



Trending Hot Bearings Read Request Guide



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Table of Contents

Welcome to Trending Hot Bearings Read Request	1
Overview.....	1
Getting Started	1
Example JSON Messages	2
JSON Schema: Read Request and Response	2
JSON Sample Inbound: Read Request Create	6
Input Data Definitions	6
JSON Sample Outbound: Read Request Error Response	7
Output Data Definitions.....	8
JSON Sample Outbound: Read Request Success Response	9
Output Data Definitions.....	12
Example XML Messages	15
XML Schema: Read Request and Response.....	15
XML Sample Inbound: Read Request Create.....	19
Input Data Definitions	20
XML Sample Outbound: Read Request Error Response	21
Output Data Definitions.....	22
XML Sample Outbound: Read Request Success Response.....	23
Output Data Definitions.....	25
Appendix A.....	28

Welcome to Trending Hot Bearings Read Request

Overview

The Trending Hot Bearings Read Request processes Equipment Health Management System (EHMS) HBD_TRND Alert data requests from Railroads to Railinc. This messaging system shares requested data at interchange in support of alert creation referenced in the Industry Standard S-6001 (4.1.3). Railinc will send response messages (outbound) to Railroads for each submitted data request (inbound). Response messages will include train pass read data for cars meeting alert criteria to inform all who would handle or otherwise interact with the bearing of interest.

Getting Started

This section describes the information needed to start sending Trending Hot Bearings message requests to the Railinc system.

- The URL endpoints for the pre-prod and prod environments are:
 - **Pre-prod:** <https://api.ehms.tst.railinc.com/rest/v1/alerts/request>
 - **Prod:** <https://api.ehms.railinc.com/rest/v1/alerts/request>
- To submit requests, a valid SSO User ID that has the *Detector Owner* role under your reporting mark is also a requirement. If you do not have an SSO User ID, [follow these steps](#) to register for a User ID in these environments:
 - **Pre-prod:** <https://login.tst.railinc.com/>
 - **Prod:** <https://login.railinc.com/>

See [Support](#) for more information.

Important: It is required that you use a separate User ID from your normal SSO User ID for this service. You should also request that this SSO user be set up as a System User, with a non-expiring password with the Detector Owner role.

Note: Authorization header is basic authorization. This User ID will be used as the REST Service Username along with your selected password. It will be included in message header and used for message authorization. It is not an element provided in the message schema itself.

Example JSON Messages

JSON Schema: Read Request and Response

Note: Maximum of one car.

```
{
  "$schema": "https://json-schema.org/draft/2020-12/schema",
  "$defs": {
    "ServiceContext": {
      "required": [
        "companyId",
        "messageId",
        "messageTimestamp"
      ],
      "type": "object",
      "properties": {
        "companyId": {
          "maxLength": 4,
          "minLength": 2,
          "pattern": "^[A-Z]*$",
          "type": "string"
        },
        "messageId": {
          "maxLength": 64,
          "type": "string"
        },
        "messageTimestamp": {
          "type": "string",
          "format": "date-time"
        }
      }
    },
    "EquipmentId": {
      "required": [
        "equipmentInitial",
        "equipmentNumber"
      ],
      "type": "object",
      "properties": {
        "equipmentInitial": {
          "maxLength": 4,
          "minLength": 2,
          "pattern": "^[A-Z]*$",
          "type": "string"
        },
        "equipmentNumber": {
          "maxLength": 10,
          "minLength": 1,
          "pattern": "^[0-9]*$",
          "type": "string"
        }
      }
    },
    "ResponseDetailEntry": {
      "required": [
        "responseCode",
        "responseMessage"
      ],
      "type": "object",
      "properties": {
```

```

        "responseCode": {
          "maxLength": 15,
          "type": "string"
        },
        "responseMessage": {
          "maxLength": 2000,
          "type": "string"
        }
      }
    },
    "required": [
      "serviceContext",
      "alertType",
      "equipmentIds"
    ],
    "type": "object",
    "properties": {
      "serviceContext": {
        "$ref": "#/$defs/ServiceContext"
      },
      "alertType": {
        "type": "string",
        "maxLength": 15
      },
      "equipmentIds": {
        "type": "array",
        "items": {
          "equipmentId": {
            "$ref": "#/$defs/EquipmentId"
          }
        }
      }
    },
    "readRequestResponse": {
      "type": "object",
      "properties": {
        "responseTimestamp": {
          "type": "string",
          "format": "date-time"
        },
        "responseStatus": {
          "type": "string",
          "enum": [
            "SUCCESS",
            "PARTIAL_SUCCESS",
            "ERROR"
          ]
        },
        "totalEquipmentsSubmitted": {
          "type": "integer"
        },
        "totalEquipmentsSuccess": {
          "type": "integer"
        },
        "totalEquipmentsError": {
          "type": "integer"
        },
        "serviceContext": {
          "$ref": "#/$defs/ServiceContext"
        },
        "responseSummaries": {
          "type": "array",
          "items": {
            "$ref": "#/$defs/ResponseDetailEntry"
          }
        }
      }
    }
  }

