



Antenna location and orientation sensor
AISG-ST-ALS
vALS3.0.0.4

Revision History

DATE	ISSUE	NOTES
31 st January 2022	vALS3.0.0.4	First public release

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



1. FOREWORD (Informative)	4
2. SCOPE (Informative).....	5
2.2 Interpretation (Normative)	5
3. REFERENCES	6
4. VERSION COMPLIANCE (Informative).....	7
5. ABBREVIATIONS (Informative).....	8
6. TERMINOLOGY	9
7. DEFINITIONS.....	12
8. GENERAL ASPECTS.....	13
8.1. Subunit relationship	13
8.2. State models.....	13
8.3. ALS capabilities	13
8.4. Return codes	13
8.5. Resumption of operation	13
9. LAYER 1	14
9.1. DC power consumption.....	14
10. LAYER 2	15
11. LAYER 7	16
11.1. Subunit type.....	16
11.2. Overview of commands for ALS subunits.....	16
11.3. Altitude representation	17
11.4. Mechanical azimuth representation.....	17
11.5. Mechanical tilt representation.....	17
11.6. Mechanical roll representation	17
11.7. Latitude representation	18
11.8. Longitude representation	18
11.8. Location precision representation.....	18
11.9 Monitoring events.....	18
11.10. ALS commands.....	18
11.10.1. ALS Get Capabilities.....	18
11.10.2. ALS Set Coordinate.....	19
11.10.3. ALS Get Coordinate.....	22
11.10.4. ALS Set Altitude	23

Antenna Interface Standards Group
Subunit Type Standard AISG-ST-ALS
vALS3.0.0.4

31st January 2022



11.10.5. ALS Get Altitude	25
11.10.6. ALS Set Orientation Thresholds	26
11.10.7. ALS Get Orientation Thresholds	28
11.10.8. ALS Set Orientation Target Values	30
11.10.9. ALS Get Orientation Target Values.....	32
11.10.10. ALS Get Orientation Information	34
11.10.11. ALS Get Monitored Orientation Information	35
11.10.12. ALS Set Array Element Numbers to Subunit.....	36
11.10.13. ALS Get Array Element Numbers From Subunit	38

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



1. FOREWORD (Informative)

This standard has been produced by the Antenna Interface Standards Group (AISG) to introduce and define new features and enhancement of the management system for antenna line devices (ALDs) with remote control and monitoring facilities. AISG v3.0 base standard describes the common behaviour of antenna line devices with AISG interfaces and type-specific functionality is defined in subunit type standards. This subunit type standard covers the antenna line devices capable of informing the location and the orientation of the antenna.

This standard is independent of previous 3GPP specifications.

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



2. SCOPE (Informative)

AISG v3.0 specifies the standard data interface between a primary, typically a base station, and antenna line devices (ALDs) which are manageable units, usually associated with base station antennas.

The standard is divided into the base standard and several subunit type standards. This subunit type standard document describes the specific behaviour of the Antenna Location and orientation Sensor (ALS) subunit type.

This standard defines the functional behaviour of ALS subunits.

2.2 Interpretation (Normative)

The text of the standard defines explicitly what is required or permitted. Anything that is not explicitly allowed is not permitted.

All statements in this document are normative, unless indicated as informative, notes or as an example.

For purposes of compliance and AISG interoperability, users should note that the implementation of this subunit type standard is optional. However, once it is selected for inclusion in a product, the entire standard becomes mandatory.

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



3. REFERENCES

This AISG Standard incorporates provisions from other publications. These are cited in the text and the referenced publications are listed below. Where references are listed with a specific version or release, subsequent amendments or revisions of these publications apply only when specifically incorporated by amendment or revision of this AISG standard. For references listed without a version or release, the latest edition of the publication referred to applies.

- 1 AISG v3.0: “Base Standard AISG v3.0”
- 2 AISG v3.0 STCM: “Subunit Type Compliance Matrix”
- 3 NIMA TR8350.2 U.S. Department of Defence World Geodetic System 1984, Third Edition – Amendment 1.

Antenna Interface Standards Group
Subunit Type Standard AISG-ST-ALS
vALS3.0.0.4

31st January 2022



4. VERSION COMPLIANCE (Informative)

The compliance of this standard with different version of AISG v3 baseline standard is defined in [2].

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



5. ABBREVIATIONS (Informative)

Where abbreviations or acronyms are used in this document they have the following meanings:

ALD	Antenna Line Device
ALS	Antenna Location and orientation Sensor
MALD	Multi-primary ALD
SALD	Single-primary ALD
TCC	Time-Consuming Command
3GPP	3 rd Generation Partnership Project
WGS	World Geodetic System



6. TERMINOLOGY

Where the following terms are used in this document, they have the following meanings:

Altitude	The elevation of a point or object from the surface of the WGS84 [3] geoid. Altitude is reported in meters, to one decimal place in accuracy.
Calculated altitude	A value representing the “best estimate” of the ALS in the altitude dimension. This value may be the result of averaging historical data, or any other means of calculation deemed appropriate by the ALS vendor for producing a consistently accurate result.
Calculated location	Coordinates representing the “best estimate” of the ALS in two dimensions (latitude and longitude). This value may be the result of averaging historical data, or any other means of calculation deemed appropriate by the ALS vendor for producing a consistently accurate result.
Calculated mechanical azimuth / tilt / roll	A value representing the “best estimate” of an antenna in one of three axes measured by the ALS (azimuth, tilt, roll). This value is the result of averaging historical data, or any other means of calculation deemed appropriate by the ALS vendor for producing a consistently accurate result.
Electrical tilt	The electrical tilt angle is, in the vertical cut, the angle between the antenna mechanical boresight and the half-power beam axis. Positive tilt values represent main beam position below boresight. Negative tilt values represent main beam position above boresight.
Half-power beam axis	The half-power beamwidth is, in a radiation pattern cut containing the beam peak axis, the angle between the two closest directions in which the radiation intensity is one-half the maximum value; its bisect is called half-power beam axis.
Highest calculated mechanical azimuth / tilt / roll	A value that represents the highest calculated result in one of the three axes measured by the ALS (azimuth, tilt, roll) since the ALS was last reset. It may be used to analyse the effect of sway or other mechanical inputs.
Latitude	An angular measurement in degrees ranging from 0 degrees at the equator, to +90 degrees at the North pole, and -90 degrees at the South pole, as specified by WGS84 [3]. Latitude identifies a position on earth north or south of the equator.

