NOTICE

U.S. Department of Transportation
Federal Aviation Administration

N 8200.94

07/25/06

Cancellation Date: 07/25/07

SUBJ: **Interim Change to FAA Order 8200.1C, Chapter 15**

1. PURPOSE. This Notice addresses concerns that localizer signal strength and clearances are not being inspected in areas where the facility is used. This Notice is issued as interim guidance and describes where to position the aircraft during specific flight inspection maneuvers.

2. DISTRIBUTION. This Notice is distributed to Air Traffic Technical Operations Service Areas, to the Air Force Flight Standards Agency, to the U.S. Navy Airspace and Air Traffic Control Program, to the U.S. Army Air Traffic Control Center, to all Aviation System Standards Flight Inspection Operations Offices and Crewmembers, and to special addressees.

3. CANCELATION: This Notice cancels Notice N 8200.88, Interim Changes to update FAA Order 8200.1C with FAA Order 6750.49A Changes (Corrected).

4. BACKGROUND. The definition of Lowest Coverage Altitude (LCA) was changed in FAA Order 8200.1C, dated October 1, 2005. The change was made to align FAA Order 8200.1 with International Civil Aeronautical Organization (ICAO) Annex 10, Aeronautical Telecommunications, Volume I, (Radio Navigation Aids), and Document 8071, Volume I, Testing of Ground-Based Radio Navigation Systems. The change was also made to separate the evaluation of the facility performance from the Standard Instrument Approach Procedure. The change to an ICAO-based definition of LCA has caused confusion and concern among aircrews. Some crews are concerned that signal strength and clearances on localizers is not being inspected in areas where the facility could be used. Research using ICAO documents and FAA Order 8260.3, United States Standard for Terminal Instrument Procedures (TERPS), was used to develop a replacement for LCA. ICAO recommendations on where to measure coverage, course width and clearances, and TERPS obstruction clearance criteria were considered. This notice deletes the use of the term LCA and replaces it with a description of where to position the aircraft during specific flight inspection maneuvers.

Distribution: ATO-W Service Areas; Air Force Flight Standards Agency; U.S. Navy Airspace and ATC Program; U.S. Army ATC Center; Aviation System Standards Flight Inspection Operations Offices and Crewmembers

Initiated By: Air Traffic Technical Operations (ATO-W) Aviation System Standards Flight Inspection Policy (AJW-331)

This notice provides an updated ILS chapter that also includes additional interim guidance that will be incorporated in the next change. Explanation of Changes:

- Paragraph 15.10.b, NOTE deleted. No longer applicable, as single transmitter facilities are acceptable, provided they meet the Level 2 performance requirements. Updated new office name
- Paragraph 15.12a, Updated new office name.
- Paragraph 15.12h, Change 5 to FAA Order 6750.49A, Notice 8200.88**.**
- Paragraph 15.20b, Replaced term LCA with specified altitude.
- Paragraph 15.20b, NOTE * Clarification of Installed added.
- Paragraph 15.20e, Replaced term LCA with procedural altitude.
- Paragraph 15.20f, Replaced term LCA with specified altitude. Added NOTE for guidance for non-repeatability of clockwise and counter clockwise measurements of localizer width in the same configuration. Reworded second to the last paragraph for sentence structure.
- Paragraph 15.20g(1)(e), Corrected reference paragraph.
- Paragraph 15.20g(2), Corrected reference paragraph. Updated new office names.
- Paragraph 15.20j, Replaced term LCA with specified altitude. Removed requirement to fly on course from 18 nm to 10 nm. Removed reference to Pt C.
- Paragraph 15.20k Replaced term LCA with specified altitude. Corrected flow chart.
- Paragraph 15.20m Replaced term LCA with specified altitude.
- Paragraph 15.30f Replaced term LCA with GSI. Updated new office of responsibility.
- Paragraph 15.30n Replaced term LCA with GSI
- Paragraph 15.51c(1)(c) Removed 10µA linearity tolerance per recommendations from third party engineering perspective.
- Paragraph 15.51e, Change 5 to FAA Order 6750.49A, Notice 8200.88. Corrected Independently Monitored Back course Alignment reference limit (from 8µA to 10µA). Added clarification to 15.51e(2)(a)10
- Figure 15-8, Change 5 to FAA Order 6750.49A, Notice 8200.88.
- Paragraph 15.60b, Corrected reference for Reference Datum Height (RDH).
- Paragraph 15.60c, Change 5 to FAA Order 6750.49A, Notice 8200.88.
- Paragraph 15.60d, Change 5 to FAA Order 6750.49A, Notice 8200.88.

5. GUIDANCE: Please insert the attached pages in front of Chapter 15 in FAA Order 8200.1C, United States Standard Flight Inspection Manual, and use as interim guidance pending publication of Change 1 to FAA Order 8200.1C.

Additional Pen and Ink changes:

Appendix 1, Page A1-11, add: ILS--Half ILS Glide Path Sector. The sector in the vertical plane containing the ILS glide path and limited by loci of points nearest to the glide path at which 75 µA occurs".

Appendix 1, Page A1-11, delete: "ILS Lowest Coverage Altitude (LCA)" definition in its entirety.

/s/

Thomas C. Accardi
Director of Aviation System Standards

Attachment

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CHAPTER 15. INSTRUMENT LANDING SYSTEM (ILS)

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CHAPTER 15. INSTRUMENT LANDING SYSTEM (ILS)

SECTION 1. GENERAL

15.10 INTRODUCTION. This chapter provides instructions and performance criteria for certifying localizer and glidepath which operate in the VHF and UHF band. Flight inspection of the associated facilities used as integral parts of the instrument landing system must be accomplished in accordance with instructions and criteria contained in their respective chapters of this order or in other appropriate documents.

The two basic types of localizers are single frequency and dual frequency. Localizers are normally sited along the extended centerline of the runway; however, some are offset from the extended centerline. Localizer type directional aids (LDA) may be located at various positions about the runway.

Another type of facility which provides azimuth guidance is the simplified directional facility (SDF). The two basic types of SDF facilities are the null reference type and the phase reference type.

The three basic image array glide slope systems are null reference, sideband reference, and capture effect. The two non-image array systems are the endfire and the waveguide.

Flight inspection techniques using the FAA automated flight inspection system (AFIS) are detailed in other directives. Where AFIS is available, these techniques must be used to accomplish the approved procedures in this chapter.

a. ILS Zones and Points. ILS zones and points are defined in Appendix 1 and are illustrated in Figures 15-1.

b. ILS Facilities Used for Higher Category Service. Some Category I ILS(s) are used to support higher than normal category of service, IAW Order 8400.13, Procedures for the Approval of Special Authorization CAT II & Lowest Standard CAT I Operations. These facilities support SIAP(s) with authorized lower than Category I minima. These systems will be identified in the Facility Database. They must be evaluated fully to the standards and tolerances of the higher category. When a facility is initially identified for use at the higher category, Aviation System Standards Flight Inspection Operations Technical Services Sub-Team will research the inspection history to determine which checks are required to bring the system to the higher standard.

c. Category I ILS Facilities (Localizer and Glide Slope Installed) Used to Support lower than Category I Operations. Many Category I ILS(s) are used below the standard Category I Decision Height of 200 ft through the use of autoland in Visual Meteorological Conditions (VMC), authorization of lower than Category I visibility minima, or published helicopter approaches. Use below Category I requires user knowledge of system suitability as indicated by the furthest ILS point where the localizer structure meets Category III standards.

(1) Qualifying Localizers must be evaluated for structure through Zone 5, and glide slope clearance below path must be evaluated to runway threshold. These limited checks are accomplished to evaluate the ILS's ability to provide service in the areas of expanded usage.

(2) The ILS is not evaluated to other Category II/ III tolerances since there will be no published Category II/ III procedures.

(3) Based on the results of the localizer structure checks, classification codes from FAA Order 6750.24, ILS and Ancillary Electronic Component and Performance Requirements, must be updated and published in the Airport/ Facility Directory. For example, when Category I Localizer structure is satisfactory through Zone 5, the Airport / Facility Directory for that facility will be upgraded to I/ E.

