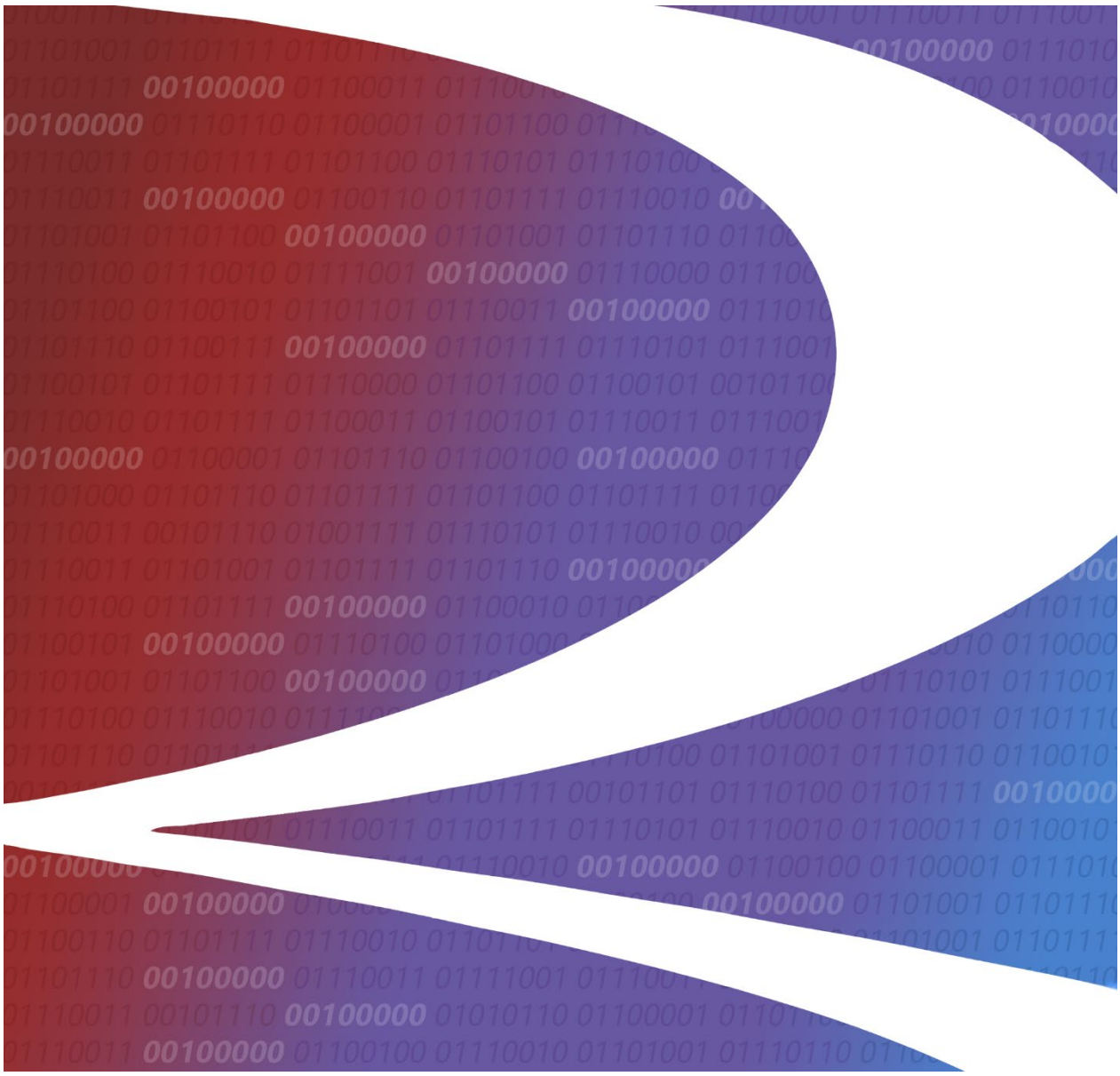


Machine Vision User Guide

Last Updated: December 2024

Table of Contents

List of Exhibits

Learning about Machine Vision

The purpose of this document is to provide step-by-step instructions for using the Machine Vision application. With Machine Vision you can view, filter and export data.

