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SURFACE VEHICLE RECOMMENDED PRACTICE

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Superseding J2461 AUG2002

Vehicle Electronic Programming Stations (VEPS) System Specification for Win32™

RATIONALE

Bring SAE J2461 up to date after six years without an update. Added a Rationale Section. Added a Table of Contents. Updated TMC and SAE references. Added a historical clarification to the Identification section.

TABLE OF CONTENTS

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1. SCOPE

1.1 Identification

SAE J2461 specifies the recommended practices of a Vehicle Electronics Programming Stations (VEPS) architecture.in a Win32™ environment.

This system specification, SAE J2461, was a revision of the requirements for Vehicle Electronics Programming Stations (VEPS) set forth in SAE J2214, Vehicle Electronics Programming Stations (VEPS) System Specification for Programming Components at OEM Assembly Plants (Cancelled Jun 2004). The J2214 standard has been cancelled indicating that it is no longer needed or relevant.

1.2 Introduction

SAE J2461 describes the application of the Win32™ environment to the customization of programmable components assembled in OEM vehicles, where components provide a communication API such as TMC RP1210B. Because the customization is performed using both OEM-provided and vendor-provided software, the roles and responsibilities of the vendor and OEM elements must be defined to permit the development of common vendor software elements for all Original Equipment Manufacturers (OEMs).

SAE J2461 identifies the system resources of a Win32™ computer between OEM and vendor components, the required elements comprising VEPS, and specifies the software interfaces needed between the OEM-supplied elements and the vendor-supplied elements. By maintaining many common elements with SAE J2214, an orderly transition from a MS-DOS™ based VEPS to a Win32™ VEPS can be achieved. SAE J2286 is the software interface element of SAE J2214 that specifies the Vendor Component Program Data File Interface for OEM Assembly Operations. SAE J2286 will still be the Data File Interface used for the Win32™ VEPS. TMC RP1210B describes the communication API used by the vendor programs.

1.3 Background

The OEMs typically are horizontally integrated. Each major vehicle component has multiple vendors who compete for component sales in OEM markets. Customer orders determine a set of components from this variety to meet the vehicle's desired performance requirements. Customization and calibration of these components for the vehicle's application necessitates the need for a standard method to perform this programming without causing the OEM to install special VEPS for each vendor component. Hence the existence of MS-DOS™ SAE J2214. As the need for more applications grow at OEM VEPS, a more flexible solution to the current RP is needed. Win32™ SAE J2461 provides such a solution.

1.3.1 WIN32™ VEPS

SAE J2461—Vehicle Electronic Programming Stations (VEPS) System Specification for Win32™
SAE J2286—Vendor Component Program Data File Interface for OEM Assembly Operations
TMC RP1210B—Windows Communications API

1.3.2 DOS VEPS

SAE J2214—Vehicle Electronic Programming Stations (VEPS) System Specification for Programming Components at OEM Assembly Plants (Cancelled Jun 2004)
SAE J2286—Vendor Component Program Data File Interface for OEM Assembly Operations
SAE J1683—MS-DOS™ Interface for SAE J1708 Communications (Cancelled Jun 2004)
SAE J1924—OEM/Vendor Interface Specification for Vehicle Electronic Programming Stations (Cancelled Aug 2000)

1.3.3 Electronics Impact

The introduction of electronic control systems for OEM vehicles such as diesel engines, transmissions, anti-lock brakes, etc. coincided with the introduction of new product features that were integrated within the system's controllers. As an example, features such as cruise control and road speed limiting require that controllers be calibrated with specific information related to the equipment installed on the vehicle such as tire size, rear axle ratio, and desired operating speeds. Programmable parameters identify the information items needed to calibrate the controllers. Parameter programming is accomplished through the use of the controller's data link. This programming function customizes controller performance to comply with the customer's specified parameter changes.

1.3.4 SAE J2214 Features and SAE J2461 Change Summary

SAE J2286 specifies a common interface format within an MS-DOS™ environment. Each parameter's requirement for an assembly job is entered as a record in an ASCII file specified as a *parameter file*. The parameter file is interpreted by a Vendor Component Program (VCP) that performs the specified programming via a common communication interface. The programming result for each parameter is reported as a record in the *verification* file. The *definition* and *remarks* files document the parameters that can be programmed in the Vendor Component. SAE J2461 retains the core architecture defined by SAE J2286, including the four defined files.