```

```

    },
    "responseDetails": {
      "type": "array",
      "items": {
        "type": "object",
        "properties": {
          "equipmentId": {
            "$ref": "#/$defs/EquipmentId"
          },
          "requestStatus": {
            "enum": [
              "SUCCESS",
              "PARTIAL_SUCCESS",
              "ERROR"
            ]
          },
          "responseDetailEntries": {
            "type": "array",
            "items": {
              "$ref": "#/$defs/ResponseDetailEntry"
            }
          }
        }
      }
    },
    "trainPassData": {
      "type": "array",
      "items": {
        "type": "object",
        "properties": {
          "equipmentId": {
            "$ref": "#/$defs/EquipmentId"
          },
          "passingTimestamp": {
            "type": "string",
          },
          "readStatus": {
            "type": "string"
          },
          "hazmatFlagEquipmentLevel": {
            "enum": [
              "Y",
              "N"
            ]
          },
          "detectorID": {
            "type": "string"
          },
          "Latitude": {
            "type": "string"
          },
          "Longitude": {
            "type": "string"
          },
          "Orientation": {
            "enum": [
              "A",
              "B",
              "U"
            ]
          },
          "numAxles": {
            "type": "string"
          },
          "axleDetails": {

```

```

    "type": "array",
    "items": {
      "type": "object",
      "properties": {
        "trainAxleNumber": {
          "type": "string"
        },
        "aarAxleName": {
          "type": "string"
        },
        "aarAxleNumber": {
          "pattern": "^(0[1-9]|1[0-9]|2[0-9]|3[0-6])$",
          "type": "string"
        },
        "sideReadings": {
          "type": "array",
          "items": {
            "type": "object",
            "properties": {
              "aarSideOfEquipment": {
                "enum": [
                  "L",
                  "R"
                ]
              },
              "bearingTempDegF": {
                "type": "number"
              },
              "bearingKValueTrainBased": {
                "type": "number"
              },
              "bearingKValueEquipmentBased": {
                "type": "number"
              },
              "hottestBearingTempFDelta": {
                "type": "number"
              }
            }
          }
        }
      }
    }
  }
}

```

JSON Sample Inbound: Read Request Create

Note: Maximum of one car.

```
{
  "serviceContext": {
    "companyId": "RAIL",
    "messageId": "VLETEST1",
    "messageTimestamp": "2024-07-03T18:23:31+00:00"
  },
  "alertType": "HBD_TRND",
  "equipmentIds": [
    {
      "equipmentInitial": "RAIL",
      "equipmentNumber": "1"
    }
  ]
}
```

Input Data Definitions

Mandatory	Element Name	Restriction	Value	Description
Yes	companyId	String	4	ID of the company submitting the request matching the submitter's company mark.
Yes	messageId	String	64	ID that uniquely identifies the message for auditing and tracing. Each message sent should have a unique value.
Yes	messageTimestamp	Date Time	20	Time stamp of when the message was created. All time stamps must be reported in UTC.
Yes	alertType	String	15	Type of Alert created by the road.
Yes	equipmentInitial	String	4	Basic type for the equipment initial; 2–4 uppercase alpha characters only.
Yes	equipmentNumber	String	10	Basic type for the equipment number, up to 10 digits.

JSON Sample Outbound: Read Request Error Response

```
{
  "responseTimestamp": "2024-07-03T18:23:51Z",
  "responseStatus": "ERROR",
  "totalEquipmentsSubmitted": 1,
  "totalEquipmentsSuccess": 0,
  "totalEquipmentsError": 1,
  "serviceContext": {
    "companyId": "RAIL",
    "messageId": "VLETEST1",
    "messageTimestamp": "2024-07-03T18:23:31Z"
  },
  "responseSummaries": [],
  "responseDetails": [
    {
      "equipmentId": {
        "equipmentInitial": "Z",
        "equipmentNumber": "1"
      },
      "requestStatus": "ERROR",
      "responseDetailEntries": [
        {
          "responseCode": "422",
          "responseMessage": "equipmentId.equipmentInitial's length needs to be in
between 2 and 4"
        }
      ]
    }
  ],
  "trainPassData": []
}
```

Output Data Definitions

Mandatory	Element Name	Restriction	Value	Description
Yes	responseTimestamp	Date Time	20	Time stamp for when the response message was created in UTC.
Yes	responseStatus	String	15	State of the message transaction.
Yes	companyId	String	4	ID of the company submitting the request matching the submitter's company mark (from inbound message).
Yes	messageId	String	64	ID that uniquely identifies the message for auditing and tracing. Each message sent should have a unique value (from inbound message).
Yes	messageTimestamp	Date Time	20	Time stamp of when the message was created. All time stamps must be reported in UTC (from inbound message).
Yes	equipmentInitial	String	4	Basic type for the equipment initial; 2–4 uppercase alpha characters only.
Yes	equipmentNumber	String	10	Basic type for the equipment number, up to 10 digits.
Yes	responseCode	String	15	Code identifying the response for system processing.
Yes	responseMessage	String	500	Human-readable message describing the response.

