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FAA STANDARDS AND GUIDELINES TO DEFINE AND ADAPT VALUES FOR MSAW AND CONFLICT ALERT SITE VARIABLES (A2.08)

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(31 pages)

ARTS IIA
COMPUTER PROGRAM

STANDARDS AND GUIDELINES TO DEFINE AND ADAPT VALUES FOR MINIMUM SAFE ALTITUDE WARNING (MSAW) AND CONFLICT ALERT (CA) SITE VARIABLES

A2.08

28 NOVEMBER 1998

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Revision History

Level	*Date*	*Reason for Revision*
---	17 November 1997	Initial
01	5 December 1997	Added Conflict Alert Standards, Section 6.0
02	10 December 1997	Mod. min. ZMC to 320ft minus 100ft for 3 deg. Glideslope
03	26 January 1998	Mod. ZMI min. to 500ft above bin or 500ft above obstacle not to exceed 200 ft per mile.
04	28 January 1998	Removed "Capture boxes.. for all runways" in section 3.0

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1.0 INTRODUCTION

1.1 PURPOSE

The Minimum Safe Altitude Warning (MSAW) system is designed to generate an alert when an associated aircraft with Mode-C is at or predicted to be at an unsafe altitude. MSAW monitors aircraft for terrain and obstacle separation and will generate an alert to the controller by displaying an "LA" in the third line of the Full Data Block (FDB) and issuing an aural alarm (where appropriate).

MSAW monitoring consists of three detection components, general terrain, primary airport, and secondary airport monitoring. Information regarding the specific functionality of each component can be found In the NAS-MD-903, chapter 15. This document defines standards for adapting each parameter for each component in MSAW system. It is intended to create a uniform method of adapting MSAW for a wide variety of configurations, while providing the flexibility needed to adapt special circumstances.

1.2 LAYOUT

For each site adaptable parameter, a parameter name, purpose, range of values, and standard is provided. The purpose provides a brief definition of each parameter. The range of values defines all of the acceptable values allowed for the parameter, while the standard defines the correct site adaptation standards needed for proper MSAW functionality.

1.3 CONVENTIONS

For each site adaptable MSAW parameter, a nominal or default value is provided (if applicable), followed by a range of acceptable values, the increment between each value, and theunits of the value. For example:

5 (0..10,1) nmi

would imply a default value of 5nmi, a minimum possible value of 0 nmi, a maximum possible value of 10 nmi, and an increment of 1 nmi. The minimum and maximum values for each parameter were obtained from the NAS-MD-903.

1.4 REFERENCES

Information in this document has been derived from many sources, including the ARTS IIA site adaptation kit, the A3.06 NAS-MD-633, FAA Order 7110.65, FAA Order 7210.3, and the NAS-MD-903.

2.0 CONVENTIONAL PRIMARY/SATELLITE AIRPORT ADAPTATION STANDARDS

This section provides definitions and standards used in primary and satellite airport monitoring. This includes primary and satellite airport area, inhibit area, and aural alert area definitions and standards.

2.1 SET STATEMENTS

Although the parameters described in this section do not use memory, they are defined in this document as they are used in the definitions of other MSAW parameters.

2.1.1 NUMBER OF SATELLITE AIRPORTS

Parameter: NSAT

Purpose: Specifies the number of satellite airports in the system.

Range of Values: 0 (0..15, 1) satellite airports

STANDARD: Define this parameter to the number of satellite airports with adapted approaches in the system.

2.1.2 NUMBER OF VOLUME INHIBIT AREAS

Parameter: NIVA

Purpose: Specifies the number of volume inhibit areas in the system. For a definition of a volume inhibit area, see the volume inhibit area definition, VRGxQ.

Range of Values: 0 (0..15, 1) volume inhibit areas

STANDARD: Define this parameter to the number of volume inhibit areas adapted in the system.

2.2 MSAW INHIBITED BEACON CODES

Parameter: BSEG11, BSEG12, BSEG21 , BSEG22

Purpose: The MSAW inhibited beacon codes consist of two blocks of beacon codes which are inhibited from MSAW processing. BSEG11 is the beginning and BSEG12 is the end of the first block. Furthermore, BSEG21 is the beginning and BSEG22 is the end of the second block. NOTE: Any track with a beacon code defined in the MSAW inhibit beacon code block(s) will not be eligible for MSAW.

Range of Values: 0000 (0000..7777, 1) octal beacon codes beacon codes 1236, 7500, 7600, and 7700 are excluded.

STANDARD: Define the beacon codes within each block which are assigned to aircraft which are to be permanently inhibited from MSAW processing, such as aircraft which operate under visual flight rules (VFR).

2.3 MSAW ELIGIBILITY DEFINITIONS

2.3.1 GROSS HIGH ALTITUDE

Parameter: GHALTQ

Purpose: The Gross High Altitude specifies the altitude which the track must at or below to receive MSAW processing. If the Gross High Altitude is updated, ensure HIGHQ and ALTBLE are updated as well.

Range of Values: 0 (0..32767, 1) feet

STANDARD: Set this parameter to the highest bin altitude adapted in the digital terrain map plus 5000 feet. This value can be obtained by locating the highest elevation defined in the altitude table (ALTBLE) and adding 5000 feet to it.

2.3.2 AREA HIGH POINT

Parameter: HIGHQ

Purpose: The Area High Point specifies the highest bin altitude in the digital terrain map (DTM). It is used as a gross filter for processing tracks under general terrain monitoring. If the Area High Point is updated, ensure GHALTQ and ALTBLE are updated as well.

Range of Values: 0 (0..27700, 1) feet

STANDARD: Set this parameter to the highest bin altitude adapted in the digital terrain map This value can be obtained from the highest elevation defined in the altitude table (ALTBLE).

2.3.3 AREA LOW POINT

Parameter: GLALTQ

Purpose: The Area Low Point specifies the altitude in which the track must at or above to receive MSAW processing.

Range of Values: 0 (-500..10000, 1) feet

STANDARD: Set this parameter to the lowest bin altitude adapted in the digital terrain map. This value can be obtained from the lowest elevation defined in the altitude table (ALTBLE); however, it is recommended that GLALTQ be defined as 0.

