted scores / number of words in source language document)

2 + 5 + 4 + 4 + 1 + 1 + 1 = **18** Sum of Weighted Scores

18 Sum of Weighted Scores / 329 Number of Words in Source Text =

0.055 Overall Document Weighted Score

Please note that it is possible for a company to develop software to tag errors and calculate scores for electronic text files. However, SAE J2450 gives instructions for working with the lowest technical denominator, paper, and it is this practice that is illustrated above.

Also note: The demonstration and practice texts should help evaluators develop the basic techniques for scoring documents. True expertise will come with time and repetition.

4.3.4 Exercise

Please choose a set of Practice Texts from the Appendix and evaluate them according to SAE J2450.

The focus for this training documentation is to provide training guidelines and hands-on experience in the application of the 7 primary error categories of the SAE J2450. By design, the application of serious and minor sub categories has been omitted in the general practice samples.

Those who have interest in practicing assigning these sub-categories may compare their results to those of an experienced evaluator, as marked up in designated samples. We recognize that the serious or minor designation is always a judgment call by the evaluator. In real world situations, the client may also provide some guidance depending on the safety aspects of the content that has been translated. The metric itself provides the following instruction: *While it is virtually impossible to define the notion of a serious or minor error, as a general guideline the metric states that if an error is clearly serious in its consequences for a technician or its effect on the meaning of the translation, then it should be marked as serious. If not, then it should be sub-classified as minor. It is a natural and expected consequence that there will be cases when an evaluator hesitates in this choice. Whenever this is the case, the general guideline is that the evaluator should sub-classify the error as serious.*

4.4 FAQ

Q. Who conducts the evaluations?

A. This is the decision of the client. The client may conduct in-house evaluation; the translation provider may conduct evaluation as part of the deliverable; or a third party might be brought in to conduct evaluation.

Q. How does an evaluator know that his error classifications are correct?

A. The error category descriptions in SAE J2450 are precise. However, the metric states “Both the primary (category) and secondary (serious/minor) classification are judgment calls by the editor.”

In other words, even experienced evaluators may differ on the classifications of some errors.

The meta-rules provide for situations where an error is difficult to categorize or weigh. Over time, an evaluator will tend to become consistent in error classification.

Q: Can different SAE J2450 evaluators examining the same translated text give similar scores to that text?

A: Yes, experienced evaluators should generate similar scores. Of course, familiarity with SAE J2450 and the degree to which the evaluators are consistent in the application of the meta-rules will play a role. Use of a glossary of terms would improve consistency of the evaluations.

Q. Should an evaluator mark and score each occurrence of a repeated error?

A. Yes.

Q. But if an error is repeated several times in a document, marking each instance makes for a very high score. A document with ten repetitions of a minor error would have a higher score than a document with one truly serious error. Is this sensible?

A. Yes. There are two reasons:

First, if a wrong term is used nine times out of ten in document A, but only once out of ten times in document B, the documents are not equivalent in terms of quality. An accurate metric cannot ignore this disparity.

Second, recording only token instances of a particular error would complicate the work of the evaluator. Following SAE J2450 as it is written, an evaluator marks each error as it is discovered. Marking only token instances, the evaluator would not only have to keep track of whether a particular error already occurred, but also whether the occurrences were truly identical. This would make use of SAE J2450 very cumbersome, and the evaluator's efforts would have as much to do with his own record keeping as with the quality of the translated text.

This principle holds true whether samples or entire texts are evaluated:

- Clients who use sampling often use SAE J2450 scores to infer the quality of millions of words of translated text. An individual error that occurs once in the sample is less likely to be found elsewhere than an error that occurs nine or ten times in the sample.
- For clients who evaluate each document with SAE J2450, repetitive errors are the most visible. Marking each instance of a minor error accounts for the error's impact on overall quality.

Q. Why does a repeated Wrong Term error add to the score every time it occurs? Doesn't this penalize consistency?

A. The objective of SAE J2450 is to measure the quality of translated text. The notion of "penalizing consistency" has to do with the process, not the product. A higher-than-normal score indicates a higher-than-normal number of errors in a given text. How the text got that way, and whether the person who used the wrong term deserves censure, is beyond the scope of the metric.

Q. Why is the weight of a Serious Wrong Term error greater than the weight of a Serious Omission error?

A. A wrong term can be more harmful to the quality of translated information. SAE J2450 attempts to measure the impact of an error on the end user. The reader can more readily discern that a passage is missing text than recognize a poor word choice. An omission error has the potential to halt the progress of a reader. A wrong term has the potential to mislead the reader, perhaps to a risky mistake.

To be sure, there are extreme cases where an omission would not be obvious to a reader and its effect could be very grave, indeed (for example, omission of a warning to work in a well-ventilated place). On the whole, however, wrong terms are more likely to be misleading.

Q. Why isn't there a mistranslation category?

A. SAE J2450 states, "Any error in a translation is regarded as a mistranslation, potentially affecting the meaning of the target text." The categories of this translation quality metric categorize linguistic errors more precisely.

Q. Can an evaluator assign more than one error per sentence?

A. Yes.

Q. Should an evaluator mark errors of formatting, and if so, in which error category do they belong?

A. No. These are non-linguistic errors, and therefore beyond the scope of SAE J2450.

Q. Should an error be marked if it is due to faulty source text?

A. Yes. As it is written, SAE J2450 is a tool for measuring the quality of the translated deliverable. It states, "Errors in the target text that are caused by source language errors or ambiguities are still errors in the target text." The metric evaluates the translated text as an independent product.

The presence of an error impacts the end user; the cause of the error is not relevant. If a misspelling occurs in the translated text, for example, it does not necessarily matter to a service technician whether the source material had a misspelling, as well.

The client may certainly choose to analyze the cause of errors, but this is outside the scope of SAE J2450.

Q. Why doesn't SAE J2450 take the quality of the source-language text into account?

A. An error in the source does not mean that the translated text will also have an error.

Consider this example of incorrect punctuation in a source text: "Were there any missing components." The grammar indicates that this sentence should be punctuated as a question. A correct translation into French, for example, would be "Des composants manquaient-ils?" If the translator ended this sentence with a period, it would have a punctuation error.

Another example: Many languages have common orthographic errors. The sentence "Were their any missing components?" is nonsensical in English. A literal rendering in a translation (if such a feat could be accomplished) would make little sense. Such a rendering would be an error that could inhibit the usefulness of the text for the end user, and it should be marked as such. One might speculate, however, that most translators would be easily capable of substituting the correct "there" for "their," and would translate accordingly.