JSON Sample Outbound: Read Request Success Response

```
{
  "responseTimestamp": "2024-07-03T18:23:51Z",
  "responseStatus": "SUCCESS",
  "totalEquipmentsSubmitted": 1,
  "totalEquipmentsSuccess": 1,
  "totalEquipmentsError": 0,
  "serviceContext": {
    "companyId": "RAIL",
    "messageId": "VLETEST1",
    "messageTimestamp": "2024-07-03T18:23:31Z"
  },
  "responseSummaries": [],
  "responseDetails": [
    {
      "equipmentId": {
        "equipmentInitial": "RAIL",
        "equipmentNumber": "9859"
      },
      "requestStatus": "SUCCESS",
      "responseDetailEntries": [
        {
          "responseCode": "200",
          "responseMessage": "Occurrence on the requested equipment exists"
        }
      ]
    }
  ],
  "trainPassData": [
    {
      "equipmentId": {
        "equipmentInitial": "RAIL",
        "equipmentNumber": "9859"
      },
      "passingTimestamp": "2024-07-03T18:23:11Z",
      "readStatus": "QUALIFYING_READ",
      "hazmatFlagEquipmentLevel": "Y",
      "detectorID": "02061",
      "orientation": "A",
      "latitude": "37.201",
      "longitude": "-84.636",
      "numAxles": "4",
      "axleDetails": [
        {
          "trainAxleNumber": "1",
          "aarAxleName": "1",
          "aarAxleNumber": "1",
          "sideReadings": [
            {
              "aarSideOfEquipment": "L",
              "bearingTempDegF": "25",
              "bearingKValueTrainBased": "1.5",
              "bearingKValueEquipmentBased": "2.5",
              "hottestBearingTempFDelta": "15"
            }
          ]
        }
      ]
    }
  ]
}
```

```

    },
    {
      "aarSideOfEquipment": "R",
      "bearingTempDegF": "10",
      "bearingKValueTrainBased": "1",
      "bearingKValueEquipmentBased": "1",
    },
  ],
},
{
  "trainAxleNumber": "2",
  "aarAxleName": "2",
  "aarAxleNumber": "2",
  "sideReadings": [
    {
      "aarSideOfEquipment": "L",
      "bearingTempDegF": "10",
      "bearingKValueTrainBased": "1",
      "bearingKValueEquipmentBased": "1",
    },
    {
      "aarSideOfEquipment": "R",
      "bearingTempDegF": "10",
      "bearingKValueTrainBased": "1",
      "bearingKValueEquipmentBased": "1",
    },
  ],
},
{
  "trainAxleNumber": "3",
  "aarAxleName": "3",
  "aarAxleNumber": "3",
  "sideReadings": [
    {
      "aarSideOfEquipment": "L",
      "bearingTempDegF": "10",
      "bearingKValueTrainBased": "1",
      "bearingKValueEquipmentBased": "1",
    },
    {
      "aarSideOfEquipment": "R",
      "bearingTempDegF": "10",
      "bearingKValueTrainBased": "1",
      "bearingKValueEquipmentBased": "1",
    },
  ],
},
{
  "trainAxleNumber": "4",
  "aarAxleName": "4",
  "aarAxleNumber": "4",
  "sideReadings": [
    {
      "aarSideOfEquipment": "L",
      "bearingTempDegF": "10",
      "bearingKValueTrainBased": "1",
      "bearingKValueEquipmentBased": "1",
    },
  ],
},

```

```
{
  [
    {
      "aarSideOfEquipment": "R",
      "bearingTempDegF": "10",
      "bearingKValueTrainBased": "1",
      "bearingKValueEquipmentBased": "1",
    },
  ]
}
```

Output Data Definitions

Mandatory	Element Name	Restriction	Value	Description
Yes	responseTimestamp	Date Time	20	Time stamp for when the response message was created in UTC.
Yes	responseStatus	String	15	State of the message transaction.
Yes	companyId	String	4	ID of the company submitting the request matching the submitter's company mark (from inbound message).
Yes	messageId	String	64	ID that uniquely identifies the message for auditing and tracing. Each message sent should have a unique value (from inbound message).
Yes	messageTimestamp	Date Time	20	Time stamp of when the message was created. All time stamps must be reported in UTC (from inbound message).
Yes	equipmentInitial	String	4	Basic type for the equipment initial; 2–4 uppercase alpha characters only.
Yes	equipmentNumber	String	10	Basic type for the equipment number, up to 10 digits.
Yes	responseCode	String	15	Code identifying the response for system processing.
Yes	responseMessage	String	500	Human-readable message describing the response.
Yes	Passing time stamp	Date Time	20	Time stamp for the wayside passing using whatever conventions by the detector (e.g. entrance, exit, etc.). All time stamps must be reported in UTC.
Yes	readStatus	String	20	Designation of 'Qualifying_Read' if read meets alert criteria, or 'Non_Qualifying_Read' if read does not meet alert criteria.
Yes	hazmatFlagEquipmentLevel	String	1	Equipment is carrying a commodity with a Standard Transportation Commodity Code (STCC) of 48 (Waste Hazardous Materials or Waste Hazardous Substances) or 49 (Hazardous Materials).
Yes	Detector ID	String	32	ID or name that uniquely identifies all hardware and software used to generate a unique data file for a specific track, following owning road's conventions.
				Orientation of the equipment in

