

SUPPLEMENTAL DYNAMIC MESSAGE SIGN (DMS) NTCIP REQUIREMENTS

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I PURPOSE

This document defines National Transportation Communications for ITS Protocol (NTCIP) requirements for Alabama Department of Transportation (ALDOT) Dynamic Message Signs (DMS). This Supplemental DMS Specification Document reflects the current trend to define protocols at each level of the NTCIP Protocol Framework.

Please note that if a Conformance Group is mandatory, then all objects within that group listed as mandatory shall be supported. If the DMS does not support the functionality associated with a specific object or group of objects, yet still meets ALDOT’s minimum requirements, then the device must respond with a noSuchName error response when requests are made for those objects.

II NTCIP REQUIREMENTS

The Dynamic Message Sign (DMS) shall comply with the following NTCIP Standards:

Table 1: Applicable NTCIP Standards for ALDOT DMS

DOCUMENT NUMBER AND VERSION	DOCUMENT TITLE
NTCIP 1102 v01.15	NTCIP Octet Encoding Rules (OER)
NTCIP 1103 v02.17	NTCIP Transportation Management Protocols (TMP)
NTCIP 1201 (latest)	NTCIP Global Object (GO) Definitions
NTCIP 1203 v02.39	NTCIP Object Definitions for Dynamic Message Signs (DMS)
NTCIP 2101 v01.19	NTCIP Subnetwork Profile - PMPP/RS-232
NTCIP 2201 v01.15	NTCIP Transport Profile - Transportation Transport Profile
NTCIP 2202 v01.05	NTCIP Transport Profile - Internet (TCP/IP and UDP/IP)
NTCIP 2301 v02.19	NTCIP Application Profile - STMF

(a) NTCIP Terms, Definitions, and Abbreviations.

For the purpose of NTCIP references, the following terms and definitions (as defined in NTCIP 8004 and NTCIP 1203) are used:

Table 2: Terms and Definitions used in this document

deprecated	<p>In the context of a MIB, “<i>deprecated</i>” is an object STATUS value that indicates the object is valid in limited circumstances but has been replaced by another.</p> <p>NOTE: This definition is modified from “<i>Understanding SNMP MIBS.</i>” To maintain multi-version interoperability (backward compatibility) for legacy implementations, objects with a STATUS value of “<i>deprecated</i>” may require support. When necessary to support legacy implementations, required support for objects with a STATUS value of “<i>deprecated</i>” is indicated using the PICS or Protocol Requirements List (PRL).</p>
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Management Information Base (MIB)	Set of object definitions that define the attributes, properties and controllable features of devices on a network, which can be remotely monitored, configured and controlled. The information is provided in a format called Abstract Syntax Notation.1 (ASN.1), which is an international standard for defining objects.
Mandatory	<p>In the context of a MIB, an object STATUS value that indicates the object is valid.</p> <p><u>NOTE:</u> In SMIv1, “<i>mandatory</i>” also indicates implementation is required for conformance. This definition is modified from “<i>Understanding SNMP MIBS.</i>”</p>
National Transportation Communications for ITS Protocol (NTCIP) object	<p>A family of protocols that provide common control and data collection services as well as accommodating various system topologies and data routing duties.</p> <p><u>NOTE:</u> NTCIP is designed to support not only currently deployed systems, but also new systems and technologies as they become available. An instance of object type is a data structure that can be used to describe the attribute or properties of a single data element or a group of data elements, such as a table.</p>
Obsolete	<p>In the context of a MIB, an object STATUS value that indicates the definition is no longer valid, was found to be flawed, was redundant, or was not useful.</p> <p><u>NOTE:</u> In the next (or some future) edition of a standard, the object or group with a STATUS value of “<i>obsolete</i>” may be removed. This definition is modified from “<i>Understanding SNMP MIBS.</i>”</p>
Protocol	A specific set of rules, procedures, and conventions defining the format and timing of data transmissions between devices that are accepted and used to understand each other.
Dynamic Message Sign (DMS)	Any sign system that can change the message presented to the viewer, such as VMS, CMS, and BOS. It includes the following major components: sign face, sign housing, controller, and, if present, the controller cabinet.