5. NOTES

5.1 Marginal Indicia

A change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document, including technical revisions. Change bars and (R) are not used in original publications, nor in documents that contain editorial changes only.

PREPARED BY THE SAE J2450 QUALITY METRIC FOR LANGUAGE TRANSLATION/SERVICE INFORMATION
TASK FORCE OF THE SAE VEHICLE E/E SYSTEMS DIAGNOSTIC STANDARDS COMMITTEE

APPENDIX A - PRACTICE TEXTS

Section 4.3.3 has a detailed monolingual example of service information text that is tagged for SAE J2450 errors and scored.

This appendix contains samples of service information text in six language pairs:

- English – Canadian French
- English – European French
- English – European Spanish
- English – Mexican Spanish
- English – German
- English – Dutch

Each language pair has a glossary and five sample texts. The samples contain the following:

- The source language text
- The target language text
- Another copy of the target language texts, with the errors identified and tagged by an experienced SAE J2450 evaluator. Comments are included where available. For most of the texts, errors are indicated by category only; they are not classified by serious or minor designation.

A new evaluator can try his hand at marking and scoring the target language text, then compare his results to those of the experienced evaluator.

SAE J2450, Appendix A, has a blank copy of a score sheet, which may be used for this exercise.

Please note: SAE J2450 clearly defines error categories, but the existence of the metarules acknowledges that there will often be room for judgment. Two experienced evaluators may categorize an error differently. However, studies conducted by the SAE J2450 Task Force indicate that on the whole, over time, evaluators tend to make the same decisions about errors.

Therefore, a new evaluator may delineate and categorize errors in these practice texts differently than the experienced evaluators. This does not necessarily make his choices “wrong.” If his choices differ significantly, it might be interesting for him to revisit these practice texts after he has gained more experience. Chances are that he will find less divergence.

A.1 ENGLISH – CANADIAN FRENCH

Glossary

close out panel	panneau de fermeture
control arm	bras de suspension
drive tires	roues motrices
electrical connector	connecteur électrique
engine protection shield	écran de protection du moteur
inflatable restraint	dispositif de protection gonflable
pitman arm	biellette pendante
rear axle	essieu arrière
rear compartment lid	couvercle de coffre
stabilizer shaft link	bielle de stabilisateur
steering linkage	tringlerie de direction
tire chain	chaîne de pneu
wiring harness	faisceau de câblage

Practice Text 1 – Source

Wiring Harness Replacement – Rear Compartment Lid

Removal Procedure

1. Open the rear compartment lid.
2. Remove the rear compartment lid trim panel. Refer to Compartment Lid Trim Replacement – Rear.
3. Remove the electrical connector from the rear compartment lid latch.
4. Remove the electrical connector from the back up lamp.
5. Remove the electrical connector from the high mounted stoplamp.
6. Pull the wiring harness (2) to disengage the push in retainers (3) from the rear compartment lid (1).
7. Remove the left hinge close out panel (1) to access the wiring harness (2).
8. Remove the clip (5) from the rear compartment lid hinge.
9. Pull the wiring harness (3) to disengage the push in retainers (4) from the rear compartment lid hinge.

Installation Procedure

1. Press the wiring harness (3) to engage the push in retainers (4) to the rear compartment lid hinge (2).
2. Install the clip (5) to the rear compartment lid hinge.
3. Install the left hinge close out panel (1) to rear compartment lid hinge (2).
4. Press the wiring harness (2) to engage the push in retainers (3) to the rear compartment lid (1).
5. Connect the electrical connector to the high mounted stoplamp.
6. Connect the electrical connector to the back up lamp.
7. Connect the electrical connector to the rear compartment lid latch.
8. Install the rear compartment lid trim panel. Refer to Compartment Lid Trim Replacement – Rear.
9. Close the rear compartment lid.

Practice Text 1 – Target

Remplacement de faisceau de câblages – Couvercle de compartiment arrière

Procédure de dépose

1. Ouvrir le coffre.
2. Enlever le panneau du couvercle du compartiment arrière. Se reporter à Remplacement de garnissage de couvercle de compartiment – Avant.
3. Débrancher le connecteur électrique du loquet du couvercle du compartiment arrière.
4. Débrancher le connecteur électrique du feu de recul.
5. Débrancher le connecteur électrique du feu de freinage surélevé.
6. Tirer le faisceau électrique (2) pour dégager les dispositifs de retenue à poussoir (3) du coffre (1).
7. Retirer le panneau de fermeture de la charnière gauche (1) pour accéder au faisceau électrique (2).
8. Enlever l'attache (5) de la penture du coffre.
9. Tirer le faisceau électrique (3) pour dégager les dispositifs de retenue à poussoir (4) de la charnière du coffre.

Procédure d'installation

1. Appuyez sur le faisceau électrique (3) pour engager les dispositifs de retenue à poussoir (4) sur la charnière du coffre (2).
2. Installer l'attache (5) sur la charnière du couvercle du coffre.
3. Installer le panneau de fermeture de la charnière gauche (1) sur la charnière du couvercle de coffre (2).
4. Appuyer sur le faisceau électrique (2) pour engager les dispositifs de retenue à poussoir (3) sur le coffre (1).
5. Brancher le connecteur électrique, sur le feu de freinage surélevé.
6. Brancher le connecteur électrique sur le feu de stationnement.
7. Brancher le connecteur électrique sur le loquet du couvercle du compartiment arrière.
8. Installer le panneau de garniture du couvercle du compartiment arrière. Se reporter à Remplacement de garnissage de couvercle de compartiment – Arrière.
9. Refermer le couvercles de coffre.

Practice Text 1 – Target with Markup

Remplacement de [SE] faisceau de câblages [SE] – Couvercle de compartiment arrière

Procédure de dépose

1. Ouvrir le coffre.
2. Enlever le panneau [OM] du couvercle du compartiment arrière [WT]. Se reporter à Remplacement de garnissage [WT] de couvercle de compartiment – Avant [WM].
3. Débrancher le connecteur électrique du loquet du couvercle du compartiment arrière.
4. Débrancher le connecteur électrique du feu de recul.
5. Débrancher le connecteur électrique du feu de freinage surélevé.
6. Tirer le faisceau électrique (2) pour dégager les dispositifs de retenue à poussoir (3) du coffre [WT] (1).
7. Retirer le panneau de fermeture de la charnière gauche (1) pour accéder au faisceau électrique (2).
8. Enlever l'attache (5) de la penture [WT] du coffre.
9. Tirer le faisceau [SP] électrique (3) pour dégager les dispositifs de retenue à poussoir (4) de la charnière du coffre.