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



Location precision	A value that represents the standard deviation of values from their arithmetic mean in one of two dimensions measured by the ALS (latitude and longitude). This value may be used to judge the credibility of calculated measurements. Precision is reported in meters, to one decimal place of accuracy.
Longitude	An angular measurement ranging from 0 degrees at the prime meridian (Greenwich meridian) to +180 degrees eastward and -180 degrees westward, as specified by the WGS84 [3] ellipsoid. Longitude identifies a position on earth east or west of the prime meridian.
Lower mechanical azimuth / tilt / roll threshold	A delta value that when subtracted to the target azimuth, tilt or roll equals the lowest measurement permitted without triggering an alarm condition. A lower threshold is given in decimal degrees to one decimal place of accuracy.
Lowest calculated mechanical azimuth / tilt / roll	A value that represents the lowest calculated result in one of the three axes measured by the ALS (azimuth, tilt, roll) since the ALS was last reset. It may be used to analyse the effect of sway or other mechanical inputs.
Mechanical azimuth	Heading angle of the ALS in the horizontal plane. In the case of directional antenna, the ALS is referenced to the boresight of the physical antenna assembly. The mechanical azimuth is equal to the direction of RF propagation when zero electrical tilt, azimuth steering, or phase shifting has been applied.
Mechanical azimuth / tilt / roll precision	Precision is presented by the standard deviation of values from their arithmetic mean in one of the three axes measured by the ALS (azimuth, tilt, roll). This value may be used to judge the credibility of calculated measurements.
Mechanical boresight	The axis perpendicular with the antenna aperture.
Mechanical roll	Roll angle of the ALS in the vertical plane between the vertical and physical axes of the antenna. In the case of a directional antenna, while facing in the direction of mechanical azimuth, roll at an angle clockwise from the vertical shall be represented by a positive number, while roll in the counter-clockwise direction shall be represented by a negative number.
Mechanical tilt	Tilt angle of the ALS in vertical plane. Tilt at an angle below straight and level shall be presented by a positive number (down-tilt), while tilt at an angle above straight and level shall be presented by negative number.

Antenna Interface Standards Group
Subunit Type Standard AISG-ST-ALS
vALS3.0.0.4

31st January 2022



Target mechanical azimuth / tilt / roll

A value representing the target alignment of an antenna in one of three axes measured by the ALS (azimuth, tilt, roll).

Upper mechanical azimuth / tilt / roll threshold

A delta value that when added to the target azimuth, tilt or roll equals the highest measurement permitted without triggering an alarm condition.

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



7. DEFINITIONS

```
Enumeration ALSAlarmCode_t : uint16_t {
    ALSAlarmMechanicalTilt    ← 0x0400
    ALSAlarmMechanicalRoll   ← 0x0401
    ALSAlarmMechanicalAzimuth ← 0x0402
}

CONSTANT uint16_t NrOfSubunitAlarms ← 3 // Number of subunit alarm types for this
subunit type
```



8. GENERAL ASPECTS

8.1. Subunit relationship

An ALS subunit has a logical relationship with array element(s) of an antenna.

8.2. State models

This subunit type standard does not have state models.

8.3. ALS capabilities

The ALSCapabilities bitfield is set by design.

```
Bitfield ALSCapabilities_t : uint8_t {  
    CoordinateFunction      : Bit 0  
    AltitudeFunction        : Bit 1  
    OrientationFunction      : Bit 2  
}
```

ALSCapabilities_t ALSCapabilities

At least one capability must be supported. Bit value 0 represents function is not supported. Bit value 1 represents function is supported.

If CoordinateFunction bit is set, then setting of coordinate is not allowed and ALS updates this information automatically.

If AltitudeFunction bit is set, then setting of altitude is not allowed and ALS updates this information automatically.

If OrientationFunction bit is set, ALS updates this information automatically and setting of orientation target and threshold values is not allowed.

8.4. Return codes

This subunit type standard does not contain subunit type specific return codes.

8.5. Resumption of operation

The following data shall be retained after reset:

- Location information (if applicable)
- Altitude information (if applicable)
- Orientation information (if applicable)

Antenna Interface Standards Group
Subunit Type Standard AISG-ST-ALS
vALS3.0.0.4

31st January 2022



9. LAYER 1

All definitions and specifications for ALDs in [1] regarding layer 1 shall be valid for ALDs which contain ALS subunits.

9.1. DC power consumption

This subunit type standard does not define the power consumption of a ALS. See [1] for details on how power consumption is reported to the primary.

This subunit type standard does not contain any commands that switch the ALD from SteadyStatePowerMode to HighPowerMode or to SleepMode.

**Antenna Interface Standards Group
Subunit Type Standard AISG-ST-ALS**

vALS3.0.0.4

31st January 2022



10. LAYER 2

All definitions and specifications for ALDs in [1] regarding layer 2 shall be valid for ALDs which contain ALS subunits.

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



11. LAYER 7

An ALD which contains ALS subunit(s) shall support the command set which is defined in [1] in addition to those commands specified in this standard.

11.1. Subunit type

Subunit type	1-octet unsigned integer code
ALS	0x04

Table 11.1-1: Subunit type code

11.2. Overview of commands for ALS subunits

The table below shows an overview of all commands used in this ALS subunit type standard.