2.3.4 MSAW ELIGIBILITY AREA

Parameter: MRG1Q

Purpose: Specifies the area in which MSAW is enabled. Tracks outside this area are not eligible for MSAW processing. This area is defined as a 3 range, 3 azimuth area. A 2 range / 2 azimuth area that encompasses the antenna is defined when the larger value is in range 1, range 2 equals range 3, and azimuth 1 equals azimuth 3. A 2 range / 2 azimuth area that does not encompass the antenna is defined when the smaller value is in range 1, range 2 equals range 3, and azimuth 3 equals 5000.

Range of Values: 0 (0..63 7/8, 1/8) nmi
0 (0..63 7/8, 1/8) nmi
0 (0..63 7/8, 1/8) nmi
0 (0..4095, 1) acps
0 (0..4095, 1) acps
0 (0..4095, 1) acps

STANDARD: This area should encompass the approach control airspace plus 5 nmi

2.4 AIRPORT AREA DEFINITIONS

2.4.1 PRIMARY AIRPORT AREA

Parameter: PRG1Q, PAZ1Q

Purpose: Defines the area around the primary airport in which all approach path monitoring occurs. No approach path monitoring will occur in the portions of the capture boxes which extend beyond the primary airport area. This area is defined as a 3 range, 3 azimuth area. A 2 range/2 azimuth area that encompasses the antenna is defined when the larger value is in range 1, range 2 equals range 3, and azimuth 1 equals azimuth 3. A 2 range / 2 azimuth area that does not encompass the antenna is defined when the smaller value is in range 1, range 2 equals range 3, and azimuth 3 equals 5000.

Range of Values: 0 (0..63 7/8, 1/8) nmi (PRG1Q)
0 (0..63 7/8, 1/8) nmi
0 (0..63 7/8, 1/8) nmi

0 (0..4095, 1) acps (PAZ1Q)
0 (0..4095, 1) acps
0 (0..4095, 1) acps

STANDARD: This area should be defined as small as possible encompassing all capture boxes adapted for the primary airport.

2.4.2 SECONDARY AIRPORT AREA DEFINITIONS

2.4.2.1 NUMBER OF SATELLITE AIRPORT AREAS

Parameter: SAT1Q

Purpose: Specifies the number of satellite airports in the system.

Range of Values: 0 (0.. NSAT, 1) satellite airports

STANDARD: Set this parameter to the number of satellite airports with adapted approaches in the system. This value is determined by NSAT.

2.4.2.2 SATELLITE AIRPORT AREA GROSS HIGH ALTITUDE

Parameter: SALT1Q

Purpose: Defines the highest altitude adapted for all the satellite airport areas defined. It provides a gross altitude filter for the satellite airport monitor (SAM).

Range of Values: 0 (0..32767, 1) feet

STANDARD: Set this parameter as the highest altitude specified in the satellite airport area altitude table (AAAT).

2.4.2.3 SATELLITE AIRPORT AREA

Parameter: SRGxQ (where x = 2 to 16)

Purpose: Defines the areas around the secondary airports in which all approach path monitoring occurs. A satellite airport area should be defined for each airport that has one or more instrument approaches only if radar coverage exists below the final approach fix crossing altitude. No approach path monitoring will occur in the portions of the capture boxes which extend beyond any secondary airport area. There can be a maximum of 15 satellite airport areas. It is accessed by retrieving the address from the Airport Area Pointer Table (AAPT) which is based upon the airport index (defined in the fix pair associated with the flight plan). Each area is defined as a 2 rng/2 azm area where range 1 is smaller than range

2. If a satellite airport area is added or deleted, ensure the parameters SAT1Q, SALT1Q, AAPT, APAL, and AAAT are also updated.

Range of Values: 0 (0..63 7/8, 1/8) nmi
0 (0..63 7/8, 1/8) nmi
0 (0..4095, 1) acps
0 (0..4095, 1) acps

STANDARD: These areas should encompass all capture boxes defined for each specific secondary airport. These areas also provide relaxed processing for departures and should therefore be kept as small as possible.

2.4.3 AIRPORT AREA ALTITUDE TABLE

Parameter: AAAT

Purpose: Defines the altitude of the primary and each satellite airport area. The first entry in the AAAT is the altitude defined for the primary airport area. Each subsequent altitude represents each secondary airport area, respectively. It is indexed by the airport index defined in the fix pair. This table has a maximum of 16 entries, 1 primary and 15 secondary altitudes.

Range of Values: 0 (0..32767, 1) feet

STANDARD: The altitude for each airport area should be equal to the highest approach path monitor initiate altitude for that secondary airport (ZMI) plus 2000 feet, plus the field elevation.

2.4.4 AIRPORT ALTITUDE TABLE

Parameter: APAL

Purpose: Defines the elevation of each airport above sea level. The first entry in APAL is the altitude defined for the primary airport elevation. Each subsequent altitude represents each secondary airport area altitude, respectively. It is indexed by the airport index defined in the fix pair. This table has a maximum of 16 entries, 1 primary and 15 secondary altitudes.

Range of Values: 0 (0.,32767, 1) feet

STANDARD: The altitude for each airport should defined as the highest published altitude of all runway threshold elevations for each airport.

2.4.5 AIRPORT AREA POINTER TABLE

Parameter: AAPT

Purpose: Defines the address in the operational program where the airport area definitions for the primary and each secondary (satellite) airport are located. This table is indexed into by the airport number, which is defined in the fix pair associated with the flight plan. For tracks without fix pairs, the airport index is zero (0), or the primary airport. An index of 1 indicates the first secondary airport, an index of 2 indicates the second secondary airport, and so on. There can be a maximum of 16 airports defined, 1 primary and 15 secondary. Generally, the airport area definitions will always be in the same place, if they are defined. An address of :0000 indicates SRGxQ is not adapted.

Range of Values:

Range of Values:	User 8 (:4422) hex address	(PRG1Q)
	User 8 (:0000 or :4428) hex address	(SRG2Q)
	User 8 (:0000 or :442C) hex address	(SRG3Q)
	User 8 (:0000 or :4430) hex address	(SRG4Q)
	-to-	
	User 8 (:0000 or :4460) hex address	(SRG16Q)

STANDARD: Define each entry in the AAPT to the address where the airport area is adapted. Ensure that the table is defined respective to the position of the airport area adapted in the PRG1Q and SRGxQ tables (i.e. the 1st entry is for the primary airport area, the 2nd entry is for the 1st secondary airport area, the 3rd entry is for the 2nd secondary airport area, and so on).