Yes	Orientation	String	1	relation to the train using AAR recognized orientation codes for railcars. Locomotives will use the same code as railcars where B is equivalent to R and A is equivalent to F.. Specify U (Unknown) if unobtainable.
Yes	Latitude	String	8	Decimal representation of latitude (negative is South of equator, positive is North) Limit to 8 decimal places.
Yes	Longitude	String	8	Decimal representation of longitude (negative is West of Prime Meridian, positive is East) Limit to 8 decimal places.
Yes	numAxles	String	2	The number of axles counted on this equipment. Use zero if the count was not obtained.
Yes	trainAxleNumber	String	2	Absolute axle number for the train. A sequential number that starts at 1 and increments by one for each axle on the train in arriving/passing order.
Yes	aarAxleName	String		Axle name using single character AAR naming standards according to field manual rule 83 and RP514.
Yes	aarAxleNumber	String	2	Axle number for the equipment starting with 1 at the B end of the equipment.
HBD Side of Axle Data				
Yes	aarSideOfEquipment	String	1	AAR side of the equipment, these readings are for (L or R) as viewed from the B end of the equipment to the A end (left/right).
Yes	bearingTempDegF	Number	10	Recorded bearing temperature (above ambient) in degrees Fahrenheit.
Yes	bearingKValueTrainBased	Number	10	Train-based K value for the bearing on this side of the train at this axle based on industry-standard calculations.
Yes	bearingKValueEquipmentBased	Number	10	Equipment-based K value for the bearing on this side of the train at this axle based on industry-standard calculations.
No	hottestBearingTempFDelta	Number	10	The difference of the temperature of the hottest bearing and the next hottest bearing for this equipment.
HBD Side of Axle Data				
Yes	aarSideOfEquipment	String	1	AAR side of the equipment, these readings are for (L or R) as viewed from the B end of the equipment to the A end

				(left/right).
Yes	bearingTempDegF	Number	10	Recorded bearing temperature (above ambient) in degrees Fahrenheit.
Yes	bearingKValueTrainBased	Number	10	Train-based K value for the bearing on this side of the train at this axle based on industry-standard calculations.
Yes	bearingKValueEquipmentBased	Number	10	Equipment-based K value for the bearing on this side of the train at this axle based on industry-standard calculations.
No	hottestBearingTempFDelta	Number	10	The difference of the temperature of the hottest bearing and the next hottest bearing for this equipment.

Example XML Messages

XML Schema: Read Request and Response

Note: Maximum of one car.

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
  targetNamespace="http://ehms.railinc.com/2024v1wm/xml/readRequestXmlSchema.xsd"
  xmlns:ns="http://ehms.railinc.com/2024v1wm/xml/readRequestXmlSchema.xsd"
  elementFormDefault="qualified">
  <xs:complexType name="serviceContext">
    <xs:sequence>
      <xs:element name="companyId" type="ns:companyId">
        <xs:annotation>
          <xs:documentation>ID of the company submitting the request.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="messageId" type="ns:messageId">
        <xs:annotation>
          <xs:documentation>Unique message ID to help trace and debug this
message.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="messageTimestamp" type="xs:dateTime">
        <xs:annotation>
          <xs:documentation>Timestamp of when the request was created.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="companyId">
    <xs:restriction base="xs:string">
      <xs:minLength value="2"/>
      <xs:maxLength value="4"/>
      <xs:pattern value="[A-Z]*/>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="messageId">
    <xs:restriction base="xs:string">
      <xs:maxLength value="64"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="equipmentId">
    <xs:sequence>
      <xs:element name="equipmentInitial" type="ns:equipmentInitial"/>
      <xs:element name="equipmentNumber" type="ns:equipmentNumber"/>
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="equipmentInitial">
    <xs:annotation>
      <xs:documentation>Basic type for an equipment initial, 2-4 upper case alpha characters
only</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:minLength value="2"/>
      <xs:maxLength value="4"/>
      <xs:pattern value="[A-Z]*/>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="equipmentNumber">
```

```

    <xs:annotation>
      <xs:documentation>Basic type for an equipment number, up to 10 digits. Optional left hand
padding with 0's is acceptable but not required</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:minLength value="1"/>
      <xs:maxLength value="10"/>
      <xs:pattern value="[0-9]*"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="responseDetailEntry">
    <xs:sequence>
      <xs:element name="responseCode" type="ns:responseCode"/>
      <xs:element name="responseMessage" type="ns:responseMessage"/>
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="responseCode">
    <xs:restriction base="xs:string">
      <xs:maxLength value="15"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="responseMessage">
    <xs:restriction base="xs:string">
      <xs:maxLength value="2000"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="readRequest">
    <xs:sequence>
      <xs:element name="serviceContext" type="ns:serviceContext" minOccurs="0"/>
      <xs:element name="alertType" type="ns:alertType" minOccurs="0"/>
      <xs:element name="equipmentIds" type="ns:equipmentIds"/>
      <xs:element name="readRequestResponse" type="ns:readRequestResponse" minOccurs="0"/>
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="alertType">
    <xs:restriction base="xs:string">
      <xs:minLength value="1"/>
      <xs:maxLength value="15"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="equipmentIds">
    <xs:sequence>
      <xs:element name="equipmentId" type="ns:equipmentId" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="readRequestResponse">
    <xs:sequence>
      <xs:element name="responseTimestamp" type="xs:dateTime"/>
      <xs:element name="responseStatus" type="ns:responseStatus"/>
      <xs:element name="totalEquipmentsSubmitted" type="xs:integer" minOccurs="0"/>
      <xs:element name="totalEquipmentsSuccess" type="xs:integer" minOccurs="0"/>
      <xs:element name="totalEquipmentsError" type="xs:integer" minOccurs="0"/>
      <xs:element name="serviceContext" type="ns:serviceContext" minOccurs="0"/>
      <xs:element name="responseSummaries" type="ns:ResponseSummaries"/>
      <xs:element name="responseDetails" type="ns:responseDetails"/>
      <xs:element name="trainPassData" type="ns:trainPassData"/>
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="responseStatus">
    <xs:restriction base="xs:string">
      <xs:enumeration value="SUCCESS"/>
      <xs:enumeration value="PARTIAL_SUCCESS"/>
      <xs:enumeration value="ERROR"/>
    </xs:restriction>
  </xs:simpleType>

```