<p>Changeable Message Sign (CMS)</p>	<p>A sign that is capable of displaying one of two or more predefined messages, or a blank message. The capabilities associated with a CMS are:</p> <ul style="list-style-type: none"> a) drum sign with several faces, or pixel matrix b) several predefined messages c) downloading of new messages, graphics, or fonts not possible d) uploading of messages and graphic definition possible e) blank message possible f) all messages are defined g) may support more than a monochrome color scheme (each drum face may have a different color scheme, each face may have multi-color text) h) error report capabilities similar to VMS i) exercising of pixels
<p>Full Matrix</p>	<p>A type of VMS with the entire display area containing pixels with the same horizontal pitch and the same vertical pitch without fixed lines or characters. A full matrix sign is characterized by its ability to address and change each pixel independently.</p>
<p>Variable Message Sign (VMS)</p>	<p>A type of DMS, which allows a user to create and download the message to be displayed into the temporary memory area of the sign controller.</p>

The following abbreviations are used to indicate status and conditional status within all NTCIP standards. Not all of these abbreviations may be used within the following NTCIP tables. The abbreviations are as follows:

Table 3: NTCIP Status Abbreviations used in this document

Abbreviation	Description
M	<i>Mandatory</i>
O	<i>Optional</i>
C	<i>Conditional</i>
D	<i>Deprecated</i>
NA	<i>Not-applicable</i> (i.e. logically impossible in the scope of NTCIP 1203 v02)
X	<i>Excluded or Prohibited</i>

(b) NTCIP Global and DMS Objects.

For each communication interface, all interfaces shall comply with NTCIP 1101, 1103 and 1202 and shall meet the requirements for Conformance Level 1. (NOTE: See Amendment to standard.)

For all communication interfaces, the information level protocol shall provide full, standardized object range support of all objects required within the Specifications and

Standards unless otherwise indicated in the following table. The maximum response time for any object or group of objects shall be 200 milliseconds.

All communication interfaces shall implement all mandatory objects of all mandatory Conformance Groups as listed in the following table:

Table 4: ALDOT – Other NTCIP Requirements Table

CONFORMANCE GROUP / OBJECT NAME	REFERENCE / OBJECT SECTION NUMBER	ALDOT REQUIREMENT *	ADDITIONAL NOTES AND REQUIREMENTS
NTCIP 1103 V02.17R			
<i>TMP Report MIB Header</i>	A.7	M	
maxEventClasses	A.7.2	M	
eventClassTable	A.7.3	M	
eventClassNumber	A.7.3.1	M	
eventClassLimit	A.7.3.2	M	
eventClassClearTime	A.7.3.3	M	
eventClassDescription	A.7.3.4	M	
eventClassNumRowsInLog	A.7.3.5	M	
eventClassNumEvents	A.7.3.6	M	
maxEventLogConfigs	A.7.4	M	
eventLogConfigTable	A.7.5	M	
eventConfigID	A.7.5.1	M	
eventConfigClass	A.7.5.2	M	
eventConfigMode	A.7.5.3	M	
eventConfigCompareValue	A.7.5.4	M	
eventConfigCompareValue2	A.7.5.5	M	
eventConfigCompareOID	A.7.5.6	M	
eventConfigLogOID	A.7.5.7	M	
eventConfigAction	A.7.5.8	M	
eventConfigStatus	A.7.5.9	M	
maxEventLogSize	A.7.6	M	
eventLogTable	A.7.7	M	
eventLogClass	A.7.7.1	M	
eventLogNumber	A.7.7.2	M	
eventLogID	A.7.7.3	M	
eventLogTime	A.7.7.4	M	
eventLogValue	A.7.7.5	M	
numEvents	A.7.8	M	
<i>TMP Security MIB Header</i>	A.8	M	
communityNameAdmin	A.8.1	M	
communityNamesMax	A.8.2	M	
communityNameTable	A.8.3	M	
communityNameIndex	A.8.3.1	M	
communityNameUser	A.8.3.2	M	

