

Hunter iShop XML Description for WinAlign 16

Introduction

This document describes the data available in Hunter Engineering iShop XML and their descriptions in WinAlign 16.0-16.3. Integrators wishing to integrate with versions before 16.0 should consult additional documentation as XML changes from release to release.

References

iShop SMS v4.1 Inspection Server Functional Implementation Guide., AutoCare Association (2015)

Definition for inspection results in asanetwork, 5.1 asanetwork, gmbh (2015)

Description of the XML

UpdateOrderMessage

The iShop Inspection Server Functional Implementation Guide describes the contents of the UpdateOrderMessage. The DiagnosticResult element contains either a ResultsObject. Note that the message is wrapped in a SOAP envelope.

The ResultsObject element contains a single RESULTS element that represents the data collected during the procedure.

The RESULTS element includes a VERSION attribute with the value "4.1" indicating the version of iShop standard this message supports.

Formal Description

The RESULTS element consists of a RESULTSHEADER and one or more RESULT elements

- A RESULTSHEADER consists of customer and vehicle information
- A RESULT consists of a header, a SUMMARY, and one or more SECTIONS.
 - A Header consists of date and time information together with information about test equipment and operator
 - A SUMMARY consists of the overall result of test kind.
 - A SECTION consists of one or more steps
 - A STEP consists of one or more MEASUREMENTs
 - A MEASUREMENT consists of one or more VALUES.

The XML produced by Hunter equipment conforms to both asanetwork and iShop standards with any differences noted. For information elements and attributes NOT implemented by Hunter, refer to the references noted earlier.

RESULTSHEADER

The RESULTSHEADER element contains customer and vehicle information. It contains the following elements defined in asanetwork and iShop documentation:

- COUNTRY (required)
- CUSTOMER (optional, typically only present in full iShop systems)
- VEHICLE (required)
- TRAILER (optional, not used by Hunter equipment)
- WORKSHOP (optional, not used by Hunter equipment)
- DRIVER (optional, not used by Hunter equipment)
- REF (optional, not used by Hunter equipment)

Country

The Country (required) element contains information about the language used on the system at the time of the procedure. It has two required child elements REGULATION and LANGUAGE that contain one of the following strings:

asanetwork country codes

AMERICAN, BRAZILIAN, CHINESE, CROATION, CZECH, DANISH, DUTCH, ENGLISH¹, FINNISH, FRENCH, GERMAN, HEBREW, HUNGARIAN, ITALIAN, NORWEGIAN, POLISH, PORTUGUESE, RUMANIAN, SLOVENE, SPANISH, SWEDISH, TURKISH

Additional Hunter defined country codes

ALBANIAN, ARABIC, BAHASA, CATALAN, BULGARIAN, ESTONIAN, FRENCHCANADIAN, GREEK, JAPANESE, KOREAN, LATVIAN, LITHUANIAN, MACEDONIAN, SERBIAN, THAI, VIETNAMESE, CHINESESIMPLE, HINDI

This table will expand as new language support is added to Hunter hardware.

Typically, any TITLE elements appear in the language indicated in this section. In practice, the REGULATION and LANGUAGE elements will have the same value.

CUSTOMER

Typically, customer information is available when the customer name is known by either

- The user enters customer information (full alignment or attended inspection)
- Customer information is available in a DMS and is supplied with a GetOrder response from a full iShop server.

The CUSTOMER element appears when, at a minimum, the NAME can be filled in.

The following child elements are available

| Element | Required | Type | Size | Description |
|---------|----------|--------|------|----------------------|
| NAME | Y | String | 128 | First and last name |
| COMPANY | N | String | 128 | Company title |
| ADDRESS | N | String | 128 | Street |
| ZIP | N | String | 64 | Postcode, zip code |
| CITY | N | String | 64 | Residence |
| TEL | N | String | 32 | Primary Phone number |
| FAX | N | String | 32 | |

¹ Typically, systems in North America use the code ENGLISH to report the language.

| | | | | |
|----------------|---|--------|----|------------------------------|
| CUSTNO | N | String | 32 | Customer number |
| ORDER | N | String | 32 | Order number |
| FIRSTNAME | N | String | 64 | First name |
| LASTNAME | N | String | 64 | Last name |
| EMAIL | N | String | 64 | Email address |
| STATE_PROVINCE | N | String | 32 | State (US) Province (Canada) |
| AAIA_ITEMID | N | String | 32 | Not used by Hunter |

WORKSHOP

The WORKSHOP element contains information about the workshop supplying the data. In practice, we find that this data is not reliably available. Its presence depends on whether the data is entered by the Hunter service technician when the equipment is purchased and configured. The most reliable source of workshop information is the from the Security Token and Equipment information supplied by you, the iShop integrator.

The WORKSHOP element is present only if, at a minimum, the NAME element can be filled in.

If present, the following fields are available

| Element | Required | Type | Size | Description |
|------------|----------|--------|------|---------------------------|
| NAME | Y | String | 128 | Workshop/dealer name |
| NAME2 | N | String | 128 | Additional Info |
| ADRESSS | N | String | 128 | Street |
| ZIP | N | String | 64 | Postcode |
| CITY | N | String | 64 | Residence |
| TEL | N | String | 32 | |
| FAX | N | String | 32 | |
| PERMISSION | N | String | 64 | Registration number |
| EMAIL | N | String | 64 | Email address of workshop |
| INTERNET | N | String | 64 | Web site URL |

VEHICLE

This section contains information about the vehicle, customer, workshop, as well as Hunter specific FEATURE information. It has following elements

- IDENT (required)
- ADDITIONALIDENT (optional)
- DATA (required)
- INSURANCE (optional, not used by Hunter Equipment)

INDENT

The IDENT element contains details about the vehicle. Note that many of these fields are OPTIONAL and may not be present in the UpdateOrderRequest messages depending on local equipment configuration.

| Element | Required | Maximum Size | Type | Used by Hunter equipment? | Description |
|---------------------|----------|--------------|--------|---------------------------|---|
| REGISTRATION | N | 32 | String | Y | iShop LicensePlate field. Hunter equipment has ISO 3166-2 state code followed by the plate number, e.g. "MO ABC123" |
| NOT_REGISTERED | N | 0 | String | N | Used instead of empty REGISTRATION element to clearly flag vehicle is NOT registered. |
| MANUFACTURER, MODEL | | 128 | String | Y | Present if at least one was true <ul style="list-style-type: none"> • Make/Model could be determined from license plate • Make/Model could be determined from VIN • User selected make/Model from user interface |
| TYPE | N | 32 | String | N | |
| KEY2, KEY3 | N | 6 | INT | Y | German KBA keys, part 2 and 3. Might be present for Hunter propriety purposes. |
| CATEGORY | N | 2 | String | N | European vehicle category Cars: M1, M@, M3 Trucks: N1, N2, N3 Trailers: O1, O2, O3 |
| VIN | N | 17 | String | Y | Present if at least one is true <ul style="list-style-type: none"> • license plate recognition was successfully converted into VIN. • VIN was read from CodeLink® subsystem • VIN was entered by technician |