2.5 INHIBIT AREA DEFINITIONS

2.5.1 PRIMARY AIRPORT DEPARTURE INHIBIT AREA

Parameter: PDR1Q

Purpose: The Primary Airport Departure Inhibit Area inhibits MSAW processing on departure tracks around the primary airport. It allows departing aircraft to climb without generating MSAW alarms. This area is defined as a 3 range, 3 azimuth area. A 2 range / 2 azimuth area that encompasses the antenna is defined when the larger value is in range 1, range 2 equals range 3, and azimuth 1 equals azimuth 3. A 2 range / 2 azimuth area that does not encompass the antenna is defined when the smaller value is in range 1, range 2 equals range 3, and azimuth 3 equals 5000.

Range of Values: 0 (0..63 7/8, 1/8) nmi
0 (0..63 7/8, 1/8) nmi
0 (0..63 7/8, 1/8) nmi
0 (0..4095, 1) acps
0 (0..4095, 1) acps
0 (0..4095, 1) acps

STANDARD: It should encompass the departure ends of all of the runways and should not exceed 2 nmi from any runway end. It should be defined as close as possible to the departure ends allowing aircraft to climb sufficiently above the altitudes associated with general terrain monitoring. If nuisance alarms persist, it may be expanded, not to exceed 6 nmi from the airport reference point (ARP).

2.5.2 APPROACH PATH MONITOR INHIBIT DEFINITIONS

2.5.2.1 APPROACH PATH MONITOR INHIBIT AREA

Parameter: APRIxQ (where x = 1 to 5)

Purpose: The Primary Airport Approach Path Monitor Area Inhibit defines up to five possible approach path monitor inhibit areas. One of the five approach path monitor inhibit areas is selected by the current sectorization number. The sectorization number is used as an index into the AMIADR table which contains an address of the approach path monitor to be used. If an approach path monitor inhibit area is adapted and activated by the supervisory keyboard entry, (MSW,R), no approach path monitoring will occur within this area; however, a track within this area will receive general terrain processing. If adapting an approach path monitor inhibit area(s), ensure that general terrain monitoring is not inhibited in the same area as this would produce a “dead spot” in which no MSAW processing would occur. This area is defined as a 3 range, 3 azimuth area, A 2 range / 2 azimuth area that encompasses the antenna is defined when the larger value is in range 1, range 2 equals range 3, and azimuth 1 equals azimuth 3. A 2 range / 2 azimuth area that does not encompass the antenna is defined when the smaller value is in range 1, range 2 equals range 3, and azimuth 3 equals 5000. If an approach path inhibit area is added or deleted, ensure the parameter AMIADR is also updated.

Range of Values: 0 (0..63 7/8, 1/8) nmi
0 (0..63 7/8, 1/8) nmi
0 (0..63 7/8, 1/6) nmi
0 (0..4095, 1) acps
0 (0..4095, 1) acps
0 (0..4095, 1) acps

STANDARD: Normally, this area is not used

2.5.2.2 APPROACH PATH MONITOR INHIBIT AREA ADDRESS TABLE

Parameter: AMIADR

Purpose: The Approach Path Monitor Inhibit Area Address Table defines the address within the operational program of the approach path monitor inhibit area which is selected (but not necessarily activated) when a new sectorization is selected.

This table is indexed by the current sectorization number (SUP xx) and gives the address of one of five possible approach path monitor inhibit areas. The APM inhibit areas are defined in five possible locations. An address of :0000 indicates AMIADR is not adapted.

Range of Values:	U8 (:0000,44AA,44B0,44 B6,44BC,44CO)	sectorization 01
	U8 (:0000,44AA,44B0,44 B6,44BC,44CO)	sectorization 02
	U8 (:0000,44AA,44B0,44 B6,44BC,44CO)	sectorization 03
	U8 (:0000,44AA,44B0,44 B6,44BC,44CO)	sectorization 04
	-to-	
	U8 (:0000,44AA,44B0,44 B6,44BC,44CO)	sectorization 32

STANDARD: Set each entry in the table relative to the sectorization selected to the address of the approach path monitor inhibit area to be used.

2.5.3 GENERAL TERRAIN MONITOR INHIBIT DEFINITIONS

2.5.3.1 GENERAL TERRAIN MONITOR INHIBIT AREA

Parameter: GTR0xQ (where x = 1 to 5)

Purpose: The General Terrain Monitor Area Inhibit Table defines up to five possible general terrain monitor inhibit areas around the primary airport. One of the general terrain monitor inhibit areas is selected by the current sectorization number. The sectorization number is used as an index into the GTIADR table which contains an address of the general terrain monitor inhibit area to be used. If a general terrain monitor inhibit area is adapted, it is always active (based upon the sectorization number). A general terrain monitor inhibit area should only be used to eliminate nuisance alarms generated as a result of practice, visual, or circling approaches. If a general terrain monitor inhibit area contains a capture box, a track will be processed by MSAW approach path monitoring if the track is qualified to be within that capture box. This area is defined as a 3 range, 3 azimuth area. A 2 range / 2 azimuth area that encompasses the antenna is defined when the larger value is in range 1, range 2 equals range 3, and azimuth 1 equals azimuth 3. A 2 range / 2 azimuth area that does not encompass the antenna is defined when the smaller value is in range 1, range 2 equals range 3, and azimuth 3 equals 5000. If a general terrain monitor inhibit area is added or deleted, ensure the parameters GTAL1Q and GTIADR are also updated.

Range of Values:	0 (0.,63 7/8, 1/8) nmi
	0 (0..63 7/8, 1/8) nmi
	0 (0..63 7/8, 1/8) nmi
	0 (0..4095, 1) acps
	0 (0..4095, 1) acps
	0 (0..4095, 1) acps

STANDARD: A general terrain monitor inhibit area may be adapted to encompass as much area as necessary within the final approach fixes, not to exceed 5 nmi from the ARP.

