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Vehicle Identification Number (VIN)– A Survey

Sanjyot Kajale¹

Student, Dept. of Electronics and Telecommunication Engineering, Pimpri-College of Engineering, Nigdi,
Maharashtra, India¹

ABSTRACT: When the production of the automobile started flourishing in the world, there were no means to identify the manufactured model. A necessity to use a unique sequence to identify the model was felt during the mid of the 19th century. The identification codes used during the initial period varied in their structure and length which created a state of inconvenience for the manufacturers. National Highway Traffic Safety Administration (USA) has imparted the standard format for Vehicle Identification number in 1981. A standardized VIN format is being followed by many countries to help the automobile owner to analyse if the vehicle is defective. VIN locking has also helped many owners to fetch the stolen cars. VIN is also used by many OEMs for diagnostic purpose to refer to the outset of the controller.

KEYWORDS: Vehicle Identification Number (VIN); Federal Motor Vehicle Safety Standards (FMVSS); International Organization for Standardization (ISO); Society of Automotive Engineers; Australian Design Rules (ADRs) Original Equipment Manufacturer (OEM), National Highway Traffic Safety Administration (NHTSA);

I. INTRODUCTION

Vehicle identification Number (VIN) is an alphanumeric identification code which is unique for all the automobiles in the world. This unique code is used in the automotive domain to distinguish the vehicles at the end of line (EOL) during the production. This code is later printed or stored in the required parts of the vehicle like Electronic Control Units, windshields or stickers[1]. The length of VIN kept on varying from 1960 to 1981. Initially only 4 digits specifying the year were chosen to be the vehicle identification number which later was modified to 10 digit number. In 1981 National Highway Traffic Safety Administration (NHTSA) mentioned the regulation to use the standard 17 digit vehicle identification number for all vehicles. [8]

The NHTSA incorporated the assignments given by 'The Society of Automotive Engineers' (SAE) and 'International Organization for Standardization' (ISO) to describe the sections of the VIN. The vehicle identification number was divided into three sections:-

1. **WMI-** World Manufacturer Identifier
This section of the VIN consisted of the country code where the vehicle is being manufactured, the name of the manufacturer and the type of the automobile. This section of the vehicle identification number was assigned by the SAE.
2. **VDS** - Vehicle Description Section
This section describes the various traits of the vehicle like the type of structure or a calculated check number. These attributes are assigned by the manufacturers.
3. **VIS-** Vehicle Identification Section
Vehicle identification section is the most important section as it consists of the serial number. This section may also include the year in which the vehicle was manufactured.

All the defined sections mentioned above form the vehicle identification number as shown in Fig1. The sections can be further divided into the sub-sections. Fig. 1 represent the format of the VIN as defined by the NHTSA along with the

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sub-sections of WMI, VDS and VIS [7]. As shown in the Fig. 1, the WMI is divided as Country, Region and vehicle. The VDS is divided into model and engine and the VIS is divided into year, plant and sequence number as reflected in Fig. 1.