CONFORMANCE GROUP / OBJECT NAME	REFERENCE / OBJECT SECTION NUMBER	ALDOT REQUIREMENT *	ADDITIONAL NOTES AND REQUIREMENTS
communityNameAccessMask	A.8.3.3	M	
NTCIP 1201 V03.15R			
globalConfiguration	2.2	M	
globalMaxModules	2.2.2	M	
globalModuleTable	2.2.3	M	
moduleNumber	2.2.3.1	M	
moduleDeviceNode	2.2.3.2	M	
moduleMake	2.2.3.3	M	
moduleModel	2.2.3.4	M	
moduleVersion	2.2.3.5	M	
moduleType	2.2.3.6	M	
controllerBaseStandards	2.2.4	M	
globalTimeManagement	2.4	M	
globalTime	2.4.1	M	
maxTimeBaseScheduleEntries	2.4.3.1	M	
timeBaseScheduleTable	2.4.3.2	M	
timeBaseScheduleNumber	2.4.3.2.1	M	
timeBaseScheduleMonth	2.4.3.2.2	M	
timeBaseScheduleDay	2.4.3.2.3	M	
timeBaseScheduleDate	2.4.3.2.4	M	
timeBaseScheduleDayPlan	2.4.3.2.5	M	
Day Plan Parameters	2.4.4	M	
maxDayPlans	2.4.4.1	M	
maxDayPlanEvents	2.4.4.2	M	
timeBaseDayPlanTable	2.4.4.3	M	
dayPlanNumber	2.4.4.3.1	M	
dayPlanEventNumber	2.4.4.3.2	M	
dayPlanHour	2.4.4.3.3	M	
dayPlanMinute	2.4.4.3.4	M	
dayPlanActionNumberOID	2.4.4.3.5	M	
dayPlanStatus	2.4.4.4	M	
timeBaseScheduleTableStatus	2.4.4.5	M	
controllerStandardTimeZone	2.4.6	M	
controllerLocalTime	2.4.7	M	
daylightSavingNode	2.4.8	M	
maxDaylightSavingEntries	2.4.8.1	M	
dstTable	2.4.8.2	M	
dstEntryNumber	2.4.8.2.1	M	
dstBeginMonth	2.4.8.2.2	M	
dstBeginOccurrences	2.4.8.2.3	M	
dstBeginDayOfWeek	2.4.8.2.4	M	

CONFORMANCE GROUP / OBJECT NAME	REFERENCE / OBJECT SECTION NUMBER	ALDOT REQUIREMENT *	ADDITIONAL NOTES AND REQUIREMENTS
dstBeginDayOfMonth	2.4.8.2.5	M	
dstBeginSecondsToTransition	2.4.8.2.6	M	
dstEndMonth	2.4.8.2.7	M	
dstEndOccurrences	2.4.8.2.8	M	
dstEndDayOfWeek	2.4.8.2.9	M	
dstEndDayOfMonth	2.4.8.2.10	M	
dstEndSecondsToTransition	2.4.8.2.11	M	
dstSecondsToAdjust	2.4.8.2.12	M	
auxIOv2	2.9	M	
maxAuxIOv2TableNumDigitalPorts	2.9.1	M	
maxAuxIOv2TableNumAnalogPorts	2.9.2	M	
auxIOv2Table	2.9.3	M	
auxIOv2PortType	2.9.3.1	M	
auxIOv2PortNumber	2.9.3.2	M	
auxIOv2PortDescription	2.9.3.3	M	
auxIOv2PortResolution	2.9.3.4	M	
auxIOv2PortValue	2.9.3.5	M	
auxIOv2PortDirection	2.9.3.6	M	
auxIOv2PortLastCommandedState	2.9.3.7	M	