(4) If the Glide Slope clearance below path checks are not satisfactory to runway threshold, Localizer Zones 4 and 5 structure must still be evaluated for potential takeoff guidance through Zone 5 using the Rollout procedure.

d. 75 MHz Markers. The marker beacon is a VHF radio transmitter which propagates an elliptically-shaped (fan) vertical radiation pattern on an assigned frequency of 75 MHz. The radiation pattern is composed of a major and a minor axis. The major axis is defined as the longest diameter of the elipse, while the minor axis is the shortest diameter. See Figures 15-2 and 15-3.

Functionally, maker beacons provide an aural and visual indication of station passage in association with facilities providing course guidance. Identification is provided by both a modulation frequency and a keying code.

Although marker beacons are basically of the same type and function, their nomenclature is generally divided into two categories: ILS markers and fan markers. The operational requirements and category are dependent upon instrument flight procedural application.

(1) ILS Markers Description. These markers are located on the approximate instrument runway centerline-extended in accordance with installation criteria specified in other documents. They are installed to indicate the position of an aircraft along the instrument approach course.

Outer Marker (OM)

Modulation Frequency. 400 Hz, Visual Signal—Illuminates the blue lamp.

Keying Code. Continuous dashes as a rate of two per second.

Middle Marker (MM)

Modulation Frequency. 1300 Hz, Visual Signal—Illuminates the amber lamp.

Keying Code. Alternating dots and dashes at a rate of 95 combinations per minute.

Inner Marker (IM)

Modulation Frequency. 3000 Hz, Visual Signal—Illuminates the white lamp.

Keying Code. Continuous dots at a rate of six dots per second.

(2) Fan Markers (FM) Description. These markers are generally associated with nonprecision approach procedures. However, they may be associated with an ILS to serve as a localizer stepdown fix or MAP for circling approaches to secondary airports.

Modulation Frequency. 3,000 Hz, Visual Signal—Illuminates the white lamp.

Keying Code:

(a) Back Course Marker. Two dot pair at a rate of 95 pair per minute; older equipment 72 pair a minute.

(b) Other Installations. Morse code letter R (• — •). Where more than one approach marker is located in the same area, different identification keying is necessary to avoid confusion. The Morse code letters K (— •—), P (• — — •), X (— • • —), and Z (— — • •) will be used in the priority listed.

15.11 PREFLIGHT REQUIREMENTS

a. ILS Facilities Maintenance Personnel. Prepare for flight inspection in accordance with Chapter 4, Section 3.

b. ILS Flight Check Personnel. Prepare for flight inspection in accordance with Chapter 4, Section 3.

c. ILS Special Equipment Requirements. AFIS is the standard system for ILS flight inspection and must be used for all commissioning checks except where RTT is required to support military contingencies. RTT may be used for all other checks; however, it should not be used solely to bypass the need for facility data of sufficient accuracy to support AFIS. AFIS or RTT must be used for all categorization or After-Accident checks. Except as limited by this paragraph, a standard theodolite may be used as indicated below:

(1) CAT I/ II/ III Localizer periodic or special checks

(2) CAT I Glide Slope periodic or special checks

(3) CAT II/ III Glide Slope checks not requiring determination of actual path angle or path structure**.**

d. ILS Glidepath Origination Point. The glidepath origination point is required for AFIS-equipped aircraft. For image array glide slopes, engineering personnel must supply the latitude/ longitude of the antenna mast and the mean sea level elevation of the glidepath origination point. For non-image arrays, engineering personnel must supply the latitude, longitude, and mean sea level altitude of the glidepath origination point.

e. ILS Angular Reference. With the exception of Tilt Checks IAW Section 3 which are referenced to localizer deflection, all glide slope offset angular measurements are referenced to a point on a localizer centerline abeam the glide slope origination point.

ILS ZONES AND POINTS
Figure 15-1A(1)

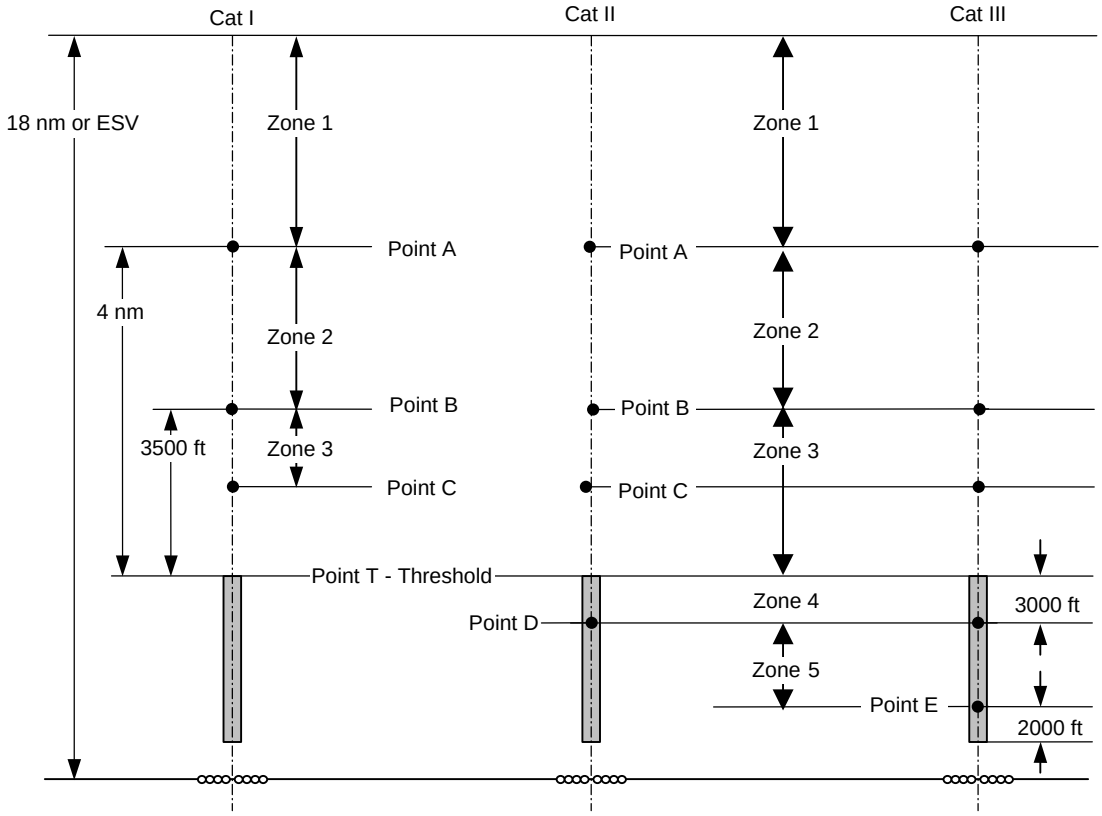


Figure 15-1A(2)
TYPICAL OFFSET ILS

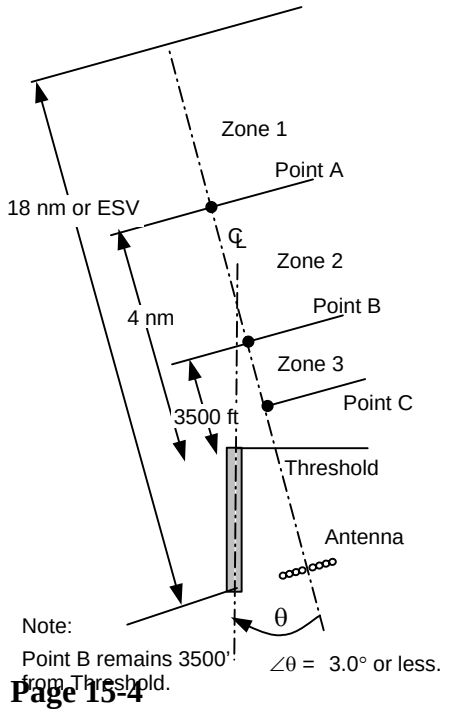
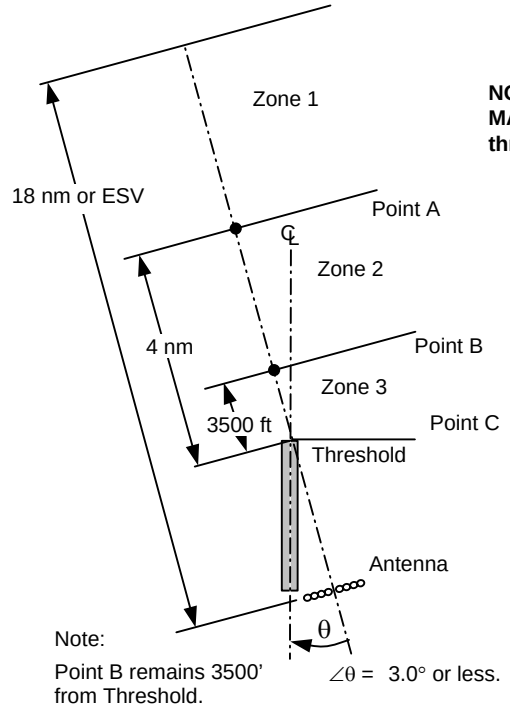