Procédure d'installation

1. Appuyez [ME] sur le faisceau électrique (3) pour engager les dispositifs de retenue à poussoir (4) sur la charnière du coffre (2).
2. Installer l'attache (5) sur la charnière du couvercle du coffre.
3. Installer le panneau de fermeture de la charnière gauche (1) sur la charnière du couvercle de coffre (2).
4. Appuyer sur le faisceau électrique (2) pour engager [SP] les dispositifs de retenue à poussoir (3) sur le coffre [WT] (1).
5. Brancher le connecteur électrique, [PE] sur le feu de freinage surélevé.
6. Brancher le connecteur électrique sur le feu de stationnement [WM].
7. Brancher la [SE] connecteur électrique sur le loquet du couvercle du compartiment arrière.
8. Installer le panneau de garniture du couvercle du compartiment arrière. Se reporter à Remplacement de garnissage [WT] de couvercle de compartiment – Arrière [ME].
9. Refermer le couvercles [SE] de coffre.

Practice Text 1 – Target Text Marked with Error Sub-Categories

Remplacement de [SEm] faisceau de câblages [SEm] – Couvercle de compartiment arrière

Procédure de dépose

1. Ouvrir le coffre.
2. Enlever le panneau [OMs] du couvercle du compartiment arrière [WTm]. Se reporter à Remplacement de garnissage [WTm] de couvercle de compartiment – Avant [WMs].
3. Débrancher le connecteur électrique du loquet du couvercle du compartiment arrière.
4. Débrancher le connecteur électrique du feu de recul.
5. Débrancher le connecteur électrique du feu de freinage surélevé.
6. Tirer le faisceau électrique (2) pour dégager les dispositifs de retenue à poussoir (3) du coffre [WTm] (1).
7. Retirer le panneau de fermeture de la charnière gauche (1) pour accéder au faisceau électrique (2).
8. Enlever l'attache (5) de la penture [WTs] du coffre.
9. Tirer le faisceau [SPm] électrique (3) pour dégager les dispositifs de retenue à poussoir (4) de la charnière du coffre.

Procédure d'installation

1. Appuyez [MEM] sur le faisceau électrique (3) pour engager les dispositifs de retenue à poussoir (4) sur la charnière du coffre (2).
2. Installer l'attache (5) sur la charnière du couvercle du coffre.
3. Installer le panneau de fermeture de la charnière gauche (1) sur la charnière du couvercle de coffre (2).
4. Appuyer sur le faisceau électrique (2) pour angager [SPm] les dispositifs de retenue à poussoir (3) sur le coffre [WTm] (1).
5. Brancher le connecteur électrique, [PEm] sur le feu de freinage surélevé.
6. Brancher le connecteur électrique sur le feu de stationnement [WMs].
7. Brancher la [SEm] connecteur électrique sur le loquet du couvercle du compartiment arrière.
8. Installer le panneau de garniture du couvercle du compartiment arrière. Se reporter à Remplacement de garnissage [WTm] de couvercle de compartiment – Arrière [MEM].
9. Refermer le couvercles [SEm] de coffre.

Practice Text 2 – Source

Tire Chain Usage Description

When you use tire chains, most current vehicles require the following chain types:

- SAE Class S or 1100 Series, Type PL tire chains (1)
- SAE Class U or 1200 Series, Type P tire chains (2)
- 1800 Series Lug Reinforced tire chains (3)

These chains are specially designed in order to limit the fly-off effect that occurs when the wheel rotates.

Manufacturers of tire chains have a specific chain size for each tire size. These ensure a proper fit when the chains are installed. Purchase the correct chains for the tires on which the chains will be used. Do not use rubber adjusters to take up slack in chains that are loose due to incorrect size. Always follow the chain manufacturer's installation instructions.

The use of chains may adversely affect handling. When using chains, remember the following information:

- Ensure that the vehicle is designed for chain clearance.
- Adjust the speed to road conditions.
- Avoid sharp turns.
- Avoid locked-wheel braking in order to prevent chain damage to the vehicle.
- Install the chains as tightly as possible on the drive tires. Tighten the chains again after driving 0.4-0.8 km (0.25-0.5 mi). Do not use chains on the non-drive tires. These chains may contact and damage the vehicle. If you use chains on the non-drive tires, ensure that there is enough clearance.
- Do not exceed 70 km/h (45 mph). Do not exceed the chain manufacturer's speed limit, if lower.
- Drive in a restrained manner. Avoid large bumps, potholes, severe turns, and other maneuvers that cause the tires to bounce up and down.
- Follow any other instructions from the chain manufacturer that do not disagree with the above.

Practice Text 2 – Target

Description d'utilisation des chaînes des pneus

En utilisant des chaînes antineiges, la plupart des véhicules courants requièrent les chaînes de types suivants:

- SAE Classe S ou Série 1100, Type chaînes antineige PL (1)
- SAE Classe U ou Série 1200, Type chaînes antineige P (2)
- 1800 Série Lug chaînes antineige renforcés (3)

Ces chaînes sont spécialement conçues pour limiter l'effet de force centrifuge lors de la rotation des roues.

Les fabricants de chaînes antineige ont des tailles approximatives de chaînes pour chaque taille de pneu. Ceci permet de s'assurer d'un ajustement approprié lorsque les chaînes sont installées. Acheter les chaînes appropriées pour les pneus sur lesquelles elles seront utiliser. Ne pas utiliser les dispositifs de réglage en caoutchouc pour réduire le mou dans les chaînes qui ne sont pas de la bonne dimension. Toujours suivre les instructions de montage du fabricant des chaînes antineige.

