

Welcome to VMRS™!



This handbook is designed to help motor carriers, software designers, information specialists and industry suppliers implement the Vehicle Maintenance Reporting Standards (VMRS)—the industry standard coding convention for tracking equipment and maintenance information. This book provides an outline of VMRS, its advantages to equipment users and industry suppliers, and guidance on the basic implementation requirements.

The development of VMRS began in 1969, undertaken jointly by the Maintenance Committee of the Regular Common Carriers Conference, the National Accounting and Finance Council, and the Management Systems Committee of American Trucking Associations (ATA). The Union 76 Division of Union Oil of California—through its participation in the ATA Foundation—sponsored the initial VMRS study. The VMRS Committee's

report was published in 1970, and its recommendations to the industry — establishing a standard coding convention for universally tracking equipment and maintenance costs and functions — were approved and adopted by the Executive Committee of American Trucking Associations in October 1970. Since 1970, American Trucking Associations has served as the official custodian

of VMRS—updating this dynamic standard to meet motor carrier and industry supplier needs. In 1997, The Maintenance Council (TMC) of American Trucking Associations became custodian of VMRS, embarking on a thorough review of VMRS at the commercial vehicle industry's request. VMRS™ Version 2.0 is the latest version of this successful standard. In 2001, TMC expanded its mission to include information technology and logistics, becoming the Technology & Maintenance Council. In 2020, TMC diversified its licensing program, introducing new options such as its VMRS Electronic Catalog and VMRS Complete license packages.

VMRS™ is a universal coding language that can be implemented successfully by any industry which must track the costs of maintaining and operating equipment.

The development of VMRS™ is owed in large part to the volunteer efforts of many segments of the equipment maintenance industry. Thanks to the work of many dedicated individuals, VMRS™ is a universal coding system that can be implemented successfully by any industry which must maintain

and operate equipment — whether it be trucking, transit, off-road, agricultural, or utility operations.

The ultimate utility and application of VMRS™ is limited only by the creativity of the user. Welcome onboard!

Robert M. Braswell
Executive Director
Technology & Maintenance Council

Jack Poster
VMRS Services Manager
Technology & Maintenance Council

1. An Introduction to VMRS™

What is VMRS?

Since 1970, the purpose of VMRS has been to provide a vital communication link between maintenance personnel, computers, and management. It establishes a “universal” language for fleets, original equipment manufacturers’ (OEMs), industry suppliers, computers, and those people whose responsibility it is to specify, purchase, operate, and maintain equipment.

Developed by and for equipment users under the auspices of American Trucking Associations, VMRS provides the discipline necessary for different industry segments to communicate with each other. VMRS is the shorthand of maintenance reporting, eliminating the need for extensive written communications with all the inherent problems of miscommunication normally associated with the written word.

To meet the ever-changing needs of the equipment industry, the Technology & Maintenance Council (TMC) of American Trucking Associations serves as the official custodian of VMRS. TMC provides OEMs, manufacturers, part suppliers, and equipment users with updated codes on an “as needed” basis reflective of current equipment design and the informational needs of the VMRS user.

VMRS™ Version 2.0 is the latest version of the VMRS coding convention, established more than 45 years ago. Since its inception, VMRS has undergone a significant evolution.

Based on user requests, TMC has:

- Expanded Code Key 31 to accommodate an ever-increasing interest in the unique reporting needs of the “off-highway” or “stationary equipment” market. As a result, TMC has made full use of the expanded three-digit code so that these equipment types are addressed. For example, System Code (X6X) has been created to accommodate “equipment dependent attachments.” The introduction of this system allows users to track the expense associated with major attachments (those that warrant their own asset number) that

are only operational when attached to a “host” piece of equipment (i.e. a truck mounted snow blower, or perhaps a plow).

- Increased the total number of codes in Code Key 33, “Component Codes” to more than 34,000.
- Added Code Key 23, which covers tire position codes; Code Key 24, covering maintenance status codes; Code Key 83, which covers claim response reason, and Code Key 84, which covers claim response status.
- Expanded to Code Key 15, “Work Accomplished” and Code Key 18, “Technician Failure Code” to satisfy customer demands.
- Expanded Code Key 34, which is used to identify more than 11,000 manufacturers, suppliers, and brands.
- Expanded Code Keys 1, 2, 10 and 48, which describe equipment vocations, categories and body types. These codes now accommodate many industries beyond trucking, such as transit, off-highway and construction industries.
- Instituted a Certified VMRS Specialist program to recognize proficiency in VMRS nomenclature, structure, and usage.
- Diversified the VMRS™ licensing offerings to encourage consistent and appropriate industry use of VMRS.
- Developed customized VMRS training options for in-person and virtual learning.
- Applied VMRS to industry benchmarking programs, such as the TMC/FleetNetAmerica Vertical Roadside Breakdown Benchmarking Program.

A Structured Coding System

VMRS is a structured coding system, providing the discipline necessary to operate in today’s computer-based information age or — where desired — as a completely manual system. Simple in concept, VMRS can be used at any level, from total operating systems down to the individual part level. The level of coding used is entirely up to the user. One can select the level

of reporting detail at any time without the need to redesign the coding structure or implement costly new programs. No matter which level the user selects, the data collected can be compared directly to data collected by others at the same or higher VMRS coding level.

The coding structure encompasses most equipment found within today's transportation activities including trucks, tractors, trailers, forklifts, shop equipment, off-road vehicles, utility vehicles, etc.

Recognized Internationally

Today, equipment users worldwide use VMRS to capture and report their equipment maintenance activities. Equipment manufacturers and maintenance software suppliers use VMRS coding for parts, thus providing additional impetus for fleets to adopt this universal coding scheme.

A complete service industry has grown up around VMRS, with a number of firms offering VMRS computerized reporting systems and/or services to fleets. This manual will help your software provider utilize VMRS to your mutual benefit.