Figure 15-1A(3)
TYPICAL OFFSET LOCALIZER



NOTE: Point C is the MAP and may be prior to threshold

LDA CONFIGURATIONS

Figure 15-1B(1)

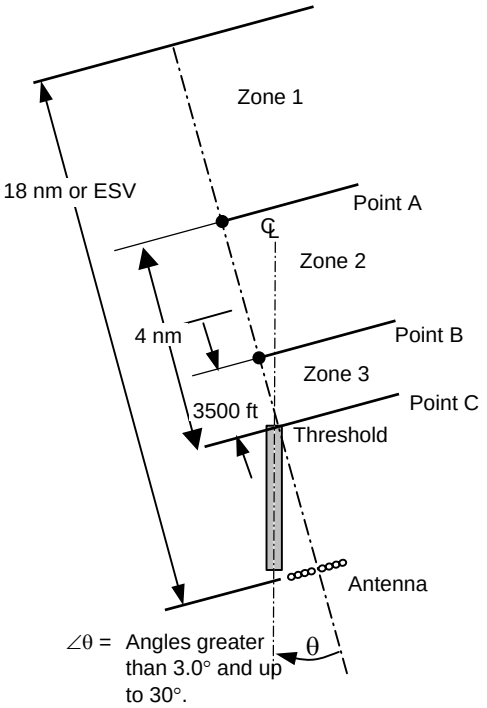


Figure 15-1B(2)

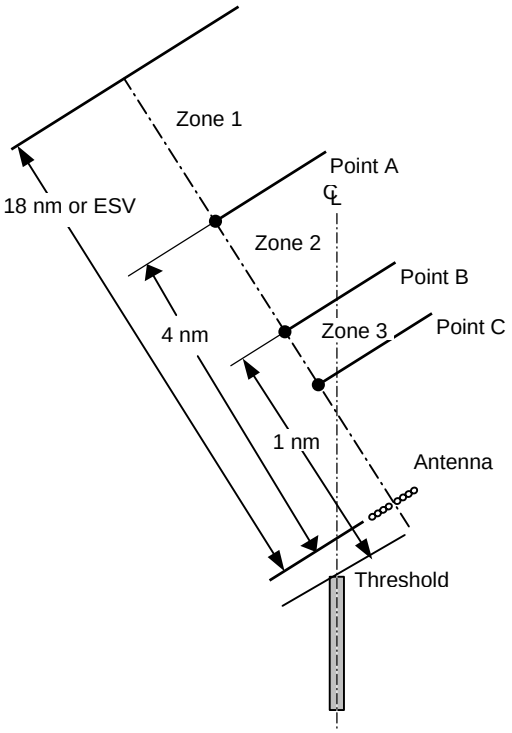


Figure 15-1B(3)
Back Course Localizer/ SDF

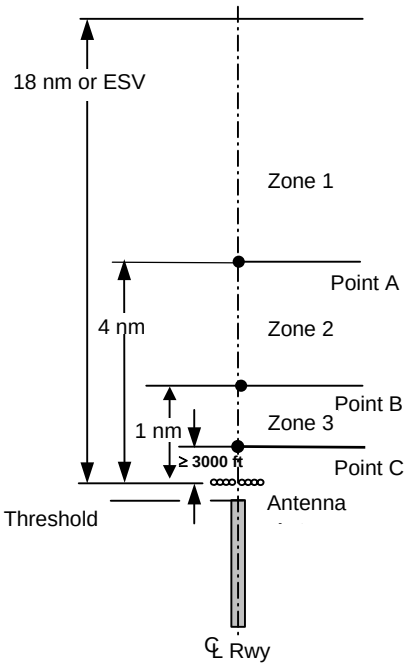
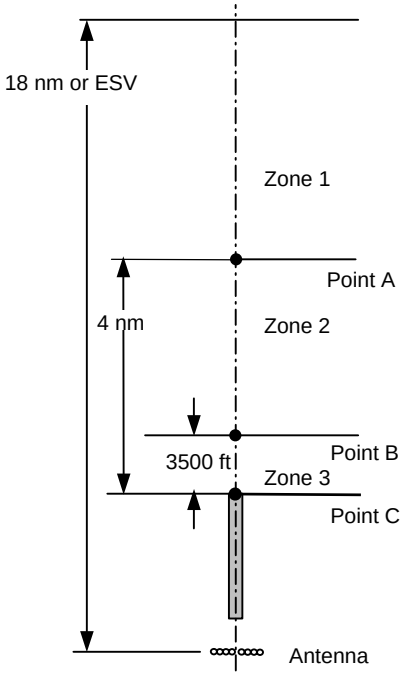


Figure 15-1B(4)
Localizer/ SDF Approach

NOTE: Point C is the MAP and may be prior to threshold



f. ILS Theodolite Procedures. The RTT or theodolite will be positioned in accordance with the following criteria:

(1) Glide Slope Image Array Systems

(a) First Method

1 Through engineering survey data or by use of the theodolite itself, determine the difference in elevation, to the nearest inch, between the ground plane at the base of the antenna mast and the center of the runway opposite the mast. This can be accomplished by sighting with the theodolite to a surveyor's marker pole placed at the center of the runway opposite the mast or vice versa. If the crown of the runway is higher than the ground level at the antenna, the difference is treated as a minus value; if lower, the difference is a plus value. If the elevation difference determined above (minus value only) provides a comfortable eyepiece height, the theodolite may be positioned at that height at the base of the antenna mast and steps 2 through 5 disregarded.

> **NOTE:** Where the elevation of the base of the antenna mast is more than 62 inches lower than the center of the runway opposite the antenna, alternate procedures to theodolite positioning should be considered. One such alternate is to apply steps 1 through 5 using an image position for the antenna base on the side of the runway opposite the facility.

2 Place the theodolite at the base of the glide slope antenna mast with the eyepiece 62 inches above the ground.

3 Sight along a line between the antenna mast and the center of the runway threshold with the eyepiece set at the commissioned or desired vertical angle.

4 Using a marker pole, determine the position on the ground along the line in Step 3 which is exactly 124 inches, plus or minus the elevation difference obtained from Step 1. For example, if the runway is higher, subtract the elevation difference from 124 inches, if lower, add the elevation difference to 124 inches.

5 Establish the eyepiece height of the theodolite at 62 inches with the commissioned angle (or desired vertical angle) of the glidepath set in the theodolite.

(b) Second Method. This method applies to locations where the transverse slope between the glide slope antenna base and the runway edge is irregular, e.g., pedestal runway. The determination of the irregular transverse slope and use of this procedure must be made by engineering/ installation personnel.

1 Place the theodolite at the base of the glide slope antenna mast with the eyepiece 62 inches above the ground.

2 Sight along a line between the glide slope antenna mast and the center of the runway threshold with the eyepiece set at the commissioned angle (or desired vertical angle).

3 Using a marker pole, determine the position on the ground where the optical angle passes through the 124-inch point of the marker pole. Mark this position for future use.

4 This is the correct position for placing the theodolite with the eyepiece 62 inches above the ground. To verify that the theodolite barrel is aligned to the optical line of the glidepath, adjust the vertical reference to a negative glidepath angle, rotate the azimuth 180° and sight on the point established in Step 1(b)1. If this point is not aligned to the horizontal crosshair, an error in establishing the theodolite position has occurred and the procedure should be accomplished.

(2) Waveguide Glide Slope

(a) Due to the complexity of determining the proper location of the theodolite, engineering personnel must compute this location.

(b) The glidepath signal is considered to emanate from the mid-point of the array; therefore, the theodolite will be oriented to this plane.

(c) Correction Factors. Due to offset distance of the theodolite from the runway centerline and distance from the antenna array, parallax errors will be induced (dissimilar width sensitivities particularly in Zone 3). Engineering personnel must provide the flight inspection crew with correction factors to be applied to the RTT differential trace.