```

<xs:complexType name="ResponseSummaries">
  <xs:sequence>
    <xs:element name="responseDetailEntry" type="ns:responseDetailEntry"
maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="responseDetails">
  <xs:sequence>
    <xs:element name="responseDetail" type="ns:responseDetail"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="responseDetail">
  <xs:sequence>
    <xs:element name="equipmentId" type="ns:equipmentId"/>
    <xs:element name="requestStatus" type="ns:requestStatus"/>
    <xs:element name="responseDetailEntries" type="ns:responseDetailEntries"/>
  </xs:sequence>
</xs:complexType>
<xs:simpleType name="requestStatus">
  <xs:restriction base="xs:string">
    <xs:enumeration value="SUCCESS"/>
    <xs:enumeration value="PARTIAL_SUCCESS"/>
    <xs:enumeration value="ERROR"/>
  </xs:restriction>
</xs:simpleType>
<xs:complexType name="responseDetailEntries">
  <xs:sequence>
    <xs:element name="responseDetailEntry" type="ns:responseDetailEntry"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="trainPassData">
  <xs:sequence>
    <xs:element name="trainPass" type="ns:trainPassDatum"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="trainPassDatum">
  <xs:sequence>
    <xs:element name="equipmentId" type="ns:equipmentId" minOccurs="0"/>
    <xs:element name="passingTimestamp" type="xs:string" minOccurs="0"/>
    <xs:element name="readStatus" type="xs:string" minOccurs="0"/>
    <xs:element name="hazmatFlagEquipmentLevel" type="ns:hazmatFlagEquipmentLevel"
minOccurs="0"/>
    <xs:element name="detectorID" type="xs:string" minOccurs="0"/>
    <xs:element name="latitude" type="xs:string" minOccurs="0"/>
    <xs:element name="longitude" type="xs:string" minOccurs="0"/>
    <xs:element name="orientation" type="ns:orientation" minOccurs="0"/>
    <xs:element name="numAxles" type="xs:string" minOccurs="0"/>
    <xs:element name="axleDetails" type="ns:axleDetails"/>
  </xs:sequence>
</xs:complexType>
<xs:simpleType name="hazmatFlagEquipmentLevel">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Y"/>
    <xs:enumeration value="N"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="orientation">
  <xs:restriction base="xs:string">
    <xs:enumeration value="A"/>
    <xs:enumeration value="B"/>
    <xs:enumeration value="U"/>
  </xs:restriction>
</xs:simpleType>
<xs:complexType name="axleDetails">

```

```

    <xs:sequence>
      <xs:element name="axleDetail" type="ns:axleDetail"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="axleDetail">
    <xs:sequence>
      <xs:element name="trainAxleNumber" type="xs:string" minOccurs="0"/>
      <xs:element name="aarAxleName" type="xs:string" minOccurs="0"/>
      <xs:element name="aarAxleNumber" type="ns:aarAxleNumber" minOccurs="0"/>
      <xs:element name="sideReadings" type="ns:sideReadings"/>
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="aarAxleNumber">
    <xs:restriction base="xs:string">
      <xs:pattern value="(0[1-9]|1[0-9]|2[0-9]|3[0-6])/"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="sideReadings">
    <xs:sequence>
      <xs:element name="sideReading" type="ns:sideReading"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="sideReading">
    <xs:sequence>
      <xs:element name="aarSideOfEquipment" type="ns:aarSideOfEquipment" minOccurs="0"/>
      <xs:element name="bearingTempDegF" type="xs:decimal" minOccurs="0"/>
      <xs:element name="bearingKValueTrainBased" type="xs:decimal" minOccurs="0"/>
      <xs:element name="bearingKValueEquipmentBased" type="xs:decimal" minOccurs="0"/>
      <xs:element name="hottestBearingTempFDelta" type="xs:decimal" minOccurs="0"/>
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="aarSideOfEquipment">
    <xs:restriction base="xs:string">
      <xs:enumeration value="L"/>
      <xs:enumeration value="R"/>
    </xs:restriction>
  </xs:simpleType>
</xs:schema>

```

XML Sample Inbound: Read Request Create

Note: Maximum of one car.