| | | | | | |
|---|---|----|--------|---|---|
| | | | | | <ul style="list-style-type: none"> VIN retrieved from iShop Server with GetOrderRequest. |
| VIN1, VIN2, VIN3 | N | 17 | String | N | Vehicle Identification numbers(s) reported by OBD if different. |
| MANUFACTURER_ID | N | 32 | String | Y | Manufacturer specific key or id. Hunter equipment uses this field to store k-type. |
| ENGINECODE | N | 32 | String | N | |
| PISTONDISPLACEMENT | N | | double | N | Will have attribute UNIT to indicate units of the value. |
| CYLINDERS | N | | INT | N | Number of cylinders. |
| FUEL1, FUEL2 | N | 32 | String | N | |
| EMISSIONCODE | N | | INT | N | German KBA_Key part 1 OR European 4 digit emission key. |
| NO_EMISSIONCODE | N | 0 | INT | N | Vehicle has not emission code (used instead of empty EMISSIONCODE element) |
| BRAKE_SYSTEM | N | 32 | String | N | Type of Brake System(e.g. crossed) |
| SERVICE_BRAKE AUXILLARY_BRALE PARKING_BRAKE | N | 16 | String | N | HYDRAULIC, MECHANICAL, PNEUMATIC, MIXED |
| PARKING_BRAKE_CONTROL | N | 4 | String | N | HAND, FOOT |
| PARKING_BRAKE_AXLE | N | 5 | String | N | FRONT, REAR |
| FOURWD | N | | BOOL | N | TRUE, FALSE |
| NUMBER_OF_AXLES | | 2 | INT | Y | Number of axles. Typically 2 for passenger cars. Can be more for heavy-duty vehicles. |
| PRODUCTION_SINCE, PRODUCTION_UNTIL | N | 4 | INT | Y | PRODUCTION_SINCE and PRODUCTION_UNTIL contain the model years in which the specification applies. These two values are often different. It corresponds to the years where the alignment specifications apply. |
| PRODUCTIONDATE | N | 4 | INT | N | Year of production |
| INSPECTIONDATE | N | 4 | DATE | N | iShopVehicle/InspectionDate |

| | | | | | |
|-----------------------------|---|----|--------|---|---|
| LASTINDATE | N | 4 | DATE | N | iiShopVehicle/LastInDate |
| AAIA_ID | N | 4 | INT | N | iShopVehicle/AAIAid |
| AAIA_TAGNAME | N | 12 | STRING | Y | iShopVehicle/AAIA_TAGNAME. Hunter equipment will fill in the tag number WITHOUT state e.g. "ABC123" |
| AAIA_LICENSESTATE | N | 5 | STRING | Y | iShopVehicle/AAIA_LICENSESTATE. Hunter will fill this in with the ISO 3166-2 code, e.g. "US-MO" |
| AAIA_GOVERNMENTID | N | | | N | iShopVehicle/GovernmentID |
| AAIA_UNITNUMBER | N | | | N | iShopVehicle/UnitNumber |
| AAIA_TELEMATICCONTACTNUMBER | N | | | N | |

License plate information is available if at least one of the following is true

- License plate recognition active and successfully determines the license plate number
- User enters license plate information
- License plate retrieved from iShop server from GetOrderRequest.

ADDITIONALIDENT

The ADDITIONALIDENT element contains one or more FEATURE elements. Each FEATURE has the attribute MID with value "Hunter Engineering". Each FEATURE element consists of a pair of NAME/VALUE elements. The FEATURE elements typically specify

- Program configuration information
- Vehicle or tire images collected during the procedure
- Decisions made during the procedure

The NAME field is always a string (max expected length 128), while the VALUE can be inferred from the datatype.

Although the ADDITIONALIDENT element is not required, in practice, it will always be present in Hunter generated XML.

| Value | Data Type | Typical values |
|---------|-----------|--|
| Boolean | | "True"/ "False" "No"/ "Yes" "Disabled"/"Enabled" 0/1 |
| INT | | 5, 1001 |
| GUID | | {9AC170DD-8396-4EA0-8643-44E54269ADA8} (includes the braces around the value) |
| Double | | 3.4, -178.654 |

| | |
|------------|--|
| IMAGE | Base64 encode jpeg image |
| Date | "7/2/20 8:10 AM" |
| Date (UTC) | "2020-07-02T13:10:34Z" |
| String | "ABC" 256 characters should be sufficient for any string values. |

For passenger vehicles with Hunter QuickTread® tread measurement systems, the following FEATURES will be present

| Name | Description |
|---------------------|--|
| FRONTLEFDDOTDIMAGE | Tire patch image from front left tire |
| FRONTRIGHTDOTDIMAGE | Tire patch image from front right tire |
| REARLEFDDOTDIMAGE | Tire patch image from rear left tire |
| REARRIGHTDOTDIMAGE | Tire patch image from rear right tire |

For systems with license plate reading cameras, there may be a FEATURE with name "LPR_LICENSE_IMAGE" that contains a base64 encoded picture of the license plate.

The FEATURE with NAME EventID_Guid contains the unique ID of the message. Each unique creation of the XML creates a new EventID_Guid. In cases where the Hunter equipment sends multiple uploads of the same data (perhaps once BEFORE alignment begins and another time AFTER alignment is complete), the EventID_Guid will be different each time. The CONTROL_NO attribute will contain the unique ID of the procedure. Multiple uploads from this procedure will have the same value of CONTROL_NO.

DATA

The DATA element contains additional vehicle information. The DATA will always be present even if none of its children are present.

| Element | Required | Maximum Size | Type | Used by Hunter equipment? | Description |
|-----------------|----------|--------------|--------|---------------------------|---|
| ODOMETER | N | | INT | Y | Can include UNIT attribute, but assume miles if not given |
| AXLE_WEIGHT | N | | double | N | Attribute UNIT, Axle=NO |
| AXLE_WEIGHT_MAX | N | | double | N | Attribute UNIT, Axle=NO |
| TOTAL_WEIGHT | N | | double | N | Attribute UNIT |

| | | | | | |
|------------------------|---|----|------------|---|---|
| TOTAL_WEIGHT_MAX | N | | double | N | Attribute UNIT |
| DIESEL_GT_35 | N | | Bool | N | Indicates if diesel vehicle weight exceeds 3.5 tons |
| NOISE | N | | Double | N | Noise level, Attribute UNIT |
| NOISE_RPM | N | | Double | N | Speed for noise level, Attribute UNIT |
| REGISTRATION_DATA | N | | Date | N | First registration, Attribute UNIT |
| LAST_REGISTRATION_DATE | N | | Date | N | Last registration, Attribute UNIT |
| COLOR | N | 32 | String | Y | Color of vehicle |
| ODOMETEROUT | N | | Int | N | Mileage out |
| INSPECTION_DATE | N | | Date | N | Date of last inspection |
| VEHICLE_IMAGE | N | | Bin.base64 | Y | Image taken of vehicle |

Typically, ODOMETER is available only when entered by a user. VEHICLE_IMAGE is available with unmanned inspection systems. The image stored with VEHICLE_IMAGE is a base64 encoded jpeg. COLOR may be filled in if the color is supplied by a GetOrder message from a full iShop server.