(3) Endfire Glide Slope

(a) The glidepath signal is considered to emanate from the phase center of the array and at the elevation plane determined by engineering personnel.

(b) The theodolite must be positioned using the data in paragraph (3)(a) corrected for eyepiece height.

(4) Localizer. The use of a theodolite, AFIS, or RTT is not required for any inspection on a localizer sited along runway centerline, regardless of category, providing performance can be satisfactorily evaluated by flying a visual centerline track.

The position of the theodolite, when used during localizer evaluations, will be placed on a line perpendicular to the localizer antenna array aligned so as to sight along the reciprocal of the calculated true course and at a point as close to the center of the array as possible.

(5) Aircraft Tracking

(a) Glide Slope. The optimum tracking point on the flight inspection aircraft is the glide slope antenna.

(b) Localizer. The optimum tracking point on the flight inspection aircraft is the localizer antenna.

g. 75 MHz Marker Facilities Maintenance Personnel. The following information must be furnished to flight inspection prior to the commissioning check:

(1) The proposed operational configuration of any adjacent marker beacon facilities which could produce interference (e.g., simultaneous operation proposed or interlock device installed).

(2) Any facility alterations performed because of unique siting requirements (e.g., 8 KHz frequency separation between markers serving parallel approaches).

h. 75 MHz Marker Flight Check Personnel. The calibration card must be used to obtain the milliampere equivalent of 1,700 microvolts (μV) required for each modulation frequency (400 Hz, 1,300 Hz, 3,000 Hz) (e.g., 1.8 milliampere (mA) may represent the 1,700 μV level instead of 2.0 mA). Determine the number of light lines which represent the 1,700 μV signal, and use this reference as the minimum acceptable signal level when evaluating marker beacon coverage.

15.12 FLIGHT INSPECTION PROCEDURES

a. Types of Inspections and General Procedures

(1) ILS Site Evaluations. Site evaluations, if performed, are made prior to installation of permanent equipment. The need for a site evaluation, and additional requirements, must be determined by engineering personnel on the basis of individual site conditions.

(2) Periodic Checks. A periodic check without monitors must consist of an inspection of the localizer and glide slope transmitter that is on the air, plus the operating transmitter of the supporting NAVAID(s_. If out-of-tolerance conditions are found, inspect the standby equipment, if available.

(3) Periodic with Monitors. Normally consists of a periodic performed on both primary and standby equipment, a monitor check on the operating transmitter, and a check on the operating transmitter of supporting NAVAID(s). Facilities that have dual parallel monitors require a monitor evaluation on one transmitter only. Matching transmitter power and phasing parameters is a maintenance action verifiable without airborne measurements. Facilities gathering reference data may request a special flight inspection to include a monitor check on both transmitters. Dual transmitter facilities with separate and dedicated monitors for each transmitter require monitor evaluation on each transmitter. On the same transmitter that monitors are checked, perform a normal localizer course width and/ or glide slope path width prior to checking the monitor conditions.

(4) Frequency Change. Following a localizer (SDF, LDA) or ILS frequency change, conduct a special inspection that fulfills the following requirements: Periodic with monitors (Pm), RF power monitor reference, and spectrum analysis.

(5) Other Component Changes. See Chapter 4, Section 1.

(6) Restrictions Based on Commissioning-Only Checks. When a facility restriction is based on a configuration normally checked only on commissioning inspections (e.g., localizer clearances in narrow or coverage with reduced power), document the condition and configuration on the Facility Data Sheet. Conditions found in these configurations do not require revalidation on periodic inspections.

(7) Restriction Removal. Restricted facilities must be evaluated on each inspection with the goal of removing restrictions that are no longer valid. Do not check configurations beyond the scope of the scheduled inspection, unless restriction removal can be expected. If the results of the current and last periodic interval inspections indicate a potential for restriction removal, notify the Aviation System Standards Flight Inspection Technical Services Sub-Team. They must review at least the last five years of inspection history. They must analyze the history and current results for maintenance actions, trends, seasonal differences, etc., to determine if restriction removal is appropriate. If an additional inspection is required, they must specify and schedule the required checks to be done with the next appropriate inspection. For those restrictions based on commissioning-only configurations, do not remove the restrictions without a check of those configurations.

(8) Back Course Use. A localizer back course used for missed approach guidance must meet the same checklist requirements and tolerances as one used for an approach.

(9) ILS Critical Area Checks. These checks are usually requested to determine the effects of permitting aircraft, vehicles, or other mobile objects to transition through ILS critical areas. The results of these flight inspections are valid only for the specific conditions existing at the time of the check and are not suitable for determination of facility performance status or reliability.

(10) Maintenance Request Checks. Items identified as “Maintenance Request” in the individual checklists are so labeled to support current FAA maintenance practices with current FAA equipment. They usually identify checks that can be performed using ground test equipment, as well as aircraft. While FAA maintenance may be able to do these checks, other maintenance activities may require flight inspection for these parameters. Flight inspection and maintenance personnel must discuss these items to ensure the adequacy of the flight check.

b. Standby Equipment – Localizer/ Glide Slope. Where dual equipment is installed, complete all checklist items for both sets of equipment, except as noted in the text of this chapter and the checklists.

c. Standby Power – Localizer/ Glide Slope. Refer to Chapter 4, Section 3. If required, make the following checks while operating on standby power.

(1) Localizer. Course width, alignment, symmetry, modulation, and identification.

(2) Glide Slope. Modulation, width, angle, symmetry, and structure below path.

d. Expanded Service Volume (ESV). Where an operational requirement exists to use either or both the glide slope and localizer to altitudes and/or distances beyond the standard service volume, the facility (ies) must be inspected to the expanded altitudes and/or distances (in accordance with Paragraph 22.11b) to determine that facility performance for the required parameters meets tolerances.

(1) Localizer. The localizer Standard Service Volume (SSV) is depicted in Figure 15-12. Use beyond these limits requires an ESV approved by spectrum management and validated by flight inspection.

(2) Glide Slope. The glide slope SSV is depicted in Figure 15-13.

e. Supporting NAVAID(s). These may consist of marker beacons, a compass locator, DME, and/or lighting systems. Additionally, some locations may require other types of NAVAID(s) to support the approach procedures. Verify RHO-THETA crossing radials associated with an ILS approach IAW Chapter 11.

f. Instrument Flight Procedures. See Chapter 6.

g. General Checklist. During a specific inspection, check the following items:

	A	**E**	**C**	**PM**	**P**
75 MHz Marker Beacons	X	-	X	X	X
Compass Locator	X	-	X	X	X
DME	X	-	X	X	X
Lighting Systems	X	-	X	X	X
Standard Instrument Approach Procedure (see Chapter 4, Section 2 and Chapter 6)	X	(1)	X	(1)	(1)

NOTE:
(1) As required by ground technical or flight inspection personnel.

h. Facility Checklists by Type. Flight inspection requirements are contained in the following checklists and in the discussion paragraphs in this chapter. The checklists are provided as a guide and do not necessarily indicate a sequence of checks. Consult the text to ensure a complete inspection.

Legend:

Fc = Localizer front course

Bc = Localizer back course

C = Commissioning or commissioning-type equipment.

E = Site evaluation

Pm = Periodic inspection with monitors

P = Periodic inspection without monitors

(1) Single Frequency Localizer, LDA(s), and SDF(s).

NOTE: Bc checks do not apply to uni-directional antennas.