2.5.3.2 GENERAL TERRAIN MONITOR INHIBIT AREA CEILING

Parameter: GTAL1Q

Purpose: The General Terrain Monitor Inhibit Area Ceiling represents the altitude below which general terrain monitoring is inhibited for any areas defined in the general inhibit area table (GTR0xQ).

Range of Values: 0 (0..10000, 1) feet

Standard: it should be defined by adding 500 feet to the highest DTM bin within the general terrain inhibit area. In no cases shall the inhibit area ceiling be defined higher than the minimum vectoring altitude.

2.5.3.3 GENERAL TERRAIN MONITOR INHIBIT AREA ADDRESS TABLE

Parameter: GTIADR

Purpose: The General Terrain Monitor Inhibit Area Address Table defines the address within the MSAW site adaptation of the general terrain monitor inhibit area which is activated when a new sectorization is selected. This table is indexed by the current sectorization number (SUP xx) and gives the address of one of five possible general terrain monitor inhibit areas. The GTM inhibit areas are defined in five possible locations. An address of :0000 indicates GTIADR is not adapted.

Range of Values: U8 (:0000,44E8,44EE,44 F0,44FA,4500) sectorization 01
U8 (:0000,44E8,44EE,44 F0,44FA,4500) sectorization 02
U8 (:0000,44E8,44EE,44 F0,44FA,4500) sectorization 03
U8 (:0000,44E8,44EE,44 F0,44FA,4500) sectorization 04
-to-
U8 (:0000,44E8,44EE,44 F0,44FA,4500) sectorization 32

STANDARD: Set each entry in the table relative to the sectorization selected, to the address of the general terrain monitor inhibit area to be used.

2.5.4 VOLUME INHIBIT DEFINITIONS

2.5.4.1 NUMBER OF VOLUME INHIBIT AREAS

Parameter: NVAS1Q

Purpose: This parameter specifies the number of volume inhibit areas in the system

Range of Values: 0 (0.. NIVA, 1) volume inhibit areas

STANDARD: Define this parameter to the number of volume inhibit areas adapted in the system.

2.5.4.2 VOLUME INHIBIT AREA GROSS HIGH ALTITUDE

Parameter: VGALTQ

Purpose: The Volume Inhibit Area Gross High Altitude specifies the highest altitude for a volume inhibit area defined in the volume inhibit area altitude table. It is used as a gross filter in determining if a track is within a volume inhibit area.

Range of Values: 0 (0.,32767, 1) feet

STANDARD: Define this parameter as the highest altitude in the volume inhibit area altitude table (VALT) + 500 feet.

2.5.4.3 VOLUME INHIBIT AREA ALTITUDE TABLE

Parameter: VALT

Purpose: The Volume Inhibit Area Altitude Table defines the altitude below which a track is inhibited from general terrain processing. A volume inhibit area is used to inhibit general terrain monitoring around a satellite airport, an airport with the MSAW eligibility area within another approach control's airspace or in a specially defined area such as a Military Operations Area (MOA). Each altitude (maximum of 15) in the table corresponds to a volume inhibit area defined in the Volume inhibit Area Table (VRGxQ), respectively.

Range of Values: 0 (0..10000, 1) feet

STANDARD: The altitude of each volume inhibit area defined should be set at the highest altitude of all of the DTM bins intersecting with the volume inhibit area plus 500 feet. This value may be increased by 100 ft increments if nuisance alarms persist. If the volume inhibit area encompasses a satellite airport, in no case should the volume inhibit area altitude be adapted above the minimum vectoring altitude (MVA).

2.5.4.4 VOLUME INHIBIT AREA

Parameter: VRGxQ (where x = 01 to 15)

Purpose: The Volume Inhibit Area suppresses general terrain monitoring within the ARTS airspace. It is intended to encompass satellite and undefined airports to prevent nuisance alarms as well as a specially defined area such as a Military Operations Area (MOA). Undefined airports are airports which are not adapted in the SRGxQ. If a volume inhibit area contains a capture box (as in a secondary airport), a track will be processed by MSAW approach path monitoring if the track is qualified to be within that capture box. A volume inhibit area may also be defined for airports outside of the approach control airspace to eliminate nuisance alarms if this area is within the MSAW eligibility area (MRG1Q). It should not be adapted for an airport where the final approach fix crossing altitudes are below the radar coverage. If a new volume inhibit area is added or deleted, ensure the parameters VASADR, VALT, VGALTQ, and NVAS1Q are also updated.

Range of Values: 0 (0..63 7/8, 1/8) nmi
0 (0..63 7/8, 1/8) nmi
0 (0..4095, 1) acps
0 (0..4095, 1) acps

STANDARD: These volume inhibit areas should only be used if nuisance alarms cannot be controlled by other means. For example, at satellite airports where circling approaches cause nuisance alarms, encompass the runways and as small a traffic pattern area as possible to control alarms. A volume inhibit area may be adapted to encompass as much area as necessary within the final approach fixes, not to exceed 5 nmi from the ARP (except at the corners). For undefined airports, encompass the area within 2 to 4 nmi from the runway thresholds, not to exceed 5 nmi from the ARP. For special MSAW inhibit areas, define the volume inhibit area to the smallest area needed to suppress nuisance alarms.

2.5.4.5 VOLUME INHIBIT AREA ADDRESS TABLE

Parameter: VASADR

Purpose: The Volume Inhibit Area Address Table specifies the address within the operational program of an adapted volume inhibit area. This table is indexed to obtain the adapted volume inhibit areas. The volume inhibit areas are defined in 15 possible locations, Volume inhibit areas are named VRGxQ where x is between 01 and 15. An address of :0000 indicates VASADR is not adapted.

Range of Values: U8(:0000,:4524,:4528,:452B...:455C) (VRG0IQ)
U8(:0000,:4524,:4528,:452B...:455C) (VRG02Q)
U8(:0000,:4524,:4528,:452B...:455C) (VRG03Q)
-to-
U8(:0000,:4524,:4528,:452B...:455C) (VRG15 Q)

STANDARD: Define each entry in the table to the address of the volume inhibit area in the same corresponding position in the table VRGxQ.