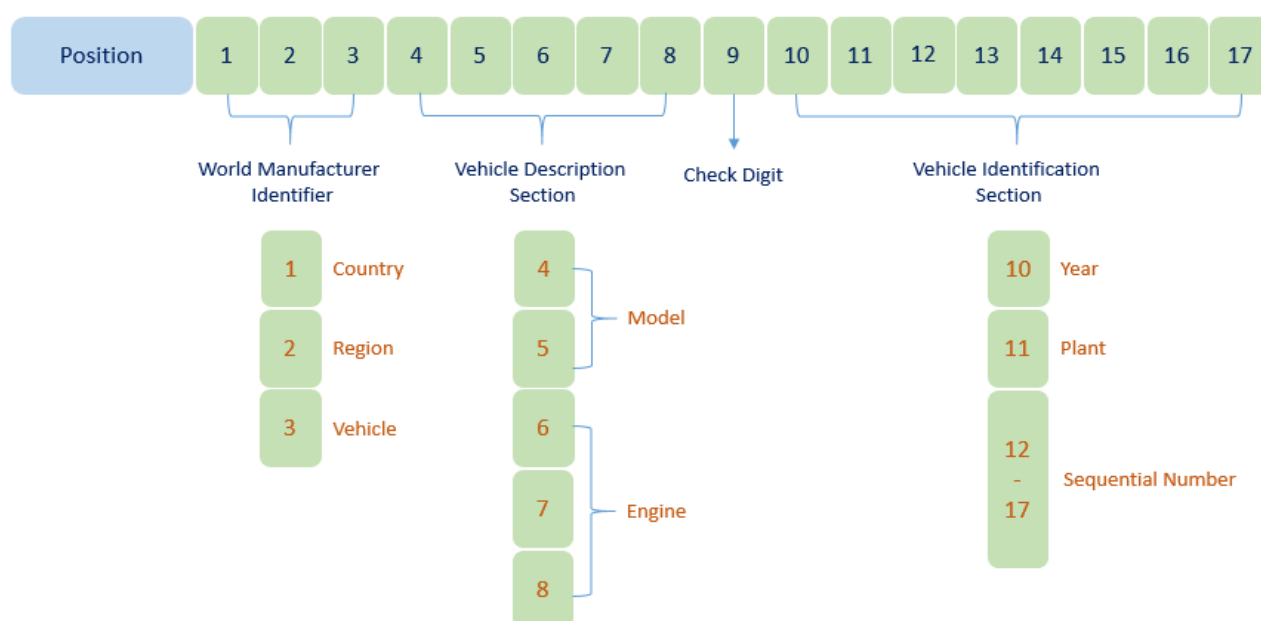


Fig. 1. Vehicle Identification Number Format

VIN helps to identify the vehicle and its model number. It also analyses if the car possesses certain safety features. VIN is used for verification purpose as well, hence it is required for the warranty claims or insurance coverage.

The calculation of the VIN across the globe is according to 4 major standards

1. FMVSS 115, part 565
2. ISO standard 3779
3. SAE J853
4. ADR 43 [2]

The calculation of VIN for all the above mentioned methods will be discussed in the successive sections.

II. RELATED WORK

In the initial period, when VIN came into existence, the combination of the digits of the vehicle identification number was decided and implemented by the manufacturer. The purpose of assigning a VIN was to identify the exact description of the vehicle during the mass production. Identification by stamping and casting was started by the American Manufacturers after 1950's [10]. VIN can be well referred as car's fingerprint since two automobiles cannot have a same identity. Today the Vehicle Identification is accepted globally accepted as more than 83 countries where automotive industries are present have had WMI's allocated [11]. The letters like I, O and Q are not allowed to be included in the 17 digit VIN. This structure is universally accepted and codified. [12]



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The places where an individual can find the VIN are listed below:-

- i. Vehicle Identification Label in the Manual
- ii. Stamped on the frame under the front hood
- iii. On a sticker on the driver's side door pillar
- iv. On state vehicle registration certificate
- v. On the vehicle title of ownership
- vi. New cars have the VIN on the price sticker
- vii. A label in the luggage/spare tire area.

III. STANDARDS USED FOR VIN CALCULATION

2. FMVSS / CMVSS

Federal Motor Vehicle Safety Standards (FMVSS) consists of the design, construction and performance requirements for motor vehicles. Canada and the USA use the VIN system as per the regulations specified in FMVSS 115 part 565. The length of the VIN specified in the FMVSS is 17 and FMVSS is the strictest standard and applies to the automobiles manufactured or sold in Northern part of America. FMVSS allows the manufacturers to reserve a digit for 'manufacturer specific information'. Canada however uses Motor Vehicle Safety Standards (CMVSS) instead of FMVSS. FMVSS are currently known as the '49 C.F.R' which stands for The United States code of federal regulations. [3]

FMVSS are divided into three categories:

- i. Crash avoidance (100-series)
- ii. Crashworthiness (200-series)
- iii. Post-crash survivability (300-series). [9]

3. ISO 3779

International Organization for Standardization (ISO) issued two licenses for Vehicle Identification Number. In 1979 ISO 3779 was introduced and later in 1980, ISO 3780 was introduced. ISO is primarily used in Europe and some other parts of world. ISO is also followed in the Northern America. [4]

- i. World manufacturer Identifier (WMI) consists of the first three characters of the VIN. ISO 3779 provides the description about the composition of VIN and ISO 3780 consists the information on codification system. The details mentioned in ISO 3780 and ISO 3779 are used by the manufacturer to identify the vehicle. [2]
- ii. Six characters from position 4-9 are used for the Vehicle Descriptor Section (VDS). They are used to identify the model features.
- iii. The Last eight characters are reserved for Vehicle Indicator Section (VIS). This section provides unique vehicle specific value. This section may or may not compulsorily contain the year or manufacturing and the plant information where the vehicle is manufactured.