15 Distinct Advantages to VMRS

There are 15 distinct advantages to using VMRS:

1. **VMRS is Easy to Use**—VMRS was designed for use at the shop level. Accurate and easily understood reporting by the mechanic is essential if any information system is to succeed. At the higher level, management must understand what the mechanic has accomplished. VMRS meets both criteria.
2. **VMRS is Cost Effective**—TMC has undertaken the initial cost normally associated with developing such a system. The practicality of the system has been proven, in that VMRS has been in continuous use since 1970. TMC keeps the system dynamic, thus eliminating the need for individual users to continually research and update their systems.
3. **Follows Accepted Accounting Practices**—The VMRS code structure allows the user to comply with the needs of most recognized accounting disciplines. VMRS provides the flexibility to properly massage data to meet both immediate and long-term needs.
4. **VMRS Enables Sound Budgeting**—VMRS provides a sound basis for budget preparation and forecasting based on fleet mix, projected utilization, and historic performance. Requests for additional mechanics, increased parts inventory, special equipment, or expanded facilities can readily be supported by data captured using VMRS. VMRS is invaluable in determining how many pieces of equipment are required to support a given workload. The same data can be used to determine the mechanic/parts mix required to support various equipment mixes and utilization criteria.
5. **VMRS Helps Control Costs**—VMRS provides detailed records of the maintenance activity comprising both equipment and facilities. It identifies where monies were spent, at which point in the life of a piece of equipment repairs were performed, and details the expenses incurred in the supporting activity. Distribution between parts and labor is an inherent part of the VMRS reporting structure, thus allowing analysis of what occurred and when. This is important in determining the cause-and-effect relationship of maintenance.
6. **VMRS Improves Facility Management**—VMRS provides the ideal basis for establishing a facility management program. The coding structure provides the basis for complete labor and material distribution, direct and indirect, thus allowing management the opportunity to analyze in detail each cost segment. With this information, management can take whatever action is deemed appropriate to correct those situations which appear out of line. This information provides the necessary input for most purchasing decisions.
7. **VMRS Tracks Labor Distribution**—VMRS provides complete labor distribution cover-

ing both direct and indirect labor.

8. **VMRS Helps Control Parts Inventory**—VMRS was developed, and is used within the industry, as the basis of many successful parts inventory control systems. Some fleets have developed their own systems using VMRS, while others utilize off-the-shelf programs designed and built around the VMRS coding structure. VMRS provides complete details as to parts use, thus identifying which part should be inventoried and which should be procured on an “as needed” basis. For those states having an Inventory Tax, VMRS provides documented back-up.
9. **VMRS Supports Warranty Claims**—The VMRS coding structure incorporates the capability to record and isolate those costs normally associated with warranty. Being a universal language, accepted and endorsed by equipment manufacturers and industry suppliers, VMRS provides the ideal audit trail for instituting and supporting warranty claims. New Code Keys have been developed exclusively for warranty, such as Code Key 81 — Type of Claim, Code Key 83 — Response Reason Code and Code Key 84 — Claim Response Status Code.
10. **VMRS Improves Preventive Maintenance Programs**—VMRS provides the ideal basis for determining the effectiveness of the PM program. Are PMs being performed too often or not often enough? Should PM intervals or their scopes be modified based on specific failures reported through maintenance reporting? What staffing is required to perform PMs? VMRS provides the answers.
11. **VMRS Helps Benchmark Equipment and Labor Productivity**—The standards provide data necessary for measuring labor productivity. The relationship between direct and indirect labor can be evaluated and changes implemented as needed. Parts/labor ratios can be established that provide the lowest overall maintenance costs. VMRS provides the basis for establishing the economic break-

point between parts replacement and parts repair. Equipment utilization, an important ingredient in transportation, is impacted by maintenance. VMRS provides the means for recording downtime and identifying the specific reason for excessive delays.

12. **VMRS Helps Benchmark Component Performance**—VMRS provides the data for measuring performance and reliability of specific components and/or parts. A determination can be made of first failure (normally attributed to the equipment manufacturer) and subsequent failure (normally attributed to maintenance).
13. **VMRS Assists in Equipment Replacement Decisions**—VMRS can substantiate requests for new or replacement equipment based on current rather than historic information. Maintenance support requirements can be determined for each class of equipment being operated. This allows management to quickly determine whether it is more economical to replace or repair and what support is required in the way of labor and material for any combination of new and/or used equipment.
14. **VMRS Satisfies Reporting Requirements**—VMRS allows fleets to fulfill the ever-changing reporting requirements dictated by government agencies.
15. **VMRS-Compatible Software is Widely Available**—Many software suppliers currently offer complete turnkey VMRS-based maintenance programs. Many of these can provide custom-made reports to suit the specific needs of the user. Software is also available from a number of sources allowing in-house processing of VMRS.

VMRS™ Version 2.0 Licensing

Description of Licensing Agreements

There are four levels of licensing agreements associated with the use of VMRS™ Version 2.0:

- Electronic Catalog
- VMRS Complete Corporate
- VMRS Complete Developer
- VMRS Complete Distribution

These license products are delivered in electronic format via download and are updated on a regular basis. Each of these license options have a term of one-year, which is renewable.

Let's examine each of the four to understand how they apply to your organization.

A. Electronic Catalog

"VMRS Electronic Catalog" is an annual subscription license that includes VMRS Code Keys 31, 32 & 33 (System/ Assembly/ Component), along with Code Key 34 (Manufacturer/ Supplier/ Brand) Codes. "VMRS Electronic Catalog" is intended for use by manufacturers and others seeking to properly identify their specific components with VMRS for use in electronic cataloging and part number matching with a VMRS code. The VMRS Electronic Catalog License includes updates and coding requests at no extra charge. Licensing fee is based on annual company sales (self-reported). License purchases will be reviewed by TMC prior to delivery. The licensee may say that they are VMRS™ compliant only if they follow the guidelines in the *VMRS Implementation Handbook*.

B. VMRS Complete Corporate License

"VMRS Complete Corporate" is an annual subscription license that includes the complete set of VMRS Code Keys and Instruction Sets. It includes the traditional service and procedural Code Keys that are of value to fleets, service providers and repair facilities. It is to be used internally by the VMRS-license holder, and allows the licensee to import the codes into a software program whose manufacturer holds a VMRS Complete Developer license. The VMRS Complete Corporate License includes updates and coding requests at no extra charge. Licensing fee is based on annual company revenue (self-reported) VMRS License purchases will be reviewed by TMC prior to delivery.

C. VMRS Complete Developer License

"VMRS Complete Developer" is an annual subscription license that limits the use of the VMRS

Code Keys only for the purpose of developing VMRS feature sets (not the VMRS codes) within a developer's own applications or tools. VMRS Code Keys are not distributable with the software or tools. The end-users of the developer's software must individually license the actual VMRS Codes through their own VMRS Complete Corporate license directly from TMC. VMRS License purchases will be reviewed by TMC prior to delivery. The VMRS Electronic Catalog License includes updates and coding requests at no extra charge. The licensee may say that they are VMRS™ compliant only if they follow the guidelines in the *VMRS Implementation Handbook*.

D. VMRS Complete Distribution License

"VMRS Complete Distribution" is an annual subscription license that includes the VMRS Developer license which also includes the right to distribute the VMRS codes in software or to present the VMRS codes within a Software-as-a-Service (SaaS) offering. Software can be hosted on-premises or cloud-based. Pricing is based on number of end-users, and an annual declaration must be provided by licensee. The VMRS Complete Distribution License includes updates and coding requests at no extra charge. VMRS License purchases will be reviewed by TMC prior to delivery. The licensee may say that they are VMRS™ compliant only if they follow the guidelines in the *VMRS Implementation Handbook*.