Like SAE J2214, SAE J2461 defines that a common communication utility be used by the VCP to prevent the proliferation of Vendor Interface Tools required to support each programmable component under SAE J2214. Also, this eliminates the need to use multiple RS-232 communications ports for Vendor Interface Tools. The common communication interface used by SAE J2214 is SAE J1683, MS-DOS™ Interface for SAE J1708 Communications. TMC RP1210B, Windows Communication API, will replace this interface for SAE J2461.

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 Publications

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 J2286 Vendor Component Program Data File Interface for OEM Assembly Operations

2.1.2 TMC Publications

Available from the Technology and Maintenance Council, American Trucking Associations, 2200 Mill Road, Alexandria, VA 22314, Tel: (703) 838-1700, www.truckline.com.

TMC RP1210B Windows Communication API

3. ACRONYMS

ASCII	American Standard Code for Information Interchange
API	Application Program Interface
DI	Data Item
ECU	Electronic Control Unit
GUI	Graphical User Interface
MIS	Management Information Systems
OEM	Original Equipment Manufacturer
PC	Personal Computer
RP	Recommended Practice
SAE	SAE International
SW	Software
STD	Standard
TMC	Technology Maintenance Council
VCP	Vendor Component Program
VEPS	Vehicle Electronics Programming Station
Win32™	32 bit Windows

4. TRADEMARK ACKNOWLEDGMENTS

MS-DOS is a trademark of Microsoft, Inc.
Win32 is a trademark of Microsoft, Inc.

5. SYSTEM OVERVIEW

The requirements for Vehicle Electronics Programming Stations (VEPS) are discussed from a functional perspective in this section.

5.1 System Objectives

SAE J2461 provides the system specification for the programming station illustrated in Figure 1. Objectives to be met by VEPS include:

a. Customize electronically controlled components to the customer's desires at vehicle OEM assembly plants.

b. Provide positive indications of programming results.

c. Simplify communications with the vehicle network.

d. Define Vendor Component Programs in such a manner that all component vendors can provide them to OEMs.

Figure 1 illustrates the process of programming the electronic components of a vehicle at an OEM assembly plant. The figure shows four assembly jobs progressing down the assembly line. Jobs 1 and 2 have been programmed. Job 3 is being programmed, and job 4 will be presented to the programming station. The station has identified that job 3 was presented to it for programming and initiated the programming process.

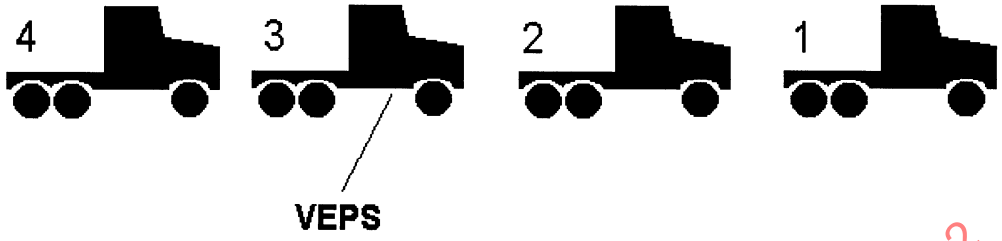

FIGURE 1 - TYPICAL VEPS USAGE

5.2 VEPS Components

Figure 2 illustrates the computer programs and interfaces that comprise a typical VEPS.