The following abbreviations are used in the Table 11.2-1: “Commands for ALS subunits”

- M Mandatory
- O Optional
- Not applicable

	Code	Initiator	Subunit	Timeout	TCC	Mandatory for:			Changes the ConnectionState	Changes HighPowerMode to	Minimum require authority
						Primary	SALD	MALD			
ALS commands											
ALS Get Capabilities	0x0400	Primary	>0	1 s	no	M	M	M	no	no	RO
ALS Set Coordinate	0x0401	Primary	>0	1 s	no	M	M	M	no	no	RW
ALS Get Coordinate	0x0402	Primary	>0	1 s	no	M	M	M	no	no	RO
ALS Set Altitude	0x0403	Primary	>0	1 s	no	M	M	M	no	no	RW
ALS Get Altitude	0x0404	Primary	>0	1 s	no	M	M	M	no	no	RO
ALS Set Orientation Thresholds	0x0405	Primary	>0	1 s	no	M	M	M	no	no	RW
ALS Get Orientation Thresholds	0x0406	Primary	>0	1 s	no	M	M	M	no	no	RO
ALS Set Orientation Target Values	0x0407	Primary	>0	1 s	no	M	M	M	no	no	RW
ALS Get Orientation Target Values	0x0408	Primary	>0	1 s	no	M	M	M	no	no	RO
ALS Get Orientation Information	0x0409	Primary	>0	1 s	no	M	M	M	no	no	RO
ALS Get Monitored Orientation Information	0x0410	Primary	>0	1 s	no	M	M	M	no	no	RO
Site mapping command for ALS											

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



	Code	Initiator	Subunit	Timeout	TCC	Mandatory for:			Changes the ConnectionState	Changes to HighPowerMode	Minimum require authority
						Primary	SALD	MALD			
ALS Set Array Element Numbers To Subunit	0x0411	Primary	>0	1 s	no	O	M	M	no	no	RW
ALS Get Array Element Numbers From Subunit	0x0412	Primary	>0	1 s	no	O	M	M	no	no	RO

Table 11.2-1: Commands for ALS subunits

11.3. Altitude representation

Altitude is reported in meters, to one decimal place in accuracy, and then multiplied by 10 so that it may be represented by an integer in 0.1 m units with a range of -10000 to 100000.

Altitude precision is presented in meters, to one decimal place in accuracy, and then multiplied by 10 so that it may be represented by an integer in 0.1 m units with a range of 0 to 1000.

11.4. Mechanical azimuth representation

The mechanical azimuth range supported is from 0.0° to +359.9° east of true north. The azimuth value and it's threshold values are expressed in 0.1° units with a range of 0 to +3599.

The mechanical azimuth precision is presented in degrees from 0.0° to +100.0° and the values are presented in 0.1° units with a range of 0 to +1000.

11.5. Mechanical tilt representation

The mechanical tilt range supported is from -90.0° to +90.0°. The tilt value and it's threshold values are expressed in 0.1° units with a range of -900 to +900.

The mechanical tilt precision is presented in degrees from 0.0° to +100.0° and the values are presented in 0.1° units with a range of 0 to +1000.

11.6. Mechanical roll representation

The mechanical roll range supported is from -180.0° to +180.0°. The roll value and it's threshold values are expressed in 0.1° units with a range of -1800 to +1800.

The mechanical roll precision is presented in degrees from 0° to +100.0° and the values are presented in 0.1° units with a range of 0 to +1000.



11.7. Latitude representation

The latitude is reported in decimal degrees, to six decimal places of accuracy, and then multiplied by 1×10^6 so that it may be represented by an integer, with a range of -90000000 to +90000000.

11.8. Longitude representation

The longitude is reported in decimal degrees, to six decimal places of accuracy, and then multiplied by 1×10^6 so that it may be represented by an integer, with a range of -180000000 to +180000000.

11.8. Location precision representation

The location precision is reported in meters, to one decimal places of accuracy, and then multiplied by 10 so that it may be represented by an integer, with a range of 0 to +10000.

11.9 Monitoring events

ON «the ALS detects exceeding of MechanicalTilt threshold»
RAISE ALSAlarmMechanicalTilt SEVERITY Major ON Cmd.Subunit

DONE

ON «the ALS detects exceeding of MechanicalRoll threshold»
RAISE ALSAlarmMechanicalRoll SEVERITY Major ON Cmd.Subunit

DONE

ON «the ALS detects exceeding of MechanicalAzimuth threshold»
RAISE ALSAlarmMechanicalAzimuth Major ON Cmd.Subunit

DONE

11.10. ALS commands

11.10.1. ALS Get Capabilities

Description (Informative):

On the receipt of this command the ALS subunit returns the ALS capabilities:

- Whether or not it is possible automatically measure the location
- Whether or not it is possible automatically measure the altitude
- Whether or not it is possible automatically measure the orientation

Primaries should use this command whenever the ALD has performed a reset.

Message format:

```
PrimaryCommand ALSGetCapabilitiesCommand {  
    CommandCode_t      Command ← 0x0400  
    CommandSequence_t  PrimaryCommandSequence  
    Subunit_t          Subunit  
    DataLength_t       DataLength ← 0  
}
```

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



```
ALDResponse ALSGetCapabilitiesResponse {
    CommandCode_t      Command ← 0x0400
    CommandSequence_t  PrimaryCommandSequence
    ReturnCode_t       ReturnCode
    DataLength_t       DataLength
    if (ReturnCode == OK) {
        ALSCapabilities_t ALSCapabilities
    }
    else {
        ALDState_t       ALDState
        ConnectionState_t ConnectionState
    }
}

Enumeration ReturnCode_t {
    OK
    FormatError
    UnknownCommand
    Busy
    InvalidSubunitNumber
    InvalidSubunitType
    NotAuthorised
    IncorrectState
}
```

Primary pseudocode:

(This section is intentionally left blank)

ALD pseudocode:

```
IF ALDType = MALD
    AND ActiveAuth[CurrentPort].Authority[Cmd.Subunit] = NoAccess THEN
        RETURN NotAuthorised
    EXIT
ENDIF

result ← IsCommandAllowed( LIST{      OperatingConnectionState
                                RestrictedConnectionState},
                            Cmd.Command, CurrentPort)

UNLESS result.allowed THEN
    RETURN result.code
    EXIT
ENDIF

RETURN OK, ALSCapabilities
CommandExit(Cmd.Command, CurrentPort)
EXIT
```

11.10.2. ALS Set Coordinate

Description (Informative):

On the receipt of this command the ALS subunit shall store the external geographic location information and their precision received from primary to non-volatile memory.