RESULT

The RESULT element contains data from one of the major measurement subsystems of Hunter equipment. The following attributes are available:

| Attribute | Required | Used by Hunter | Values | Description |
|-----------|----------|----------------|--------------------------------------|--|
| OBJECT | Y | Y | WHEEL_ALIGNMENT EMISSION BRAKE | Wheel/tire data Emission data Brake data Battery data |

| | | | DIAGNOSIS ² | |
|--------------|---|---|---|---|
| METHOD | N | N | | Test procedure |
| METHOD_TITLE | N | N | | Localized description of method |
| MODE | N | N | DEMO, DEMO_MEAS, DEMO_LIMITS, REAL | Indicates results from a demo or real results |
| GL | N | N | 1,2,3,4,5 | Used Guideline |

Each RESULT contains the following:

- TITLE (Required), in localized language
- HEADER (Required)
- SECTION (Required)
- SUMMARY (Optional)

HEADER

Each RESULT includes a HEADER that contains information about the test. The following elements can appear in the HEADER:

| Element | Required | Used by Hunter | Description |
|----------------------|----------|----------------|--------------------------|
| EQUIPMENT | Y | Y | Description of equipment |
| START_TEST | Y | Y | When test started |
| END_TEST | Y | Y | When test ended |
| CONTROL_NO | N | Y | Official Code Number |
| PROTOCOL_NO | N | N | |
| OPERATOR | N | Y | Information about user |
| COUNTRY | N | N | |
| ORDER | N | N | |
| HUMIDITY | N | N | |
| TEMPERATURE | N | N | |
| ATMOSPHERIC_PRESSURE | N | N | |

Hunter uses CONTROL_NO as a unique identifier for the procedure. It is a GUID (wrapped with braces).

Multiple equipment elements can be present when more than one applies to a measurement.

² The asanetwork documentation defines additional valid values for OBJECT, but these the only ones currently produced by Hunter.

EQUIPMENT

The EQUIPMENT element contains information about the equipment used for the test. The required TYPE attribute can have any of the following values.

| TYPE Value | Used by Hunter | Description |
|-----------------------------|----------------|--|
| CONTROL | Y | Computer used for control and operation |
| BRAKE | Y | Test block for brake test |
| GAS | N | Test bench |
| SMOKE | N | Test bench |
| WHEEL_ALIGNMENT | Y | Wheel alignment tester |
| LIGHT | N | Head light tester |
| SIDE_SLIP | N | Side slip test |
| NOISE | N | Noise level meter |
| SUSPENSION | N | Suspension tester |
| OIL_MANAGEMENT | N | Oil management system |
| INTERFACE | N | If a network interface is realized as separate module |
| OBD | Y | Device used for readout; used by Hunter to indicate emission data read from OBD port |
| WHEELBALANCER | N | Device used for balancing wheels |
| HANDHELD_DIAGNOSTIC_UNIT | N | Handheld device used for diagnostics |
| WORKSTATION_DIAGNOSTIC_UNIT | N | Workstation device used for diagnostics |
| IGNITION_ANALYZER | N | Device for ignition analysis |
| ENGINE_ANALYZER | N | Device for engine analysis |
| BATTERY | Y | Device that diagnoses battery and electrical systems |
| COATING_THICKNESS_TESTER | N | Coating thickness tester |
| TIRE_PRESSURE_TESTER | N | Tire pressure tester |
| AIRCONDITION | N | Air condition service unit |

Each EQUIPMENT element contains the following elements

| Element | Required | Used by Hunter | Type | Character Limit | Description |
|--------------|----------|----------------|--------|-----------------|------------------------------------|
| TITLE | Y | Y | String | 64 | Localized description of equipment |
| MANUFACTURER | Y | Y | String | 32 | "Hunter Engineering Company" |
| MODEL | Y | Y | String | 32 | Depends on equipment |

| | | | | | |
|---------------------|---|---|--------|----|--|
| PROCEDURE | N | N | String | | Description of procedure |
| SERIAL_NO | N | Y | String | 32 | Serial number |
| HOMOLOGATION_NO | N | N | String | | |
| VERSION | Y | Y | String | 16 | Version number of equipment, software on equipment |
| DATA_RELEASE | N | N | String | | Formatted as "X/YYYY" where X is the quarter (I, II, III, IV) and YYYY is the year |
| CALIBRATION_EXPIRES | N | N | String | | Calibration date |
| CALIBRATED_BY | N | N | String | | Person/organization that performed calibration |
| CHECKSUM | N | N | String | | Check sum |
| SUPPORTS | N | N | String | | Supported OBD protocols |

START_TEST, END_TEST

These elements indicate the start and end date/time of the procedure. The time is the LOCAL time on the equipment at the time procedure was performed. The UNIT attribute is optional and Hunter does not include it. The data is in the format MM/DD/YY HH:MM:SS AM/PM. An alternative is to use the FEATURE named WO_DATE_UTC, which includes the UTC time stamp at the time the XML was generated.

CONTROL_NO

The control number field contains the unique id of the procedure. All measurements taken during the same procedure have the save value for control number. This field contains a GUID enclosed with braces, e.g. {30D8144E-A635-4E5F-AAD3-F887E7DA63A4}. This will always appear in the XML.

OPERATOR

The operator element can be present in full iShop settings. It will be present only if at least the operator name is known. It contains two child elements

- NAME (required, as string/128)
- PERMISSION (optional, not used by Hunter)

SECTION

Each RESULT has one or more SECTION elements corresponding to a portion of a test. The following attributes are available:

| Attribute | Required | Used by Hunter | Type/Limit | Description |
|-----------|----------|----------------|------------|-------------|
|-----------|----------|----------------|------------|-------------|

| | | | | |
|------------|---|---|-----------|--|
| OBJECT | Y | Y | String/64 | What is being tested. These are detailed later |
| TYPE | N | N | | How is it tested |
| TYPE_TITLE | N | N | | Localized version of TYPE |
| AXLE | N | Y | int | axle number starting at front axle=1 |
| AXLE_TITLE | N | N | | Localized description of axle |
| NO | N | Y | int | Index of the section for cases when there are multiple numbered sections |
| LOC | N | Y | String/32 | Where the test occurred |
| LOC_TITLE | N | Y | enum | Localized description of LOC |

Each section contains the following elements

- TITLE (required, localized title of section)
- STEP or MEAS or MEAS_ROW or DIAGRAM or DEFECT (required, repeatable)
- SUMMARY (optional)

Neither the DIAGRAM nor DEFECT elements are used by Hunter equipment.