The DMS shall implement all mandatory objects of the mandatory Conformance Groups as defined in NTCIP 1203 and listed in the following table:

Table 5: ALDOT – Dynamic Message Sign NTCIP Requirements Table

CONFORMANCE GROUP / OBJECT NAME	REFERENCE / OBJECT SECTION NUMBER	ALDOT REQUIREMENT *	ADDITIONAL NOTES AND REQUIREMENTS
NTCIP 1203 v02.39			
dmsSignCfg	5.2	M	
dmsSignAccess	5.2.1	M	
dmsSignType	5.2.2	M	
dmsSignHeight	5.2.3	M	
dmsSignWidth	5.2.4	M	
dmsHorizontalBorder	5.2.5	M	
dmsVerticalBorder	5.2.6	M	
dmsLegend	5.2.7	M	
dmsBeaconType	5.2.8	M	
dmsSignTechnology	5.2.9	M	
vmsCfg	5.3	M	
vmsCharacterHeightPixels	5.3.1	M	
vmsCharacterWidthPixels	5.3.2	M	
vmsSignHeightPixels	5.3.3	M	
vmsSignWidthPixels	5.3.4	M	

CONFORMANCE GROUP / OBJECTNAME	REFERENCE / OBJECT SECTION NUMBER	ALDOT REQUIREMENT *	ADDITIONAL NOTES AND REQUIREMENTS
vmsHorizontalPitch	5.3.5	M	
vmsVerticalPitch	5.3.6	M	
monochromeColor	5.3.7	M	
fontDefinition	5.4	M	
numFonts	5.4.1	M	
fontTable	5.4.2	M	
fontIndex	5.4.2.1	M	
fontNumber	5.4.2.2	M	
fontName	5.4.2.3	M	
fontHeight	5.4.2.4	M	
fontCharSpacing	5.4.2.5	M	
fontLineSpacing	5.4.2.6	M	
fontVersionID	5.4.2.7	M	
fontStatus	5.4.2.8	M	
maxFontCharacters	5.4.3	M	
characterTable	5.4.4	M	
characterNumber	5.4.4.1	M	
characterWidth	5.4.4.2	M	
characterBitmap	5.4.4.3	M	
fontMaxCharacterSize	5.4.5	M	
multiCfg	5.5	M	
defaultBackgroundColor	5.5.1	M	for multi-version interoperability with NTCIP 1203:1997 (version v01)
defaultForegroundColor	5.5.2	M	for multi-version interoperability with NTCIP 1203:1997 (version v01)
defaultFlashOn	5.5.3	M	
defaultFlashOnActivate	5.5.4	M	
defaultFlashOff	5.5.5	M	
defaultFlashOffActivate	5.5.6	M	
defaultFont	5.5.7	M	
defaultFontActivate	5.5.8	M	
defaultJustificationLine	5.5.9	M	
defaultJustificationLineActivate	5.5.10	M	
defaultJustificationPage	5.5.11	M	
defaultJustificationPageActivate	5.5.12	M	
defaultPageOnTime	5.5.13	M	
defaultPageOnTimeActivate	5.5.14	M	
defaultPageOffTime	5.5.15	M	
defaultPageOffTimeActivate	5.5.16	M	
defaultBackgroundRGB	5.5.17	M	
defaultBackgroundRGBActivate	5.5.18	M	
defaultForegroundRGB	5.5.19	M	