```
<?xml version="1.0" encoding="UTF-8" ?>
<ns:readRequest xmlns:ns="http://ehms.railinc.com/2024v1wm/xml/readRequestXmlSchema.xsd"
  xmlns:ns2="http://ehms.railinc.com/2024v1wm/xml/alertReportXmlSchema.xsd">
  <ns2:serviceContext>
    <ns2:companyId>RAIL</ns2:companyId>
    <ns2:messageId>VLETEST1</ns2:messageId>
    <ns2:messageTimestamp>2024-07-03T18:23:31+00:00</ns2:messageTimestamp>
  </ns2:serviceContext>
  <ns:alertType>HBD_TRND</ns:alertType>
  <ns:equipmentIds>
    <ns2:equipmentId>
      <ns2:equipmentInitial>RAIL</ns2:equipmentInitial>
      <ns2:equipmentNumber>1</ns2:equipmentNumber>
    </ns2:equipmentId>
  </ns:equipmentIds>
</ns:readRequest>
```

Input Data Definitions

Mandatory	Element Name	Restriction	Value	Description
Yes	companyId	String	4	ID of the company submitting the request matching the submitter's company mark.
Yes	messageId	String	64	ID that uniquely identifies the message for auditing and tracing. Each message sent should have a unique value.
Yes	messageTimestamp	Date Time	20	Time stamp of when the message was created. All time stamps must be reported in UTC.
Yes	alertType	String	15	Type of Alert created by the road.
Yes	equipmentInitial	String	4	Basic type for the equipment initial; 2–4 uppercase alpha characters only.
Yes	equipmentNumber	String	10	Basic type for the equipment number, up to 10 digits.

XML Sample Outbound: Read Request Error Response

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns:readRequestResponse xmlns:ns="http://ehms.railinc.com/2024v1wm/xml/readRequestXmlSchema.xsd">
  <ns:responseTimestamp>2024-07-03T18:23:51Z</ns:responseTimestamp>
  <ns:responseStatus>ERROR</ns:responseStatus>
  <ns:serviceContext>
    <ns:companyId>RAIL</ns:companyId>
    <ns:messageId>VLETES1</ns:messageId>
    <ns:messageTimestamp>2024-07-03T18:23:31Z</ns:messageTimestamp>
  </ns:serviceContext>
  <ns:responseSummaries>
    <ns:responseDetailEntry>
      <ns:responseCode>422</ns:responseCode>
      <ns:responseMessage>equipmentId.equipmentInitial's length needs to be in between 2
and 4</ns:responseMessage>
    </ns:responseDetailEntry>
  </ns:responseSummaries>
  <ns:responseDetails/>
</ns:readRequestResponse>
```

Output Data Definitions

Mandatory	Element Name	Restriction	Value	Description
Yes	responseTimestamp	Date Time	20	Time stamp for when the response message was created in UTC.
Yes	responseStatus	String	15	State of the message transaction.
Yes	companyId	String	4	ID of the company submitting the request matching the submitter's company mark (from inbound message).
Yes	messageId	String	64	ID that uniquely identifies the message for auditing and tracing. Each message sent should have a unique value (from inbound message).
Yes	messageTimestamp	Date Time	20	Time stamp of when the message was created. All time stamps must be reported in UTC (from inbound message).
Yes	equipmentInitial	String	4	Basic type for the equipment initial; 2–4 uppercase alpha characters only.
Yes	equipmentNumber	String	10	Basic type for the equipment number, up to 10 digits.
Yes	responseCode	String	15	Code identifying the response for system processing.
Yes	responseMessage	String	500	Human-readable message describing the response.

XML Sample Outbound: Read Request Success Response

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns:readRequestResponse xmlns:ns="http://ehms.railinc.com/2024v1wm/xml/readRequestXmlSchema.xsd">
  <ns:responseTimestamp>2024-07-03T18:23:51Z</ns:responseTimestamp>
  <ns:responseStatus>SUCCESS</ns:responseStatus>
  <ns:totalEquipmentsSubmitted>1</ns:totalEquipmentsSubmitted>
  <ns:totalEquipmentsSuccess>1</ns:totalEquipmentsSuccess>
  <ns:totalEquipmentsError>0</ns:totalEquipmentsError>
  <ns:serviceContext>
    <ns:companyId>RAIL</ns:companyId>
    <ns:messageId>VLETEST1</ns:messageId>
    <ns:messageTimestamp>2024-07-03T18:23:31Z</ns:messageTimestamp>
  </ns:serviceContext>
  <ns:responseSummaries/>
  <ns:responseDetails>
    <ns:responseDetail>
      <ns:equipmentId>
        <ns:equipmentInitial>RAIL</ns:equipmentInitial>
        <ns:equipmentNumber>9859</ns:equipmentNumber>
      </ns:equipmentId>
      <ns:requestStatus>SUCCESS</ns:requestStatus>
      <ns:responseDetailEntries>
        <ns:responseDetailEntry>
          <ns:responseCode>200</ns:responseCode>
          <ns:responseMessage>Occurrence on the requested equipment
exists</ns:responseMessage>
        </ns:responseDetailEntry>
      </ns:responseDetailEntries>
    </ns:responseDetail>
  </ns:responseDetails>
  <ns:trainPassData>
    <ns:trainPass>
      <ns:equipmentId>
        <ns:equipmentInitial>RAIL</ns:equipmentInitial>
        <ns:equipmentNumber>9859</ns:equipmentNumber>
      </ns:equipmentId>
      <ns:passingTimestamp>2024-07-03T18:23:11Z</ns:passingTimestamp>
      <ns:readStatus>QUALIFYING_READ</ns:readStatus>
      <ns:hazmatFlagEquipmentLevel>Y</ns:hazmatFlagEquipmentLevel>
      <ns:detectorID>02061</ns:detectorID>
      <ns:latitude>37.201</ns:latitude>
      <ns:longitude>-84.636</ns:longitude>
      <ns:numAxles>4</ns:numAxles>
      <ns:orientation>A</ns:orientation>
      <ns:axleDetails>
        <ns:axleDetail>
          <ns:trainAxleNumber>1</ns:trainAxleNumber>
          <ns:aarAxleName>1</ns:aarAxleName>
          <ns:aarAxleNumber>1</ns:aarAxleNumber>
          <ns:sideReadings>
            <ns:sideReading>
              <ns:aarSideOfEquipment>L</ns:aarSideOfEquipment>
              <ns:bearingTempDegF>25</ns:bearingTempDegF>
              <ns:bearingKValueTrainBased>1.5</ns:bearingKValueTrainBased>
              <ns:bearingKValueEquipmentBased>2.5</ns:bearingKValueEquipmentBased>
              <ns:hottestBearingTempFDelta>15</ns:hottestBearingTempFDelta>
            </ns:sideReading>
            <ns:sideReading>
              <ns:aarSideOfEquipment>R</ns:aarSideOfEquipment>
              <ns:bearingTempDegF>10</ns:bearingTempDegF>
              <ns:bearingKValueTrainBased>1</ns:bearingKValueTrainBased>
            </ns:sideReading>
          </ns:sideReadings>
        </ns:axleDetail>
      </ns:axleDetails>
    </ns:trainPass>
  </ns:trainPassData>
</ns:readRequestResponse>
```