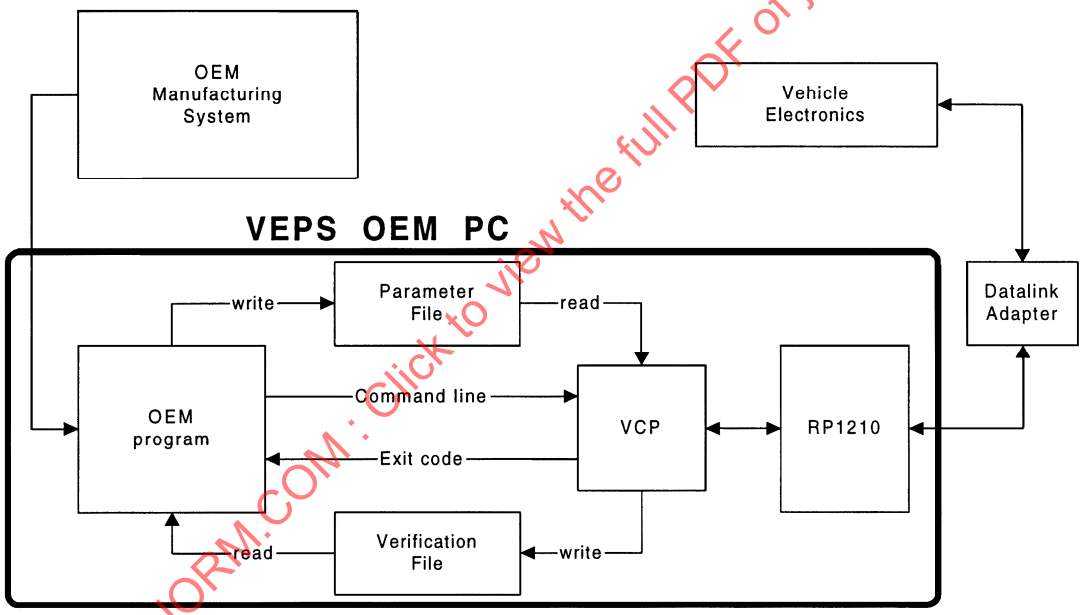

FIGURE 2 - VEPS COMPONENTS AND INTERFACES

5.2.1 OEM Shop Floor Program

The main purpose of the OEM Shop Floor Program is to identify the assembly job, extract parameter information (usually from the OEM Manufacturing System), format the parameter file, and invoke the VCP. The preceding steps represent the minimum requirements to support the execution of the VCP.

The methods associated for supporting the VCP execution is left to each individual OEM to implement.

5.2.2 VCP

The VCP is responsible for auditing the parameter values, programming the values into the vendor's vehicle electronics, and reporting the programming results. The VCP only needs to support one component or family of components produced by an individual vendor.

5.2.3 TMC RP1210B

This document describes a standardized interface—TMC's RP1210B Windows™ Communication Application Program Interface (API)—for personal computer (PC) to on-vehicle data link communications under the Microsoft Windows™ family of operating systems (Windows™3.1x, Windows™95, Windows™ NT, Windows™2000, Windows™XP and Windows™ Vista (32 bit only)). See Figure 3.

Technology Maintenance Council (TMC) established this Recommended Practice for vehicle ECU communication and control under the Microsoft Windows™ family of operating systems. Anyone is welcome to employ this RP in implementing software systems for ECU reprogramming and communication. This standard will use the generic reference RP1210 to allow backwards compatibility with older VEPS systems that have already been implemented using RP1210A.

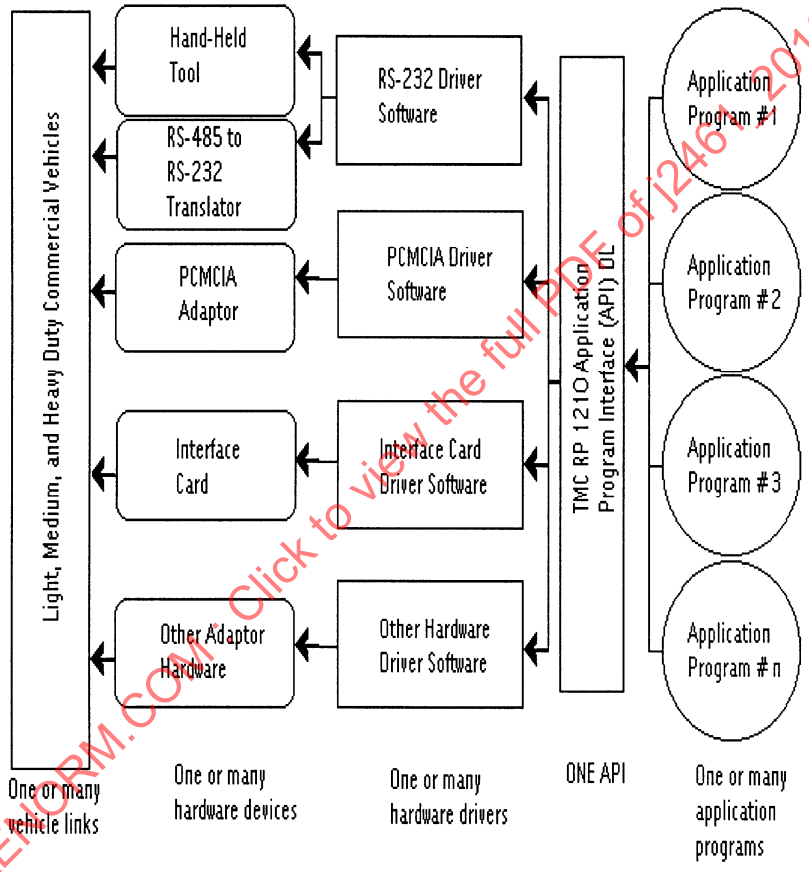

FIGURE 3 - ARCHITECTURAL OVERVIEW - POTENTIAL COMMUNICATIONS INTERFACES

5.2.4 Parameter File

The parameter file is produced by the OEM Shop Floor program. It contains all the particular vendor's parameters that the OEM wishes to program for the immediate programming session. The parameter file format is defined by SAE J2286.