E. Use of the Implementation Handbook

No license is needed / offered. Additional copies of the *VMRS™ Implementation Handbook* may be obtained from TMC / ATA. (See page 6.)

Frequently Asked Questions on VMRS™ Licensing

- Q. Why does TMC / ATA require license agreements?
- A. TMC / ATA has always owned proprietary rights in the VMRS system and its trademarks. TMC / ATA uses licensing to make clear how VMRS™ may be used by members and others. This helps ensure the integrity and utility of the VMRS system, as well as enable TMC / ATA to maintain and enhance the viability of this industry standard.

Q. Why are there different types of licenses?

A. Different customers use the VMRS™ product in different ways. Having different types of licenses, with prices determined by the type of usage, is a fair way to permit appropriate levels of usage by customers.

Q. Can I make copies of the electronic media and put the materials on my computer network for use by my employees?

A. All four license versions permit the licensee to copy the electronic media onto an internal network. A licensee may not do share the codes beyond its own company if it holds a VMRS Complete Corporate or Developer License.

Q. I obtained a copy of the Handbook. Can I type the Code Keys into my own computer?

A. Purchasing a copy of the Handbook does *not* provide you with the right to create your own electronic database. You may purchase a license to use the electronic media if you want to use the Code Keys on your computer.

Q. Do I have to use all of the Code Keys?

A. TMC/ATA does not intend to dictate any particular usage of the VMRS™ product by members or others. However, a licensee can only say that they or their product are VMRS™ compliant if they utilize all of the particular Code Key values for the Code Key(s) that they use. If you wish

TMC/ATA to assign a new code not listed in the Code Keys, you may call TMC/ATA's offices at (703) 838-1763. Licensees may request new codes without charge.

Q. Can I add my own information to the Code Keys?

A. TMC/ATA has rights in the Code Keys and in its trademarks, such as VMRS™. To maintain the integrity of the Code Keys the significance and good will TMC/ATA has obtained through its trademarks, TMC/ATA prohibits members who add material to the Code Keys from using any TMC/ATA trademarks in conjunction with the modified material. For example, if you were to add new part numbers to Code Key 33, then you would not be permitted to call it part of the VMRS™ system. If you wish TMC/ATA to assign a new code not listed in the Code Keys, you may call TMC/ATA at (703) 838-1763.

Q. Can I distribute copies of the Code Keys to others in the industry?

A. TMC/ATA does not normally permit distribution of copies of the electronic materials or the Handbook to any entity outside your enterprise. Software containing the Code Keys may be distributed as part of a separate software product under a Distribution License Agreement. Copies of the electronic version may be distributed within your enterprise pursuant to the VMRS Complete Corporate License.

2015 - present VMRS™ logo



1999 - 2015 VMRS 2000™ logo



1998 Logo



The VMRS™ symbol identifies products that use the VMRS™ coding convention. Products bearing these logos meet certain minimum criteria set by TMC/ATA as key to using VMRS. For more information, see VMRS™ Licensing in Section I of this Handbook.

2. Requirements for Using VMRS™

What Are the Basic Requirements for Implementing VMRS?

All external reporting and data interchange must adhere to VMRS coding conventions as defined herein or further described in this *VMRS™ Implementation Handbook*.

Internal reporting may use other techniques; however, all external interchange of information must be converted to VMRS using direct correlations. No assumptions, prorations, or averages can be used in any conversions.

Full implementation of VMRS™ uses nine key VMRS components. Unless each of the nine items listed below can be checked “yes,” the user is not implementing VMRS™ correctly and will be unable to obtain credible or meaningful direct comparisons from any VMRS data base or other VMRS participant.

YES Does the System Do the Following?

- Use the VMRS Equipment Master Record.
- Identify Equipment Vocation — Code Key 1.
- Segregate costs by Reason for Repair—Code Key 14
- Identify work accomplished using VMRS Coding—Code Key 15
- At minimum, identify systems via the three-digit VMRS System Code —Code Key 31
- For more detail, identify assemblies via the three-digit VMRS Assembly Code—Code Key 32
- For even more detail, identify individual parts via the three-digit VMRS Component Code—Code Key 33.
- Identify part/equipment manufacturers, suppliers or brands universally using Code Key 34.
- Have the capability to record VMRS Technician Failure Codes—Code Key 18.

Let’s now look at each of these nine VMRS components to see how VMRS works.

The Equipment Master Record

What is a piece of equipment? It is not just a year, make, and model, but rather a unique series of components assembled to perform a specific task. Under VMRS, each of these components can be followed and monitored on an independent basis or as a total piece of equipment. The sum of the costs of maintaining the components represents total equipment maintenance cost.

VMRS uses a Equipment Master Record (similar to a birth certificate) to record many of the items appearing on the manufacturer’s line set tickets. The Equipment Master Record Form allows for consolidation of data from all manufacturers into a uniform format.

Equipment Vocation Codes: Code Key 1

Each piece of equipment must be clearly identified as being assigned to a specific mission, identifiable within the VMRS coding system. To this end, TMC has expanded these codes to meet additional equipment user needs. Using Code Key 1, for example, allows linehaul costs to be identified and separated from pickup and delivery and/or other equipment assignments.

Code Key 1 identifies the primary activity or vocation to which a unit has been assigned—“what the equipment does.” Additional codes are available through TMC for those equipment operations that do not fall into the following categories. What follows is a sampling of codes that appear in Code Key 1.

| Code | Equipment Activity |
|------|---|
| 10 | Linehaul (non-refrigerated) |
| 11 | Combination Service (predominately linehaul, non-refrigerated) |
| 12 | Linehaul (refrigerated) |
| 13 | Combination Service (predominately linehaul, refrigerated) |
| 20 | Pickup and Delivery (non-refrigerated) |
| 21 | Combination Service (predominately pickup and delivery, non-refrigerated) |
| 22 | Pickup and Delivery (refrigerated) |

| | |
|----|---|
| 23 | Combination Service (predominately pickup and delivery, refrigerated) |
| 30 | Billing and Collecting |
| 40 | Platform |
| 50 | Terminal/Warehouse/Plant |
| 60 | Maintenance |
| 80 | Insurance and Safety |
| 90 | General and Administration |
| A1 | Airport / Airport Support / Ground Support Vehicles |
| B1 | Construction |
| C1 | Farm / Agriculture |
| D1 | Fire Service |
| E1 | Heavy Haul |
| F1 | Logging |
| G1 | Mining |
| H1 | Oil Field |
| L1 | Refuse / Recycle Vehicle |
| M1 | Rescue / Crash Vehicle |
| N1 | Utility |
| P1 | Wrecker / Recovery Vehicle |
| Q1 | Military Vehicle |
| S1 | Earth Moving/Land Clearing |
| T1 | Demolition |
| U1 | Public Transportation |
| V1 | Construction - Redi-Mix |
| W1 | Feed Mill |

Combinations of Code Keys can be used as a numerical sentence to describe various aspects of labor or equipment. For example, Code Keys 1, 2, and 48 can be used together to generate a single code that describes what the equipment does, what it is, and what special body type it has.