Machine Vision provides data to the industry used to analyze equipment characteristics within a car's design, for the purpose of reducing LORFs.

Overview

Machine Vision gathers and stores comprehensive, distinct, and scalable data related to end of car arrangements and other equipment characteristics that impact Line of Road Failures (LORFs) and support industry identification of potential car design issues.

Machine Vision provides the following benefits:

- Expand data available for analyzing equipment characteristics.
- Define distinct classifications for Machine Vision Systems data.
- Record arrangement reports through systems integration.
- Increase access to industry data and identification of car design issues, reducing LORF events.
- Minimize human error contributions which can negatively affect data quality.

System Requirements

For information about the system requirements of Railinc web applications and for information about downloading compatible web browsers and file viewers, refer to the *Railinc UI Dictionary*.

Accessing the Railinc Customer Success Center

The Railinc Customer Success Center provides reliable, timely, and high-level support for Railinc customers. Representatives are available to answer calls and respond to emails from 7:00 a.m. to 7:00 p.m. Eastern time, Monday through Friday, and provide on-call support via pager for all other hours to ensure support 24 hours a day, 7 days a week. Contact us toll-free by phone at 877-RAILINC (1-877-724-5462) or send an email directly to csc@railinc.com.

Getting Started

Machine Vision is accessed using the Railinc Single Sign-On (SSO). SSO can be accessed from the Railinc portal at *Railinc Single Sign-On/Launch Pad User Guide*. The SSO login is located at the upper right of the page.

Register to Use Railinc SSO

Each Machine Vision user must register to use Railinc Single Sign-On. Refer to the *Railinc Single Sign-On/Launch Pad User Guide* for more information.

Once SSO registration is complete, you must request access to Machine Vision within SSO.

Role-Based Application

Access and authorization for Machine Vision is determined when requesting access through Railinc Single Sign-On.

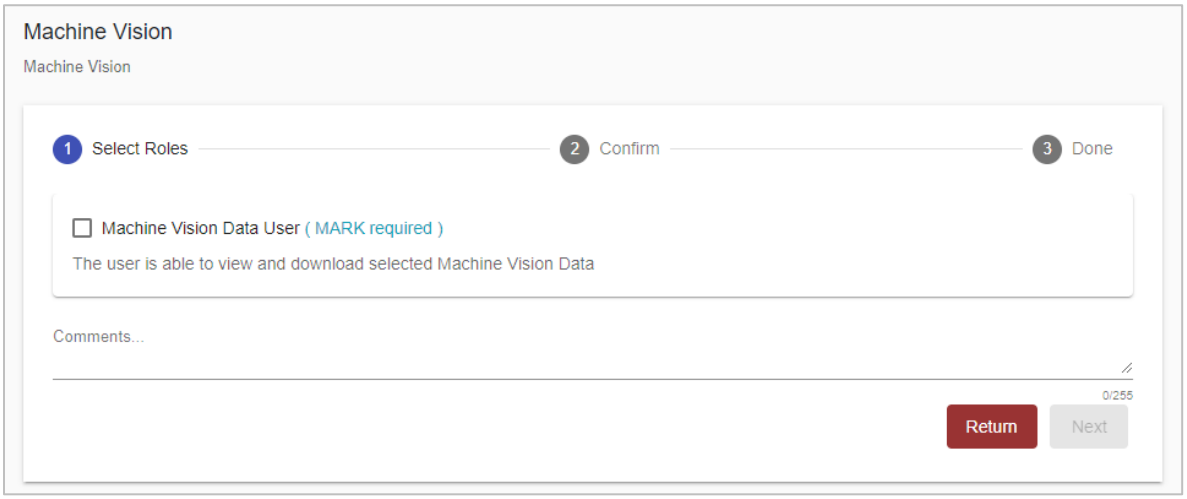
Exhibit 1. User Role and Description

Role	Description
Machine Vision Data User	This role can view and download selected Machine Vision data.