5.2.5 Verification File

The verification file is produced by the VCP. It contains records identifying the status of the VCP programming session. The verification file format is defined by SAE J2286.

5.2.6 Definition File

The definition file is provided by the vendor. It contains records which describe the parameters supported by the VCP, including default value, lower limit, upper limit, etc. The definition file format is defined by SAE J2286.

The use of the definition file is optional to both the OEM shop floor program and the VCP.

5.3 Process Overview

a. STEP 1—The OEM shop floor program generates the parameter file to provide VCP with parameter programming information. See Figure 4.

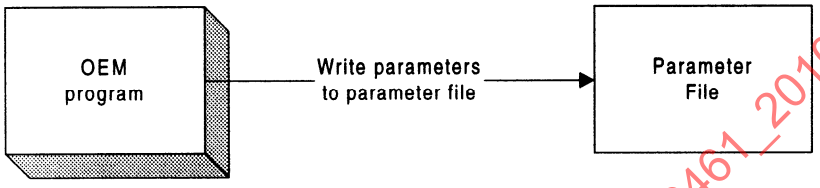

FIGURE 4 - OEM CREATES PARAMETER FILE

b. STEP 2—The OEM shop floor program invokes the VPC with optional command line arguments. The VCP runs as a separate Windows™ application. See Figure 5.

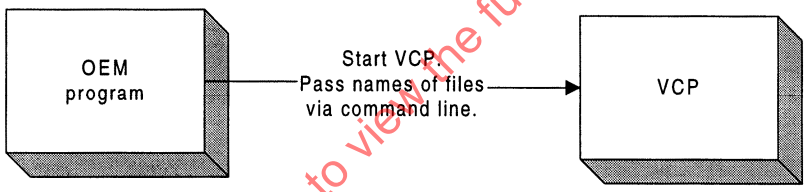

FIGURE 5 - OEM STARTS THE VCP

c. STEP 3—The VCP parses the parameter files. The VCP locates the parameter file using the rules found in SAE J2286. See Figure 6.

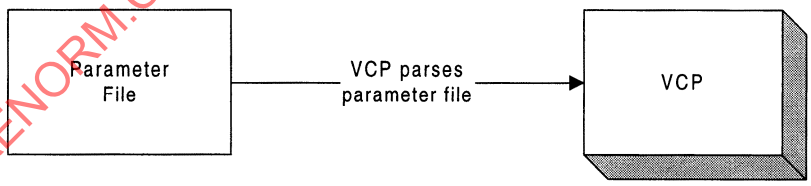

FIGURE 6 - VCP RETRIEVES INFORMATION FROM PARAMETER FILE

d. STEP 4—The VCP begins the communication session with the vendor component electronics via the TMC RP1210B Windows Communication API. Here the VCP reads, writes, and validates ECU data. If the OEM has enabled the VCP GUI, then the VCP gives visual feedback of the VEPS communication session. See Figure 7.

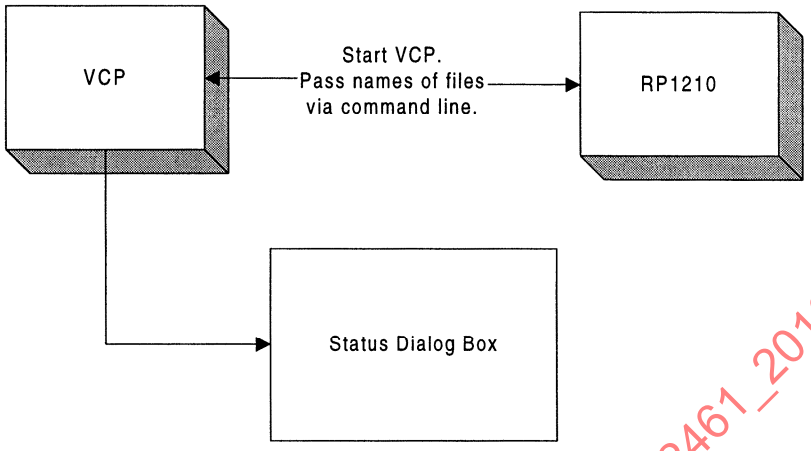

FIGURE 7 - VCP PROGRAMS VEHICLE ELECTRONICS

e. STEP 5—The VCP creates a verification file based on the path/name information. The status of the VEPS communications session, as well as the programming status of each parameter is written to the verification file. If the OEM has enabled the VCP GUI, then the VCP displays the VEPS communications results. See Figure 8.