TITLE

All title elements are localized strings. Hunter includes these because they are required elements; they are not used on any reports or displays for users. You should identify elements by language neutral attributes like OBJECT instead of localized strings. TITLE elements has a maximum size of 128.

LOC

The LOC attribute is a description of what part of the car the test was performed. Values used by Hunter include INSIDE, OUTSIDE, LEFT, RIGHT, INSIDE LEFT, INSIDE RIGHT, OUTSIDE LEFT, OUTSIDE RIGHT, CENTER

SUMMARY

A summary contains a summary of a section or a complete test result. Each summary contains

- TITLE (required, localized description of result)
- STEP or MEAS or MEAS_ROW or DIAGRAM

STEP

A STEP breaks a SECTION into smaller groups. A STEP has the following attributes:

| Attribute | Required | Used by Hunter | Type/Limit | Description |
|-----------|----------|----------------|------------|---|
| OBJECT | N | Y | String/64 | What is tested |
| NO | N | Y | int | Successive numbers starting with 1, used when there are repeating steps |
| NO_TITLE | N | N | | Localized description of individual step. |

A step contains the following elements

- TITLE (required, localized description of the STEP)
- MEAS or MEAS_ROW (required, repeatable)
- DIAGRAM (optional, not used by Hunter)
- SUMMARY (optional)

MEAS

Each measurement object contains the result of a single measurement. Each contains the following attributes:

| Attribute | Required | Used by Hunter | Type/Limit | Description |
|-----------|----------|----------------|------------|--------------------------------------|
| OBJECT | Y | Y | String/64 | What is being measured |
| LOC | N | Y | Enum | Location of measurement. |
| LOC_TITLE | N | Y | String/64 | Localized description of measurement |
| DISTANCE | N | N | | Distance in meters |

Each MEAS contains

- TITLE (required, localized description of the measurement)
- VALUE(required, repeatable)

When consuming measurements

- Do not assume a particular measurement will be present. The measurements in a particular data set depend on the exact configuration of the system that generated the measurements. Always test to see if a particular measurement is present before accessing its value.
- Additional measurements may be added in the future as Hunter Engineering adds additional features or measurement types based on internal or customer requests. Changes in iShop implementation are published with each WinAlign release.
- If the UNIT attribute is not specified, assume the measurement has no units.

- Except as noted, do not depend on measurements appearing in particular order. A measurement, if present, will appear in the appropriate SECTION and/or STEP, but the order of the measurements within the SECTION or STEP may change.
- Do not assume that RESULT="0" implies that the measurement is invalid. It only means that there is no specification to determine if the measurement passes or fails.
- There is no comprehensive list of values for OBJECT, Hunter Engineering adds new types at each WinAlign release. When new measurements are added/replaced, the old measurements are still available for systems that require compatibility with older WinAlign releases.
- The size of the OBJECT value will not exceed 64 characters.

VALUE

Each measurement contains at least one VALUE that represents the result of a measurement. When multiple values are present, one represents a raw measurement and additional measurements are those that are presented to the user. For example, the Hunter QuickTread® system measures tread depth in millimeters. The tread measurements may be presented to the user in inches (as fractions or as a decimal) or in millimeters. Using multiple values allow you to see both the original value and how it was presented to the user without loss of precision.

The following attributes are available

| Attributes | Required | Used by Hunter | Type/Size | Values |
|------------|----------|----------------|-----------|---|
| TYPE | N | Y | Enum | MAX MIN AVG(Default) DELTA DISP ³ PERM INTERM ⁴ ABS RMS POTENTIAL PENDING CONFIRMED_ACTIVE PREVIOUSLY_ACTIVE NOX_EXCEPTION |
| UNIT | N | Y | Enum | Detailed later |
| DIGITS | N | Y | Int | Resolution of measurement |
| DISPDIGITS | N | Y ⁵ | Int | Result of displayed value |
| RESULT | N | Y | int | 0 (default, undefined) 1 (pass, good) 2 (warning, marginal) 3 (fail, severe fault) |

³ Used for QuickTread® tread measurements

⁴ Used for emission testing

⁵ Not currently used, but has been proposed for use with TYPE="DISP" VALUES

| | | | | |
|--|------------------|------------------|------------|---|
| | | | | 4 (fault, danger) 5 (aborted) 6 (overflow) 7 (timeout) Only values 0-3 are used by Hunter equipment |
| REF | N | Y | String/32 | Signal reference |
| REF_LOC | N | Y | String/128 | Location of reference |
| SOURCE | N | N | | HAND MEASURED(default) |
| SOURC_LOC | N | N | | Location of signal source |
| CALIBRATED | N | N | | 0— uncalibrated 1—Calibrated |
| TEXT | N | Y | String/128 | See description |
| FORMAT | N | N | | NUM(Numeric data) ALPHA(string data, default) |
| LOWLIM1, LOWLIM2, LOWLIM3 LOWLIM4 | N N N N | Y Y N N | double | Set point minimum |
| HIGHLIM1, HIGHLIM2, HIGHLIM3 HIGHLIM4 | N N N N | Y N N N | double | Set point maximum |
| LIMIT_SOURCE | N | N | | Origin of limit: P – plaque on vehicle M – manufacturer D—default |
| NOMINAL | N | Y | double | Expected value of measurement |
| LOWDISP | N | N | | Display range limit |
| HIGHDISP | N | N | | Display range limit |
| NOMINALDISP | N | N | | Display range target value |
| IMAGE | N | Y | Enum | GIF, JPEG |
| TRIGGER | N | N | | Trigger signal |
| TRIGGER_EDGE | N | N | | Trigger slope, POS,NEG |
| REF_VALUE | N | N | | Reference value |
| COUPLING | N | N | | AC, DC |
| DATE | N | N | | Date |
| TIME | N | N | | Time |
| RESOLUTION | N | N | | Time is seconds |

| | | | | |
|------------------|---|---|-----|---|
| ADDRESS | N | N | | Controller address, hexadecimal |
| CLASS | N | N | | Error Class OBD (C, B2, B1, A) |
| STANDARD | N | N | | ISO_15031 or SAE_J1929 |
| AFI | N | N | | Error code |
| AFI_TEXT | N | N | | Error string |
| OC | N | N | | |
| CM | N | N | | |
| MIL ⁶ | N | Y | int | Tread measurement in mils using the Hunter handheld tread device. |

TYPE

Hunter equipment currently uses either the default (AVG) or DISP. DISP is used to indicate the value that was presented to the user when it may differ from the raw measurement. For instance, drive over tread systems measure tread in millimeters, but tread measurements are often displayed to the user in other units or with less precision.