“1-10-185” identifies a truck (Code Key 2), used in pickup and delivery service (Code Key 1), with a special walk-in refrigerated van type body (Code Key 48). VMRS™ calls these numerical sentences “Instructional Sets.”

Reason for Repair Codes: Code Key 14

Identifying what caused a piece of equipment to come in for repair is essential to proper equipment management. VMRS provides for the segregation of this activity in one of the three following areas:

1. **Maintenance**—This represents all monies spent on equipment to keep it operational, and could be used to affect management’s

decision to purchase that piece of equipment again. Monies spent in this category directly influence the replacement decision.

2. **Management Decision**—This category identifies and isolates all monies spent which are neither the equipment’s nor manufacturer’s fault and over which management has direct control. An example would be the cost of adding new logos onto a piece of equipment.
3. **Outside Influence**—Those items, over which neither the manufacturer nor the user have direct control, are classified in this category.

Under VMRS, each of the major groupings listed previously is further subdivided into a series of specific “Reason for Repair” codes.

Maintenance

| Code | Item |
|------|-------------------------------|
| 01 | Breakdown |
| 02 | Consumption, Fuel |
| 03 | Consumption, Oil |
| 04 | Driver’s Report |
| 05 | Routine Inspection |
| 06 | Lubrication |
| 07 | Pre-Delivery |
| 08 | PM |
| 09 | Rework |
| 10 | Road Call |
| 11 | Routine |
| 12 | Noted During PM or Inspection |
| 13 | No Start |
| 18 | Wheel-off |

Management Decision

| Code | Item |
|------|---------------------|
| 21 | Capital Improvement |
| 22 | Conversion |
| 23 | Modification |
| 24 | Special Study |
| 25 | Non-contract |

Outside Influence

| Code | Item |
|------|------------------------|
| 31 | Accident, Non-Reported |
| 32 | Accident, Reported |
| 33 | Manufacturer’s Recall |
| 34 | Statutory Inspection |
| 35 | Statutory Modification |
| 36 | Theft |

| | |
|----|-------------------------|
| 37 | Vandalism |
| 38 | Warranty |
| 39 | Natural Causes |
| 41 | Abuse of Equipment |
| 42 | Decommissioned/Sold |
| 43 | Roadside Inspection |
| 44 | Campaign |
| 47 | Abuse Caused By Drivers |
| 48 | Goodwill-Manufacturer |

Towing

| Code | Item |
|------|----------------------------|
| 61 | Load Shift / Load Transfer |
| 64 | Driver Out of Hours |
| 65 | Lock-out |
| 69 | Secure/Storage Impound |

**Work Accomplished Codes:
Code Key 15**

Classifying the work performed by the mechanic is important. For example, there is considerable difference between inspecting, adjusting, or repairing brakes. The original VMRS Codes Committee determined, and rightfully so, that use of such terms as major and minor would not suffice, as these terms left too much interpretation to the user. As a result, a series of two-digit work accomplished codes were developed. Each code specifically identifies what work was accomplished by the mechanic at the time the work was performed. The codes are briefly summarized below:

| Code | Work Accomplished |
|------|-----------------------|
| 01 | Adjust |
| 02 | Clean |
| 03 | Replace New |
| 04 | Replace Rebuilt |
| 05 | Replace Used |
| 06 | Inspect |
| 07 | Lubricate |
| 08 | Overhaul |
| 09 | Troubleshooting |
| 13 | Other Maint. Repair |
| 14 | Install |
| 15 | Paint Prep, & Repaint |
| 17 | Add Fluids |
| 18 | Road Test |
| 19 | Rewire / Wire |
| 20 | Towing |
| 21 | Fabricate/Weld/Burn |
| 24 | Repair |

| | |
|----|-------------------------|
| 25 | Remove |
| 30 | Work Incomplete |
| 31 | Rotate |
| 32 | Torque |
| 33 | Tighten |
| 44 | Flush |
| 51 | Rebuild |
| 58 | Diagnose |
| 98 | In Frame Overhaul |
| 99 | Out of Chassis Overhaul |
| A | PM Level A |
| B | PM Level B |
| C | PM Level C |
| D | PM Level D |
| E | PM Level E |
| F | PM Level F |
| G | PM Level G |
| H | PM Level H |
| O | PM Level O |

**VMRS System Level Codes:
Code Key 31**

VMRS™ uses a series of three-digit descriptor codes that readily and consistently identify the specific systems involved. While these codes are the heart of the “common language” of VMRS and are a vital part of the VMRS concept, they are by themselves nothing more than coding conventions designed for use at all levels within the industry, from fleets to mechanics to manufacturers to suppliers of parts. For example, brakes are identified as a system by Code Key 31 System Code 013.

A brief listing of Code Key 31 codes follows:

Cab, Climate Control, Instrumentation and Aerodynamic Devices

| Code | System |
|------|---|
| 001 | Air Conditioning, Heating, and Ventilating System |
| 002 | Cab and Sheet Metal |
| 003 | Instruments, Gauges (All), and Meters |
| 004 | Aerodynamic Devices |

Chassis

| | |
|-----|------------------------|
| 011 | Axles Front—Non-Driven |
| 012 | Axles Rear—Non-Driven |
| 013 | Brakes |
| 014 | Frame |
| 015 | Steering |
| 016 | Suspension |

- 173 Tilt Bodies
- 174 Bus Body
- 175 Emergency Vehicle
- 177 Recreational Vehicle

Heating and Refrigeration

- 081 Heating Unit (for power units, trailers, etc.)
- 082 Refrigeration, Mechanical (for power units, trailers, etc.)
- 083 Refrigeration, Nitrogen (for power units, trailers, etc.)
- 084 Refrigeration, Holdover Plate (for power units, trailers, etc.)

Bulk Product Transfer Systems

- 091 Blowers, Conveyors, and Vibrators (for power units, trailers, etc.)
- 092 Compressor, Bulk Product Systems (for power units, trailers, etc.)
- 094 Engine, Auxiliary (for power units, trailers, etc.)
- 095 Manifold (for power units, trailers, etc.)
- 096 Power Shaft (for power units, trailers, etc.)
- 097 Pump (for power units, trailers, etc.)
- 098 Valves and Controls (for power units, trailers, etc.)
- 099 Safety Devices, Instruments and Gauges (for power units, trailers, etc.)
- 191 Bulk Storage System
- 192 Batch Mobile Processing Plant
- 193 Belt Conveyor System
- 194 Bucket Conveyor System
- 195 Screw Conveyor System
- 196 Roller Conveyor System
- 197 Chain Conveyor System
- 198 Paddle Wagon, Drag Chain Assembly
- 199 Processing Screens
- 291 Dairy Pumping Unit
- 292 Concrete Pumping Equipment
- 293 Oil Shaker Box
- 294 Fuel Metering

**Assembly Level Codes:
Code Key 32**

Through the use of assembly level codes, VMRS provides additional capability to further define Code Key 31's System Codes. The first classification below the system level is referred to as

the assembly. At this level, all major groupings within each system are broken out and reported through the use of a three digit code. These, when used with their system prefix, identify the specific assembly within a piece of equipment. For example, front brakes and drums can be identified by a combination of the System and Assembly Code 013-001. A complete listing of Code Key 32 appears elsewhere in this *Handbook*.