2.6 MISCELLANEOUS MSAW PARAMETERS

2.6.1 TOWER AURAL ALERT AREA

Parameter: TWRAAA

Purpose: The Tower Aural Alert Area specifies the area in which the tower aural alarm will activate if a track is in altitude violation, regardless of the control position symbol. The tower position is identified by the adapted values in the tower console and the tower keyboard TWRCON and TWRKB). This area is defined as a 3 range, 3 azimuth area. A 2 range/2 azimuth area that encompasses the antenna is defined when the larger value is in range 1, range 2 equals range 3, and azimuth 1 equals azimuth 3. A 2 range/2 azimuth area that does not encompass the antenna is defined when the smaller value is in range 1, range 2 equals range 3, and azimuth 3 equals 5000.

Range of Values: 0 (0..63 7/8, 1/8) nmi
0 (0..63 7/8, 1/8) nmi
0 (0..63 7/8, 1/8) nmi
0 (0..4095, 1) acps
0 (0..4095, 1) acps
0 (0..4095, 1) acps

STANDARD: This area should be adapted no less than where the transfer of control from the TRACON to the tower is initiated. It must be adapted equal to or beyond the TRACON aural alarm inhibit area (IFRAAA).

2.6.2 IFR ALERT AREA

Parameter: IFRAAA

Purpose: The IFR Aural Alert Area specifies the area in which the aural alarm will be inhibited in the TRACON if a track is in altitude violation. This area must not extend beyond the Tower Aural Alert Area (TWRAAA). This area is defined as a 3 range, 3 azimuth area. A 2 range/2 azimuth area that encompasses the antenna is defined when the larger value is in range 1, range 2 equals range 3, and azimuth 1 equals azimuth 3. A 2 range/2 azimuth area that does not encompass the antenna is defined when the smaller value is in range 1, range 2 equals range 3, and azimuth 3 equals 5000.

Range of Values: 0 (0..63 7/8, 1/8) nmi
0 (0..63 7/8, 1/8) nmi
0 (0..63 7/8, 1/8) nmi
0 (0..4095, 1) acps
0 (0..4095, 1) acps
0 (0..4095, 1) acps

STANDARD: The IFRAAA must be defined with TWRAAA, it should define an area in which all aircraft are in communication with the tower.

2.6.3 TOWER KEYBOARD

Parameter: TWRKB

Purpose: This parameter defines the tower keyboard. The keyboard position is used in conjunction with the tower and IFR aural alert areas when MSAW alarms are issued. (See TWRAAA and IFRAAA).

Range of Values: 0 (0.. NKEY, 1) Keyboard Number

STANDARD: Define this parameter to be a keyboard in the tower at the primary airport.

2.6.4 TOWER CONSOLE

Parameter: TWRCON

Purpose: This parameter defines the tower keyboard, The keyboard position is used in conjunction with the tower and IFR aural alert areas when MSAW alarms are issued, (See TWRAAA and IFRAAA)

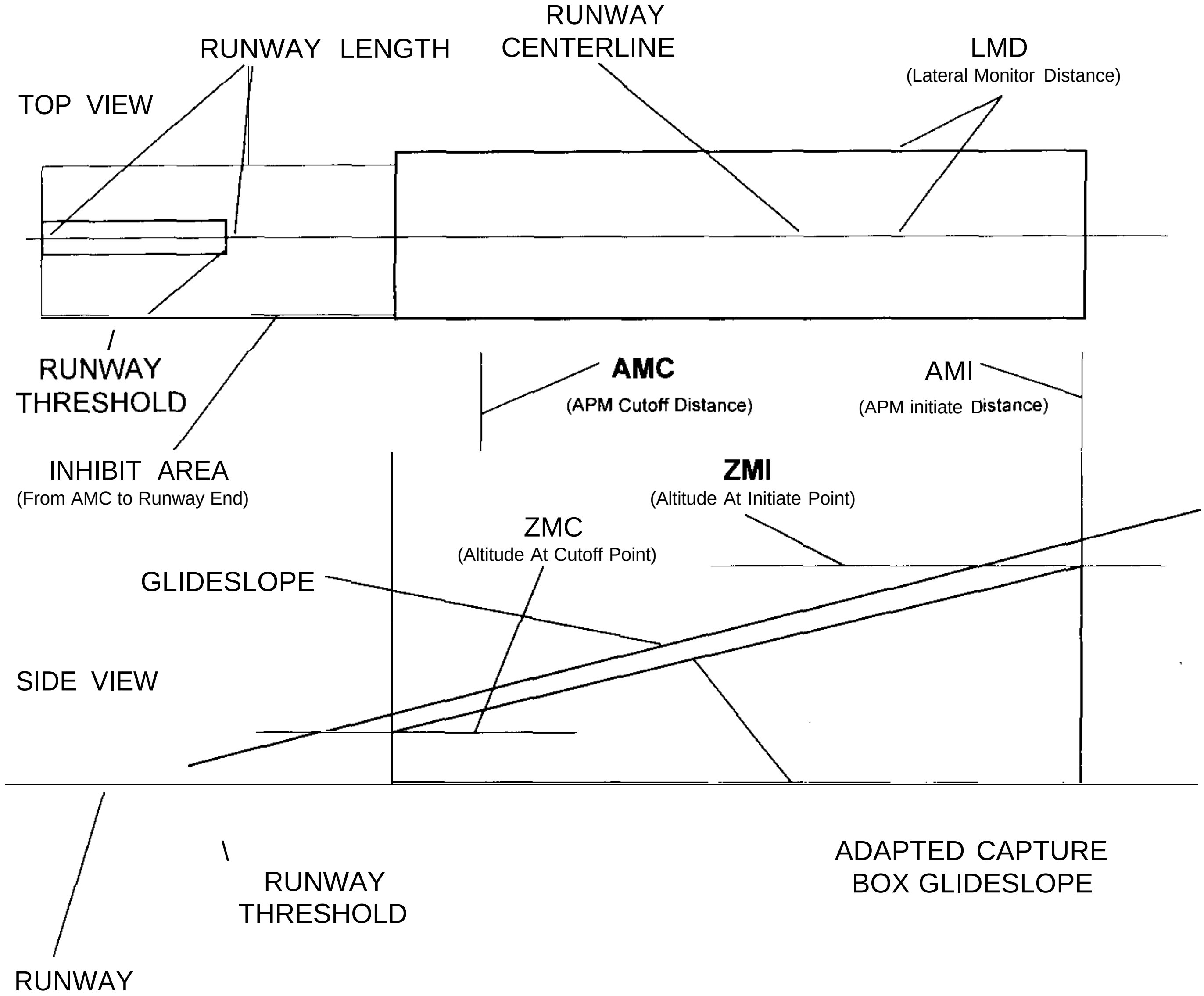
Range of Values: 0 (0.. NCON, 1) Console Number

STANDARD: Define this parameter to be a keyboard in the tower at the primary airport.