L'utilisation peut affecter de manière négative la tenue de route. Lors de l'utilisation des chaînes, se rappeler des informations suivantes:

- S'assurer que le véhicule a un dégagement pour les chaînes
- Ajuster la vitesse du véhicule aux conditions routières.
- Éviter les virages larges.
- Éviter de freiner en bloquant, les roues afin d'éviter que la chaîne n'endommage le véhicule.
- Installer les chaînes aussi serrées que possible sur les roues motrices. Serrer les chaînes à nouveau après avoir roulé 0.4–0.8 km. Ne pas utiliser les chaînes sur les roues non-motrices. Ces chaînes peuvent entrer en contact avec le véhicule et l'endommager. Si vous utilisez des chaînes sur les pneus de roues non motrices, assurez-vous qu'il y a suffisamment de dégagement.
- Ne pas outrepasser 70 km/h. Ne pas dépasser la limite de vitesse recommandée par le fabricant de chaîne, si elle est inférieure.
- Conduire avec prudence. Éviter les bosses, les nids de poules, les virages serrés et toute autre manoeuvre qui fait rebondir le pneu.
- Suivre toutes les directives du fabricant de chaînes qui ne soient pas en désaccord avec les directives ci-dessus.

Practice Text 2 – Target with Markup

Description d'utilisation des chaînes des pneus

En utilisant des chaînes antenneige [WT] [SE], la plupart des véhicules courants requièrent les chaînes de types suivants:

- SAE Classe [SP] S ou Série [SP] 1100, Type [SP] chaînes antenneige [WT] PL (1)
- SAE Classe [SP] U ou Série [SP] 1200, Type [SP] chaînes antenneige [WT] P (2)
- 1800 Série [SP] Lug [WT] chaînes antenneige [WT] renforcés [SE] (3)

Ces chaînes sont spécialement conçues pour limiter l'effet de force centrifuge lors de la rotation des roues [SE].

Les fabricants de chaînes antenneige [WT] ont des tailles approximatives [WM] de chaînes pour chaque taille de pneu. Ceci permet de s'assurer d'un ajustement approprié lorsque les chaînes sont installées. Acheter les chaînes appropriées pour les pneus sur lesquelles [SE] elles seront utiliser [SE]. Ne pas utiliser les dispositifs de réglage en caoutchouc pour réduire le mou dans les chaînes qui ne sont pas de la bonne dimension. Toujours suivre les instructions de montage du fabricant des chaînes antenneige [WT].

L'utilisation peut affecter [WT] de manière négative la tenue de route. Lors de l'utilisation des chaînes, se rappeler des [SE] informations [WT] suivantes:

- S'assurer que le véhicule a un dégagement pour les chaînes [PE]
- Ajuster [WT] la vitesse du véhicule aux conditions routières.
- Éviter les virages larges [WM].
- Éviter de freiner en bloquant, [PE] les roues afin d'éviter que la chaîne n'endommage le véhicule.
- Installer les chaînes aussi serrées que possible sur les roues motrices. Serrer les chaînes à nouveau [SE] après avoir roulé 0.4–0.8 km [SP]. Ne pas utiliser les chaînes sur les roues non-motrices [SP]. Ces chaînes peuvent entrer en contact avec le véhicule et l'endommager. Si vous utilisez des chaînes sur les pneus de roues non motrices, assurez-vous qu'il y a suffisamment de dégagement.
- Ne pas outrepasser [WT] 70 km/h. Ne pas dépasser la limite de vitesse recommandée par le fabricant de chaîne [SE], si elle est inférieure.
- Conduire avec prudence. Éviter les bosses [OM], les nids de poules, les virages serrés et toute autre manoeuvre qui fait rebondir le pneu.
- Suivre toutes les directives du fabricant de chaînes qui ne soient [SE] pas en désaccord avec les directives ci-dessus.

Practice Text 3 – Source

Inflatable Restraint Steering Wheel Module Coil – Assemble – Off Vehicle Manual Tilt

1. Install the wave washer (1) to the race and upper shaft assembly (2).
2. To install the inflatable restraint steering wheel module coil: Align the block tooth on the race and upper shaft assembly (1) to the 12 o'clock position.
3. When reusing the original inflatable restraint steering wheel module coil, refer to the centering procedure Inflatable Restraint Coil Centering – Off Vehicle before assembly.
4. The new inflatable restraint steering wheel module coil will be precentered. Pull the tab and remove. Do not depress the tab (1) on the back of the inflatable restraint steering wheel module coil.
5. Align the inflatable restraint steering wheel module coil (1) with the horn tower on the turn signal cancel cam assembly (2).

Important

The retaining ring (1) must seat securely on the groove of the race and upper shaft assembly (2).

6. Install the retaining ring (1).
7. Route the lower inflatable restraint steering wheel module coil wires along the steering column jacket assembly.
8. Install the black inflatable restraint steering wheel module coil connector (2) to the fused jumper assembly connector (1).
9. Install the wire harness assembly (1) into the wire harness strap (2).
10. Install the 2 wire harness straps (2). Install the wire harness strap (2) to the steering column tilt head assembly (1).
11. Install the upper and lower trim covers. Refer to Steering Column Trim Covers – Assemble – Off Vehicle.

Practice Text 3 – Target

Bobine du module du dispositif de protection gonflable du volant – montage – hors du véhicule Dispositif d'inclinaison manuel

1. Installer la rondelle ondulé (1) sur l'ensemble de bague et arbre supérieur (2).
2. Installer la du module de sac gonflable du volant: Amener la dent de l'ensemble bague de roulement et arbre supérieur (7) à la position 12 heures.
3. En cas de réutilisation de la bobine originale du module de sac gonflable intégré au volant, se reporter à la procédure de centrage Bobine de centrage du dispositif de protection gonflable – hors du véhicule avant assemblage.
4. La nouvelle bobine du module de dispositif supplémentaire de protection intégré au volant sera pré-centrée. Tirer de la patte et l'enlever. Ne pas enfoncer la patte (1) située à l'arrière de la bobine du module de sac gonflable intégré au volant.
5. Aligner le module de dispositif supplémentaire de protection intégré au volant (1) avec le contacteur de klaxon sur la came d'annulation de l'indicateur de direction (2).

Important

L'anneau élastique (1) doit se caler à fond dans la rainure de la bague et de l'ensemble demi-axe supérieur (2).

6. Poser l'anneau élastique (1).
7. Faire passer les fils intérieurs de bobine du module de sac gonflable intégré au volant le long de l'enveloppe de colonne de direction.
8. Installez le connecteur (2) de la bobine du module de dispositif supplémentaire de protection intégré au volant sur le connecteur (1) du fil, volant avec fusible.
9. Installer le faisceau de câblage (1) dans la sangle de faisceau de câblage (2).
10. Installer les 2 sangles de faisceau de fils (2). Démonter la sangle de faisceau de câblage (2) sur la tête inclinable de colonne de direction (1).
11. Installer les couvercles de garniture supérieur et inférieur. Se reporter à Remplacement des couvercles de garniture de colonne de direction – montage – hors du véhicule.