**Component Level Codes:
Code Key 33**

In order to provide a common generic term for each part within a piece of equipment, the system and assembly codes are further subdivided to the component level. This is accomplished through the use of an additional three digit part identifier code. These codes should not be confused with the manufacturers' or suppliers' unique identification (part) numbers, but rather should be considered universal identifiers or generic terms for the part. For example, a front brake lining can be identified by the following combination of System / Assembly / Component codes—013-001-015. A complete listing of Code Key 33 appears elsewhere in this *Handbook*.

**Manufacturer/Supplier/Brand
Identification: Code Key 34**

In order not to disturb either the manufacturers' or suppliers' unique numbering system, VMRS uses its own generic means of identifying manufacturers/suppliers or their brands. The identifier is a five-character alpha code, assigned by TMC.

It used as a prefix to the manufacturers' and/or suppliers' unique number. It is not the intent of VMRS to supplant the manufacturers' /suppliers' unique part numbering systems, but rather to supplement them.

When a Code Key 34 manufacturer's (or brand) code and part number are used in conjunction with the VMRS System / Assembly / Component level codes (Code Key 33), precise identification of a specific part is possible on a universal basis. This commonality of identification on a consistent basis is a prerequisite to developing an industry database for analysis of maintenance information or for mutually exchanging

information on a meaningful basis. A complete listing of Code Key 34 appears elsewhere in this Handbook.

Technician Failure Codes:

Code Key 18

VMRS has the additional capability of identifying why a mechanic or supervisor thinks a part failed and why. It is a two-character alpha-numeric code.

An example of a technician part failure code is:
22 = Part Misaligned.

Code Key 18 is listed briefly below:

| Code | Description |
|------|-------------------------------------|
| 00 | No Failure |
| 01 | Battered, Hammered |
| 02 | Burned, Scorched, Melted, Blistered |
| 03 | Crushed, Pinched, Folded, Crimped |
| 04 | Dented |
| 05 | Elongated, Stretched |
| 06 | Faded, Dulled Finish |
| 07 | Improper Fluid Level |
| 08 | Improper Electrical Value |
| 09 | Insufficient Clearance, Rubs |
| 10 | Bent |
| 11 | Binds, Sticks |
| 12 | Broken |
| 13 | Chipped, Pitted |
| 14 | Cracked |
| 15 | Foreign Material Present |
| 16 | Glazed |
| 17 | Insufficient Lubrication |
| 18 | Leaking |
| 19 | Loose |
| 20 | Lubrication or Oil Soaked |
| 21 | Misadjusted |
| 22 | Misaligned |
| 23 | Not Connected |
| 24 | Not Drilled |
| 25 | Out of Balance |
| 26 | Out of Round |
| 27 | Overheated |
| 28 | Part Improperly Installed |
| 29 | Part Omitted |
| 30 | Poor Fit, Wrong Size |
| 31 | Poor Metal Finish |
| 32 | Porosity |
| 33 | Registers Incorrectly |
| 34 | Rough |
| 35 | Rusted or Corroded |
| 36 | Scored or Scratched |
| 37 | Seized |
| 38 | Shorted |
| 39 | Soiled or Stained |
| 40 | Stripped / Cross Threaded |
| 41 | Torn, Punctured or Split |
| 42 | Warped, Twisted |
| 43 | Weak |
| 44 | Worn |
| 45 | Wrong Part |
| 46 | Lost or Missing |
| 47 | High Pressure |
| 48 | Low Pressure |
| 49 | Cut or Rubbed |
| 50 | Hard or Brittle |
| 51 | Inoperative |
| 52 | Leaking Air |
| 53 | Leaking Compression |
| 54 | Leaking Exhaust |
| 55 | Leaking Fuel |
| 56 | Leaking Oil |
| 57 | Leaking Refrigerant |
| 58 | Leaking Water |
| 59 | Moisture, Condensation |
| 60 | Noisy |
| 61 | Oil Passing |
| 62 | Improper Fabrication |
| 63 | Improper Weld |
| 64 | Plugged |
| 66 | Vibration |
| 67 | Spun |
| 68 | Brightwork/Chrome Defect |
| 69 | Insufficient Ground |
| 70 | Underspray |
| 71 | Overspray |
| 72 | Peeled, Flaked, Bubbled |
| 73 | Orange Peel |
| 74 | Runs, Sags |
| 75 | Thin Paint or Unpainted |
| 80 | Underinflated |
| 81 | Flat |
| 82 | Needs Repair |
| 83 | Mismatched Height/Tread |
| 84 | Irregular Wear |
| 85 | Curbed |
| 86 | Brake Skid |
| 87 | Chain Damage |
| 88 | Vehicle Mechanical Damage |
| 94 | Leaking Coolant |
| 95 | Reprogram |
| 96 | Primer Peeling from Part |

| | |
|----|------------------------------------|
| 97 | Paint Peeling from Primer |
| 98 | Wrong Color |
| 99 | Replaced Before Failure |
| A1 | Campaign |
| A2 | Leaking Diesel Exhaust Fluid (DEF) |
| A9 | Improper Torque |
| B1 | Blowout |
| B2 | Contamination |

Summary

In summary, there are nine basic, integral parts to VMRS™, each interrelated to the other. Independently they cannot be considered VMRS any more than a chassis by itself can be considered a truck. VMRS, by its very concept, requires complete integration of all elements in the same manner that all parts of a piece of equipment must be considered when reviewing the entire piece of equipment. The basic VMRS elements are:

1. The VMRS Equipment Master Record—an equipment birth certificate.
2. Code Key 1: Equipment Vocation Codes—used to identify the specific work assignment of the piece of equipment.
3. Code Key 14: Reason for Repair Codes—used for segregating repair expenditures.
4. Code Key 15: Work Accomplished Codes—used to denote what tasks were performed to the piece of equipment.
5. Code Key 31: System Level Coding—used to identify equipment systems.
6. Code Key 32: Assembly Level Coding—used to identify equipment subsystems.*
7. Code Key 33: Component Level Coding—used to identify equipment components.*

*SPECIAL NOTE: If coding to the assembly or part level is exercised, no substitution or deviation of coding structure is permitted.