3.0 APPROACH PATH MONITORING/RUNWAY DATA TABLES

The Runway Data Tables (MRDxxy), also known as capture boxes, define the area in which Approach Path Monitoring (APM) will be executed for a track. The capture boxes allow MSAW to be more sensitive or less sensitive to terrain elevation changes depending on the adaptation of the specific capture box. Where more than one instrument approach is authorized for a single runway and the final approach course centerlines do not coincide, an additional capture box(es) could be defined. If a three capture box overlap situation occurs for a single runway, these additional capture boxes for the instrument approaches shall not be defined; only a two capture box overlap can exist. The runway data tables contain multiple parameters in order to define a single capture box. Each parameter used in the creation of a capture box is described independently. When defining capture boxes for a particular airport, ensure all capture box definitions are defined consecutively, where the first capture box address for the airport is defined in MRDAT and the number of capture boxes for the airport is defined in NAP. The order of the capture boxes by airport should be respective to the MRDAT, NAP, and the PRG1Q/SRGxQ tables. There can be a maximum of 15 capture boxes for each airport with a maximum of 15 satellite airports plus the primary airport having capture boxes defined.

When adapting the capture boxes, be aware of the terrain and obstacles in the vicinity of the capture box. Be sure that the capture box glideslope is above all terrain and obstacles in the immediate area.



CAPTURE BOX

NOTE: Each adaptable parameter of the capture box is discussed independently. Entire capture box adaptation can be found immediately following. Be advised that the capture box adaptation presented below does not agree with the NAP table. A separate sheet with a blank capture box definition has been provided for capture box documentation.

3.1 RUNWAY LENGTH

Parameter: RWL

Purpose: The runway length defines the length of the runway, from threshold to threshold. It is used to identify the area in which MSAW is inhibited for landing aircraft. The inhibit area extends from the approach path cutoff distance (AMC) to a point beyond the threshold, defined by the runway length.

Range of Values: 0 (0..4, 1/256) nmi

STANDARD: The actual runway length should be used for all straight-in approaches (approaches with a heading less than 30 degrees difference from the actual runway heading.). For approaches which exceed 30 degrees difference, use a runway length of approximately 1500 feet,

3.2 HEADING DEVIATION INDEX

Parameter HDI

Purpose: The heading deviation index designates an index into the APHT (heading deviation table) to define the heading deviation for the capture box.

Range of Values: 0 (0..7, 1) heading deviation index

STANDARD: Initially, specify an index which corresponds to a heading deviation of 90 degrees. It can be reduced if aircraft transversing a capture box but not landing are receiving incorrect MSAW monitoring,

3.3 RUNWAY HEADING

Parameter: RWH

Purpose: The runway heading defines the magnetic heading of the final approach course (capture box direction).

Range of Values: 0 (0..4095, 1) acps

STANDARD: This parameter should be defined as the magnetic heading of the final approach course to a specific runway.

3.4 RUNWAY THRESHOLD

Parameter: RXT, RYT

Purpose: The runway threshold X coordinate and Y coordinate specify the runway threshold. This point is used for determining the approach path monitor reference point.

Range of Values: 0 (-63 255/256..63 255/256, 1/256) nmi (RXT)
0 (-63 255/256..63 255/256, 1/256) nmi (RYT)

STANDARD: The runway threshold X coordinate and Y coordinate define the approach end of the runway for all straight in approaches (approaches with a heading less than 30 degrees difference from the actual runway heading). For approaches which exceed 30 degrees difference, define the threshold to be the missed approach point.

3.5 APPROACH PATH MONITOR INITIATE DISTANCE

Parameter: AMI

Purpose: The approach path monitor initiate distance defines the distance from the runway threshold in which approach path monitoring is initiated.

Range of Values: 0 (0..63 255/256, 1/256) nmi

STANDARD: Initially, this should be defined as the distance from the final approach fix to the-runway threshold. If a step down fix exists, define AMI as the distance from the step down fix to the runway threshold. Where no final approach or step down fix is available or the final approach fix is greater than 5 nmi, AMI should be defined as 5 nmi from the threshold. AMI may be increased or decreased, not to be defined smaller than the distance adapted in AMC.

3.6 APPROACH PATH MONITOR CUTOFF DISTANCE

Parameter AMC

Purpose: The approach path monitor cutoff distance defines the distance from the runway in which approach path monitoring is terminated. MSAW is inhibited from AMC to a point beyond the threshold, defined by the runway length.

Range of Values: 0 (0..15, 1/256) nmi

STANDARD: Initially, define AMC to be 1 nmi from the runway threshold not to exceed 2 nmi. The AMC should be adapted as close to the runway threshold as possible, since MSAW is inhibited from AMC to a point beyond the threshold, defined by the runway length.

3.7 CAPTURE BOX OVERLAP DESIGNATOR

Parameter COD

Purpose: The capture box overlap designator determines if this capture box overlays another capture box. Overlap can only be considered for capture boxes which are defined within the same airport area. If a three capture box overlap situation occurs for a single runway, these additional capture boxes for the instrument approaches shall not be defined; only a two capture box overlap can exist.

Range of Values: 0 (0, 1, 2) overlap type

STANDARD: If no overlap exists, the COD should be set to zero (0). Overlapping capture boxes must be defined consecutively. If an overlap is exists between two capture boxes, set the COD field of the capture box which appears in the first in the runway data table of the overlapping pair to a value of 1 or a value of 2. The COD field associated with the second capture box of the overlapping pair should be defined as 0. Set the COD to a value of 1 if the overlapping capture box headings are greater than 20 degrees; set the COD to a value of 2 if the overlapping capture box headings are less than 21 degrees. Note that the COD field for the last capture box defined for an airport should be set to 0 as the following capture box, if any, is defined for a different airport.