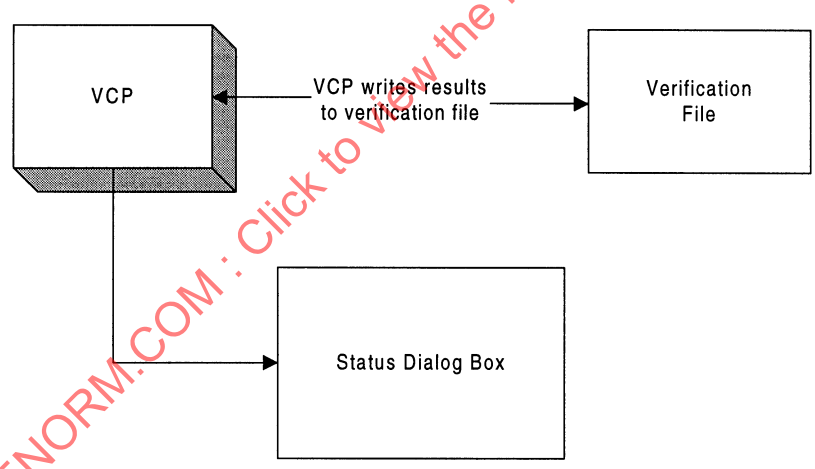

FIGURE 8 - VCP SIGNALS PROGRAMMING RESULTS

f. STEP 6—The VCP terminates. Upon termination, the VCP supplies an exit code. See Figure 9 and 6.2.2.

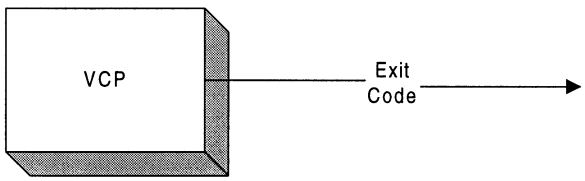

FIGURE 9 - VCP RETURNS EXIT CODE

g. STEP 7—The OEM shop floor program reads the exit code to determine the status of the VEPS communications session. Optionally, the OEM shop floor program can read the verification file to determine the status. See Figure 10.

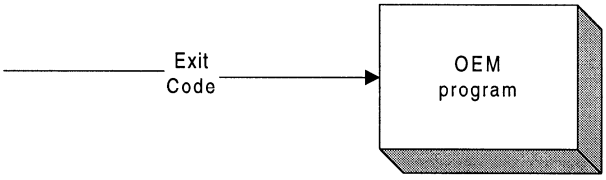

FIGURE 10 - OEM PROGRAM READS EXIT CODE

h. STEP 8—If the exit code indicates that an error has occurred during the programming session, the OEM shop floor program can read and parse the verification file to determine the cause of the error. See Figure 11.

FIGURE 11 - OEM PROGRAM RETRIEVES INFORMATION FROM VERIFICATION FILE

6. VENDOR COMPONENT PROGRAM (VCP)

6.1 Configuration

6.1.1 Setup

The vendor will make use of a commercially available installation program to install and configure the VCP on the OEM's VEPS PC. This installation program should also allow the OEM to cleanly uninstall the VCP from the OEM's VEPS PC. The installation program allows the OEM to select setting such as enabling/disabling the VCP GUI interface, and selecting timeouts values.

6.1.2 Home Directory

All VCP executables and support files must reside in a vendor home directory. This directory will be created and named by the OEM. The vendor's install program should prompt the user for the location of the vendor home directory.

6.1.3 Home Directory Example

The OEM has created the home directory for vendor3 name "vendor3" in a directory named "vendors." All files necessary for vendor3 are located in the vendor's home directory.

..\vendors\vendor3\vendor3.exe
…\vend31.dll
…\vend32.dll
…\vend33.dll
…\readme.txt

6.2 Interfaces

6.2.1 Command Line Parameters

See SAE J2286 for details on the command line parameters.

6.2.2 Exit Codes

The VCP must return an exit code when the VCP has terminated. The exit codes are defined by the following Component Error Code table (see Table 1):

TABLE 1 - VCP EXIT CODES

Exit Code	Description
0000	No errors; the VEPS session was a success
001	Error

6.3 User Interface

The VCP is required to provide real-time programming feedback to the operator. The OEM must be able to inhibit this feature if desired.

The vendor also has the option of providing immediate, graphical feedback to the OEM when a critical error is encountered by the VCP. The feedback should be done with a simple message box. The OEM must be able to inhibit this feature if desired.

Figure 12 shows an example screenshot of a vendor user interface.

7. NOTES

7.1 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.

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