8. Code Key 34: Manufacturer/Supplier/Brand Code—used to identify the actual manufacturer/supplier or brand of a given part.
9. Code Key 18: Technician Failure Code—used to record the technician’s/supervisor’s best estimate as to why a specific component failed.

3. How to Implement VMRS™

This section provides guidelines for implementing VMRS™. While general in nature, the procedures and recommendations discussed herein are based upon proven procedures and equipment user experience representing a variety of fleet types and sizes. Whether or not you choose to implement VMRS directly, or through an outside vendor, this section should provide useful guidance in managing and streamlining the implementation process.

How you — the equipment user — choose to implement VMRS beyond the basic requirements is a matter of individual management judgement. However, following these guidelines increases your chances of making VMRS work for your operation.

The best means of ensuring successful implementation of VMRS is through:

- full management participation during initial implementation,
- adequate training of all personnel in VMRS fundamentals, and;
- action upon the information produced by VMRS.

Implementation Preparation

A fleet maintenance information system should be one of several equipment history subsystems capable of providing uniform source data and information to all relevant fleet management functions. The principle is simple: data is captured once, then redistributed as needed in appropriate formats. Eliminating duplication minimizes information errors.

Right from the start, all managers who will derive information from VMRS should be involved in the process of determining how the information will be formatted. Top management should support the formation of an implementation committee which will represent appropriate management functions and assist in implementing VMRS. It's important that all members of this committee approach this task free of any preconceived ideas. Finally, one person should

be given responsibility and authority to lead this team effort.

There are 17 basic steps to implementing VMRS from scratch. These are:

1. Define the company purpose for implementing VMRS.
2. Assign a VMRS project manager.
3. Designate participating departments.
4. Obtain all appropriate VMRS™ references, such as this *Handbook*.
5. Contact and visit fleets currently using VMRS.
6. Conduct a systems study of current practices.
7. Approve the findings of the systems study from Step 6.
8. Develop a VMRS implementation plan.
9. Design the new fleet management system around VMRS.
10. Develop all necessary data processing system applications (i.e., maintenance management software or paper-based data entry system) either internally, or through an outside supplier.
11. Develop/obtain VMRS training materials and support procedures.
12. Train all necessary personnel.
13. "Beta" test the VMRS system.
14. Document VMRS system performance.
15. Modify training materials and procedures if necessary.
16. Fully implement VMRS.
17. Review, evaluate, enhance and expand VMRS usage either continually or periodically.

Failure to follow these 17 steps has proven troublesome for fleets trying to haphazardly implement VMRS. Shortcuts to this process inevitably lead to incomplete and ineffective systems, duplication of work, and systems interface incompatibility. The only way to avoid such waste is through the planned, progressive and orderly development of integrated systems.

Let's now examine each of the 17 steps in detail.

1. Define the Company Purpose for Implementing VMRS.

This definition should be general in scope, reflecting the goals of what VMRS should ultimately provide the company. This step helps establish a company-wide common objective.

An example of such a purpose statement is:

"The purpose of the Equipment and Maintenance Management Information System is to provide essential information for the future and current procurement, operation, and maintenance of the company's automotive and associated equipment. Uniform financial, usage, and utilization information on individual pieces of equipment, maintenance parts, labor charges, and maintenance facilities should be available to all departments in the detail and format they separately require."

2. Assign a VMRS project manager.

The project manager is the team leader and should be selected with care. This person must have:

- a degree of recognition within the organization,
- time to devote to the project,
- an overall understanding of various departmental functions, responsibilities, and interrelationships, and;
- possess the ability to develop consensus between subordinates, supervisors and peers.

It's a mistake to simply assign this role to the company's data processing manager just because someone expects that this person should design the system.

3. Designate participating departments.

Initially, it may not be possible to designate all participants to the project. However, it is essential to include, as soon as possible, managers from all relevant departments, such as maintenance, accounting, equipment and data processing. Other participants may represent operations, environmental, and safety departments, for example. As the project evolves, participants may be added or removed as needed.

4. Obtain all appropriate VMRS™ references, such as this Handbook.

Since you're reading this you've obviously already purchased the VMRS™ Handbook. Other informative VMRS references are available by calling the Technology & Maintenance Council's customer service line at (866) 821-3468 or (703) 838-1763. You should always check to see that you have the latest codes and materials, as updates are issued frequently.

5. Contact and visit fleets currently using VMRS.

If one picture is worth a thousand words, several visits to fleets already using VMRS can be worth many times that. Such visits should be planned so that key project team members can meet with their host fleet's opposites. Feel free to contact TMC staff at (703) 838-1763 for assistance in making such contacts.

6. Conduct a systems study of current practices.

A systems study of current practices can reveal a detailed understanding and identification of:

- existing information systems in the company directly or indirectly related or applicable to the equipment and maintenance function and their interrelationships, if any.
- data and information requirements of users of the one or more existing systems which may or may not relate to the new system.
- all prospective users of the new system and data/information requirements.
- sources of data input to the existing system.
- similar data currently being recorded at several points and, similarly, the identification of similar or duplicate reports being prepared and distributed from several uncoordinated sources.

Interviews, reports, and onsite visits may all be necessary during the systems study. Documentation, including appropriate flow charts of data/information, should be included in the report.

A draft should be reviewed by all project members to ensure its effectiveness and accuracy. The

final report should acquaint the task organization, top management, and all other persons likely to be involved with the development, design, and implementation of the new system. The systems study is the point of departure for the implementation of VMRS and the design of the new system upon which it is based.

7. Approve the findings of the systems study from Step 6.

Upper management should approve the systems study in writing. Prior to approval, it may be necessary to brief upper management on various aspects of the report. Therefore, it's a good idea to prepare an executive summary of the full report for such meetings.

8. Develop a VMRS implementation plan.

The implementation plan provides orderly structure to the implementation process, based on realistic time schedules, financial and personnel resources. The plan should specify assignments, costs, responsibilities and timetables for each step of the implementation process. If necessary, obtain upper management approval for the plan prior to implementation.

9. Design the new fleet management system around VMRS.

In designing a new equipment and maintenance information system, six basic questions must be answered initially:

- Will this be a computer- or manual-based information system?
- If computer-based, what computer will be used to process the data, both now and in the foreseeable future?
- What elements of existing systems, if any, will be preserved in the new system?
- If maintenance work is now performed at one location, can this work be expected to be performed at additional locations in future?
- By what date must the new system be operational?
- Are suitable computer applications available for purchase or lease?

When these questions are answered, the design process can proceed.

VMRS can provide users with as much or as little data and information as is desired. Because

various users will need varying amounts of detail, it is important to meet with those individuals who will ultimately use the information to determine their specific needs. Experience to date has shown that the more knowledgeable VMRS users become about the system, the more they demand from it.