TYPE CHECK	REFERENCE PARAGRAPH	INSPECTION				FACILITY CONFIGURATION	MEASUREMENTS REQUIRED					
		E	C (6)	Pm (7)	P		MODULATION	WIDTH	SYMMETRY	CLEARANCE	ALIGNMENT	STRUCTURE
Spectrum Analysis	15.20a	Reserved										
Ident. & Voice	15.20o	(1)	X	X	X							Fc&Bc
Modulation Level	15.20b	X	X	X	X	Normal	Fc					
Modulation Equality (2) Caution: HMI	15.20c	(1)	(1)			Carrier Only						
Phasing (3) Caution: HMI	15.20e	(1)	(1)			Quadrature	Set to Value of Modulation Equality					
Width & Clearance (9)	15.20f 15.20k	X	X	X	X	Normal	Fc&Bc	Fc&Bc	Fc&Bc	Fc&Bc		
Clearance Comparability (10)	15.20k(1)		X			As Required		Fc&Bc		Fc&Bc		
Alignment and Structure	15.20g	X	X	X	X	Normal	Fc&Bc				Fc&Bc	Fc&Bc
Localizer Only Minima	15.20g(1)	X	X			Normal	Fc&Bc					Fc&Bc
Polarization (10)	15.20n	X	X	X	X	Normal						Fc&Bc

TYPE CHECK	REFERENCE PARAGRAPH	INSPECTION				FACILITY CONFIGURATION	MEASUREMENTS REQUIRED					
		E	C (6)	Pm (7)	P		MODULATION	WIDTH	SYMMETRY	CLEARANCE	ALIGNMENT	STRUCTURE
Monitors (5) Width	15.20i 15.12a(3)	(1)	X, (11)	X		Wide		Fc&Bc		Fc&Bc		
		(1)	X, (11)			Narrow		Fc		Fc		
Alignment Caution: HMI	15.20i	(1)	(1)			Shifted Alignment					Fc	
RF Power Monitor Reference (8)(10)	15.20j	(1)	X			Reduced RF Power				Fc&Bc		Fc&Bc
High Angle Clearance (10)	15.20k(3)	X	X			Normal	Fc&Bc			Fc&Bc		
Standby Equipment	15.12b 4.33b		X	X								
Standby Power (10)	15.12c 4.33c		X			Normal	Fc&Bc	Fc&Bc	Fc&Bc		Fc&Bc	

FOOTNOTES:

(1) Maintenance request

(2) Adjustments to carrier modulation balance will require a subsequent check of course alignment.

(3) Width and clearance should be measured prior to the phasing check. If, after the quadrature phase check, the width has remained the same or has narrowed and/or the clearances have increased from the first width and clearance check, then the phasing has been improved. Final determination of optimum phase should be discussed with Facilities Maintenance personnel.

(4) (Reserved)

(5) Facilities with dual transmitters and single solid state modulators—check both transmitters.

(6) Replacement of an antenna array with a different type (e.g., V-Ring elements to LDP element, 8-element to 14-element), require commissioning inspection checks, except for those checks not required, as determined jointly by flight inspection and Facilities Maintenance personnel.

(7) Same type antenna replacements require PM checks, in addition to all of Zone 1 structure (Paragraph 15.20g(3)) and localizer only structure checks (Paragraph 15.20g(1)(b).

(8) Request RF level in watts from ground technician.

(9) Recheck clearances each 1,080 days at the lower standard altitude of 1,500 feet above the antenna or 500 feet above intervening terrain, whichever is highest.

(10) One XMTR Only

(11) Facilities maintained using FAA Order 6750.49 require monitor checks on one XMTR only.

(2) Dual Frequency Localizer

TYPE CHECK	REFEREMCE PARAGRAPH	INSPECTION				TRANSMITTER CONFIGURATION		MEASUREMENTS REQUIRED					
		E	C (4)	Pm (5)	P	COURSE XMTR	CLEARANCE XMTR	MODuULATION	WIDTH	SYMMETRY	CLEARANCE	ALIGNMENT	STRUCTURE
Spectrum Analysis	15.20a	Reserved											
Ident. & Voice	15.20o	(1)	X	X	X								Fc&Bc
Power Ratio	15.20d	(1)	(1)			Reduced RF Pwr	Normal						
Modulation Level	15.20b	X	X			Normal	Off	Fc					
		X	X			Off	Normal	Fc					
		X	X	X	X	Normal	Normal	Fc					
Modulation Equality (2) **Caution: HMI**	15.20c	(1)	(1)			Carrier Only	Off	Fc	Balance Determined by Maintenance				
		(1)	(1)			Off	Carrier Only	Fc	Balance Determined by Maintenance				
Phasing (3) **Caution: HMI**	15.20e	(1)	(1)			Quad	Off		Set to Value of Modulation Equality				
		(1)	(1)			Off	Quad		Set to Value of Modulation Equality				
Width & Clearance	15.20f	(1)	(1)			Off	Normal	Fc	Fc				
	15.20k	X	X	X	X	Normal	Normal	Fc&Bc	Fc&Bc	Fc& Bc	Fc& Bc		
Clearance Comparability (7)(8)	15.20k(1)		X			As Require d	As Require d		Fc&Bc		Fc& Bc		
Alignment and Structure	15.20g	X	X	X	X	Normal	Normal	Fc&Bc				Fc&Bc	Fc&Bc
Localizer Only Minima	15.20g(1)	X	X			Normal	Normal	Fc&Bc					Fc&Bc
Polarization (8)	15.20n	X	X	X	X	Normal	Normal						Fc&Bc
Monitors Width	15.20i 15.12a(3)		(1)			Wide	Normal		Fc				
		(1)	X, (9)			Narrow	Wide		Fc&Bc		Fc& Bc		
		(1)	X, (9)	X		Wide	Wide		Fc&Bc		Fc& Bc		

(2) Dual Frequency Localizer, continued

TYPE CHECK	REFEREMCE PARAGRAPH	INSPECTION				TRANSMITTER CONFIGURATION		MEASUREMENTS REQUIRED					
		E	C (4)	Pm (5)	P	COURSE XMTR	CLEARANCE XMTR	MODULATION	WIDTH	SYMMETRY	CLEARANCE	ALIGNMENT	STRUCTURE
Dephase	15.20i		(1)			ADV Phase	Normal		Fc				
			(1)			RET Phase	Normal		Fc				
			(1)			Normal	ADV Phase		Fc		Fc		
			(1)			Normal	RET Phase		Fc		Fc		
Alignment Caution: HMI	15.20i		(1)			Shifted Alignment	Normal					Fc	
RF Power Monitor Reference (6)(8)	15.20j	(1)	X			Reduced RF Power	Reduced RF Power				Fc&Bc		Fc&Bc
High Angle Clearance (8)	15.20k(3)	X	X			Normal	Normal	Fc&Bc			Fc&Bc		
Standby Equipment	15.12b 4.33b		X	X									
Standby Power (8)	15.12c 4.33c		X			Normal	Normal	Fc&Bc	Fc&Bc	Fc& Bc		Fc&Bc	

FOOTNOTES:

(1) Maintenance request

(2) Adjustments to carrier modulation balance will require a subsequent check of course alignment.

(3) Width and clearance should be measured prior to the phasing check. If, after the quadrature phase check, the width has remained the same or has narrowed and/or the clearances have increased from the first width and clearance check, then the phasing has been improved. Final determination of optimum phase should be discussed with Facilities Maintenance personnel.

(4) Replacement of an antenna array with a different type (e.g., V-Ring elements to LDP element, 8-element to 14-element) require commissioning inspection checks, except for those checks not required, as determined jointly by flight inspection and Facilities Maintenance personnel.

(5) Same type antenna replacements require PM checks, in addition to all of Zone 1 structure (Paragraph 15.20g(3)) and localizer only structure checks. (Paragraph 15.20g(1)(b)).

(6) Request RF level in watts from ground technician.

(7) Recheck clearances each 1,080 days at the lower standard altitude of 1,500 feet above the antenna or 500 feet above intervening terrain, whichever is highest.

(8) One XMTR Only

(9) Facilities maintained using FAA Order 6750.49 require monitor checks on one XMTR only.