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



Message format:

```
PrimaryCommand ALSSetCoordinateCommand {
    CommandCode_t      Command ← 0x0401
    CommandSequence_t  PrimaryCommandSequence
    Subunit_t          Subunit
    DataLength_t       DataLength
    int32_t            Latitude           // Provenance manual indicates
    Provenance_t       LocationProvenance // the latitude and longitude
    int32_t            Longitude         // are based on an external geographic
    Provenance_t       LocationProvenance // location source information
    uint16_t           LocationPrecision
}

ALDResponse ALSSetCoordinateResponse {
    CommandCode_t      Command ← 0x0401
    CommandSequence_t  PrimaryCommandSequence
    ReturnCode_t       ReturnCode
    DataLength_t       DataLength
    if (ReturnCode == OK) {
    }
    else {
        ALDState_t      ALDState
        ConnectionState_t  ConnectionState
    }
}

Enumeration ReturnCode_t {
    OK
    FormatError
    UnknownCommand
    Busy
    InvalidSubunitNumber
    InvalidSubunitType
    NotAuthorised
    IncorrectState
    DataReadOnly
    OutOfRange
    InvalidProvenance
    GeneralError
}
```

Primary pseudocode:

(This section is intentionally left blank)

ALD pseudocode:

```
IF ALSCapabilities.CoordinateFunction THEN
    RETURN DataReadOnly
    EXIT

IF ALDType = MALD THEN
    UNLESS ActiveAuth[CurrentPort].Authority[Cmd.Subunit] = ReadWrite THEN
        RETURN NotAuthorised
        EXIT
    ENDIF
```

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



```
ENDIF
result ← IsCommandAllowed( LIST{   OperatingConnectionState,
                                   RestrictedConnectionState},
                           Cmd.Command, CurrentPort)

UNLESS result.allowed THEN
    RETURN result.code
    EXIT
ENDIF
IF Cmd.Latitude < -90000000 OR Cmd.Latitude > 90000000 THEN
    RETURN OutOfRange
    EXIT
ENDIF
IF Cmd.Longitude < -180000000 OR Cmd.Longitude > 180000000 THEN
    RETURN OutOfRange
    EXIT
ENDIF
IF Cmd.LocationPrecision < 0 OR Cmd.LocationPrecision > 10000 THEN
    RETURN OutOfRange
    EXIT
ENDIF
IF Cmd.LatitudeProvenance NOT Manual THEN
    RETURN InvalidProvenance
    EXIT
ENDIF
IF Cmd.LocationProvenance NOT Manual THEN
    RETURN InvalidProvenance
    EXIT
ENDIF
«store the longitude and latitude information, their provenances and precisions to non-volatile
memory»
IF «the ALD detects a hardware error» THEN
    // Replace “Hardware error” with descriptive text to be read using
    // GetDiagnosticInformation
    RAISE AlarmGeneralError SEVERITY Major ON Cmd.Subunit, “Hardware error”
    RETURN “GeneralError”
ELSE
    RETURN OK
ENDIF
CommandExit(Cmd.command, CurrentPort)
EXIT
```

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



11.10.3. ALS Get Coordinate

Description (Informative):

This command returns the calculated location information and its precision. In the case CoordinateFunction capability is not supported, the information set by ALS Set Coordinate command is returned.

Message format:

```
PrimaryCommand ALSGetCoordinateCommand {
    CommandCode_t          Command ← 0x0402
    CommandSequence_t     PrimaryCommandSequence
    Subunit_t              Subunit
    DataLength_t           DataLength ← 0
}

ALDResponse ALSGetCoordinateResponse {
    CommandCode_t          Command ← 0x0402
    CommandSequence_t     PrimaryCommandSequence
    ReturnCode_t           ReturnCode
    DataLength_t           DataLength
    if (ReturnCode == OK) {
        int32_t             Latitude           // Provenance manual indicates
        Provenance_t        LocationProvenance // that the latitude and longitude
        int32_t             Longitude          // are based on an external geographic
        Provenance_t        LocationProvenance // coordinate source information
        uint16_t            LocationPrecision
    }
    else {
        ALDState_t          ALDState
        ConnectionState_t   ConnectionState
    }
}

Enumeration ReturnCode_t{
    OK
    FormatError
    UnknownCommand
    Busy
    InvalidSubunitNumber
    InvalidSubunitType
    NotAuthorised
    IncorrectState
    DataReadOnly
}
```

Primary pseudocode):

(This section is intentionally left blank)

ALD pseudocode:

IF ALDType = MALD THEN

```
    IF ActiveAuth[CurrentPort].Authority[Cmd.Subunit] = NoAccess THEN
        RETURN NotAuthorised
    EXIT
ENDIF
```

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



```
ENDIF
result ← IsCommandAllowed( LIST{      OperatingConnectionState,
                                     RestrictedConnectionState},
                           Cmd.Command, CurrentPort)

UNLESS result.allowed THEN
    RETURN result.code
    EXIT
ENDIF
RETURN OK, «Latitude and longitude information, their corresponding provenance and
precision»
CommandExit(Cmd.Command, CurrentPort)
EXIT
```

11.10.4. ALS Set Altitude

Description (Informative):

On the receipt of this command the ALS subunit shall store the altitude information and it's precision received from primary to non-volatile memory.