Figure 3-1 illustrates primary and alternative approaches for implementing a computer-based system using VMRS. As shown, the design phase can be divided into two simultaneous interrelated phases: (1) systems and data processing development, and (2) training and procedures development. Both phases are vital for successful use of VMRS.

The basic categories of data which may be derived from VMRS are:

1. Identification of equipment by:
 - category
 - activity
 - general configuration
 - major component characteristics and features
 - size and weight
 - manufacturers
 - location
 - acquired date
 - cost and depreciation schedule
 - ownership
 - individual equipment identification.
2. Identification of individual equipment maintenance work performed by:
 - facility which performed the work
 - equipment identification
 - date service performed
 - accumulated service (miles/hours)
 - category of repair/service performed
 - repair class/service performed
 - location where repair/service was performed
 - equipment components repaired/serviced
 - parts failure description
 - labor identity and cost by component category.

The VMRS™ Repair Order Form (*Form 6*) and the Equipment Master Record (*Form 1*) are the system source input documents for the previously described data. **Figure 3-2** illustrates how the two documents interrelate.

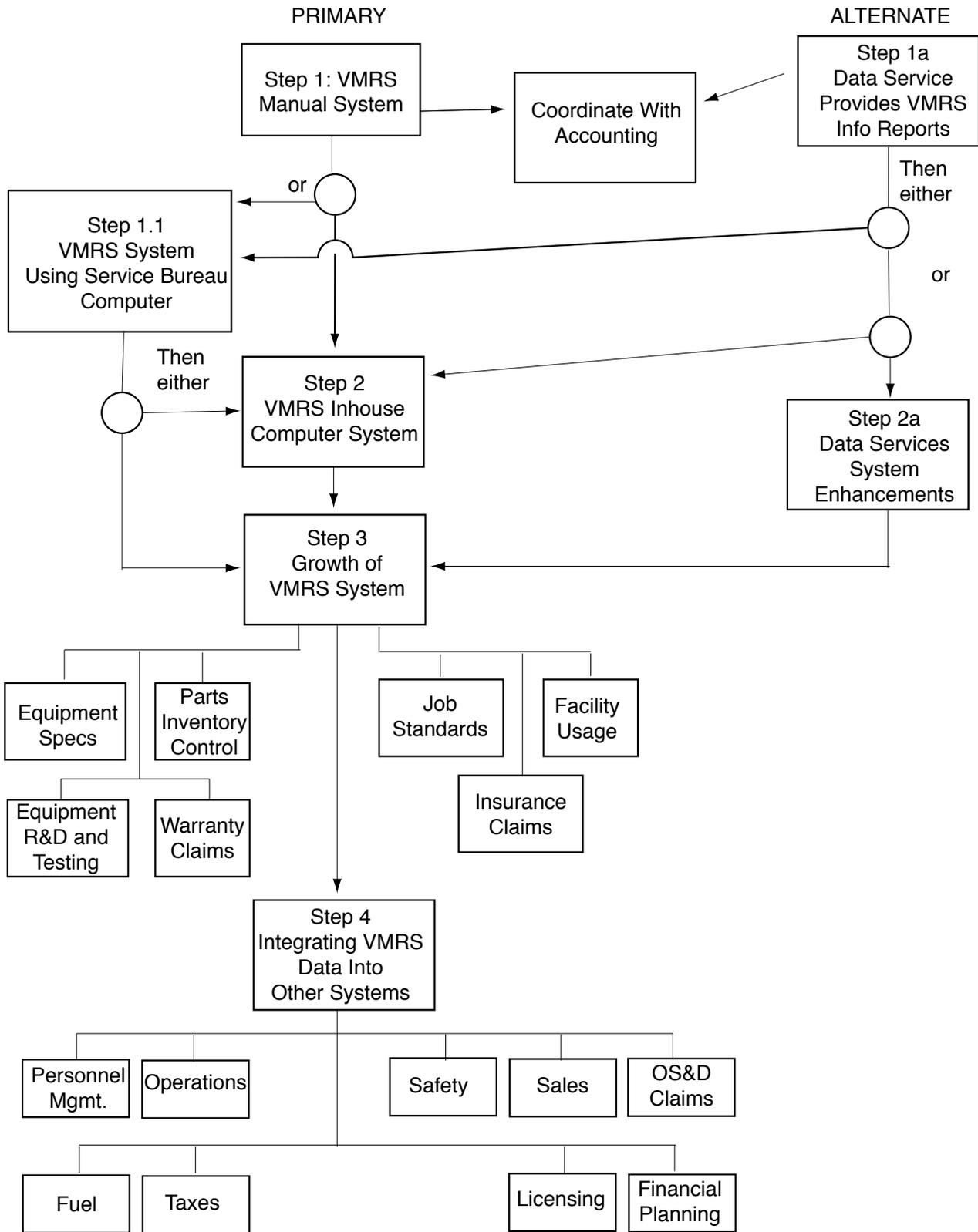


Figure 3-1

The ability to identify and record this type of data makes it possible to:

- Classify expense by activity
- Identify expense by type
- Report performance, costs, etc., by individual units of equipment, groups of like equipment, groups of unlike equipment in like service or at the same location, etc.
- Report equipment utilization individually, by groups, by location, by type activity, etc.
- Report facility utilization.
- Report direct labor utilization
- Report indirect labor utilization
- Identify rework
- Identify warranty work/ claims
- Control inventories by identifying spare parts required to support maintenance operations by equipment groups, loca-

tions, manufacturer, supply source, cost and usage

- Identify obsolete spare parts.

When data is identified and recorded as described above, the basis of the equipment and maintenance information reporting system is established. Some of the information that is available to departments beyond equipment and maintenance, based on this data includes:

- Operations
 - Equipment utilization
 - Special load requirements
 - Driver training needs
 - Licensing data
 - Claims analysis of damaged freight
- Sales
 - Unprofitable shipper identification
- Safety
 - Equipment characteristics in accident analysis
 - Component life history
 - Component identity by manufacturer
 - Parts failure cause
- Accounting
 - Equipment costs for financial reporting
 - Equipment costs for tax purposes
 - Valuation of equipment and supporting spare parts inventories
- Personnel
 - Staffing requirements at specific locations