3.8 LATERAL MONITOR DISTANCE

Parameter: LMD

Purpose: The lateral monitor distance defines the width of the capture box from the runway centerline. The total width of the capture box is twice the value specified in the lateral monitor distance.

Range of Values: 0 (0..5, 1/256) nmi

STANDARD: This value is normally defined as 1 nmi creating a capture box which is 2 nmi wide. It may be increased or decreased depending on the approach path monitor width desired. Ensure that no high terrain or obstacles exist within the defined LMD each side of the centerline, If so, adjust the LMD, ZMI, ZMC, or AMI to remove it from the capture box or increase the elevation of the glideslope to ensure adequate alert time if the glideslope altitude is violated.

3.9 APPROACH PATH MONITOR INITIATE ALTITUDE

Parameter: ZMI

Purpose: The altitude at the approach path monitor initiate point defines the altitude at the capture box initiate point. ZMI is defined in feet above ground level (AGL). When defining AGL altitudes, subtract the altitude adapted in the Airport Altitude Table (APAL) for the appropriate airport from the approach path monitor initiate altitude in mean sea level (MSL). These altitudes may be different from the actual airport elevations. This parameter is modified at program initialization; Inspecting ZMI using Online Teletype Changer (OTC) will not display the adapted value.

Range of Values: 0 (0..4000, 1/8) feet

STANDARD: Initially, the altitude for ZMI should be defined as the altitude of the highest bin intersecting with the capture box plus 500 feet or highest obstacle within the capture box plus 500 feet, not to exceed 200 ft. per mile. The altitude for ZMI shall be defined no lower than the minimum descent altitude (MDA) of the lowest non-precision approach minus 100 ft within the final approach fix, except where a step down fix for that approach exists. If the approach path monitor initiate point (AMI) is adapted to be greater than 5 nmi, the altitude for ZMI should be defined as the altitude of the highest bin intersecting with the capture box plus 500 feet. In no cases shall ZMI be defined lower than ZMC. Where a step down fix exists set ZMI equal to the altitude at the step down fix minus 100 ft unless the fix is established for reasons other than TERPs requirements. If the step down fix exists solely for ATC procedures, noise abatement, etc., consult the Flight Standards Field Office and establish an MDA. Define ZMI as this value minus 100 feet.

3.10 APPROACH PATH MONITOR CUTOFF ALTITUDE

Parameter: ZMC

Purpose: The altitude at the approach path monitor cutoff point defines the altitude of the capture box cutoff point. ZMC is defined in feet above ground level (AGL). When defining AGL altitudes, subtract the altitude adapted in the Airport Altitude Table (APAL) for the appropriate airport from the approach path monitor initiate altitude in mean sea level (MSL), These altitudes may be different from the actual airport elevations.

Range of Values: 0 (0..4000, 1/8) feet

STANDARD: Adapt ZMC using the smallest value from the following three methods:

1. MDA of the lowest non-precision approach minus 100 feet.
2. The altitude of the precision approach glideslope minus 100 feet at AMC.
3. 320 feet multiplied by AMC minus 100 feet which establishes a 3 degree descent from AMC to the threshold.

Ensure all high terrain and obstacles are below the glideslope generated by the ZMI/ZMC settings.

3.11 MISCELLANEOUS APPROACH PATH MONITOR ADAPTATION

3.11.1 APPROACH PATH MONITOR HEADING DEVIATION TABLE

Parameter: APHT

Purpose: The Approach Path Monitor Deviation Table defines the heading deviation allowed by an aircraft from the adapted approach path monitor (capture box) heading. If the heading of the aircraft exceeds the defined value in the APHT, the aircraft will not be considered for approach path monitoring. This table is indexed by the heading deviation index (HOI) defined in each capture box definition. There is a maximum of 8 possible heading deviations.

Range of Values: 1024 (0..1024, 1) acps

STANDARD: The deviation defined for most capture boxes is 90 degrees, however, it can be reduced if aircraft transversing a capture box but not landing are receiving incorrect MSAW monitoring.

3.11.2 NUMBER OF APPROACHES TABLE

Parameter NAP

Purpose: The Number of Approaches Table specifies the number of approaches adapted for each airport defined in the approach control airspace. For the primary and each satellite airport, the number of adapted approaches is defined in the NAP table, respectively, for a total of 16 entries. Indexing into the NAP by the airport index gives the number of approaches for that airport. Note that the first entry in the table refers to the primary airport. The airport index is defined in the fix pair which is associated with the flight plan. There can be a maximum of 15 approaches associated with any single airport. Adapting zero for the number of approaches for an airport would remove all approach path monitoring for that airport.

Range of Values: 0 (0..15, 1) number of approaches

STANDARD: Define the number of approaches for each airport adapted, respectively

3.11.3 RUNWAY DATA ADDRESS TABLES

Parameter: MRDAT

Purpose: The Runway Data Address Table defines the hexadecimal address within the operational program of the approach path monitor boxes (capture boxes). For the primary and each satellite airport, the first capture box of each airport is addressed in the MRDAT, respectively, for a total of 16 entries. The number of capture boxes associated with the airport index is defined in the NAP table. Unlike other tables which supply addresses for geographical areas, there is no specific area in which a capture box may exist; however, the capture boxes for each airport must be consecutive.

Range of Values: N/A

STANDARD: N/A

4.0 NON-CONVENTIONAL PRIMARY/SATELLITE AIRPORT ADAPTATION STANDARDS

Irregular operational and environment characteristics of some terminal areas can cause excessive nuisance alarms in spite of attentive adaptation of the conventional standards described above. In these situations, pseudo-capture boxes can be defined. Pseudo-capture boxes must be defined as any other capture box (i.e. within the airport area, defined in the NAP, consecutively adapted with other capture boxes for that airport, etc.). At this point, it is very hard to present guidelines for adapting these capture boxes as each implementation of a pseudo-capture box will be unique in definition. For pseudo capture box definitions, the runway length and the capture box cutoff distance should be set to 0. This is because the fictitious runway threshold for the pseudo capture box will be the cutoff distance where approach path monitoring will be terminated for that pseudo-capture box.