Message format:

```
PrimaryCommand ALSSetAltitudeCommand {
    CommandCode_t      Command ← 0x0403
    CommandSequence_t  PrimaryCommandSequence
    Subunit_t          Subunit
    DataLength_t       DataLength
    int32_t            Altitude           // Provenance manual indicates that
    Provenance_t        AltitudeProvenance // the altitude is based on an
    uint_16t           AltitudePrecision // external altitude information
}

ALDResponse ALSSetAltitudeResponse {
    CommandCode_t      Command ← 0x0403
    CommandSequence_t  PrimaryCommandSequence
    ReturnCode_t       ReturnCode
    DataLength_t       DataLength
    if (ReturnCode == OK) {
    }
    else {
        ALDState_t      ALDState
        ConnectionState_t  ConnectionState
    }
}
```

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



```
Enumeration ReturnCode_t {
    OK
    FormatError
    UnknownCommand
    Busy
    InvalidSubunitNumber
    InvalidSubunitType
    NotAuthorised
    IncorrectState
    DataReadOnly
}
```

Primary pseudocode:

(This section is intentionally left blank)

ALD pseudocode:

```
IF ALS.Capabilities.AltitudeFunction THEN
    RETURN DataReadOnly
    EXIT
ENDIF

IF ALDType = MALD THEN
    UNLESS ActiveAuth[CurrentPort].Authority[Cmd.Subunit] = ReadWrite THEN
        RETURN NotAuthorised
        EXIT
    ENDIF
ENDIF

result ← IsCommandAllowed( LIST{ OperatingConnectionState,
                                RestrictedConnectionState},
                           Cmd.Command, CurrentPort)

UNLESS result.allowed THEN
    RETURN result.code
    EXIT
ENDIF

IF Cmd.Altitude < -100000 OR Cmd.Altitude > 100000 THEN
    RETURN OutOfRange
    EXIT
ENDIF

IF Cmd.AltitudePrecision < 0 OR Cmd.AltitudePrecision > 1000 THEN
    RETURN OutOfRange
    EXIT
ENDIF

IF Cmd.AltitudeProvenance NOT Manual THEN
    RETURN InvalidProvenance
    EXIT
ENDIF

«store the altitude information and its provenance to non-volatile memory»
IF «the ALD detects a hardware error» THEN
    // Replace "Hardware error" with descriptive text to be read using
    // GetDiagnosticInformation
```


Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



```
        RAISE AlarmGeneralError SEVERITY Major ON Cmd.Subunit, "Hardware error"
        RETURN "GeneralError"
ELSE
    RETURN OK
ENDIF
CommandExit(Cmd.command, CurrentPort)
EXIT
```

11.10.5. ALS Get Altitude

Description (Informative):

On the receipt of this command the ALS subunit shall return the calculated altitude information, it's provenance and precision. In the case AltitudeFunction capability is not supported, the information set by ALS Set Altitude command is returned.

Message format:

```
PrimaryCommand ALSGetAltitudeCommand {
    CommandCode_t      Command ← 0x0404
    CommandSequence_t  PrimaryCommandSequence
    Subunit_t          Subunit
    DataLength_t       DataLength ← 0
}

ALDResponse ALSGetAltitudeResponse {
    CommandCode_t      Command ← 0x0404
    CommandSequence_t  PrimaryCommandSequence
    ReturnCode_t       ReturnCode
    DataLength_t       DataLength
    if (ReturnCode == OK) {
        int32_t         Altitude           // Provenance manual indicates that
        Provenance      AltitudeProvenance // the altitude is based on an
        uint16_t         AltitudePrecision // external altitude information
    }
    else {
        ALDState_t      ALDState
        ConnectionState_t  ConnectionState
    }
}

Enumeration ReturnCode_t{
    OK
    FormatError
    UnknownCommand
    Busy
    InvalidSubunitNumber
    InvalidSubunitType
    NotAuthorised
    IncorrectState
}
```

Primary pseudocode):

(This section is intentionally left blank)

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



ALD pseudocode:

```
IF ALDType = MALD THEN
    IF ActiveAuth[CurrentPort].Authority[Cmd.Subunit] = NoAccess THEN
        RETURN NotAuthorised
    EXIT
ENDIF
ENDIF
result ← IsCommandAllowed( LIST{ OperatingConnectionState,
                                RestrictedConnectionState},
                           Cmd.Command, CurrentPort)
UNLESS result.allowed THEN
    RETURN result.code
EXIT
ENDIF
RETURN OK, «Altitude information, its corresponding provenance and precision»
CommandExit(Cmd.Command, CurrentPort)
EXIT
```

11.10.6. ALS Set Orientation Thresholds

Description (Informative):

On the receipt of this command the ALS subunit shall store the threshold information received from primary to non-volatile memory.

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



Message format:

```
PrimaryCommand ALSSetOrientationThresholdsCommand {
    CommandCode_t      Command ← 0x0405
    CommandSequence_t  PrimaryCommandSequence
    Subunit_t          Subunit
    DataLength_t       DataLength
    int16_t            UpperMechanicalTiltThreshold
    Provenance_t       MechanicalTiltThresholdProvenance
    int16_t            LowerMechanicalTiltThreshold
    Provenance_t       MechanicalTiltThresholdProvenance
    int16_t            UpperMechanicalRollThreshold
    Provenance_t       MechanicalRollThresholdProvenance
    int16_t            LowerMechanicalRollThreshold
    Provenance_t       MechanicalRollThresholdProvenance
    int16_t            UpperMechanicalAzimuthThreshold
    Provenance_t       MechanicalAzimuthThresholdProvenance
    int16_t            LowerMechanicalAzimuthThreshold
    Provenance_t       MechanicalAzimuthThresholdProvenance
}

ALDResponse ALSSetOrientationThresholdsResponse {
    CommandCode_t      Command ← 0x0405
    CommandSequence_t  PrimaryCommandSequence
    ReturnCode_t       ReturnCode
    DataLength_t       DataLength
    if (ReturnCode == OK) {
    }
    else {
        ALDState_t      ALDState
        ConnectionState_t  ConnectionState
    }
}

Enumeration ReturnCode_t {
    OK
    FormatError
    UnknownCommand
    Busy
    InvalidSubunitNumber
    InvalidSubunitType
    NotAuthorised
    IncorrectState
}
```

Primary pseudocode:

(This section is intentionally left blank)

ALD pseudocode:

```
UNLESS ALS.Capabilities.OrientationFunction THEN
    RETURN UnsupportedCapability
EXIT
ENDIF

IF ALDType = MALD THEN
    UNLESS ActiveAuth[CurrentPort].Authority[Cmd.Subunit] = ReadWrite THEN
        RETURN NotAuthorised
    EXIT
ENDIF
```