CONFORMANCE GROUP / OBJECTNAME	REFERENCE / OBJECT SECTION NUMBER	ALDOT REQUIREMENT *	ADDITIONAL NOTES AND REQUIREMENTS
defaultForegroundRGBActivate	5.5.20	M	
defaultCharacterSet	5.5.21	M	
dmsColorScheme	5.5.22	M	
dmsSupportedMultiTags	5.5.23	M	
dmsMaxNumberPage	5.5.24	M	
dmsMaxMultiStringLength	5.5.25	M	
dmsMessage	5.6	M	
dmsNumPermanentMsg	5.6.1	M	
dmsNumChangeableMsg	5.6.2	M	
dmsMaxChangeableMsg	5.6.3	M	
dmsFreeChangeableMemory	5.6.4	M	
dmsNumVolatileMsg	5.6.5	M	
dmsMaxVolatileMsg	5.6.6	M	
dmsFreeVolatileMemory	5.6.7	M	
dmsMessageTable	5.6.8	M	
dmsMessageMemoryType	5.6.8.1	M	
dmsMessageMemoryType	5.6.8.1	M	Value of '5' only
dmsMessageNumber	5.6.8.2	M	
dmsMessageNumber	5.6.8.2	M	Value of '1' only
dmsMessageMultiString	5.6.8.3	M	
dmsMessageOwner	5.6.8.4	M	
dmsMessageCRC	5.6.8.5	M	
dmsMessageBeacon	5.6.8.6	M	
dmsMessagePixelService	5.6.8.7	M	
dmsMessageRunTimePriority	5.6.8.8	M	
dmsMessageStatus	5.6.8.9	M	
dmsValidateMessageError	5.6.9	M	
signControl	5.7	M	
dmsControlMode	5.7.1	M	
dmsSWReset	5.7.2	M	
dmsActivateMessage	5.7.3	M	
dmsMessageTimeRemaining	5.7.4	M	
dmsMsgTableSource	5.7.5	M	
dmsMsgRequesterID	5.7.6	M	
dmsMsgSourceMode	5.7.7	M	
dmsShortPowerRecoveryMessage	5.7.8	0.4 (1...*) M	
dmsLongPowerRecoveryMessage	5.7.9	0.4 (1...*) M	
dmsShortPowerLossTime	5.7.10	0.4 (1...*) M	
dmsResetMessage	5.7.11	0.4 (1...*) M	
dmsCommunicationsLossMessage	5.7.12	0.4 (1...*) M	
dmsTimeCommLoss	5.7.13	0.4 (1...*) M	

CONFORMANCE GROUP / OBJECTNAME	REFERENCE / OBJECT SECTION NUMBER	ALDOT REQUIREMENT *	ADDITIONAL NOTES AND REQUIREMENTS
dmsPowerLossMessage	5.7.14	M	
dmsEndDurationMessage	5.7.15	0.4 (1...*) M	
dmsMemoryMgmt	5.7.16	O	
dmsActivateMsgError	5.7.17	M	
dmsMultiSyntaxError	5.7.18	M	
dmsMultiSyntaxErrorPosition	5.7.19	M	
dmsMultiOtherErrorDescription	5.7.20	M	
vmsPixelServiceDuration	5.7.21		
vmsPixelServiceFrequency	5.7.22		
vmsPixelServiceTime	5.7.23		
dmsActivateErrorMsgCode	5.7.24	M	
illum	5.8	M	
dmsIllumControl	5.8.1	O	
dmsIllumControl	5.8.1	0.6 M	Set to either 'manualDirect' or 'manualIndexed'
dmsIllumControl	5.8.1	0.6 M	To facilitate multiversion interoperability, the retired value of 'manual' must be used for version 1 implementations.
dmsIllumMaxPhotocellLevel	5.8.2	M	
dmsIllumPhotocellLevelStatus	5.8.3	M	
dmsIllumNumBrightLevels	5.8.4	M	
dmsIllumBrightLevelStatus	5.8.5	0.6 M	
dmsIllumManLevel	5.8.6	0.6 M	This may be a value between zero (0) and either the maximum number of brightness levels that the DMS supports (indicated by selecting a control mode of 'manualDirect') or the number of brightness levels defined in the brightness values table (indicated by selecting a control mode of 'manualIndexed').
dmsIllumBrightnessValues	5.8.7	M	
dmsIllumBrightnessValuesError	5.8.8	M	
dmsIllumLightOutputStatus	5.8.9	0.6 M	
dmsSchedule	5.9	M	
numActionTableEntries	5.9.1	M	
dmsActionTable	5.9.2	M	
dmsActionIndex	5.9.2.1	M	
dmsActionMsgCode	5.9.2.2	M	
dmsStatus	5.11	M	
<i>Core Status</i>	<i>5.11.1</i>	<i>M</i>	
statMultiFieldRows	5.11.1.1	M	
statMultiFieldTable	5.11.1.2	M	
statMultiFieldIndex	5.11.1.2.1	M	