Requesting Machine Vision Access

After you receive authorization to use Railinc SSO, you must request general access to Machine Vision following instructions in the *Railinc Single Sign-On/Launch Pad User Guide*.

Exhibit 2. Machine Vision Request Permission



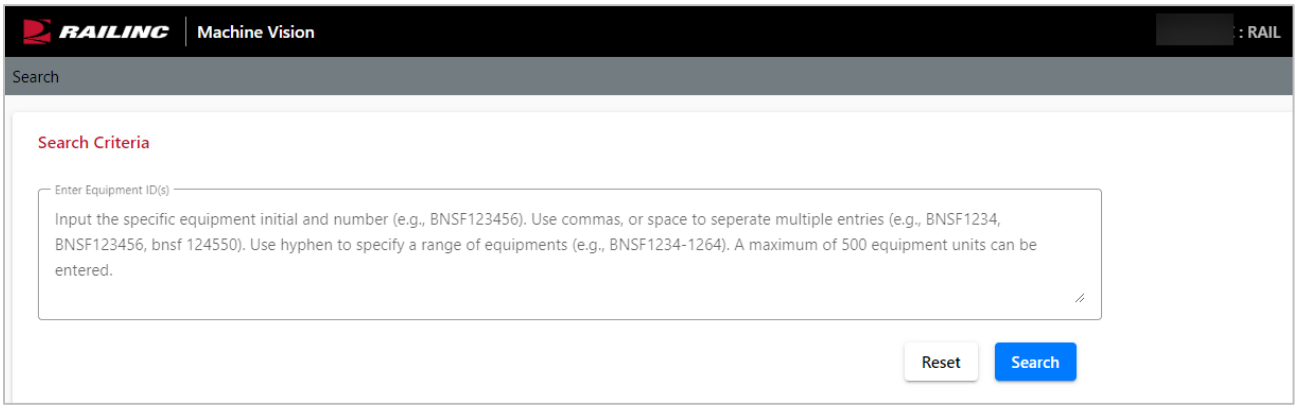
Once you receive an email notification confirming your access to Machine Vision, you can login and begin using Machine Vision.

Logging In

Use the following procedure to log into Machine Vision:

1. Open your internet browser and enter https://public.railinc.com to open the Railinc website.
2. Select the **Customer Login** link in the upper right of the page. The Account Access page is displayed.
3. Enter your **User ID** and **Password**. Select **Sign In**. The Railinc Launch Pad is displayed.
4. In **My Applications**, select **Machine Vision**. The Machine Vision Home page is displayed.

Exhibit 3. Machine Vision Home Page



Logging Out

To log out of Machine Vision, select the **Sign Out** link. The Account Access page is displayed.