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



```
ENDIF
result ← IsCommandAllowed( LIST{      OperatingConnectionState,
                                     RestrictedConnectionState},
                           Cmd.Command, CurrentPort)

UNLESS result.allowed THEN
    RETURN result.code
    EXIT
ENDIF
«store the orientation threshold values and their provenance to non-volatile memory»
IF «the ALD detects a hardware error» THEN
    // Replace “Hardware error” with descriptive text to be read using
    // GetDiagnosticInformation
    RAISE AlarmGeneralError SEVERITY Major ON Cmd.Subunit, “Hardware error”
    RETURN “GeneralError”
ELSE
    RETURN OK
ENDIF
CommandExit(Cmd.command, CurrentPort)
EXIT
```

11.10.7. ALS Get Orientation Thresholds

Description (Informative):

On the receipt of this command the ALS subunit shall return the orientation thresholds.

Message format:

```
PrimaryCommand ALSGetOrientationThresholdsCommand {
    CommandCode_t      Command ← 0x0406
    CommandSequence_t  PrimaryCommandSequence
    Subunit_t          Subunit
    DataLength_t       DataLength ← 0
}
```

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



```
ALDResponse ALSGetOrientationThresholdsResponse {
    CommandCode_t      Command ← 0x0406
    CommandSequence_t  PrimaryCommandSequence
    ReturnCode_t       ReturnCode
    DataLength_t       DataLength
    if (ReturnCode == OK) {
        int16_t         UpperMechanicalTiltThreshold
        Provenance_t    UpperMechanicalTiltThresholdProvenance
        int16_t         LowerMechanicalTiltThreshold
        Provenance_t    LowerMechanicalTiltThresholdProvenance
        int16_t         UpperMechanicalRollThreshold
        Provenance_t    UpperMechanicalRollThresholdProvenance
        int16_t         LowerMechanicalRollThreshold
        Provenance_t    LowerMechanicalRollThresholdProvenance
        int16_t         UpperMechanicalAzimuthThreshold
        Provenance_t    UpperMechanicalAzimuthThresholdProvenance
        int16_t         LowerMechanicalAzimuthThreshold
        Provenance_t    LowerMechanicalAzimuthThresholdProvenance
    }
    else {
        ALDState_t      ALDState
        ConnectionState_t  ConnectionState
    }
}

Enumeration ReturnCode_t{
    OK
    FormatError
    UnknownCommand
    Busy
    InvalidSubunitNumber
    InvalidSubunitType
    NotAuthorised
    IncorrectState
}
```

Primary pseudocode):

(This section is intentionally left blank)

ALD pseudocode:

```
IF ALDType = MALD THEN
    IF ActiveAuth[CurrentPort].Authority[Cmd.Subunit] = NoAccess THEN
        RETURN NotAuthorised
    EXIT
ENDIF

result ← IsCommandAllowed( LIST{ OperatingConnectionState,
                               RestrictedConnectionState},
                          Cmd.Command, CurrentPort)

UNLESS result.allowed THEN
    RETURN result.code
EXIT
ENDIF
```

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



RETURN OK, «Orientation thresholds and their corresponding provenances»

CommandExit(Cmd.Command, CurrentPort)

EXIT

11.10.8. ALS Set Orientation Target Values

Description (Informative):

On the receipt of this command the ALS subunit shall store the target mechanical tilt, target mechanical roll and target mechanical azimuth values received from primary to non-volatile memory. ALS shall reset the current target value and shall set the actual measured value as the target value in the case the primary has set the provenance to Automatic. If a measured value is not ready, the secondary device shall set the actual value as the target value automatically as soon as possible.

The bitfield OrientationDataToBeStored controls which data fields are stored. The same bit in the bitfield controls the storage of the length of the data (where applicable), the data itself and its provenance as follows:

Bit value 1: Corresponding data is stored together with length (where applicable) and provenance. Existing data is overwritten.

Bit value 0: No data is written to the non-volatile memory and existing data is preserved. The corresponding data in the message is ignored. It is recommended that such data shall be zeroed.

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



Message format:

```
Bitfield DataToBeStored_t uint8_t {
    TargetMechanicalTilt      Bit 0
    TargetMechanicalRoll      Bit 1
    TargetMechanicalAzimuth   Bit 2
}

PrimaryCommand ALSSetOrientationTargetValuesCommand {
    CommandCode_t      Command ← 0x0407
    CommandSequence_t  PrimaryCommandSequence
    Subunit_t          Subunit
    DataLength_t       DataLength
    Int16_t            TargetMechanicalTilt
    Provenance_t       TargetMechanicalTiltProvenance
    Int16_t            TargetMechanicalRoll
    Provenance_t       TargetMechanicalRollThreshold
    Int16_t            TargetMechanicalAzimuth
    Provenance_t       TargetMechanicalAzimuthProvenance
}

ALDResponse ALSSetOrientationTargetValuesResponse {
    CommandCode_t      Command ← 0x0407
    CommandSequence_t  PrimaryCommandSequence
    ReturnCode_t       ReturnCode
    DataLength_t       DataLength
    if (ReturnCode == OK) {
    }
    else {
        ALDState_t      ALDState
        ConnectionState_t  ConnectionState
    }
}

Enumeration ReturnCode_t {
    OK
    FormatError
    UnknownCommand
    Busy
    InvalidSubunitNumber
    InvalidSubunitType
    NotAuthorised
    IncorrectState
    UnsupportedCapability
}
```

Primary pseudocode:

(This section is intentionally left blank)

ALD pseudocode:

```
UNLESS ALS.Capabilities.OrientationFunction THEN
    RETURN UnsupportedCapability
EXIT
ENDIF
```

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



```
IF ALDType = MALD THEN
    UNLESS ActiveAuth[CurrentPort].Authority[Cmd.Subunit] = ReadWrite THEN
        RETURN NotAuthorised
    EXIT
ENDIF
ENDIF
result ← IsCommandAllowed( LIST{      OperatingConnectionState,
                                   RestrictedConnectionState},
                           Cmd.Command, CurrentPort)

UNLESS result.allowed THEN
    RETURN result.code
EXIT
ENDIF
«store the altitude information and its provenance to non-volatile memory»
IF «the ALD detects a hardware error» THEN
    // Replace “Hardware error” with descriptive text to be read using
    // GetDiagnosticInformation
    RAISE AlarmGeneralError SEVERITY Major ON Cmd.Subunit, “Hardware error”
    RETURN “GeneralError”
ELSE
    RETURN OK
ENDIF
CommandExit(Cmd.command, CurrentPort)
EXIT
```

11.10.9. ALS Get Orientation Target Values

Description (Informative):

On the receipt of this command the ALS subunit shall return the orientation target values.