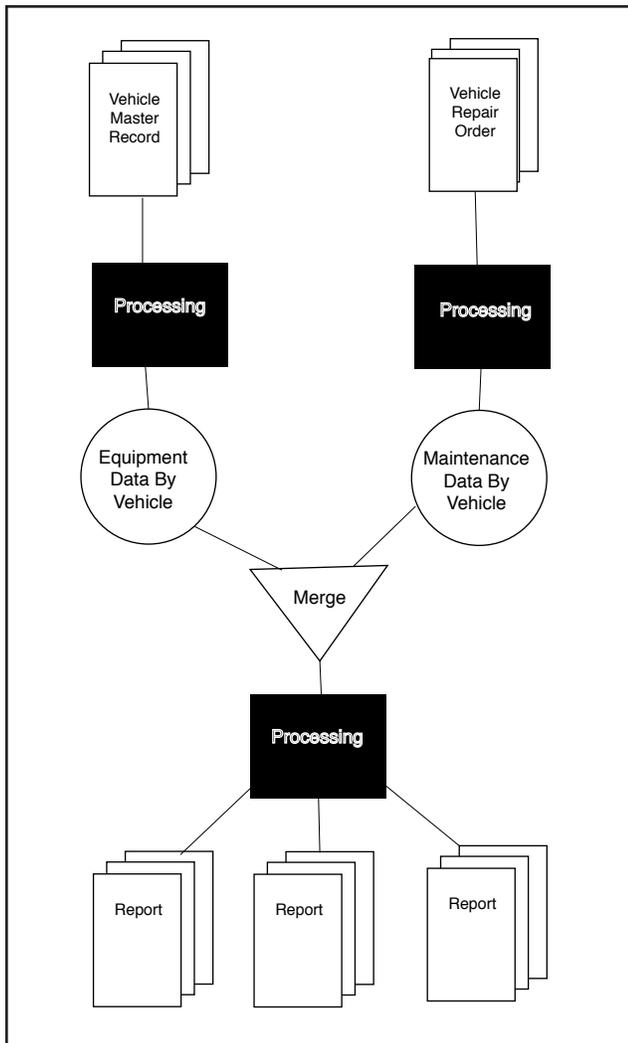


Figure 3-2

In corporate management meetings, it is important that information on the performance of various equipment makes and models — as well as the performance of various maintenance facilities — be available for future financial and development planning. Such information can be derived from the equipment and maintenance information system in the form of summary reports.

Before either the systems and data processing applications or the manual support procedures can be developed, the specific requirements of the user's new systems must be determined, with regard to individual report information and layout, forms, equipment used for data recording, data transmission methods, data codes,

report frequency, etc. Additionally, the specific requirements of the new system must be considered with regard to their impact on established or new manual procedures. Finally, a general system design should be presented to allow for the subsequent guidance and direction of detailed systems development and implementation.

10. Develop all necessary data processing system applications (i.e., maintenance management software or paper-based data entry system) either internally, or through an outside supplier.

This step — and that of developing manual support procedures — should occur at the same time, if possible. The potential relationship between these two steps may point out systems and/or support requirements unforeseen in earlier states of the project.

In program design, modular programming is recommended to facilitate future development within the system, as well as in the overall systems relationship to other systems. Do preserve the ability to use all the features of VMRS in the system, even though initially their usage may not be required or envisioned. Also provide room for records of maximum size for future systems growth.

Use open-ended code lists so new codes can be added later. And, program for nine-digit component codes, even though initial requirements may only be for three- or six-digit codes. (Refer to Code Key 33.) Finally, write the required applications as needed.

11. Develop/obtain VMRS training materials and support procedures.

The design of the systems paper flow should include all steps from initial data entry to final systems input. The responsibilities of specific position job descriptions for the data input, review and supervision and paper flow should be assigned at this step.

Backup or contingency plans should be made in the event that normal support procedures are disrupted, such as using truck mail to substitute for e-mail, or postal service. Perform a critical analysis of the manual support procedures to

determine possible causes and effects of such disruptions, and alternate means of functioning.

12. Train all necessary personnel.

Personnel can make or break even the most carefully designed system. If the project has the full support of the highest levels of management, personnel resistance to change can be more readily overcome.

All participants should receive appropriate training in VMRS and the overall management system, as it directly impacts their work. Those individuals directly responsible for data input or subsequent review or verification of basic data (mechanics, supervisors, parts specialists, etc.) must appreciate how their performance is critical to the success of the entire system.

The training phase offers an excellent opportunity to gather both test data and historical data. Early introduction of the VMRS Repair Order Form (*Form 6*) will capture basic data in its new format, and enable test data to be live data. Furthermore, this live data can be used in any existing system as well as stored for subsequent entry into the new system. Thus, when the new system is implemented, a meaningful file of relevant past data will be available in VMRS format for initial output reports.

13. “Beta” test the VMRS system.

Good data samples should be used to beta test the system, and can best be obtained by following the procedures outlined previously.

Test results should be analyzed to uncover programming or input errors, as well as errors in output reports. If a present maintenance information system exists, it may be possible to compare and validate some of the test data with the live data of the current system. Furthermore, the two systems can be run on a parallel basis. Problems uncovered should be shared with those concerned, and resolved. Subsequently, programming changes can be made.

Test/sample reports should be provided to all users for review, comments, recommendations, and approval. Finally, changes should be made as necessary.

14. Document VMRS system performance.

The four key elements to this step are:

- prepare systems operations flow charts and instructions.
- prepare data entry instructions.
- document the system.
- document applications programming.

15. Write or modify training materials and procedures as necessary.

This step creates institutional memory of how the system functions. As personnel change, these materials will increase in value. It is essential that formal procedural references be available to train new and current personnel. Development and maintenance of the systems and procedures manual should be assigned to the one manager who has the fullest understanding of the system at the operating level.

16. Fully implement VMRS.

The actual implementation of a VMRS-based maintenance management system can be accomplished in several ways. If an existing system has been in operation, the two systems can be run parallel, beyond the test phase, so as to thoroughly familiarize all persons with all phases of the new system.

If, on the other hand, management believes the system can be implemented without further trial and training, a set date can be established to terminate the old system and begin the new system.

If multiple shop locations are involved, it may be a good idea to phase in the new system at one or several sites at a time. This permits onsite supervision by management to ensure implementation is off to a good start.

It may be a good idea to convert historical data to the new system, if justifiable.

Closely monitor the new system and evaluate its output and the relationship it has with other systems. Fine tuning is easier to accomplish earlier, rather than later. Additionally, solicit feedback from all relevant parties—from the shop floor to the front office—so necessary adjustments can be made as quickly as possible.

17. Review, evaluate, enhance and expand VMRS usage, either continually or periodically.

All management information systems should undergo periodic review or audit to determine whether or not they are functioning efficiently. For example, the equipment that supports the system may become less efficient and/or more costly as technology improves.

New management information requirements may overlook the fact that the basic information sought may be derived from data already being recorded, or available to be recorded in the existing system. Similarly, new information requirements may be met with data available for processing from both the maintenance and other information systems.

Enhancements should be treated as if one were establishing a new system. The same considerations should be applied even to “one-time only” projects. Finally, the continuing process of fine-tuning should seek as its goal the best possible information at the least expense.

Conclusion

Equipment and maintenance reporting is not a speciality. It is a major component of any fleet’s data reporting and analysis effort. As such, maintenance reporting should be a thoroughly integrated component of both the basic fleet management information system and its subsidiary systems.