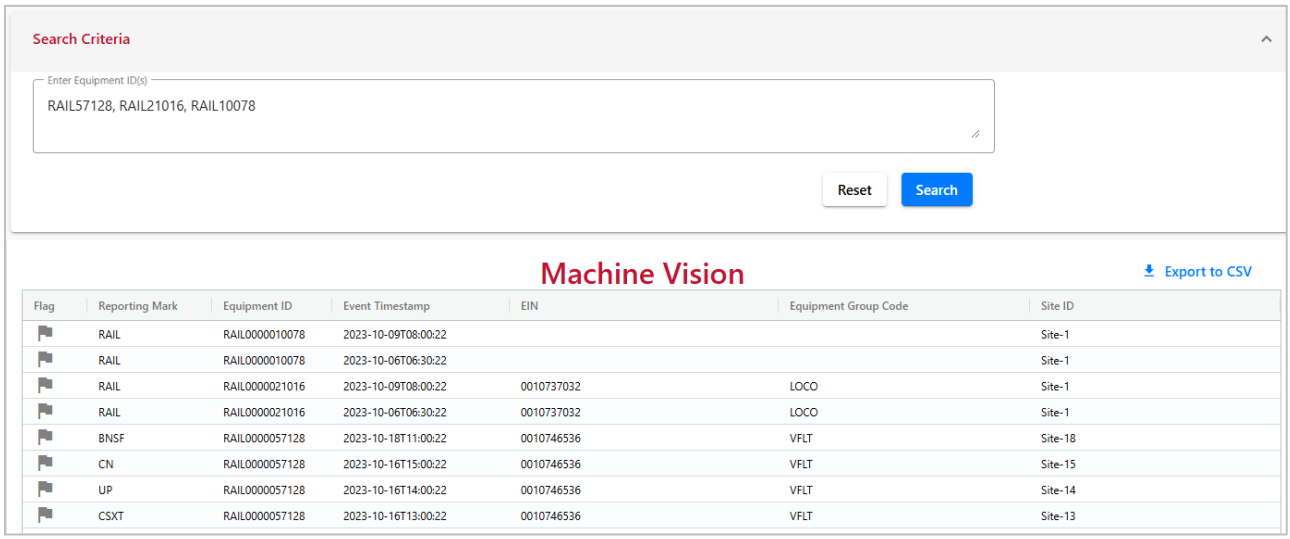
Search

Search Criteria

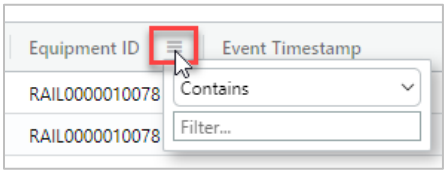
Use the following procedure to view and export Machine Vision data for one or more equipment Ids:

1. Log into SSO and navigate to Machine Vision. The Machine Vision home page displays (Exhibit 3).
2. Enter one or more specific **Equipment IDs** and/or enter a range (e.g., RAIL1000-1400) and select **Search**.

Exhibit 4. Search Results

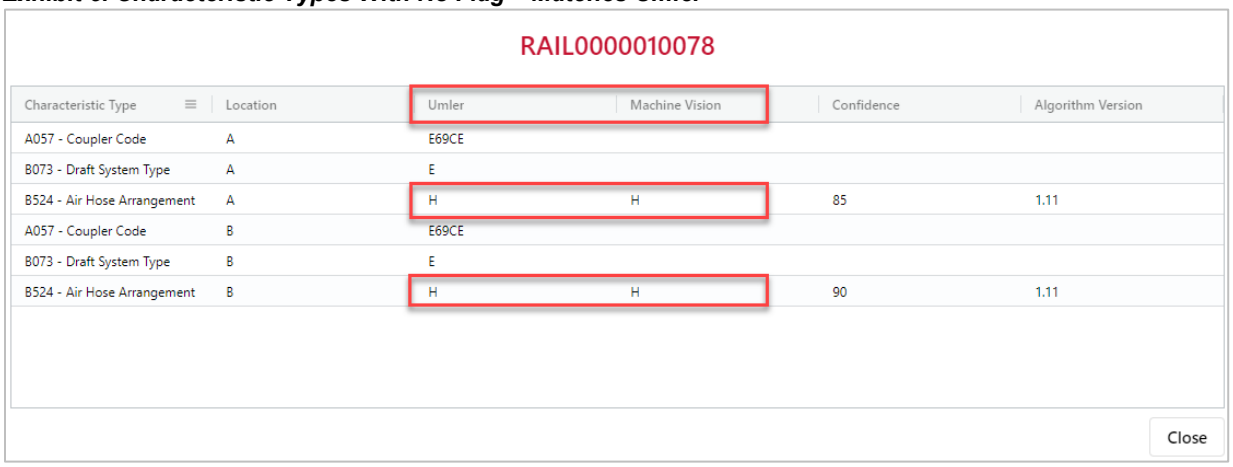


3. Select **Export to CSV** to save the list and characteristic types to a file on your computer.
4. Click on a column header once to sort in ascending order, click twice to sort in descending order and click three times to remove the sort.
5. Use the filter icon next to a column title to filter on that column.