Practice Text 3 – Target with Markup

Bobine du module du dispositif de protection gonflable du volant – montage – hors du véhicule Dispositif [SP] d'inclinaison manuel [SE]

1. Installer la rondelle ondulé [SE] (1) sur l'ensemble de [SE] bague et arbre supérieur (2).
2. Installer la ____ [OM] du module de sac gonflable [WT] du volant: Amener la dent de l'ensemble bague de roulement et arbre supérieur (7) [WT] à la position 12 heures.
3. En cas de réutilisation de la bobine originale du module de sac gonflable [WT] intégré au volant, se reporter à la procédure de centrage Bobine de centrage du dispositif de protection gonflable – hors du véhicule avant assemblage.
4. La nouvelle bobine du module de dispositif supplémentaire de protection [WT] intégré au volant sera pré-centrée. Tirer de la patte [WM] et l'enlever. Ne pas enfoncer la patte (1) située à l'arrière de la bobine du module de sac gonflable [WT] intégré au volant.
5. Aligner le module de dispositif supplémentaire de protection [WT] intégré au volant (1) avec le contacteur de klaxon sur la camme [SP] d'annulation de l'indicateur de direction (2).

Important

L'anneau élastique (1) doit se caler à fond dans la rainure de la bague et de l'ensemble demi-axe [WT] supérieur (2).

6. Poser l'anneau élastique (1).
7. Faire passer les fils intérieurs [SP] de bobine du module de sac gonflable [WT] intégré au volant le long de l'enveloppe de colonne de direction.
8. Installez [ME] le connecteur ____ [OM] (2) de la bobine du module de dispositif supplémentaire de protection [WT] intégré au volant sur le connecteur (1) du fil₁ [PE] volant avec fusible.
9. Installer le faisceau de câblage (1) dans la sangle de [SE] faisceau de câblage (2).
10. Installer les 2 sangles de faisceau de fils (2). Démonter [WM] la sangle de faisceau de câblage (2) sur la tête inclinable de colonne de direction (1).
11. Installer les couvercles de garniture supérieur et inférieur. Se reporter à Remplacement des couvercles de garniture de colonne de direction – montage – hors du véhicule.

Practice Text 4 – Source

Rear Axle Lower Control Arm Replacement

Tools Required

J 24319-B Universal Steering Linkage Puller

Removal Procedure

1. Remove the rear support. Refer to Support Replacement.
2. Remove the stabilizer shaft link. Refer to Stabilizer Shaft Link Replacement.
3. Remove the adjustment link retaining nut from the lower control arm.
4. Using J 24319-B separate the adjustment link from the lower control arm. Remove the wheel bearing and hub from the lower control arm. Refer to Wheel Bearing/Hub Replacement – Rear.
5. Remove the lower control arm mounting bolts and nuts.
6. Remove the lower control arm.

Installation Procedure

1. Install the lower control arm to the support.

Important

The control arm nuts should be tightened with the vehicle unsupported and resting on the wheels at the normal trim height.

2. Install the lower control arm mounting bolts and nuts.
3. Install the wheel bearing and hub. Refer to Wheel Bearing/Hub Replacement – Rear.
4. Install the adjustment link to the lower control arm.
5. Install the adjustment link retaining nut.

Tighten

Tighten the adjustment link retaining nuts to 75 N·m (55 lb ft).

6. Install the stabilizer shaft link. Refer to Stabilizer Shaft Link Replacement.
7. Install the rear support. Refer to Support Replacement.
8. Lower the vehicle to obtain the trim height.

Tighten

Tighten the lower control arm mounting nuts to 106 N·m (78 lb ft).

Practice Text 4 – Target

Échange de bras de direction inférieur arrière

Outils nécessaires

J 24319-B Extracteur universel de tringlerie de direction

Procédure de dépose

1. Retirer le support arrière. Se reporter à Échange de support.
2. Enlever le raccord de l'arbre stabilisateur. Se reporter à Échange de tringlerie d'arbre de stabilisateur.
3. Retirer l'écrou de retenue de l'entretoise de réglage du bras inférieur de suspension.
4. À l'aide de J 24320-C, détacher la biellette de direction du bras de suspension inférieur. Retirer le roulement et le moyeu de roue du bras inférieur de suspension. Se reporter à Échange roulement/moyeu roué – arrière.
5. Enlever les boulons et les écrous de fixation du bras de suspension inférieurs.
6. Enlevez le bras inférieur de suspension.

Procédure d'installation

1. Démonter le bras inférieur de suspension sur le support.

Important

Les écrous de bras de suspension devraient être serrer avec le véhicule non supporté et reposant sur les roues à la hauteur d'assiette normale.

2. Installer les boulons de fixation du bras inférieur de suspension.
3. Installer le palier et le moyeu de la roue. Se reporter à Échange de roulement/moyeu de roué – arrière.
4. Installer l'articulation de réglage sur le suspension inférieur.
5. Installer l'écrou de retenue de l'articulation de réglage.

Serrer

Serrer les écrous de retenue de l'entretoise de réglage jusqu'à 15 N·m.

6. Installer le raccord de l'arbre stabilisateur. Se reporter à Échange de tringlerie d'arbre de stabilisateur.
7. Installer le support arrière. Se reporter à Échange de support.
8. Abaisser le véhicul pour obtenir la hauteur d'assiette.

Serrer

Serrer les écrous de montage du bras inférieur de suspension jusqu'à 106 lb-po.

Practice Text 4 – Target with Markup

Échange [WT] de bras de direction [WT] inférieur arrière [OM]

Outils nécessaires

J 24319-B Extracteur universel de tringlerie de direction [SE]

Procédure de dépose

1. Retirer le support arrière. Se reporter à Échange [WT] de support [ME].
2. Enlever le raccord [WT] de l'arbre stabilisateur [WT]. Se reporter à Échange [WT] de tringlerie [WT] d'arbre de stabilisateur [ME].
3. Retirer l'écrou de retenue de l'entretoise [WT] de réglage du bras inférieur de suspension.
4. À l'aide de J 24320-C [WT], détacher la biellette de direction du bras de suspension inférieur. Retirer le roulement et le moyeu de roue du bras inférieur de suspension. Se reporter à Échange [WT] roulement/moyeu roué [SP] – arrière.
5. Enlever les boulons et les écrous de fixation du bras de suspension inférieurs [SE].
6. Enlevez [ME] le bras inférieur de suspension.