(3) Null Reference Glide Slope

CODE: W/A/S = Width, Angle, Symmetry

TYPE CHECK	REFERENCE PARAGRAPH	INSPECTION				FACILITY CONFIGURATION	MEASUREMENTS REQUIRED						
		E	C	Pm	P		MODULATION	WIDTH	ANGLE	SYMMETRY	STRUC BELOW PATH	CLEARANCE	STRUCTURE
Spectrum Analysis	15.30a	Reserved											
Engineering Support Tests (5) Caution: HMI	15.30e	(1)	(1)			As Required							
Modulation Level	15.30b	X	X	X	X	Normal	X						
Modulation Equality Caution: HMI	15.30c	(1)	(1)			Carrier Only	X						
Phasing Caution: HMI	15.30d	(1)	(1)			Quadrature	SET TO VALUE FOUND IN MODULATION EQUALITY						
Spurious Radiation	15.30e(3)	(1)	(1)			Dummy Load Radiating Signal							X
W/A/S	15.30f	X	X	X	X	Normal		X	X	X	X, (2)		
Structure	15.30j	X	X	X	X	Normal	X		X				X
Clearance (CBP One XMTR Only)	15.30g	X	X			Normal						X	
Tilt (5)	15.30i	X	X			Normal	X		X			X	
Mean Width (5)	15.30h	(1)	X			Normal		X		X			

(3) Null Reference Glide Slope (continued)

TYPE CHECK	REFERENCE PARAGRAPH	INSPECTION				FACILITY CONFIGURATION	MEASUREMENTS REQUIRED						
		E	C	Pm	P		MODULATION	WIDTH	ANGLE	SYMMETRY	STRUC BELOW PATH	CLEARANCE	STRUCTURE
Monitors Width	15.30m 15.12a(3)	(1)	X, (6)	X		ADV Phase		X	X		X, (2)	(3)	
		(1)	X, (6)	X		RET Phase		X	X		X, (2)	(3)	
		(1)	X, (6)	X		Wide		X	X		X, (2)	(3)	
			X, (6)			Narrow		X	X		X, (2)		
RF Power Monitor Reference (4) (5)	15.30n	(1)	X			Reduced RF Power							
Standby Equipment	15.12b 4.33b		X	X									
Standby Power	15.12c 4.33c		X			Normal	X	X	X	X	X, (2)		

FOOTNOTES:

(1) Maintenance request

(2) If structure below path tolerances cannot be met, clearance procedures and tolerances will be applied.

(3) Clearance Below Path (CBP) required on commissioning type inspections, one XMTR only.

(4) Request RF level in watts from ground technician.

(5) One XMTR Only

(6) Facilities maintained using FAA Order 6750.49 require monitor checks on one XMTR only.

(4) Sideband Reference Glide Slope.

CODE: W/A/S = Width, Angle, Symmetry

TYPE CHECK	REFERENCE PARAGRAPH	INSPECTION				FACILITY CONFIGURATION	MEASUREMENTS REQUIRED						
		E	C	Pm (5)	P		MODULATION	WIDTH	ANGLE	SYMMETRY	STRUC BELOW PATH	CLEARANCE	STRUCTURE
Spectrum Analysis	15.30a	Reserved											
Engineering Support Tests (7) Caution: HMI	15.30e	(1)	(1)			As Required							
Modulation Level	15.30b	X	X	X	X	Normal	X						
Modulation Equality Caution: HMI	15.30c	(1)	(1)			Carrier Only	X						
Phasing Caution: HMI	15.30d	(1)	(1)			As Required	SET TO VALUE FOUND IN MODULATION EQUALITY						
Spurious Radiation	15.30e(3)	(1)	(1)			Dummy Load Radiating Signal							X
W/ A/ S	15.30f	X	X	X	X	Normal		X	X	X	X, (2)		
Structure	15.30j	X	X	X	X	Normal	X		X				X
Clearance (CBP One XMTR only)	15.30g	X	X			Normal						X	
Tilt (7)	15.30i	X	X			Normal	X		X			X	
Mean Width (7)	15.30h	(1)	X			Normal		X		X			

(4) Sideband Reference Glide Slope (Continued)

TYPE CHECK	REFERENCE PARAGRAPH.	INSPECTION				FACILITY CONFIGURATION	MEASUREMENTS REQUIRED						
		E	C	Pm (5)	P		MODULATION	WIDTH	ANGLE	SYMMETRY	STRUC BELOW PATH	CLEARANCE	STRUCTURE
Monitors (5) Angle	15.30m 15.12a(3)		(1)	(1)		High Angle (4)		X	X, (4)		X, (2)		
		(1)	X, (7)	X		Low Angle (4)		X	X, (4)		X, (2)	(3)	
Width	15.30m					Upper Antenna:							
			X, (7)	X		ADV Phase		X	X		X, (2)	(3)	
			X, (7)	X		RET Phase		X	X		X, (2)	(3)	
						Main Sideband:							
			(1)			ADV Phase		X	X		X, (2)		
			(1)			RET Phase		X	X		X, (2)		
		(1)	X, (7)	X		Wide		X	X		X, (2)	(3)	
			X, (7)			Narrow		X	X		X, (2)		
RF Power Monitor Reference (6) (7)	15.30n	(1)	X			Reduced RF Power							
Standby Equipment	15.12b 4.33b		X	X									
Standby Power	15.12c 4.33c		X			Normal	X	X	X	X	X, (2)		

FOOTNOTES:

(1) Maintenance request

(2) If structure below path tolerances cannot be met, clearance procedures and tolerances will be applied.

(3) Clearance Below Path (CBP) required on commissioning type inspections, one XMTR only.

(4) Perform a final actual angle check at the completion of any width or angle monitor inspection.

(5) Request RF level in watts from ground technician.

(6) One XMTR Only

(7) Facilities maintained using FAA Order 6750.49 require monitor checks on one XMTR only.

(5) Capture Effect Glide Slope

CODE: W/A/S = Width, Angle, Symmetry

TYPE CHECK	REFERENCE PARAGRAPH	INSPECTION				FACILITY CONFIGURATION	MEASUREMENTS REQUIRED						
		E	C	Pm	P		MODULATION	WIDTH	ANGLE	SYMMETRY	STRUC TURE BELOW PATH	CLEARANCE	STRUCTURE
Spectrum Analysis	15.30a	Reserved											
Engineering Support Tests (7) Caution: HMI	15.30e	(1)	(1)			As Required							
Modulation Level	15.30b	X	X	X	X	Normal:	X						
Modulation Equality Caution: HMI	15.30c	(1)	(1)			Carrier Only	X						
Phasing Proc. 1 or 2 Caution: HMI	15.30d(3)	(1)	(1)			As Required	SET TO VALUE FOUND IN MODULATION EQUALITY						
Phase Verification (4)	15.30d(3)	(1)	X			As Required	X	X	X	X		X	
Spurious Radiation	15.30e(3)	(1)	(1)			Dummy Load Radiating Signal							X
W/ A/ S	15.30f	X	X	X	X	Normal		X	X	X	X, (2)		
Structure	15.30j	X	X	X	X	Normal	X		X				X
Clearance (CBP One XMTR only)	15.30g	X	X			Normal						X	

(5) Capture Effect Glide Slope (continued)

TYPE CHECK	REFERENCE PARAGRAPH	INSPECTION				FACILITY CONFIGURATION	MEASUREMENTS REQUIRED						
		E	C	Pm	P		MODULATION	WIDTH	ANGLE	SYMMETRY	STRUC TURE BELOW PATH	CLEARANCE	STRUCTURE
Tilt (7)	15.30i	X	X			Normal	X		X			X	
Mean Width (7)	15.30h	(1)	X			Normal	X		X				
Monitors Width	15.30m 15.12a(3)	(1)	X, (8)	X		Middle Antenna ADV Phase		X	X		X, (2)	(3) (5)	
		(1)	X, (8)	X		RET Phase		X	X		X, (2)	(3) (5)	
		(1)	X, (8)	X		Narrow		X	X		X, (2)		
		(1)	X, (8)			Primary XMTR wide and clearance XMTR reduced modulation		X	X		X, (2)	(3)	
		(1)	(1)			Middle Antenna Attenuate		X	X		X, (2)	(3)	
		(1)	X, (8)	X		Upper Antenna Attenuate		X	X		X, (2)		
RF Power Monitor Reference (6) (7)	15.30n	(1)	X			Reduced RF Power							
Standby Equipment	15.12b 4.33b		X	X									
Standby Power	15.12c 4.33c		X			Normal	X	X	X	X	X, (2)		

FOOTNOTES:

(1) Maintenance request

(2) If structure below path tolerances cannot be met, clearance procedures and tolerances will be applied.

(3) Clearance Below Path (CBP) required on commissioning type inspections, one XMTR only.

(4) Normally required on only one transmitter. Perform on second transmitter at maintenance request.

(5) CBP not required if the dephasing is equal to or less than the amount used for phase verification.

(6) Request RF level in watts from ground technician.

(7) One XMTR Only

(8) Facilities maintained using FAA Order 6750.49 require monitor checks on one XMTR only.

(6) Waveguide Glide Slope with Auxiliary Waveguide Antennas

NOTE: For those waveguide glide slopes that do not have auxiliary waveguide antennas, complete all checklist items except the following monitor checks: Upper Auxiliary Waveguide—attenuate, advance and retard—dephase; Lower Auxiliary Waveguide—attenuate; Upper and Lower Waveguide—simultaneously advance and retard dephase.