6. Click inside any row to view the Characteristic Types and details for an Equipment ID.

Exhibit 5. Characteristic Types With No Flag – Matches Umler



7. A flag appears in the **Flag** column when Machine Vision data does not match Umler data. In the example below, Air Hose Arrangement A and B data for Machine Vision does not match with Umler.

Exhibit 6. Characteristic Types With Flag – Does Not Match Umler

8. Select **Close** to close the pop-up window.
9. Select **Reset** to clear any search criteria in the Enter Equipment ID(s) text box.

Adding Machine Vision Contacts to FindUs.Rail

To receive notifications when there is a conflict between Umler and Machine Vision data reported by a Class I railroad, your contact information should be set up in FindUs.Rail with your email and phone number contact information. Within FindUs.Rail, there is a Machine Vision controlling entity contact type. If this contact information is not setup, then your controlling entity contact information will not be available for notification about conflicts. If you are not already registered in the FindUs.Rail contact database, go to https://public.railinc.com to request permission after establishing your SSO account. Refer to the *FindUs.Rail User Guide* for complete instructions on using the FindUs.Rail system.

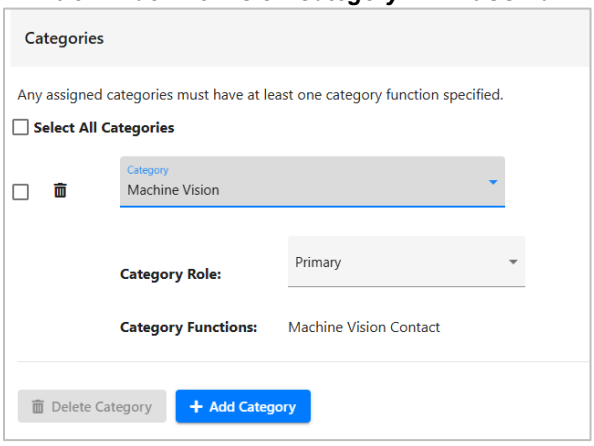
FindUs.Rail is a web-based centralized database that allows you to review and manage your company's contact information. It helps railroad departments, private equipment owners, and leasing companies stay connected and query contacts and agency relationships for industry functions and roles.

Use the following procedure to add a Machine Vision contact into FindUs.Rail.

Note: This procedure requires that you have set up a Railinc Single Sign-On (SSO) User ID and already have a FindUs.Rail account.

1. Go to https://public.railinc.com to login (see Logging In).
2. From the Launch Pad, in the **My Applications** section, select **FindUs.Rail**.
3. From the FindUs.Rail menu, select **Contacts** < **Add Contact**. The Add Contact page is displayed, with the **Contact** section at the top of the page and the **Categories** section at the bottom of the page.
4. In the **Contact** section, complete all the mandatory fields (shown in red).
5. In the **Categories** section, select **Machine Vision** from the Category drop-down box.

Exhibit 7. Machine Vision Category in FindUs.Rail



6. Select the **Save** button. The new FindUs.Rail contact information is added. If you receive an error message stating that only one primary contact can exist for a company, select **Secondary** as the Category Role.

Machine Vision JSON

Overview

The Machine Vision system accepts inbound to Railinc/Machine Vision JSON messages from customers. The messages are a JSON message body with a TRAIN II header and TRAIN II trailer.