UNIT

Hunter includes units with all measurements when the measurement has units. Units used by Hunter equipment include the following subset of asanetwork units (see table 3.39)

| Description | Unit | Allowed values |
|-------------------------------|------------|----------------|
| Binary data | Bin.base64 | ASCII string |
| Bool | 1(default) | 0 false 1 true |
| Date | Date | DD.MM.YYYY |
| Pressure in Bar | bar | Numerical |
| Pressure in Pascal | Pa | Numerical |
| Pressure in psi | psi | Numerical |
| Speed in m/s | m/s | Numerical |
| Speed in km/h | km/h | Numerical |
| Speed in mi/h | mph | Numerical |
| Force in N | N | Numerical |
| Length in meter | m | Numerical |
| Length in kilometer | km | Numerical |
| Length in miles | miles | Numerical |
| Length in inches (decimal) | inch | Numerical |
| Length in inches (fractional) | finch | Format "a b/c" |
| Percent | % | Numerical |
| Second | S | Numerical |
| Voltage | V | Numerical |
| Temperature in degrees C | degC | Numerical |
| Temperature in degrees F | degF | Numerical |

⁶ Non-standard TYPE

| | | |
|--|----------|---------------------|
| Time | Time | hh:mm:ss |
| DateTime | DateTime | DD.MM.YYYY hh:mm:ss |
| Angle in degrees, minutes, seconds | deg60 | DDD:MM:SS |
| Angle in decimal degrees | deg | Numerical |
| Battery Capacity (CCA) ⁷ | CCA | Numerical |
| Battery Capacity (CA) ⁷ | CA | Numerical |
| Battery Capacity (JIS Standard) ⁷ | CCA JIS | Numerical |
| Battery Capacity (DIN Standard) ⁷ | CCA DIN | Numerical |
| Battery Capacity (SAE Standard) ⁷ | CCA SAE | Numerical |

Note that if TYPE=DISP, nonstandard units, including such as millimeters are available.

RESULT

This attribute indicates whether a measurement passes, fails, is marginal, or is undefined. The undefined result does not mean the measurement is invalid; it often means that there is no standard to determine if it passes or fails. For instance, some vehicles have nonadjustable rear axles, so while you can measure the total toe of the axle, the manufacturer does not have a specification to determine if the value is in spec or not.

NOMINAL, LOWLIM1 and HIGHLIM1

For many VALUE elements, the NOMINAL, LOWLIM1 and HIGHLIM1 attributes are used to indicate the range of allowable measurements for a particular measurement. For instance, if a camber angle measurement has an allowed range of $-0.4 \pm 1.0^\circ$, it can be represented in XML with NOMINAL="-0.4" LOWLIM1="-1.4" HIGHLIM1="0.7".

For alignment measurements, the attribute TEXT="SPEC" will indicate that the VALUE contains the actual spec values and measurements. If TEXT="SPEC" is not present, then the VALUE contains scaled measurements. Scaled measurements are only produced during QuickCheck inspections. Information on using scaled measurements appears later.

LOWLIM1 & LOWLIM2 & HIGHLIM1

For QuickTread tread measurements, these attributes indicate the thresholds for deciding if this tread passes, fails, or is marginal.

| Attribute | Related Feature NAME | Purpose |
|-----------|---------------------------|-----------------------------|
| LOWLIM1 | TREAD_DEPTH_DANGER_LEVEL | Threshold for fail/marginal |
| LOWLIM2 | TREAD_DEPTH_WARNING_LEVEL | Threshold for marginal pass |

The related features include the thread thresholds in mils. These values are included for reference because the RESULT code includes the overall decision on the tread depth already.

For handheld tread devices, the following are available:

| Attribute | Purpose |
|-----------|----------------------|
| LOWLIM1 | Lowest allowed value |

⁷ Non-standard unit, not in asanetwork standard

| | |
|----------|---|
| HIGHLIM1 | Highest allowed value (not useful, but written) |
| NOMINAL | Expected value (not useful, but written) |

Measurements for handheld tread depth system DO NOT include RESULT codes. Consumers this data will need to use the thresholds in the related FEATURES to determine if the result passes or fails.

TEXT

Hunter equipment uses the TEXT attribute to indicate special behaviors. For alignment measurements, TEXT="spec" indicates that the NOMINAL, LOWLIM1, HIGHLIM1 and the measurement value are the actual specifications. If the TEXT attribute is missing, the measurement value and attributes represent *scaled* values, described in

REF & REF_LOC

These two attributes are currently used only with multi-spec descriptions. The REF attribute contains information about what vehicle specification was used and REF_LOC contains a localized (and escaped) text representation of the vehicle specification. Maximum length of REF_LOC is about 256.

MEAS_ROW

The MEAS_ROW element is used for storing array data. Currently, the only use of this element in Hunter generated data is for "multi-spec" vehicles. The MEAS_ROW element has two attributes: OBJECT, which describes what is measured, and COUNT, which gives the number of items in the array. It has two required children, VALUE and ARRAY. The VALUE element contains any attributes, similar to the VALUE element of MEAS. The actual data is stored in the ARRAY element, and the array contains COUNT items. Each item in the array is separated with white space.

Example with three Voltage measurements

```
<MEAS_ROW OBJECT="EXAMPLE" COUNT="3">
  <VALUE UNIT="V"/>
  <ARRAY 12.5 12.1 12.6/>
</MEAS_ROW>
```

Hunter Alignment/Inspection Data

Common Wheel Alignment Data

Wheel alignment data (either from unattended or attended systems) is located in the RESULTS element with OBJECT="WHEEL_ALIGNMENT". Two axle passenger vehicles typically have two or four SECTION elements. The first two sections are applicable to inspection only systems, while full alignment systems use all four sections to store data before and after the wheel alignment is performed.

| OBJECT attribute | AXLE attribute | Description |
|---------------------|----------------|---|
| INITIAL_MEASUREMENT | 1 | Front Axle Inspection results |
| INITIAL_MEASUREMENT | 2 | Rear Axle Inspection results |
| FINAL_MEASUREMENT | 1 | Front Axle measurements AFTER alignment is complete |
| FINAL_MEASUREMENT | 2 | Rear Axle measurements AFTER alignment is complete |

Multi-axle vehicles have additional, similar sections, with AXLE numbers 3 and up. The number of axles can be inferred from the number of wheel alignment sections or by checking the IDENT child element named NUMBER_OF_AXLES

The WHEEL_ALIGNMENT RESULT may conclude with a SUMMARY element with MEAS elements that describe the overall result of the wheel alignment and tire inspection.