Procédure d'installation

1. Démonter [WM] le bras inférieur de suspension sur le support.

Important

Les écrous de bras de suspension devraient être serrer [SE] avec le véhicule non supporté et reposant sur les roues à la hauteur d'assiette normale.

2. Installer les boulons [OM] de fixation du bras inférieur de suspension.
3. Installer le palier et le moyeu de la roue. Se reporter Se reporter à Échange [WT] roulement/moyeu roué [SP] – arrière.
4. Installer l'articulation de réglage sur le ____ [OM] suspension inférieur.
5. Installer l'écrou de retenue de l'articulation de réglage.

Serrer [PE]

Serrer les écrous de retenue de l'entretoise [WT] de réglage jusqu'à 15 N·m [WT].

6. Installer le raccord [WT] de l'arbre stabilisateur [WT]. Se reporter à Échange [WT] de tringlerie [WT] d'arbre de stabilisateur [ME].
7. Installer le support arrière. Se reporter à Échange [WT] de support [ME].
8. Abaisser, [PE] le véhicul [SP] pour obtenir la hauteur d'assiette.

Serrer [PE]

Serrer les écrous de montage du bras inférieur de suspension jusqu'à 106 lb-po [WT].



Practice Text 5 – Source

Pitman Arm Replacement 4WD

Tools Required

J 6632-01 Pitman Arm Puller

J 29193 Steering Linkage Installer (12 mm)

J 29194 Steering Linkage Installer (14 mm)

J 29107-A Universal Pitman Arm Puller

J 24319-B Universal Steering Linkage Puller

J 24319-B Extracteur universel de tringlerie de direction

Removal Procedure

1. Raise the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove the engine protection shield, if equipped. Refer to Engine Protection Shield Replacement in Frame and Underbody.
3. Remove the relay rod nut (8) from the pitman arm ball stud (2). Do not reuse the nut.

Notice

Do not hammer on the pitman arm, pitman arm shaft or puller. Damage to the pitman arm or steering gear may result.

4. Use the J 24319-B in order to remove the relay rod from the pitman arm ball stud.
5. Remove the power steering gear. Refer to Power Steering Gear Replacement in Power Steering System. Mark the pitman arm and the pitman shaft in order to ensure the proper alignment at assembly.
6. Remove the pitman arm nut.
7. Use the J 29107-A or J 6632-01 in order to remove the pitman arm from the steering gear pitman shaft.
8. Inspect the ball stud threads for damage.
9. Inspect the ball stud seals for excessive wear.
10. Clean the threads on the ball stud.

Installation Procedure

1. Install the pitman arm on the pitman shaft.
2. Align the marks made at the removal on the pitman arm and the pitman arm shaft.
3. Install a new pitman arm nut.
4. Install the power steering gear. Refer to Power Steering Gear Replacement in Power Steering System.
5. Install the relay rod (9) to the pitman arm ball stud.
6. Ensure the seal is on the stud. Install the J 29193 or the J 29194.
7. Remove the J 29193 or the J 29194.
8. Install the new relay rod prevailing torque nut.
9. Install the engine protection shield, if equipped. Refer to Engine Protection Shield Replacement in Frame and Underbody.
10. Lower the vehicle.
11. Check the wheel alignment. Refer to Measuring Wheel Alignment in Wheel Alignment.

Practice Text 5 – Target

Échange biellette pendante Transmission automatique à 4 roues motrices

Outils nécessaires

J 6632-01 Extracteur de bielle pendante.

Outil de pose (12 mm) de la tringlerie de direction J 29193.

Outil de dépose (14 mm) de la tringlerie de direction J 29194.

Extracteur universel de bielle pendante J 29107-V

J 24319-B Extracteur universel de tringlerie de direction

Procédure de pose

1. Soulever le véhicule. Se reporter à Lavage sur pont et sur cric du véhicule sous la rubrique Généralités.
2. Retirer l'écran de protection du moteur, le cas échéant. Se reporter à Échange du bouclier moteur sous la rubrique Cadre et soubassement de carrosserie.
3. Retirez l'écrou de la barre d'accouplement (8) du pivot à rotule (2) de la bielle pendante. Ne pas réutiliser l'écrou.

Mode d'emploi

Ne pas donner des coups de marteau sur la bielle pendante, sur l'arbre de la bielle pendante ou sur l'extracteur. Un endommagement de la bielle pendante ou de l'engrenage de direction peut en découler.

4. À l'aide d'un J 24319-B, retirer la barre d'accouplement du pivot à rotule de la bielle pendante.
5. Enlever le boîtier de direction assistée. Se reporter à Échange d'engrenage direct assistée sous la rubrique Direction assistée. Marquer des repères sur la bielle pendante et sur son arbre, pour pouvoir les aligner convenablement au moment de leur assemblage.
6. Retirer l'écrou de la bielle pendante.
7. Utiliser le J 29107-A ou le J 6632-01 pour retirer la bielle pendante de l'arbre de bielle du boîtier de direction.
8. Vérifier si les filets du pivot à rotule sont endommagés.
9. Vérifier si les joints du pivot à rotule ne montrent pas de signes d'usures excessives.
10. Nettoyer les filets du pivot à rotule.

Procédure d'installation

1. Poser la bielle pendante à l'arbre de la bielle.
2. Aligner les points de repère marqués au moment de l'enlèvement de la bielle pendante et de son arbre.
3. Poser un nouvel écrou bielle pendante.
4. Poser le boîtier de direction assistée. Se reporter à Échange d'engrenage direct assistée sous la rubrique Direction assistée.
5. Installer la barre d'accouplement (6) sur le pivot à rotule de la bielle pendante.
6. Vérifier que le joint d'étanchéité soit bien sur le pivot. Installer le J 29193 ou le J 29194.
7. Retirer le J 29193 ou le J 29194.
8. Installez le nouvel écrou de réglage trilobé de la barre d'accouplement.
9. Installer la plaque de protection du moteur, si équipé. Se reporter à Échange du bouclier de moteur sous la rubrique Cadre et soubassement de carrosserie.
10. Abaisser le véhicule.
11. Vérifier le parallélisme des roues. Se reporter à Mesure géométrie de roue sous la rubrique Parallélisme des roues.