Message format:

```
PrimaryCommand ALSGetOrientationTargetValuesCommand {
    CommandCode_t      Command ← 0x0408
    CommandSequence_t  PrimaryCommandSequence
    Subunit_t          Subunit
    DataLength_t       DataLength ← 0
}
```


Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



```
ALDResponse ALSGetOrientationTargetValuesResponse {
    CommandCode_t      Command ← 0x0408
    CommandSequence_t  PrimaryCommandSequence
    ReturnCode_t       ReturnCode
    DataLength_t       DataLength
    if (ReturnCode == OK) {
        int16_t         TargetMechanicalTilt
        Provenance_t    TargetMechanicalTiltProvenance
        int16_t         TargetMechanicalRoll
        Provenance_t    TargetMechanicalRollProvenance
        int16_t         TargetMechanicalAzimuth
        Provenance_t    TargetMechanicalAzimuthProvenance
    }
    else {
        ALDState_t      ALDState
        ConnectionState_t  ConnectionState
    }
}

Enumeration ReturnCode_t{
    OK
    FormatError
    UnknownCommand
    Busy
    InvalidSubunitNumber
    InvalidSubunitType
    NotAuthorised
    IncorrectState
}
```

Primary pseudocode):

(This section is intentionally left blank)

ALD pseudocode:

IF ALDType = MALD THEN

```
    IF ActiveAuth[CurrentPort].Authority[Cmd.Subunit] = NoAccess THEN
        RETURN NotAuthorised
    EXIT
ENDIF
```

ENDIF

```
result ← IsCommandAllowed( LIST{      OperatingConnectionState,
                                   RestrictedConnectionState},
                           Cmd.Command, CurrentPort)
```

UNLESS result.allowed THEN

```
    RETURN result.code
    EXIT
```

ENDIF

RETURN OK, «Orientation target values and their corresponding provenances»

CommandExit(Cmd.Command, CurrentPort)

EXIT

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



11.10.10. ALS Get Orientation Information

Description (Informative):

On the receipt of this command the ALS subunit shall return current orientation information.

Message format:

```
PrimaryCommand ALSGetOrientationInformationCommand {
    CommandCode_t      Command ← 0x0409
    CommandSequence_t  PrimaryCommandSequence
    Subunit_t          Subunit
    DataLength_t       DataLength ← 0
}

ALDResponse ALSGetOrientationInformationResponse {
    CommandCode_t      Command ← 0x0409
    CommandSequence_t  PrimaryCommandSequence
    ReturnCode_t       ReturnCode
    DataLength_t       DataLength
    if (ReturnCode == OK) {
        int16_t         CalculatedMechanicalTilt
        Provenance_t    CalculatedMechanicalTiltProvenance
        Int16_t         CalculatedMechanicalRoll
        Provenance_t    CalculatedMechanicalRollProvenance
        Int16_t         CalculatedMechanicalAzimuth
        Provenance_t    CalculatedMechanicalAzimuthProvenance
    }
    else {
        ALDState_t      ALDState
        ConnectionState_t  ConnectionState
    }
}

Enumeration ReturnCode_t{
    OK
    FormatError
    UnknownCommand
    Busy
    InvalidSubunitNumber
    InvalidSubunitType
    NotAuthorised
    IncorrectState
}
```

Primary pseudocode):

(This section is intentionally left blank)

ALD pseudocode:

IF ALDType = MALD THEN

 IF ActiveAuth[CurrentPort].Authority[Cmd.Subunit] = NoAccess THEN

 RETURN NotAuthorised

 EXIT

 ENDIF

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



```
ENDIF
result ← IsCommandAllowed( LIST{      OperatingConnectionState,
                                     RestrictedConnectionState},
                           Cmd.Command, CurrentPort)

UNLESS result.allowed THEN
    RETURN result.code
    EXIT
ENDIF
RETURN OK, «Orientation information and their corresponding provenances»

CommandExit(Cmd.Command, CurrentPort)
EXIT
```

11.10.11. ALS Get Monitored Orientation Information

Description (Informative):

On the receipt of this command the ALS subunit shall return the minimum and maximum orientation information monitored since the ALS was reset. This information may be used to analyse the effect of sway or other mechanical inputs.

Message format:

```
PrimaryCommand ALSGetMonitoredOrientationInformationCommand {
    CommandCode_t      Command ← 0x0410
    CommandSequence_t  PrimaryCommandSequence
    Subunit_t          Subunit
    DataLength_t       DataLength ← 0
}

ALDResponse ALSGetMonitoredOrientationInformationResponse {
    CommandCode_t      Command ← 0x0410
    CommandSequence_t  PrimaryCommandSequence
    ReturnCode_t       ReturnCode
    DataLength_t       DataLength
        Int16_t        HighestCalculatedMechanicalTilt
        Provenance_t   HighestCalculatedMechanicalTiltProvenance
        Int16_t        HighestCalculatedMechanicalRoll
        Provenance_t   HighestCalculatedMechanicalRollProvenance
        Int16_t        HighestCalculatedMechanicalAzimuth
        Provenance_t   HighestCalculatedMechanicalAzimuthProvenance
        Int16_t        LowestCalculatedMechanicalTilt
        Provenance_t   LowestCalculatedMechanicalTiltProvenance
        Int16_t        LowestCalculatedMechanicalRoll
        Provenance_t   LowestCalculatedMechanicalRollProvenance
        Int16_t        LowestCalculatedMechanicalAzimuth
        Provenance_t   LowestCalculatedMechanicalAzimuthProvenance
    }
    else {
        ALDState_t     ALDState
        ConnectionState_t  ConnectionState
    }
}
```

