Hunter Transmit Measurements XML Description for WinAlign 16

Introduction

This document describes the data available in Hunter Engineering transmit measurements 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

transmit measurements 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 transmit measurements 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 transmit measurements 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 transmit measurements 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 transmit measurements documentation:

- COUNTRY (required)
- CUSTOMER (optional, typically only present in full transmit measurements 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, ENGLISH[1], 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 transmit measurements 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 transmit measurements 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	transmit measurements 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 • 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 • license plate recognition was successfully converted into VIN. • VIN was read from CodeLink® subsystem • VIN was entered by technician

					• VIN retrieved from transmit measurements 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		doubl e	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	transmit measurementsVehicle/Inspec

					tionDat e

LASTINDATE	N	4	DATE	N	itransmit measurementsVehicle/LastInDate
AAIA_ID	N	4	INT	N	transmit measurementsVehicle/AAIAid
AAIA_TAGNAME	N	12	STRING	Y	transmit measurementsVehicle/AAIA_TAGNA ME. Hunter equipment will fill in the tag number WITHOUT state e.g. “ABC123”
AAIA_LICENSESTATE	N	5	STRING	Y	transmit measurementsVehicle/AAIA_ LICENSE STATE. Hunter will fill this in with the ISO 3166-2 code, e.g. “US-MO”
AAIA_GOVERMENTID	N			N	transmit measurementsVehicle/GovernmentI D
AAIA_UNITNUMBER	N			N	transmit measurementsVehicle/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 transmit measurements 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 DataType	**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
FRONTLEFTDOTDIMAGE	Tire patch image from front left tire
FRONTRIGHTDOTDIMAGE	Tire patch image from front right tire
REARLEFTDOTDIMAGE	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 if 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 transmit measurements 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)
- SECITION (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_MANAGMENT	N	Oil management system
INTERFACE	N	If asanetwork 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 transmit measurements settings. If 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	Desciption
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 transmit measurements 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°±1.0°, 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=”MEASURMENT”. 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 six[12] 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 groves detected for that tire. Each MEAS element contains two VALUE elements. The LOC attribute will have values like LEFT or RIGHT[13].

[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&amp;quot; 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.