Practice Text 5 – Target with Markup

Échange [WT] biellette pendante Transmission [SP] automatique à 4 roues motrices

Outils nécessaires

J 6632-01 Extracteur de bielle pendante [SE].

Outil de pose (12 mm) de la tringlerie de direction J 29193.

Outil de dépose [WM] (14 mm) de la tringlerie de direction J 29194.

Extracteur universel de bielle pendante J 29107-V [WT] [PE]

J 24319-B [SE] Extracteur universel de tringlerie de direction [PE]

Procédure de pose [WM]

1. Soulever le véhicule. Se reporter à Lavage [SP] sur pont et sur cric du véhicule sous la rubrique Généralités.
2. Retirer l'écran de protection du moteur, le cas échéant. Se reporter à Échange [WT] du bouclier moteur [WT] sous la rubrique Cadre et soubassement de carrosserie.
3. Retirez [ME] l'écrou de la barre d'accouplement (8) du pivot à rotule (2) de la bielle pendante. Ne pas réutilisé [SE] l'écrou.

Mode d'emploi [WM]

Ne pas donnez [SE] des coups de marteau sur la bielle pendante, sur l'arbre de la bielle pendante ou sur l'extracteur. Un endommagement de la bielle pendante ou de l'engrenage [WT] de direction peut en découler.

4. À l'aide d'un J 24319-B, retirer la barre d'accouplement du pivot à rotule de la bielle pendante.
5. Enlever le boîtier de direction assistée. Se reporter à Échange [WT] d'engrenage [WT] direct [WT] assistée sous la rubrique Direction assistée. Marquer des ____ [OM] de repère sur la bielle pendante et sur son arbre, [PE] pour pouvoir les aligner convenablement au moment de leur assemblage.
6. Retirer l'écrou de la bielle pendante.
7. Utiliser le J 29107-A ou le J 6632-01 pour retirer la bielle pendante de l'arbre de bielle du boîtier de direction.
8. Vérifier si les filet [SE] du pivot à rotule sont endommagés.
9. Vérifier si les joints du pivot à rotule ne montrent pas de signes d'usures [SE] excessives [SE].
10. Nettoyer les filets du pivot à rotule.

Procédure d'installation

1. Poser la bielle pendante à [SE] l'arbre de la bielle.
2. Aligner les points de repère marqués au moment de l'enlèvement de la bielle pendante et de son arbre.
3. Poser un nouvel écrou ____ [OM] bielle pendante.
4. Poser le boîtier de direction assistée. Se reporter à Échange [WT] d'engrenage [WT] direct [WT] assistée sous la rubrique Direction assistée.
5. Installer la barre d'accouplement (6) [WT] sur le pivot à rotule de la bielle pendante.
6. Vérifier que le joint d'étanchéité soit [SE] bien sur le pivot. Installer le J 29193 ou le J 29194.
7. Retirer le J 29193 ou le J 29194.
8. Installez [ME] le nouvel écrou de réglage trilobé de la barre d'accouplement.
9. Installer la plaque de protection [WT] du moteur, si équipé [SE]. Se reporter à Échange [WT] du bouclier [WT] de moteur sous la rubrique Cadre et soubassement de carrosserie.
10. Abaisser le véhicule.
11. Vérifier le parallélisme [SP] des roues. Se reporter à Mesure géométrie de roue [SE] sous la rubrique Parallélisme des roues.

A.2 ENGLISH – EUROPEAN FRENCH

Glossary

accelerator pedal position sensor (APP)	capteur de position de la pédale d'accélérateur (APP)
alloy wheel	roue en alliage
anti-theft alarm system	système d'alarme antivol
barrel	barillet
battery backed-up sounder (BBUS)	alarme sonore de débranchement de la batterie (BBUS)
blind hole	trou borgne
bore	alésage
B-pillar	montant central
brake booster	servofrein
central junction box (CJB)	boîtier électrique central (CJB)
column lock	ensemble de verrouillage de la colonne
cylinder bank	rangée de cylindres
cylinder head	culasse
DC motor	moteur à courant continu
electronic throttle	papillon électronique
engine control module (ECM)	module de gestion du moteur (ECM)
engine torque	couple moteur
exhaust gas recirculation (EGR)	soupape de recyclage des gaz d'échappement
fault code	code de défaut
fitting arm	bras de montage
fuel pressure regulator	régulateur de pression de carburant
fuel rail	rampe d'alimentation
ground connection	connexion de masse
Hall effect sensor	capteur à effet Hall
hazard flasher	feu de détresse
ignition key	clé de contact

ignition switch	commutateur d'allumage
inlet port	port d'entrée
instrument pack	tableau de bord
intake manifold	collecteur d'admission
light emitting diode (LED)	diode électroluminescente (DEL)
limp home mode	mode de dépannage
plenum	chambre de répartition
plunger	plongeur
pulse width modulated (PWM) signal	signal à modulation de largeur d'impulsions (PWM)
roll pin	goupille cylindrique
shaft	arbre
shear bolt	boulon à cisaillement
space saver	faible encombrement
space saver wheel	roue à faible encombrement
spare wheel	roue de secours
swirl pot	chambre de turbulence
tailgate	hayon
throttle plate	volet de papillon
tilt sensor	capteur d'inclinaison
tire bead	talon de pneu
tire pressure monitoring system	système de contrôle de pression des pneus
tire pressure sensor	capteur de pression
tread pattern	dessin de bande de roulement
volumetric sensor	capteur volumétrique

Practice Text 1 – Source

GENERAL

A number of alloy wheel and tire size combinations are available.

A Tire Pressure Monitoring System (TPMS) is also available. This system monitors the pressure in each tire and informs the driver if the pressure is outside predetermined thresholds.

WHEELS

B

8JX18 – Style 1

C

8JX18 – Style 2

E

5.5JX19 – Space saver

There are a number of different alloy wheel styles as follows:

7J X 17" – one style

8J X 18" – two styles

8J X 19" – one style

The spare wheel fitted to all vehicles is a steel space saver wheel. The wheel size is 5.5J X 19 and uses a T175/80R19 tire.

The space saver wheel is a standard fitment for all markets except Gulf states.

A full size spare is offered as an optional fitment.

TIRES

Tires are available in a number of sizes and tread patterns dependent on the vehicle usage.

The following tires are available; All Season (AS), All Terrain (AT) and All Terrain – Sport (AT-S).