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



```
Enumeration ReturnCode_t{
    OK
    FormatError
    UnknownCommand
    Busy
    InvalidSubunitNumber
    InvalidSubunitType
    NotAuthorised
    IncorrectState
}
```

Primary pseudocode):

(This section is intentionally left blank)

ALD pseudocode:

```
IF ALDType = MALD THEN
    IF ActiveAuth[CurrentPort].Authority[Cmd.Subunit] = NoAccess THEN
        RETURN NotAuthorised
        EXIT
    ENDIF
ENDIF

result ← IsCommandAllowed( LIST{    OperatingConnectionState,
                                   RestrictedConnectionState},
                           Cmd.Command, CurrentPort)

UNLESS result.allowed THEN
    RETURN result.code
    EXIT
ENDIF
RETURN OK, «Orientation information and their corresponding provenances»

CommandExit(Cmd.Command, CurrentPort)
EXIT
```

11.10.12. ALS Set Array Element Numbers to Subunit

Description (Informative):

This command stores the provided list of array element numbers to which the subunit has a logical relationship.

The ALD vendor may have defined one or more array element numbers as read only. If the array element numbers are not stored, the ALD will return the DataReadOnly return code.

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



Message format:

```
PrimaryCommand ALSSetArrayElementNumbersToSubunitCommand {
    CommandCode_t      Command ← 0x0411
    CommandSequence_t  PrimaryCommandSequence
    Subunit_t          Subunit
    DataLength_t       DataLength
    uint8_t            NrOfArrayElementss
    uint16_t           ArrayElementNumbers[1..NrOfArrayElements]
    Provenance_t       ArrayElementNumbersProvenance
}

ALDResponse ALSSetArrayElementNumbersToSubunitResponse {
    CommandCode_t      Command ← 0x0411
    CommandSequence_t  PrimaryCommandSequence
    ReturnCode_t       ReturnCode
    DataLength_t       DataLength
    if (ReturnCode == OK) {
    }
    else {
        ALDState_t      ALDState
        ConnectionState_t  ConnectionState
    }
}

Enumeration ReturnCode_t {
    OK
    FormatError
    UnknownCommand
    Busy
    IncorrectState
    InvalidSubunitNumber
    InvalidSubunitType
    NotAuthorised
    DataReadOnly
    InvalidArrayElementNumber
    GeneralError
}
```

Primary pseudocode:

(This section is intentionally left blank)

ALD pseudocode:

```
UNLESS Cmd.ArrayElementNumber IN ArrayElementNumberList THEN
    RETURN InvalidArrayElementNumber
EXIT
ENDIF

IF ALDType = MALD THEN
    UNLESS ActiveAuth[CurrentPort].Authority[Cmd.Subunit] = ReadWrite THEN
        RETURN NotAuthorised
    EXIT
ENDIF
```

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



```
ENDIF
result ← IsCommandAllowed( LIST{      OperatingConnectionState,
                                     RestrictedConnectionState},
                           Cmd.Command, CurrentPort)

UNLESS result.allowed THEN
    RETURN result.code
    EXIT
ENDIF
IF «Array element numbers are read only in this ALS subunit» THEN
    RETURN DataReadOnly
ELSE
    «Store the array element numbers and their provenance for the supplied Subunit to
    non-volatile memory»

    IF «the ALD detects a hardware error» THEN
        // Replace “Hardware error” with descriptive text to be read using
        // GetDiagnosticInformation
        RAISE AlarmGeneralError SEVERITY Major ON Cmd.Subunit, “Hardware error”
        RETURN “GeneralError”
    ELSE
        RETURN OK
    ENDIF
ENDIF
CommandExit(Cmd.command, CurrentPort)
EXIT
```

11.10.13. ALS Get Array Element Numbers From Subunit

Description (Informative):

This command returns the list of arrays elements to which the subunit has a logical relationship.

Message format:

```
PrimaryCommand ALSGetArrayElementNumbersOfSubunitCommandCommand {
    CommandCode_t      Command ← 0x0412
    CommandSequence_t  PrimaryCommandSequence
    Subunit_t          Subunit
    DataLength_t       DataLength ← 0
}
```

```
ALDResponse ALSGetArrayElementNumbersOfSubunitResponse {
    CommandCode_t      Command ← 0x0412
    CommandSequence_t  PrimaryCommandSequence
    ReturnCode_t       ReturnCode
    DataLength_t       DataLength
    if (ReturnCode == OK) {
        uint8_t         NrOfArrayElements
        uint16_t        ArrayElementNumber[1..NrOfArrayElements]
        Provenance_t    ArrayElementNumbersProvenance
    }
    else {
```

Antenna Interface Standards Group

Subunit Type Standard AISG-ST-ALS

vALS3.0.0.4

31st January 2022



```
        ALDState_t      ALDState
        ConnectionState_t  ConnectionState
    }
}

Enumeration ReturnCode_t{
    OK
    FormatError
    UnknownCommand
    Busy
    InvalidSubunitNumber
    InvalidSubunitType
    NotAuthorised
    IncorrectState
}
```

Primary pseudocode):

(This section is intentionally left blank)

ALD pseudocode:

```
IF ALDType = MALD
    AND ActiveAuth[CurrentPort].Authority[Cmd.Subunit] = NoAccess THEN
        RETURN NotAuthorised
    EXIT
ENDIF

result ← IsCommandAllowed( LIST{      OperatingConnectionState,
                                   RestrictedConnectionState,
                                   MALDSetupConnectionState},
                           Cmd.Command, CurrentPort)

UNLESS result.allowed THEN
    RETURN result.code
    EXIT
ENDIF
RETURN OK, «for the requested ALS subunit, return the number of stored array elements,
the list of array numbers, and their provenance »

CommandExit(Cmd.Command, CurrentPort)
EXIT
```