Units for alignment measurements

| Alignment Quantity | Units | UNIT attribute |
|--------------------|--|--|
| Camber & Caster | Decimal Degrees Fractional Degrees DMS | deg deg deg60 ⁸ |
| Toe ⁹ | Decimal Degrees DMS Decimal Inches Fractional Inches Decimal mm Decimal Inches at reference diameter ¹⁰ Fractional Inches at reference diameter Decimal mm at reference diameter | deg deg60 inch finch mm inch finch mm |
| Thrust Angle | Decimal Degrees Fraction Degrees DMS | deg deg deg60 |
| Ride Height | Decimal inches Fractional inches Decimal mm | inch finch mm |

Inspection Systems

Inspection only systems will include the following measurements for each axle:

| OBJECT | LOC | Description |
|-----------|-------|-----------------------|
| CAMBER | LEFT | Camber of left wheel |
| CAMBER | RIGHT | Camber of right wheel |
| TOTAL_TOE | n/a | Total Toe of axle |

The measurements will most often appear in degrees, but may appear in degree/minute/second or in inches or mm. The UNIT attribute will contain the measurement units.

The measurements will appear with the following RESULT values:

| RESULT | Meaning | Description |
|--------|----------------|---|
| 0 | Not Determined | Measurement not available or no specification available to evaluate |

⁸ Degree-Minute-Second

⁹ About 75% of North American passenger vehicles specify toe in decimal degrees. Decimal inches and decimal mm make up most of the rest.

¹⁰ Specifying Toe angle with a reference diameter is uncommon for passenger vehicles, but typical for heavy-duty vehicles.

| | | |
|---|------|---|
| 1 | PASS | The measurement was within specification range |
| 3 | FAIL | The measurement was outside specification range |

Measurements from fixed axle rear wheel drive vehicles often will have RESULT="0" because no specification range is available.

By default, alignment measurements on inspection systems do not represent the actual measurements, but instead are scaled to a value such that a value lies between -1 and 1 if it is within specifications. If a measurement contains actual measured values, it will include a TEXT attribute with the value "SPEC".

For inspection data, you should NOT display the measurement values to vehicle owners. When scaled values are present AND RESULT="0", assume the value of the measurement is invalid.

The overall result of the alignment is available in a SUMMARY element at near the end of the RESULTS element.

```
<SUMMARY>
  <TITLE>Quick Check Results</TITLE>
  <MEAS OBJECT="WHEEL_ALIGNMENT">
    <TITLE>Initial Alignment Results</TITLE>
    <VALUE RESULT="1">PASSED</VALUE>
  </MEAS>
</SUMMARY>
```

Measurements specific to unattended alignment systems

Unattended inspection systems, such as Hunter's QuickCheck® Drive, include other measurements that may be of interest to integrators.

Rim Diameter

The QuickCheckDrive system measures the rim diameter as the vehicle passes through it. WinAlign 16.2 and later measures the rim diameter for each axle.¹¹ A RIM_DIAMETER measurement is included with the other axle measurements. WinAlign 16.0 & 16.1 include only a single axle measurement for the entire vehicle in a separate SECTION element with OBJECT="MEASUREMENT". This measurement will continue to be available for legacy integrations.

The rim diameter measurement contains at least one VALUE element. The first is the wheel diameter in inches as an integer. The second, if present, contains the wheel diameter in the units depending on the local system configuration.

Additional test conditions

Several measurements indicate if it is difficult to determine alignment results due to the drive steering or braking during the inspection. The VALUE of these measurements indicate true or false. The following are available in each axle section: CAMBER_STEERING (LEFT or RIGHT side), CAMBER_BRAKING (LEFT or RIGHT side), CAMBER_ACCELERATION (LEFT or RIGHT side), TOE_STEERING, TOE_BRAKING, and TOE_ACCELERATION.

¹¹ Some vehicles have different sized wheels on different axles.

Similar tests are recorded on a whole vehicle basis in the SECTION element with OBJECT="MEASUREMENT": ANY_STEERING_DETECTED, ANY_BRAKING_DETECTED, ANY_ACCELERATION_DETECTED.

The measurements TOO_FAST and TOO_SLOW indicate if the vehicle drove through the test equipment too fast or too slow to make a reliable measurement.

The measurement SPEED records the measured speed the vehicle drove through the test equipment.

Measurements specific to full wheel alignment system

In a full wheel alignment procedure, measurements are recorded at the beginning of the procedure (INITIAL measurements) as well as at the end (FINAL measurements). A larger list of measurements are also potentially available, depending on the type of vehicle and measurement conditions. Unlike inspection systems, measurements from full alignment are stored in the form they were displayed in on the customer's alignment system.

| OBJECT attribute | Allowed LOC attribute | Description |
|---------------------|-----------------------|---|
| CAMBER | LEFT, RIGHT | Camber angle |
| TOE | LEFT, RIGHT | Toe Angle |
| TOTAL_TOE | n/a | Total Toe |
| CROSS_TOE | n/a | Cross Toe |
| CROSS_CAMBER | n/a | Cross Camber |
| CASTER_20 | LEFT, RIGHT | Caster angle |
| SAI_20 | LEFT, RIGHT | Steering Axis Inclination |
| TOE_OUT_ON_TURNS_20 | LEFT, RIGHT | Toe out on Turns |
| TOE | LEFT, RIGHT | Toe angle |
| THRUST_ANGLE | n/a | Thrust Angle |
| WHEEL_SETBACK | n/a | Wheel Setback |
| MAX_STEER_TO_LEFT | LEFT, RIGHT | Maximum steer angle to left |
| MAX_STEER_TO_RIGHT | LEFT, RIGHT | Maximum steer angle to right |
| WIDTH_OFF_L_MEAS | LEFT, RIGHT | body width offset, distance, as measured |
| WIDTH_OFF_L_CORR | LEFT, RIGHT | body width offset, distance, corrected with uncompensated camber and ride height |
| HEIGHT_L_MEAS | LEFT | ride height, left, distance, as measured (result of correction with uncompensated camber and width offset goes into AP_HEIGHT_L) |
| HEIGHT_R_MEAS | RIGHT | ride height, right, distance, as measured (result of correction with uncompensated camber and width offset goes into AP_HEIGHT_R) |
| WHEEL_OFF_L | LEFT | body wheel offset, left, distance |
| WHEEL_OFF_R | RIGHT | body wheel offset, right, distance |
| SETBACKD | n/a | body wheel set back parallel to body centerline, distance, positive if left wheel ahead of right wheel |
| TRACKWIDTH | n/a | track width (distance between wheel centers), distance |

| | | |
|-------------------------|-------|--|
| WHEELBASE_L | LEFT | wheelbase (distance between wheel centers), left, distance (vehicle-, not axle-related stored only in front axle) |
| WHEELBASE_R | RIGHT | wheelbase (distance between wheel centers), right, distance (vehicle-, not axle-related; stored only in front axle) |
| BODY_ANGLE | n/a | body angle, angle, positive if body centerline is rotated clockwise from geometric centerline when viewed from above (vehicle-, not axle-related; stored only in front axle) |
| ROLL_ANGLE | n/a | roll angle, angle, positive counterclockwise when viewed from behind, with 0 = level (calculated individually for each axle) |
| TRACK_WIDTH_OUTSIDE_RIM | n/a | pseudo-track-width computed from the outside centers of the wheels, distance |