Tires should be inflated to the recommended pressures (as given in the owners handbook) only when the tires are cold (ambient temperature). If the tires have been subjected to use or exposed to direct sunlight, move the vehicle into a shaded position and allow the tires to cool before checking and/or adjusting the pressures.

Tire Changing

Care must be taken when removing and refitting tires to ensure that the tire pressure sensor is not damaged.

When using the tire removal machine, the fitting arm start position must be positioned as shown in the tire changing illustration. The wheel can then be rotated through 180 degrees in a counter clockwise direction. This will relieve the high tension from the tire bead allowing the remaining 180 degrees of the tire to be manually pulled from the rim.

When refitting the tire, position the fitting arm as shown. Rotate the tire and take care that the bead on the low tension side of the tire does not damage the sensor.

Tread Act – NAS Only

Vehicles supplied to the North American markets must comply with the legislation of the Transport Recall Enhancement, Accountability and Documentation (TREAD) act.

Part of the requirement of the TREAD act is for the vehicle to display a label, positioned on the driver's side B-pillar, which defines the recommended tire inflation pressure, load limits and maximum load of passengers and luggage weight the vehicle can safely carry.

This label will be specific to each individual vehicle and will be installed on the production line. This label must not be removed from the vehicle. The label information will only define the specification of the vehicle as it came off the production line. It will not include dealer or owner fitted accessory wheels and tires of differing size from the original fitment.

If the label is damaged or removed for body repair, it must be replaced with a new label specific to that vehicle.

Practice Text 1 – Target

GENERALITES

Il existe plusieurs combinaisons de dimensions de roues en alliage de cuivre et de plomb et de pneus.

Un système de contrôle de pression des pneus (TPMS) est également disponible. Ce système en surveillant la pression dans chaque pneu informe le conducteur si elle dépasse les seuils prédéterminés.

ROUES

B

8JX18 – Style 1

C

8JX18 – Style 2

E

5.5JX19 –Faible encombrement

Les différents styles de jantes en alliage suivants sont proposés:

7J X 17" – Un style
8J X 18" – Deux styles
8J X 19" – Un style

Tous les véhicules sont équipés d'une roue d'urgence en acier à faible encombrement. Ses dimensions sont de 5.5J X 19" ; elle s'utilise avec un pneu T175/80R19.

La roue à faible encombrement est fournie pour tous les marchés en série.

Une roue de secours de taille normale est proposée en option

PNEUS

Les pneus existent en différentes dimensions et avec différents dessins de bande de roulement, en fonction de l'usage du véhicule.

Les pneus suivants sont disponibles: All Season (AS) (4 saisons), All Terrain (AT) (tout-terrain) et All Terrain – Sport (tout-terrain sport).

Les pneus doivent être gonflés à la pression recommandée (indiquée dans le manuel du conducteur) et uniquement à froid (température ambiante). Si le véhicule vient de rouler ou qu'il a stationné en plein soleil, gardez-le à l'ombre et laissez refroidir les pneus avant de vérifier et/ou corriger leur pression.

Changement de pneu

Lors de la dépose et de la repose des pneus, veuillez prendre les précautions nécessaires pour éviter d'endommager leur capteur de pression.

Si une machine est utilisée pour déposer le pneu, positionnez le bras de montage dans la position de départ indiquée sur l'illustration de changement d'un pneu. La roue peut alors être tournée de 180° dans le sens des aiguilles d'une montre. Ceci permettra de libérer la tension élevée exercée sur le talon du pneu et de retirer manuellement de la jante les 180° restants du pneu.

Pour reposer le pneu, positionnez le bras de montage comme illustré. Tournez le pneu et prenez garde de ne pas endommager le capteur avec le talon du côté basse tension du pneu.

Loi TREAD – Amérique du nord uniquement

Les véhicules destinés aux marchés sud-américains doivent être conformes aux prescriptions de la loi Transport Recall Enhancement, Accountability and Documentation ou TREAD (amélioration du rappel de véhicules, responsabilité et documentation).

Entre autres, la loi TREAD stipule que le véhicule doit être muni d'un autocollant, apposé sur le montant B du côté conducteur, indiquant la pression recommandée pour les pneus, les limites de charge et le poids maximum des occupants et de tout chargement pouvant être transporté en toute sécurité dans le véhicule.

Cet autocollant, spécifique à chaque véhicule, est mis en place au moment de l'assemblage en usine ; il ne doit pas être retiré du véhicule. Les informations figurant sur celui-ci s'appliquent uniquement à la spécification du véhicule à sa sortie de l'usine. Elles ne tiennent pas compte des ensembles roue-pneu montés comme accessoire par le concessionnaire ou le propriétaire et de dimensions différentes de la première monte.

Si l'autocollant est endommagé ou enlevé pour des réparations de carrosserie, il doit être remplacé par un autocollant neuf spécifique à ce véhicule.

Practice Text 1 – Target with Markup

GENERALITES

Il existe plusieurs combinaisons de dimensions de roues en alliage de cuivre et de plomb [ME] et de pneus.

Un système de contrôle de pression des pneus (TPMS) est également disponible. Ce système en surveillant [SE] la pression dans chaque pneu informe le conducteur si elle dépasse les seuils prédéterminés.

ROUES

B

8JX18 – Style 1

C

8JX18 – Style 2

E

5.5JX19 –Faible [PE] encombrement

Les différents styles de jantes [WT] en alliage suivants sont proposés:

7J X 17" – Un style
8J X 18" – Deux styles
8J X 19" – Un style

Tous les véhicules sont équipés d'une roue d'urgence [WT] en acier à faible encombrement. Ses dimensions sont de 5.5J X 19" ; elle s'utilise avec un pneu T175/80R19.

La roue à faible encombrement est fournie pour tous les marchés en série [SE] _ [OM].

Une roue de secours de taille normale est proposée en option_ [PE]

PNEUS

Les pneus existent en différentes dimensions et avec différents dessins de bande de roulement, en fonction de l'usage du véhicule.

Les pneus suivants sont disponibles: All Season (AS) (4 saisons), All Terrain (AT) (tout-terrain) et All Terrain – Sport (tout-terrain sport) _ [OM].

Les pneus doivent être gonflés à la pression recommandée (indiquée dans le manuel du conducteur) et uniquement à froid (température ambiante). Si le véhicule vient de rouler ou qu'il a stationné en plein soleil, gardez-le à l'ombre et laissez refroidir les pneus avant de vérifier et/ou corriger leur pression.