CONFORMANCE GROUP / OBJECTNAME	REFERENCE / OBJECT SECTION NUMBER	ALDOT REQUIREMENT *	ADDITIONAL NOTES AND REQUIREMENTS
statMultiFieldCode	5.11.1.2.2	M	
statMultiCurrentFieldValue	5.11.1.2.3	M	
dmsCurrentSpeed	5.11.1.3	O	
dmsCurrentSpeedLimit	5.11.1.4	O	
watchdogFailureCount	5.11.1.5	M	
dmsStatDoorOpen	5.11.1.6	M	
statError	5.11.2	M	
shortErrorStatus	5.11.2.1.1	M	
controllerErrorStatus	5.11.2.1.2	M	
<i>Power Status Data</i>	<i>5.11.2.2</i>	<i>M</i>	
dmsPowerFailureStatusMap	5.11.2.2.1	M	
dmsPowerNumRows	5.11.2.2.2	M	
dmsPowerStatusTable	5.11.2.2.3	M	
dmsPowerIndex	5.11.2.2.3.1	M	
dmsPowerDescription	5.11.2.2.3.2	M	
dmsPowerMfrStatus	5.11.2.2.3.3	M	
dmsPowerStatus	5.11.2.2.3.4	M	
dmsPowerVoltage	5.11.2.2.3.5	M	
dmsPowerType	5.11.2.2.3.6	M	
<i>Climate Control Status Data</i>	<i>5.11.2.3</i>	<i>M</i>	
dmsClimateCtrlStatusMap	5.11.2.3.3	M	
dmsClimateCtrlNumRows	5.11.2.3.4	M	
dmsClimateCtrlStatusTable	5.11.2.3.5	M	
dmsClimateCtrlIndex	5.11.2.3.5.1	M	
dmsClimateCtrlDescription	5.11.2.3.5.2	M	
dmsClimateCtrlMfrStatus	5.11.2.3.5.3	M	
dmsClimateCtrlErrorStatus	5.11.2.3.5.4	M	
dmsClimateCtrlOnStatus	5.11.2.3.5.5	M	
dmsClimateCtrlTestActivation	5.11.2.3.5.6	M	
dmsClimateCtrlAbortReason	5.11.2.3.5.7	M	
dmsClimateCtrlType	5.11.2.3.5.8	M	
<i>Pixel Failure Data</i>	<i>5.11.2.4</i>	<i>M</i>	
pixelFailureTableNumRows	5.11.2.4.1	M	
pixelFailureTable	5.11.2.4.2	M	
pixelFailureDetectionType	5.11.2.4.2.1	M	
pixelFailureIndex	5.11.2.4.2.2	M	
pixelFailureXLocation	5.11.2.4.2.3	M	
pixelFailureYLocation	5.11.2.4.2.4	M	
pixelFailureStatus	5.11.2.4.2.5	M	
pixelTestActivation	5.11.2.4.3	M	
pixelStatusTable	5.11.2.4.4	M	