```

        <ns:bearingKValueEquipmentBased>1</ns:bearingKValueEquipmentBased>
      </ns:sideReading>
    </ns:sideReadings>
  </ns:axleDetail>
  <ns:axleDetail>
    <ns:trainAxleNumber>2</ns:trainAxleNumber>
    <ns:aarAxleName>2</ns:aarAxleName>
    <ns:aarAxleNumber>2</ns:aarAxleNumber>
    <ns:sideReadings>
      <ns:sideReading>
        <ns:aarSideOfEquipment>L</ns:aarSideOfEquipment>
        <ns:bearingTempDegF>10</ns:bearingTempDegF>
        <ns:bearingKValueTrainBased>1</ns:bearingKValueTrainBased>
        <ns:bearingKValueEquipmentBased>1</ns:bearingKValueEquipmentBased>
      </ns:sideReading>
      <ns:sideReading>
        <ns:aarSideOfEquipment>R</ns:aarSideOfEquipment>
        <ns:bearingTempDegF>10</ns:bearingTempDegF>
        <ns:bearingKValueTrainBased>1</ns:bearingKValueTrainBased>
        <ns:bearingKValueEquipmentBased>1</ns:bearingKValueEquipmentBased>
      </ns:sideReading>
    </ns:sideReadings>
  </ns:axleDetail>
  <ns:axleDetail>
    <ns:trainAxleNumber>3</ns:trainAxleNumber>
    <ns:aarAxleName>3</ns:aarAxleName>
    <ns:aarAxleNumber>3</ns:aarAxleNumber>
    <ns:sideReadings>
      <ns:sideReading>
        <ns:aarSideOfEquipment>L</ns:aarSideOfEquipment>
        <ns:bearingTempDegF>10</ns:bearingTempDegF>
        <ns:bearingKValueTrainBased>1</ns:bearingKValueTrainBased>
        <ns:bearingKValueEquipmentBased>1</ns:bearingKValueEquipmentBased>
      </ns:sideReading>
      <ns:sideReading>
        <ns:aarSideOfEquipment>R</ns:aarSideOfEquipment>
        <ns:bearingTempDegF>10</ns:bearingTempDegF>
        <ns:bearingKValueTrainBased>1</ns:bearingKValueTrainBased>
        <ns:bearingKValueEquipmentBased>1</ns:bearingKValueEquipmentBased>
      </ns:sideReading>
    </ns:sideReadings>
  </ns:axleDetail>
  <ns:axleDetail>
    <ns:trainAxleNumber>4</ns:trainAxleNumber>
    <ns:aarAxleName>4</ns:aarAxleName>
    <ns:aarAxleNumber>4</ns:aarAxleNumber>
    <ns:sideReadings>
      <ns:sideReading>
        <ns:aarSideOfEquipment>L</ns:aarSideOfEquipment>
        <ns:bearingTempDegF>10</ns:bearingTempDegF>
        <ns:bearingKValueTrainBased>1</ns:bearingKValueTrainBased>
        <ns:bearingKValueEquipmentBased>1</ns:bearingKValueEquipmentBased>
      </ns:sideReading>
      <ns:sideReading>
        <ns:aarSideOfEquipment>R</ns:aarSideOfEquipment>
        <ns:bearingTempDegF>10</ns:bearingTempDegF>
        <ns:bearingKValueTrainBased>1</ns:bearingKValueTrainBased>
        <ns:bearingKValueEquipmentBased>1</ns:bearingKValueEquipmentBased>
      </ns:sideReading>
    </ns:sideReadings>
  </ns:axleDetail>
</ns:axleDetails>
</ns:trainPass>
</ns:trainPassData>
</ns:readRequestResponse>

```

Output Data Definitions

Mandatory	Element Name	Restriction	Value	Description
Yes	responseTimestamp	Date Time	20	Time stamp for when the response message was created in UTC.
Yes	responseStatus	String	15	State of the message transaction.
Yes	companyId	String	4	ID of the company submitting the request matching the submitter's company mark (from inbound message).
Yes	messageId	String	64	ID that uniquely identifies the message for auditing and tracing. Each message sent should have a unique value (from inbound message).
Yes	messageTimestamp	Date Time	20	Time stamp of when the message was created. All time stamps must be reported in UTC (from inbound message).
Yes	equipmentInitial	String	4	Basic type for the equipment initial; 2–4 uppercase alpha characters only.
Yes	equipmentNumber	String	10	Basic type for the equipment number, up to 10 digits.
Yes	responseCode	String	15	Code identifying the response for system processing.
Yes	responseMessage	String	500	Human-readable message describing the response.
Yes	Passing time stamp	Date Time	20	Time stamp for the wayside passing using whatever conventions by the detector (e.g., entrance, exit, etc.). All time stamps must be reported in UTC.
Yes	readStatus	String	20	Designation of Qualifying_Read if read meets alert criteria, or Non_Qualifying_Read if read does not meet alert criteria.
Yes	hazmatFlagEquipmentLevel	String	1	Equipment is carrying a commodity with a Standard Transportation Commodity Code (STCC) of 48 (Waste Hazardous Materials or Waste Hazardous Substances) or 49 (Hazardous Materials).