4. SAE J853

Society of Automotive Engineers is an organization involved in developing the globally accepted standards used mainly in the automotive, aerospace and commercial vehicles. The design and installation of a Vehicle Identification Number allocated to a truck or a passenger car are provided by the SAE. The National Highway Traffic Safety Administration (NHTSA) contracted SAE International to allocate a defined section of VIN to the World Manufacturers Identifier (WMI). FMVSS part 565 and ISO 3779 use the SAE standard to code the WMI and the year of manufacture. [5]



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5. ADR 43

Australia has its own technical standard named 'Australian Design Rules (ADRs)' for safety of automobile, defence against robbery and discharge of harmful effluents. The standards are in accordance with the regulations publicized by the World Forum for Harmonization of Vehicle Regulations. The OEMs in Australia certify that their vehicles are in accordance with the provisions defined in the ADRs. A plate is fixed by the manufacturer specifying the details like build date, identification number and information along with the notice that the vehicle complies with all the required regulations specified in the ADRs. [6][2]

IV. REQUIREMENT OF A GLOBAL STANDARD

The foundation of the engineering has been laid by the global standards and these standards conform to the wellbeing of the nations across the globe. The age of globalization has led to render a special attention to the developed standards. Adoption of global standards has emanated into surpassing the technical hurdles in the international business. The differences due to independent regulations and standards specific to each country or organization seems to wither away by introduction of the global standards. Development of the set of common principles and standards for propriety, integrity and transparency in international business Global standards has thus led to technical compatibility among the nations.

Following are the benefits of adopting a globally accepted standard:-

- i. Corporate Governance
- ii. Market Integrity
- iii. Financial regulation
- iv. Transparency of policy and data.
- v. Tax cooperation

It is necessary to follow the standards for generation of Vehicle Identification Number as it is very difficult for a manufacturer or an individual to identify the model or the age of the vehicle. Establishing an independent VIN, not conforming to any standard may lead to following causes:-

- i. Variable length of the VIN
- ii. Variable structure of the VIN
- iii. Inadequacy of the required data in produced VIN
- iv. Misinterpretation of safety performance

Hence for improved vehicle safety, establishment of VIN conforming to a standard is necessary.

V. USE OF VEHICLE IDENTIFICATION NUMBER

As the assigned vehicle identification number is unique, it is used to match the records in different databases. The VIN can be identified by decoding it from the ECU or sometimes the VIN is directly printed on the windscreen or is present on the stickers provided by the OEM.

Following Fig 2 is an example of the VIN printed on a sticker in the car. The figure shows that the length of the VIN used is 17 which is agreed globally. The 17 digits assigned are as per the NHTSA format and each digit shown in Fig.2 has its own significance.

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Fig. 2. Vehicle Identification Number printed on a sticker

Below are few applications and details of the VIN and its use:-

- i. Prevention of Vehicle theft: VIN is stored and locked in specific components of the vehicle. Whenever a vehicle is robbed, VIN can be used to track the location of the stolen car. VIN can also be used to prove that the vehicle is registered with the actual owner.
- ii. Identify the vehicles involved in the crash: The VIN of vehicles which have undergone the crash can be considered as unfit for further use.
- iii. Product recall: Whenever there is a situation of product recall, the vehicle with specific WMI can be identified and recalled from the market.
- iv. Insurance: VIN can be used to redeem the insurance amount if a vehicles has met with an accident.[2]

V. CONCLUSION

The survey states the emergence of Vehicle Identification Number and the use of various standards used for the generation of the same. From the survey it can be concluded that there is necessity for standardized VIN for all vehicles. The paper also focuses on the issues and the advantages of VIN. The use of VIN for various scenarios have also been covered in this survey paper. This survey paper also tries to appeal all the OEMs to establish a VIN complying with a specific standard in order to provide ease to the manufacturer as well as the individual.

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