Train II Types

Message Type	Inbound to Railinc	Outbound to Industry	
		Success	Failure
Train Pass	MCVSN10		

MCVSNXY

X -> 1 (Train Pass)
Y -> 0 (Inbound)

Train II Wrapper

The Train II header and trailer defined for Machine Vision will be used for wrapping the new routing and has the format below. These are the same as the existing Train II header and trailer formats:

Train II Header			
Start Position	**Length**	**Field Description**	**Value in Examples**
1	1	Beginning of message header indicator	#
2	4	Reporting mark of the message originator	BNSF
6	4	Office within the originators company	
10	4	Message control number	0001
14	7	Message Type	MCVSN10
21	10	Date message prepared by originator Format=YYMMDDHHMM	1903281950
31	4	Reporting mark destination	RRDC
35	4	Office within destination	
39	2	End of message header	/*
Header Examples:			
`Inbound Message: #BNSF  0001MCVSN102002281950RRDC  /*`			

Train II Trailer			
Start Position	**Length**	**Field Description**	**Value in Examples**
1	1	Beginning of message trailer indicator	$
2	4	Message control number	0001
5	3	End of message indicator	EOM
8	1	End of Trailer control character	Hex Value CP500 – 0x9C
Trailer Examples:			
`Inbound Message: $0001EOMæ`			

Example JSON Messages

Sample Inbound Machine Vision Message (MCVSN10)

```
#BNSF    0001MCVSN102002281950RRDC    /*
"serviceContext":{
     "reportingMark":"RAIL",
     "messageID":"123456789",
     "messageTimestamp":"2023-06-06T14:38:22",
     "eventTimestamp":"2023-06-06T14:38:22",
     "schemaTypeVersion":"EAHA",
     "siteID":"1234"
  },
   "cars":[
     {
       "equipInitial":"RAIL",
       "equipNumber":"0000000052",
       "machineVision":[
         {
           "type":"B524",
           "location":"A",
           "classification":"S424",
           "value":"S",
           "confidence":"85",
                                    "algorithmVersion":"1.3"
         },
         {
           "type":"B524",
           "location":"B",
           "classification":"S4003",
           "value":"U",
           "confidence":"95",
                                    "algorithmVersion":"1.3"
         },
         {
           "type":"A057",
           "location":"A",
           "classification":"BE60AHT",
           "value":"E",
           "confidence":"70",
                                    "algorithmVersion":"2.0"
         },
         {
           "type":"A057",
           "location":"B",
           "classification":"E42BEX",
           "value":"EF",
           "confidence":"75",
                                    "algorithmVersion":"2.0"
         }
       ]
     },
     {
       "equipInitial":"RAIL",
       "equipNumber":"0000000052",
       "machineVision":[
         {
           "type":"B073",
           "location":"A",
           "value":"P",
           "confidence":"85",
                                    "algorithmVersion":"2.3"
         },
         {
           "type":"B073",
           "location":"B",
           "value":"C",
           "confidence":"95",
```

```
                                "algorithmVersion":"2.3"
        }
      ]
    }
  ]
}
$0001EOMæ
```


Data Definitions

Inputs

Mandatory	Element Name	# Characters	Example	Description
	ServiceContext			Wrapper for Service Context
Yes	reportingMark	2-4	NS, BNSF	Road Submitting JSON
No	messageID	50	123456AFR	Message ID of Road Submitting
No	messageTimestamp	40	2023-06-06T14:38:22	Timestamp of when message was sent to Railinc
No	eventTimestamp	40	2023-06-06T13:38:22	Time locomotive passes through arch
No	schemaTypeVersion	50	EAHA	Schema of software
No	siteID	50	1234, Port Washington	Location of arch
	cars			Wrapper for cars
Yes	equipInitial	2-4	RAIL	Initial of equipment
Yes	EquipNumber	1-10	00000053, 53	Number of equipment
	machineVision			Wrapper for machineVision
Yes	type	50	B524	Equipment Attribute (Air Hose Arrangement)
No	location	30	A, Top, Side	Location on Car of Equipment Attribute (type)
No	Classification	50	S424	Classification of Equipment Attribute (type)
No	value	50	A	Value of Classification
No	confidence	6	85.12, 100.00	Confidence of Algorithm
No	algorithmVersion	50	1.35.B Blue	Algorithm that determined value of Equipment Attribute (type)