CONFORMANCE GROUP / OBJECTNAME	REFERENCE / OBJECT SECTION NUMBER	ALDOT REQUIREMENT *	ADDITIONAL NOTES AND REQUIREMENTS
dmsPixelStatusIndex	5.11.2.4.4.1	M	
dmsPixelStatus	5.11.2.4.4.2	M	
dmsPixelFailureTestRows	5.11.2.4.5	M	
dmsPixelFailureMessageRows	5.11.2.4.6	M	
<i>Lamp Status Data</i>	5.11.2.5	O	Note: None of the objects under 5.11.2.5 are required.
<i>Drum Status Data</i>	5.11.2.6	O	Note: None of the objects under 5.11.2.6 are required.
<i>Light Sensor Status Data</i>	5.11.2.7	M	
dmsLightSensorStatusMap	5.11.2.7.1	M	
dmsLightSensorNumRows	5.11.2.7.2	M	
dmsLightSensorStatusTable	5.11.2.7.3	M	
dmsLightSensorIndex	5.11.2.7.3.1	M	
dmsLightSensorDescription	5.11.2.7.3.2	M	
dmsLightSensorCurrentReading	5.11.2.7.3.3	M	
dmsLightSensorStatus	5.11.2.7.3.4	M	
<i>Humidity Data</i>	5.11.2.8	M	
dmsHumiditySensorStatusMap	5.11.2.8.1	M	
dmsHumiditySensorNumRows	5.11.2.8.2	M	
dmsHumiditySensorStatusTable	5.11.2.8.3	M	
dmsHumiditySensorIndex	5.11.2.8.3.1	M	
dmsHumiditySensorDescription	5.11.2.8.3.2	M	
dmsHumiditySensorCurrentReading	5.11.2.8.3.3	M	
dmsHumiditySensorStatus	5.11.2.8.3.4	M	
<i>Temperature Sensor Data</i>	5.11.2.9	M	
dmsTempSensorStatusMap	5.11.2.9.1	M	
dmsTempSensorNumRows	5.11.2.9.2	M	
dmsTempSensorStatusTable	5.11.2.9.3	M	
dmsTempSensorIndex	5.11.2.9.3.1	M	
dmsTempSensorDescription	5.11.2.9.3.2	M	
dmsTempSensorCurrentReading	5.11.2.9.3.3	M	
dmsTempSensorHighWarningTemperature	5.11.2.9.3.4	M	
dmsTempSensorLowWarningTemperature	5.11.2.9.3.5	M	
dmsTempSensorHighCriticalTemperature	5.11.2.9.3.6	M	
dmsTempSensorLowCriticalTemperature	5.11.2.9.3.7	M	
dmsTempSensorStatus	5.11.2.9.3.8	M	
dmsTempSensorHighestCriticalTempThreshold	5.11.2.9.4	M	
dmsTempSensorLowestCriticalTempThreshold	5.11.2.9.5	M	
<i>statPower</i>	5.11.3	M	
signVolts	5.11.3.1	M	
lowFuelThreshold	5.11.3.2	O	
fuelLevel	5.11.3.3	M	

CONFORMANCE GROUP / OBJECTNAME	REFERENCE / OBJECT SECTION NUMBER	ALDOT REQUIREMENT *	ADDITIONAL NOTES AND REQUIREMENTS
engineRPM	5.11.3.4	M	
lineVolts	5.11.3.5	M	
powerSource	5.11.3.6	M	
statTemp	5.11.4	M	
tempMinCtrlCabinet	5.11.4.1	M	
tempMaxCtrlCabinet	5.11.4.2	M	
tempMinAmbient	5.11.4.3	M	
tempMaxAmbient	5.11.4.4	M	
tempMinSignHousing	5.11.4.5	M	
tempMaxSignHousing	5.11.4.6	M	
tempSensorWarningMap	5.11.4.7	M	
tempSensorCriticalTempMap	5.11.4.8	M	
graphicDefinition	5.12	M	
dmsGraphicMaxEntries	5.12.1	M	
dmsGraphicNumEntries	5.12.2	M	
dmsGraphicMaxSize	5.12.3	M	
availableGraphicMemory	5.12.4	M	
dmsGraphicBlockSize	5.12.5	M	
dmsGraphicTable	5.12.6	M	
dmsGraphicIndex	5.12.6.1	M	
dmsGraphicNumber	5.12.6.2	M	
dmsGraphicName	5.12.6.3	M	
dmsGraphicHeight	5.12.6.4	M	
dmsGraphicWidth	5.12.6.5	M	
dmsGraphicType	5.12.6.6	M	
dmsGraphicID	5.12.6.7	M	
dmsGraphicTransparentEnabled	5.12.6.8	M	
dmsGraphicTransparentColor	5.12.6.9	M	
dmsGraphicStatus	5.12.6.10	M	
dmsGraphicBitmapTable	5.12.7	M	
dmsGraphicBitmapIndex	5.12.7.1	M	
dmsGraphicBlockNumber	5.12.7.2	M	
dmsGraphicBlockBitmap	5.12.7.3	M	
dmsGraphicStatus	5.12.8.10	M	