CODE: W/ A/ S = Width, Angle, Symmetry

TYPE CHECK	REFERENCE PARAGRAPH.	INSPECTION				FACILITY CONFIGURATION	MEASUREMENTS REQUIRED						
		E	C	Pm	P		MODULATION	WIDTH	ANGLE	SYMMETRY	STRUC TURE BELOW PATH	CLEARANCE	STRUCTURE
Spectrum Analysis	15.30a	Reserved											
Engineering Support Tests (6) **Caution: HMI**	15.30e	(1)	(1)			As Required							
Modulation Level	15.30b	X	X	X	X	Normal	X						
Modulation Equality **Caution: HMI**	15.30c	(1)	(1)			Carrier Only							
Spurious Radiation	15.30e(3)	(1)	(1)			Dummy Load Radiating Signal							X
W/ A/ S	15.30f	X	X	X	X	Normal		X	X	X	X, (2)		
Structure	15.30j	X	X	X	X	Normal	X		X				X
Clearance (CBP One XMTR only)	15.30g	X	X			Normal						X	
Tilt (6)	15.30i	X	X			Normal	X		X			X	
Mean Width (6)	15.30h	(1)	X			Normal		X		X			

(6) Waveguide Glide Slope with Auxiliary Waveguide Antennas (continued)

TYPE CHECK	REFERENCE PARAGRAPH	INSPECTION				FACILITY CONFIGURATION	MEASUREMENTS REQUIRED						
		E	C	Pm	P		MODULATION	WIDTH	ANGLE	SYMMETRY	STRUC TURE BELOW PATH	CLEARANCE	STRUCTURE
Monitors Width	15.30m	(1)	X	X		Wide		X	X		X, (2)	(3)	
			X			Narrow		X	X		X, (2)		
						Main Sideband:							
			X	X		ADV Phase		X	X		X, (2)	(3)	
			X	X		RET Phase		X	X		X, (2)	(3)	
(6)						Upper Auxiliary Waveguide:							
			X			Attenuate		X	X, (4)			X	X
			X			ADV Phase		X	X, (4)			X	X
			X			RET Phase		X	X, (4)			X	X
(6)						Lower Auxiliary Waveguide:							
			X			Attenuate		X	X, (4)			X	X
(6)						Upper & Lower Waveguide Simultaneously:							
			X			ADV Phase		X	X		X, (2)		X
			X			RET Phase		X	X		X, (2)		X
(6)						Main Waveguide Feed Phaser:							
			X	X		ADV Phase (4)		X	X		X, (2)	(3)	
			X	X		RET Phase (4)		X	X		X, (2)	(3)	
Angle (6)			X			Lower Main Waveguide Feed: Attenuate (High Angle)		X	X		X, (2)		
(6)			X			Upper Main Waveguide Feed: Attenuate (Low Angle)		X	X		X, (2)	(3)	
RF Power Monitor Reference (5)	15.30n	(1)	X			Reduced RF Power							
Standby Equipment	15.12b 4.33b		X	X									
Standby Power	15.12c 4.33c		X			Normal	X	X	X	X	X, (2)		

FOOTNOTES:

(1) Maintenance request

(2) If structure below path tolerances cannot be met, clearance procedures and tolerances will be applied.

(3) Clearance Below Path (CBP) required on commissioning type inspections, one XMTR only.

(4) This check can be made on either the upper or lower main antenna feed, but both steps must be performed on the same feed.

(5) Request RF level in watts from ground technician.

(6) One XMTR Only

(7) Endfire Glide Slope Standard (capture effect in the horizontal plane)

CODE: W/ A/ S = Width, Angle, Symmetry

TYPE CHECK	REFERENCE PARAGRAPH	INSPECTION				FACILITY CONFIGURATION		MEASUREMENTS REQUIRED						
		E	C (4)	Pm (6)	P	PRIMARY XMTR	CLEARANCE XMTR	MODULATION	WIDTH	ANGLE	SYMMETRY	STRUCTURE BELOW PATH	CLEARANCE	STRUCTURE
Spectrum Analysis	15.30a	Reserved				Reserved								
Engineering Support Tests (10)	15.30e	(1)	(1)			As Required								
Modulation Level	15.30b	X	X	X	X	Norm	Norm	X						
Modulation Equality Caution: HMI	15.30c	(1)	(1)			Carrier Only	OFF	X						
W/A/S	15.30f	X	X	X	X	Norm	Norm		X	X	X	X, (2)		
Structure	15.30j	X	X	X	X	Norm	Norm	X		X				X
Clearance (CBP One XMTR only)	15.30g	X	X			Norm	Norm						X	
Transverse Structure	15.30k	X	X	(1)		Norm	OFF							X
Transverse Structure (7)	15.30k	X	X	X		Norm	Norm							X

(7) Endfire Glide Slope—Standard (capture effect in the horizontal plane) (continued)

TYPE CHECK	REFERENCE PARAGRAPH	INSPECTION				FACILITY CONFIGURATION		MEASUREMENTS REQUIRED						
		E	C (4)	Pm (6)	P	PRIMARY XMTR	CLEARANCE XMTR	MODULATION	WIDTH	ANGLE	SYMMETRY	STRUCTURE BELOW PATH	CLEARANCE	STRUCTURE
Tilt (10)	15.30i	X	X			Norm	Norm	X		X			X	
Mean Width (10)	15.30h	(1)	X			Norm	Norm		X		X			
Transverse Structure (7)	15.30k	(1)	X	(1)		Norm	Reduced RF Power							X
Clearance at 5° of LCZR course on G/S equip side (5) (7)	15.11e 15.30g	(1)	X			Norm	Reduced RF Power						X	
Clearance at 8°of LCZR course on side opposite G/S equip (5) (7)	15.11e 15.30g	(1)	X			Norm	Reduced RF Power						X	
Spurious Radiation	15.30e(3)	(1)	(1)			Dummy Load	Dummy Load							X
Monitors Width	15.30m 15.12a(3)	(1)	X (11)	X		Wide	Norm		X	X		X, (2)	(3)	
		(1)	X (11)			Narrow	Norm		X	X		X, (2)		
Phase	15.30m	(1)	X (11)	(4)		ADV Phase	Norm		X	X		X, (2)	(3)	
		(1)	X (11)	(4)		RTD Phase	Norm		X	X		X, (2)	(3)	
		(1)	X (11)	(1)		Main Array: Dephase for High Angle	Norm		X	X		X, (2)		
		(1)	X (11)	X		Main Array: Dephase for Low Angle	Norm		X	X		X, (2)	(3)	Angle
RF Power Monitor Reference (9) (10)	15.30n	(1)	X			Reduced RF Power	Reduced RF Power							

(7) Endfire Glide Slope—Standard (capture effect in the horizontal plane) (continued)

TYPE CHECK	REFERENCE PARAGRAPH	INSPECTION				FACILITY CONFIGURATION		MEASUREMENTS REQUIRED						
		E	C (4)	Pm (6)	P	PRIMARY XMTR	CLEARANCE XMTR	MODULATION	WIDTH	ANGLE	SYMMETRY	STRUCTURE BELOW PATH	CLEARANCE	STRUCTURE
Transverse Structure	15.30k		(1) (8) (11)			Norm	ADV front CLR ANT Phase							X
			(1)(8) (11)			Norm	RET front CLR ANT Phase							X
Standby Equipment	15.12b 4.33b		X	X										
Standby Power	15.12c 4.33c		X					X	X	X	X	X, (2)		

FOOTNOTES:

(1) Maintenance request

(2) If structure-below-path tolerances cannot be met, clearance procedures and techniques will be applied.

(3) Clearance Below Path (CBP) required on commissioning type inspections, one XMTR only.

(4) On facilities without a quadrature phase monitor (Path 2 Detector), conduct dephase check on the width monitor with main sideband dephasing of ± 15° or less. If a quadrature phase monitor is installed, a commissioning check is required, but no periodic dephase check is needed.

(5) Clearance above and below path required. (See Paragraph 15.11e.)

(6) Perform a final actual angle check at the completion of any width or angle monitor inspection.

(7) Perform also after antenna repair, replacement, modification, or any adjustment maintenance expects will change transverse structure and/or clearances.