Yes	Detector ID	String	32	ID or name that uniquely identifies all hardware and software used to generate a unique data file for a specific track, following owning road's conventions.

Yes	Orientation	String	1	Orientation of the equipment in relation to the train using AAR recognized orientation codes for railcars. Locomotives will use the same code as railcars where B is equivalent to R and A is equivalent to F. Specify U (Unknown) if unobtainable.
Yes	Latitude	String	8	Decimal representation of latitude (negative is South of equator, positive is North) Limit to 8 decimal places.
Yes	Longitude	String	8	Decimal representation of longitude (negative is West of Prime Meridian, positive is East) Limit to 8 decimal places
Yes	numAxles	String	2	The number of axles counted on this equipment. Use zero if the count was not obtained.
Yes	trainAxleNumber	String	2	Absolute axle number for the train. A sequential number that starts at 1 and increments by one for each axle on the train in arriving/passing order.
Yes	aarAxleName	String		Axle name using single character AAR naming standards according to field manual rule 83 and RP514.
Yes	aarAxleNumber	String	2	Axle number for the equipment starting with 1 at the B end of the equipment.
HBD Side of Axle Data				
Yes	aarSideOfEquipment	String	1	AAR side of the equipment, these readings are for (L or R) as viewed from the B end of the equipment to the A end (left/right).
Yes	bearingTempDegF	Decimal	10	Recorded bearing temperature (above ambient) in degrees Fahrenheit.
Yes	bearingKValueTrainBased	Decimal	10	Train-based K value for the bearing on this side of the train at this axle based on industry-standard calculations.
Yes	bearingKValueEquipmentBased	Decimal	10	Equipment-based K value for the bearing on this side of the train at this axle based on industry-standard calculations.
No	hottestBearingTempFDelta	Decimal	10	The difference of the temperature of the hottest bearing and the next hottest bearing for this equipment.
HBD Side of Axle Data				
Yes	aarSideOfEquipment	String	1	AAR side of the equipment, these readings are for (L or R) as viewed from the B end of the

				equipment to the A end (left/right).
Yes	bearingTempDegF	Decimal	10	Recorded bearing temperature (above ambient) in degrees Fahrenheit.
Yes	bearingKValueTrainBased	Decimal	10	Train-based K value for the bearing on this side of the train at this axle based on industry-standard calculations.
Yes	bearingKValueEquipmentBased	Decimal	10	Equipment-based K value for the bearing on this side of the train at this axle based on industry-standard calculations.
No	hottestBearingTempFDelta	Decimal	10	The difference of the temperature of the hottest bearing and the next hottest bearing for this equipment.

Appendix A

HBD Trending Alert 51.3 (R19) - Read Request Format				
	Item / Element Name	Status	Content	Example(s)
Inbound Pull Request (Roads)	companyId	M	2 - 4 Alpha (Mark)	NS, BNSF
	messageId	M	Alpha Numeric	edgf_202405_xyz
	messageTimestamp	M	YYYY-MM-DDTHH:MM:SSZ	2024-04-02T08:43:23Z
	alertType	M	HBD_TRND	HBD_TRND
	equipmentInitial	M	2 - 4 Uppercase Alpha	CN, CSXT
	equipmentNumber	M	1-10 digits only	4521, 0000004893
Outbound Message (Railinc)	responseTimestamp	M	YYYY-MM-DDTHH:MM:SSZ	2024-04-02T08:43:23Z
	responseStatus	M	Success, Partial_Success, Error	SUCCESS, ERROR
	companyId	M	2 - 4 Alpha (mark)	NS, BNSF
	messageId	M	Alpha Numeric	edgf_202405_xyz
	messageTimestamp	M	YYYY-MM-DDTHH:MM:SSZ	2024-04-02T08:43:23Z
	equipmentInitial	M	2 - 4 Uppercase Alpha	CN, CSXT
	equipmentNumber	M	1-10 digits only	4521, 0000004893
	responseCode	M	Positive Whole Number	200, 404
	responseMessage	M	Alpha Numeric	Alert Processed Successfully
	Train Pass Data	CM	Alpha Numeric	S-6102

Important: Train pass read data will be returned when one or more of the available consecutive reads contains values meeting alert criteria. In this scenario, the most recent number of consecutive reads defined in standard will be returned in data sent to roads. Each read will be presented in descending order of most recently received and designated as **Qualifying_Read** if read meets alert criteria, or **Non_Qualifying_Read** if read does not meet alert criteria. Read data will be returned so that each road can insert into their existing alert creation logic, taking into account existing alert notifications and alert closures.