(c) MULTI Message Language.

The DMS shall implement all mandatory objects of the mandatory Conformance Groups as defined in NTCIP 1203 and listed in the following table:

Table 6: ALDOT – Required MULTI Tags Table

ATTRIBUTE TAG	DESCRIPTION	REQUIRED VALUES
[cbx]	Color–background The background color for a message	<i>OPTIONAL</i> (NTCIP 1203 v01 support only; see [pbz] below for v02 support.)
[pbz] or [pbr,g,b]	Color–page background The page background color for a message	<i>REQUIRED</i> (NTCIP 1203 v02 support only.)
[cfx] or [cfr,g,b]	Color–foreground The foreground color for a message.	
[crx,y,w,h,r,g,b] or [crx,y,w,h,z]	Color Rectangle Color for a rectangular area of the current page of a message.	
[fx,y]	Field The information to embed within a message that is based on data from some device, e.g., clock calendar, temperature sensor, detector, etc. The pre-defined data fields are as follows: f1 = Local Time 12 Hour; f2 = Local Time 24 Hour; f3 = Ambient Temperature Celsius; f4 = Ambient Temperature Fahrenheit; f5 = Speed km/h; f6 = Speed mph; f7 = Day of Week; f8 = Date of Month; f9 = Month of Year; f10 = Year 2 Digit; f11 = Year 4 Digit; f12 = Local time (12 hour format with capital AM/PM indicator present); and, f13 = Local time (12 hour format with lowercase am/pm indicator present).	Pre-defined data fields where x=1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13; and, User Definable data fields from x=50 to 99.
[fltxoy] or [floytx]	Flash Activate flashing of the text, define the flash on and off times, and the order of flashing (on/off or off/on).	
[fox] or [fox,cccc]	Font Select a font number (as specified within the font table) for the message display. Optional cccc indicates the fontVersionID.	
[gn] or [gn,x,y] or [gn,x,y,cccc]	Graphic Select a graphic image to insert into the message. A graphic image is treated as a single displayable character. It may require a few pixels, or the whole sign to display it. The optional cccc indicates the graphicID for the image.	
[hcx]	Hexadecimal Character The hexadecimal value of the character to display. Value of a character for display.	Standard ASCII Codes and Common Extended ASCII Codes (required).
[jlx]	Justification–Line Specify line justification: left, center, right, or full.	where x=2, 3, 4, 5

ATTRIBUTE TAG	DESCRIPTION	REQUIRED VALUES
[jpx]	Justification–Page Specify page justification: top, middle, or bottom.	where x=2, 3, 4
[msx,y]	Manufacturer Specific Tag(s) Specifies a manufacturer specific tag.	<u>OPTIONAL</u> . (Manufacturer shall submit to the Engineer a list of tags supported.)
[mvtwdw,s,r,text]	Moving Text Specify the parameters of a horizontal moving (scrolling) text.	
[nlx]	New Line Specify the start of a new line.	
[np]	New Page Specify the start of a new page.	
[ptxoy]	Page Time Specify the page times (t = on, o = off).	
[scx]	Spacing Character Specify the spacing between characters.	
[trx,y,w,h]	Text Rectangle Specify the placement of a text window on the display.	