Consider pseudo capture boxes for use in providing approach path monitoring in visual approach corridors or multiple step down approaches. Capture boxes can be used to inhibit MSAW general terrain projection and reduce the prediction time to 15 seconds (system parameter) if for example aircraft on a downwind approach turning to final get projected into an area beyond the capture box associated with the final approach heading. In this example, the pseudo-capture box is defined in the corridor where the turn is initiated/completed to the final approach heading insuring that the pseudo-capture box intersects with the conventionally defined capture box, Note that the altitude of the pseudo-capture box should not be set to an altitude lower than that defined in the digital terrain map, as it is only used in inhibiting projection.

In step down approaches, capture boxes can be “lined up” end-to-end with each successive capture box approaching the runway threshold having the same heading, only different altitudes, In this example, flat capture boxes can be used to define each “step” or different glideslope angles. For this pseudo capture box, define AMC to be the distance to the step down and ZMC the altitude of the step down. Define AMI and ZMI to values associated with the final approach fix or the next furthest step of the approach according to the guidelines above. Monitoring from the step down fix to the threshold will be provided by the conventionally defined capture box.

When adapting pseudo-capture boxes, consider all obstacles within the defined area as well as obstacles which exist on the boundaries. The altitude of the pseudo-capture box (ZMI and ZMC) should not be much less than 500 feet above the ground or highest obstacle and should exist within the appropriate airport area. When adapting conventional capture boxes as well as pseudo capture boxes, consider mapping them on a topographical map. Remember, if you choose to map them, consider the magnetic declination of the antenna, as the topographical map maybe aligned to true north.

Use caution when adapting AMI, AMC, ZMI, and ZMC. Adjusting any one of these parameters effects the glideslope angle and the altitude of the glideslope at a specified distance from the runway threshold. For instance, if AMI is increased or ZMI is decreased, the glideslope angle will decrease along with the altitude at the specified point from the runway threshold. This means the altitude of the terrain and obstacles which exist inside and in the immediate area of the capture box must be verified to be below the adapted glideslope. Conversely, if AMI is decreased or ZMI is increased, the glideslope angle will increase along with the altitude at the specified point. If AMC is decreased or ZMC is increased, the glideslope angle will decrease and the altitude at the specified point will increase. On the other hand, if AMC is increased or ZMC is decreased, the glideslope angle will increase and the altitude will decrease.

5.0 GENERAL TERRAIN MONITORING ADAPTATION

A track receives General Terrain Monitoring (GTM) when it is determined to be outside all inhibit and approach path monitor areas. GTM consists of a Digital Terrain Map (DTM), which provides MSAW with local terrain and obstacle elevation information. The DTM is comprised of 2nmi by 2 nmi bins, creating a grid covering a 128 nmi by 128 nmi area. Each bin has an assigned altitude which is used to for comparison against the track's altitude in determining if an altitude violation has occurred.

5.1 ALTITUDE TABLE

Parameter: ALTBLE

Purpose: The Altitude Table provides elevation information for the digital terrain map. The Altitude Table contains 84 entries, each representing a unique altitude in 100 ft increments. It is indexed by the Digital Terrain Map for altitude elevation of a specific area. If the Altitude Table is updated, ensure HIGHQ and GHALTQ are updated as well.

Range of Values 0 (0..27700, 1) feet

STANDARD: The first entry in the Altitude Table is -10,000 which represents an off-map indication. This is used to define altitudes of bins which exist beyond 60 nmi from the antenna. Each successive entry represents an altitude rounded up to the next 100 ft increment. Duplication of altitudes within this table is not recommended.

5.2 DIGITAL TERRAIN MAP

Parameter: DTM

Purpose: The Digital Terrain Map is comprised of 2nmi by 2nmi bins, covering a 128 nmi by 128 nmi area. Each bin is assigned an altitude by an index into the Altitude Table.

Range of Values: 0 (0..63, 1) ALTBLE index

STANDARD: Bins which entirely exist beyond 60 nmi from the antenna should contain an index into the Altitude Table in which an off-map value is stored. All other bins should contain indexes into the Altitude Table other than the off-map value representing terrain and obstacle elevations.

6.0 CONFLICT ALERT ADAPTATION

Conflict alert provides three types of processing. Type 3, the most stringent processing is provided to all associated tracks within the ARTS area who are not in close proximity to an airport. As an aircraft turns final it will enter a type 2 area, where conflict alert processing is slightly desensitized. This area typically starts at approximately 8 mile final and continues to the type I area. As the aircraft approaches the landing area, it will enter the type I area associated with that airport. This area is typically approximately 2 mile radius surrounding the airport and provides less sensitive processing than a type II area.

6.1 GROSS LOW ALTITUDE FOR ALL CONFLICT ALERT PROCESSING

Parameter CALOWT

Purpose: The Gross Low Altitude for All Conflict Alert processing specifies the altitude the track must be at or above to receive any type CA processing. Tracks below this altitude are inhibited from CA processing.

Range of Values: 0 (0..32767, 1) feet

STANDARD: Set this parameter to and altitude not higher than GLALTQ, the altitude in which the track must at or above to receive MSAW processing.

6.2 CONFLICT ALERT BEACON FLAG

Parameter: CABCFL

Purpose: The Conflict Alert Beacon Flag either enables or disables beacon codes which have been adapted for conflict alert inhibiting.

Range of Values: 0 (0..1, 1)

STANDARD: Set this parameter to 0, disabling any adapted beacon codes. When required, conflict alert should be inhibited via keyboard entry not beacon code assignment.

6.3 MAXIMUM ALTITUDE FOR AN AREA

Parameter: MXALQ

Purpose: The Gross High Altitude for an area specifies the altitude a track must be at or below to receive type I or II processing. Each type I and II area contains this parameter. Tracks above this altitude receive type Ill processing.

Range of Values: 0 (0..32767, 1) feet

STANDARD: Set this parameter to and altitude not higher than field elevation plus 3000 feet

6.4 AREA LOW POINT

Parameter: ALALT

Purpose: The Gross Low Altitude for an area specifies the altitude the track must be at or above to receive CA processing. Each type I and II area contains this parameter. Tracks below this altitude are inhibited from CA processing.

Range of Values: 0 (0..32767, 1) feet

STANDARD: Set this parameter to an altitude not higher than field elevation plus 200 feet.