Manufacturer Specific Measurements

| OBJECT attribute | Allowed LOC attribute | Manufacturer | Description |
|-------------------------|-----------------------|--------------|--------------------------|
| MB_TOE_PRESSED | LEFT, RIGHT | MB | Toe pressed, |
| MB_TOTAL_TOE_PRESSED | n/a | MB | Total toe Pressed |
| MB_ZERO_TOE | LEFT, RIGHT | MB | Zero spec toe |
| MB_ZERO_TOTAL_TOE | n/a | MB | Zero spec total toe |
| LIVE_MB_CASTER_ADJUST | LEFT, RIGHT | MB | Caster Adjust, live |
| FROZEN_MB_CASTER_ADJUST | LEFT, RIGHT | MB | Caster Adjust, frozen |
| LIVE_MB_CAMBER_ADJUST | LEFT, RIGHT | MB | Camber Adjust, live |
| MB_CAMBER_ZERO_TOE | LEFT, RIGHT | MB | Camber Adjust, zero spec |

Tire Inspection Measurements

Tire Inspection results are available in SECTION elements with OBJECT="TIRE_INSPECTION". The axle is specified for each section.

Unmanned Tire Inspection Measurements

Hunter’s QuickTread® systems measure tread depth of tires as they drive over the device.

All versions of WinAlign 16 with unmanned tire inspection systems can measure up to six¹² tread grooves per tire.

If tread depth groove data is available, it will appear in MEAS elements with names like TREAD_POINT_DEPTH_DISPLAY_X, where X can have values from 1 to N, where N is the number of grooves detected for that tire. Each MEAS element contains two VALUE elements. The LOC attribute will have values like LEFT or RIGHT¹³.

¹² Future version of WinAlign may allow more tread grooves per tire

¹³ Future support for multi-wheel axles might include LOC attribute values INSIDE LEFT, OUTSIDE LEFT, INSIDE RIGHT, OUTSIDE RIGHT.

The first VALUE element includes the raw tread measurement in the units of the measuring device, typically in mm. No RESULT attribute is specified.

The second VALUE element includes the equivalent measurement in local unit system. For North American systems, this is typically in fractional inches, but may be in decimal inches or decimal millimeters depending on equipment setup. The LOWLIM1 and LOWLIM2 attributes describe the threshold to determine if the tire. A RESULT attribute is also included to indicate if the tread measurement is PASS, MARGINAL, or FAIL. The test is applied in the unit system selected by the user.

Example:

```
<MEAS OBJECT="TREAD_POINT_DEPTH_DISPLAY_1" LOC="LEFT">
  <VALUE RESULT="0" UNIT="mm">2.803</VALUE>
  <VALUE TYPE="DISP" RESULT="2" UNIT="finch" LOWLIM1="2/32" LOWLIM2="4/32">4/32</VALUE>
</MEAS>
```

The following measurements are deprecated for use with unmanned tread measurement systems, but appear in the XML anyway: TIRE_TREAD_DEPTH_INSIDE, TIRE_TREAD_DEPTH_CENTER, TIRE_TREAD_DEPTH_OUTSIDE, TREAD_POINT_DEPTH_X

Tread images taken by the equipment are stored in four FEATURE elements listed below. The VALUE element contains a base-64 encoded image of the tread.

| FEATURE Name | Description |
|---------------------|---------------------------------|
| FRONTLEFTDOTDIMAGE | Image of front left tire tread |
| FRONTRIGHTDOTDIMAGE | Image of front right tire tread |
| REARLEFTDOTDIMAGE | Image of rear left tire tread |
| REARRIGHTDOTDIMAGE | Image of rear right tire tread |

Manned Tire Inspection Measurements

Hunter’s hand held tread depth device allows up to three measurements per tire. Results are stored in the MEAS elements with the following OBJECT attributes:

| OBJECT attribute | Description |
|--------------------------|--|
| TIRE_TREAD_DEPTH_INSIDE | Represents a tread measurement closest to the center of the vehicle |
| TIRE_TREAD_DEPTH_CENTER | Represents a tread measurement near the center of the tire |
| TIRE_TREAD_DEPTH_OUTSIDE | Represents a tread measurement near the outside of the tire, furthest away from the center of the vehicle. |

The number of samples per tire is stored in FEATURE element TREAD_DEPTH_SAMPLE_POINTS. It will have the value 1 or 3.

If the system is configured to take a single measurement per tire, only TIRE_TREAD_DEPTH_CENTER will be present.

These measurements may include a MIL attribute that represents the tread depth in mils. The measurement may also include LOWLIM1 and LOWLIM2 that represent the threshold that determines if the tread measurement is marginal or fails. In older versions of WinAlign, these attributes might not be present. If needed, these thresholds are stored in mils in two FEATURE elements named TREAD_DEPTH_WARNING_LEVEL and TREAD_DEPTH_DANGER_LEVEL.

[Additional Tire inspection measurements](#)

The following measurements may be available based on how the Hunter system is equipped.

| OBJECT | Quantity | Description |
|-------------------------------------|-------------------------------------|--|
| LIVE_RIDE_HEIGHT | Ride Height (Left, Right, Cross) | Height of vehicle chassis above ground |
| TIRE_PRESSURE_INITIAL | INITIAL Tire pressure (Left, Right) | Tire pressure before Adjustment; limited to systems that include inflation systems |
| TIRE_PRESSURE | Tire pressure (Left, Right) | Tire pressure after Adjustment; limited to systems that include inflation systems |
| IDEAL_STOPPING_DISTANCE | Distance | Reserved for Hunter Engineering |
| BRAKE_STOPPING_DISTANCE | Distance | Reserved for Hunter Engineering |
| TREAD_STOPPING_DISTANCE | Distance | Reserved for Hunter Engineering |
| TOTAL_STOPPING_DISTANCE | Distance | Reserved for Hunter Engineering |
| WHEEL_TREAD_STOPPING_DISTANCE | Distance | Reserved for Hunter Engineering |
| VELOCITY_AT_IDEAL_STOPPING_DISTANCE | Velocity | Reserved for Hunter Engineering |
| VELOCITY_AT_BRAKE_STOPPING_DISTANCE | Velocity | Reserved for Hunter Engineering |
| VELOCITY_AT_TREAD_STOPPING_DISTANCE | Velocity | Reserved for Hunter Engineering |
| TREAD_POINT_X_N Pixel | PIXEL | Reserved for Hunter Engineering |
| TREAD_POINT_Y_N Pixel | PIXEL | Reserved for Hunter Engineering |
| TREAD_POINT_WIDTH_N | PIXEL | Reserved for Hunter Engineering |

[Battery Inspection](#)

Some manned Hunter inspection systems include a battery inspection system. Battery measurements are available in a RESULT object with OBJECT="DIAGNOSIS".

The following measurements are available.

| OBJECT | Description |
|-------------------|---|
| MEASUREMENT | Battery terminal voltage |
| CURRENT | Battery capacity, typically in CCA but other related units may appear |
| BATTERY_HEALTH | Health of battery, range -180 to 0 where 0 is best |
| BATTERY_STATUS | Results of battery test. 0 – Battery is good 1 – Battery needs further test 2 – Too much noise to get definitive result 3 – A bad connection prevents the system from getting a definitive result 4 – The battery contains at least one bad cell 5 – Battery is good, but needs recharged |
| SYSTEM_NOISE | >1 if excessive noise detected during test |
| CHECK_CONNECTIONS | >1 if user was instructed to check battery connections |

The following FEATURE elements also describe features of the battery test:

| FEATURE | Type | Description |
|----------------------------|------|---|
| BATTERY_CUSTOM_USED | Bool | Indicates if the user used the default battery selection from the database (0) or used a custom battery setting (1) |
| BATTERY_TEST_EXCLUSIONCODE | Int | Indicates the reason why a battery test is contraindicated for this vehicle. |

A SUMMARY section is included that indicates the overall result of the battery.

Dynamic Brake Tester

Brake measurements are found in a RESULT element with OBJECT="BRAKE". The RESULT has three SECTION elements, each with a single measurement. Brake data is included only if the Hunter system is configured to collect brake measurements. Brake results are stored as a percentage. The RESULT attribute of the measurement indicates if the measurement passed or failed.

Front/Rear Brake Balance

The first section contains the front/rear brake balance.

- It is contained in the SECTION with AXLE="0"
- The measurement has OBJECT="BRAKING_RATIO_CALC"

Front Axle Left/Right Balance

- It is contained in the SECTION with AXLE="1"
- The measurement has OBJECT="BRAKEFORCE"

Rear Axle Left/Right Balance

- It is contained in the SECTION with AXLE="2"
- The measurement has OBJECT="BRAKEFORCE"

A SUMMARY element concludes the RESULT presenting the overall brake test result.

Emission Related Measurements

All emission related measurements are found in a RESULT element with OBJECT="EMISSION". Emission measurements are included only if the Hunter system is configured to collect emission data.

Emission Monitors

Emission monitors measurements are found in a SECTION with OBJECT="OBD_CTRL". The SECTION contains a STEP with OBJECT="EMISSION_MONITORS". At the current time, all emission monitor measurements have the same OBJECT attribute (OBJECT="VISUAL_INSPECTION") and can be distinguished using their TITLE element.

The following emission monitors are recorded in this order:

| TITLE | Description |
|--|-----------------------------|
| SCANTOOL_IM_MONITOR_Misfire | Misfire |
| SCANTOOL_IM_MONITOR_Fuel System | Fuel System |
| SCANTOOL_IM_MONITOR_Comprehensive | Comprehensive Component |
| SCANTOOL_IM_MONITOR_Catalyst | Catalyst |
| SCANTOOL_IM_MONITOR_Heated Catalyst | Heated Catalyst |
| SCANTOOL_IM_MONITOR_Evaporative System | Evaporative System |
| SCANTOOL_IM_MONITOR_2nd Air System | Secondary Air System |
| SCANTOOL_IM_MONITOR_A/C Refrigerant | Air Conditioner Refrigerant |
| SCANTOOL_IM_MONITOR_O2 Sensor | O2 Sensor |
| SCANTOOL_IM_MONITOR_O2 Sensor Heater | O2 Sensor Heater |
| SCANTOOL_IM_MONITOR_EGR/VVT System | EGR/VVT |

The following is an example of an emission monitor measurement:

```
<MEAS OBJECT="VISUAL_INSPECTION">
  <TITLE> SCANTOOL_IM_MONITOR_Evaporative System</TITLE>
  <VALUE RESULT="0">N/S</VALUE>
</MEAS>
```

In this case, "N/S" indicates the monitor has not been set.

Trouble Codes

Trouble codes are included in the same SECTION as the emission monitors. They appear in a STEP with OBJECT="TROUBLE_CODES".

If a trouble code was found during the inspection, it will appear as follows:

```
<MEAS OBJECT="TROUBLE_CODE">
<TITLE>EVAP System Leak Detected (very small leak)</TITLE>
<VALUE TYPE="INTERM">OBDII-P0456</VALUE>
</MEAS>
```

The VALUE contains the system and code of the error, separated by a hyphen. Consult manufacturer specific emission system documentation for a complete list of trouble codes.

MIL (Malfunction Indicator Lamp)

The status of the MIL (or Check Engine Light) is stored in the same RESULT object as the other emission data, but appears in a SECTION with OBJECT="MIL". This section contains a single measurement, with OBJECT="VISUAL_INSPECTION" and with a TITLE of "SCANTOOL_MIL_STATUS_Check Engine". The example below shows a measurement where the MIL is ON.

```
<MEAS OBJECT="VISUAL_INSPECTION">
<TITLE> SCANTOOL_MIL_STATUS_Check Engine</TITLE>
<VALUE RESULT="3">ON</VALUE>
</MEAS>
```

Multi-spec vehicles

For some vehicles with used with unmanned inspection systems, the VIN does not give enough information to resolve to a single alignment specification. The VIN may not allow the system to determine which optional trim level, suspension, wheel size, etc. is present on the tested vehicle. In these cases, the same alignment measurements are applied to all applicable vehicle types. If all variations pass, WinAlign selects a single vehicle specification to represent the vehicle under test. If some variations pass and others fail, these variations and their alignment results are included in the SUMMARY element of the alignment RESULT. If multiple specs apply, the FEATURE element VehicleHasMultipleSpecsForVIN will have a value of TRUE.

Each individual spec is included as a separate STEP element in the SUMMARY. Each STEP is sequentially numbered with the NO attribute. Each STEP contains a MEAS_ROW element with the alignment check results. The VALUE element includes

- The overall result of the alignment check (RESULT attribute)
- a Hunter reserved quantity (REF attribute)
- the localized name of the vehicle specification (might contain escaped characters)

The ARRAY element contains the RESULT each individual alignment measurement in the following order: Left Front Camber, Right Front Camber, Front Total Toe, Left Rear Camber, Right Rear Camber, and Rear Total Toe. The following example shows that if the tested vehicle were evaluated as a BMW F10 with 17" wheels, each of the six alignment values measured during the test would fail.

```
<STEP OBJECT="ADDITIONAL" NO="1">
<TITLE>BMW 2011-16 F10 4X2 Series 17" Wheel</TITLE>
<MEAS_ROW OBJECT="ALIGNMENT_SUMMARY" COUNT="6">
<VALUE RESULT="3" REF="47400" REF_LOC="BMW 2011-16 F10 4X2 Series 17" Wheel"/>
<ARRAY>3 3 3 3 3 3</ARRAY>
</MEAS_ROW>
</STEP>
```

Manned inspection and alignment systems guide the operator to resolve to a single specification for the vehicle. Multispec is only available for two axle passenger cars and is not applicable to heavy-duty vehicles.