(8) Not applicable to Single Clearance Antennas.

(9) Request RF level in watts from ground technician.

(10) One XMTR Only

(11) Facilities maintained using FAA Order 6750.49 require monitor checks on one XMTR only.

(8) 75 MHz Marker Beacon Checklist. Markers are installed as a constituent part of some other primary aid; therefore, they are inspected concurrently with the primary aid.

ILS AND FAN MARKERS

Inspections

Type Check	Reference Paragraph	Commissioning	Periodic	Antenna and/or Transmission Lines Replacement/ Adjustment
Spectrum Analysis	15.40a	Reserved	Reserved	
Identification and Modulation Tone	15.40b	X	X	X
Coverage	15.40c			
Major Axis	15.40c(2)	X	-	X
Minor Axis	15.40c(1)	X	X	X
Proximity Check	15.40d	X	-	X
Holding Fixes	15.40f	X	-	X
Standby Equipment	15.40g 4.33b	X	-	-
Standby Power	15.40h 4.33c	X	-	-

Figure 15-2

RADIATION PATTERN - PLAN VIEW

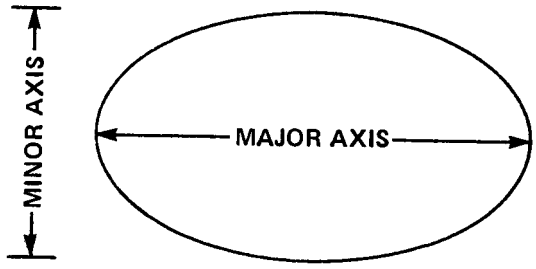
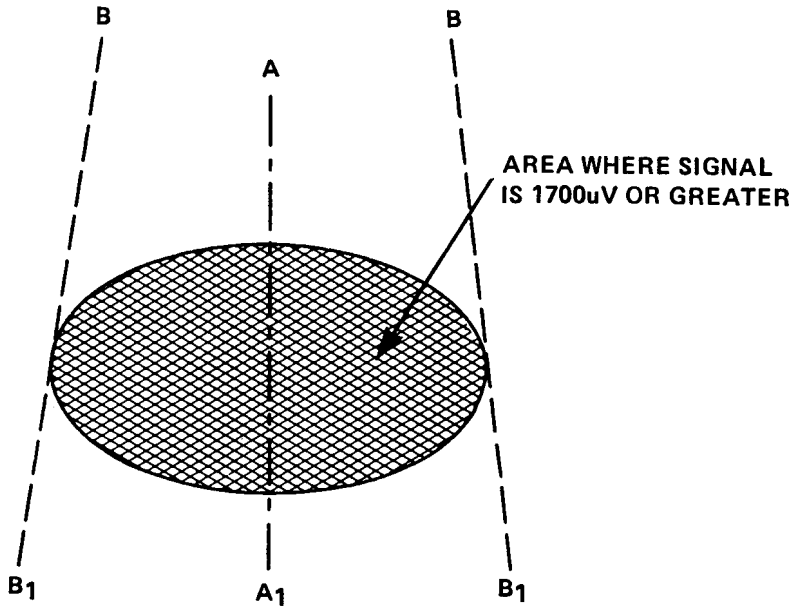


Figure 15-3

MARKER BEACON COVERAGE

A-A$_1$ - ELECTRONIC LOCALIZER ON-COURSE NDB OR VOR/VORTAC SIGNAL

B-B$_1$ - LOCALIZER/SDF/LDA 75 μA 90 or 150 Hz OR OMNI-DIRECTIONAL 5° EITHER SIDE OF THE ELECTRONIC PROCEDURAL BEARING/RADIAL



SECTION 2. LOCALIZER FLIGHT INSPECTION PROCEDURES

15.20 Detailed Procedures – Localizers. Unless otherwise noted, the following procedures apply to all localizers, offset localizers, LDA(s), and SDF(s).

a. Spectrum Analysis. Reserved.

b. Modulation Level. This check measures the modulation of the radiated signal.

Approved Procedure—Front Course. Measure modulation while inbound on the localizer, between 10 miles and 3 miles from the localizer antenna, and on glidepath (at procedural altitude for localizer-only facilities). Preliminary checks may be made when transitioning the "on-course" position during course width and symmetry measurements; however, they must be validated while flying inbound on-course. Some dual frequency antennas do not provide enough clearance power to measure modulation on centerline. For these facilities, measure the clearance-only modulation level while inbound between 5 and 10° off course at the lower standard altitude of 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest, with the clearance transmitter in the modulation balance configuration.

Approved Procedure—Back Course. Measure modulation by using the front course flight procedures described above. On single frequency localizers, adjustments to front course modulation will also affect the back course; therefore, adjustments are not required on the back course. Where a separate antenna provides clearance, as well as a back course (such as the waveguide system), modulation checks and adjustments of the clearance transmitter(s) are valid only while on the back course, unless the course transmitter is OFF.

NOTE: Modulation must be measured during the NORMAL configuration clearance checks required by Paragraph 15.20k. Some receivers see excessive modulation as low clearances. Out-of-tolerance modulation must be a basis for restrictions on facilities installed or reconfigured with new type antennas* after January 1, 2000. To implement this requirement, perform a 35 - 35° clearance arc on both transmitters in NORMAL on the front and back course at the first available opportunity. Document the results in the report and Facility Data Sheet. Subsequently, the check needs only to be performed when a 35 - 35° arc in NORMAL is required per the applicable checklist.

*Installed refer to newly commissioned and relocated facilities. New type antennas refer to a change from Log Periodic to V-Ring or vice-versa, a change from Capture Effect to Single Frequency or vice-versa, or a change in the number of elements in the antenna array.

c. Modulation Equality. This check is performed to obtain a crosspointer value, which will be used as a reference for phasing.

WARNING
HAZARDOUSLY MISLEADING INFORMATION
Misleading information is produced by this configuration. Ensure NOTAM is active. Monitor ATC communications for improper clearances to other aircraft.
WARNING

NOTE: FAA Glide Slopes must be OFF when the Localizer is producing HMI

Approved Procedure. Position the aircraft as outlined in Paragraph 15.20b, Modulation Level. The angle of descent on an ILS must emulate the commissioned glide path when the glide slope is not radiating. Adjustments to modulation equality will require a subsequent check of course alignment.

d. Power Ratio Check. The purpose of this check is to measure the ratio of power between the course and clearance transmitters of dual frequency localizers.

Approved Procedure—Using the Spectrum Analyzer. Position the aircraft on the localizer on-course within 10 miles and in line-of-sight of the antenna or parked on the runway on-course in line-of-sight of the antenna. Compare the relative signal strength of the course and clearance transmitters with the course transmitter in RF power monitor reference and the clearance transmitter in normal.

Approved Procedure—Not Using the Spectrum Analyzer. Position the aircraft on the runway centerline/ on-course at or near the approach end of the runway in line-of-sight of the antenna. Use the AGC meter or equivalent and note the voltage level of the facility in the following configurations:

(1) Course transmitter at RF power monitor reference setting; clearance transmitter OFF.

(2) Clearance transmitter in normal; course transmitter OFF.

Compute the power ratio using the dual frequency power ratio formula (see Appendix 2).

e. Phasing. The purpose of this check is to determine that the phase relationship between the sideband and carrier energy is optimum. The facility will normally be phased using ground procedures. No specific requirement exists for airborne phasing.

WARNING
HAZARDOUSLY MISLEADING INFORMATION
Misleading information is produced by this configuration. Ensure NOTAM is active. Monitor ATC communications for improper clearances to other aircraft.
WARNING

NOTE: FAA Glide Slopes must be OFF when the Localizer is producing HMI

Approved Procedure--Front Course. Since antennas vary greatly, obtain the correct azimuth for phasing the facility from Facilities Maintenance personnel. Fly inbound toward the antenna on the appropriate azimuth at procedural altitude between 10 and 3 miles. Transmit the crosspointer values to assist the ground technician to adjust the phasing. The optimum quadrature phase condition is established when the microampere deflection is the same as that found when checking modulation equality.

Approved Procedure--Back Course. If maintenance requests phasing on the back course, apply the procedures described above.

f. Course Sector Width and Symmetry. The purpose of this check is to establish and maintain a course sector width and ratio between half-course sectors that will provide the desired displacement sensitivity required at the procedural missed approach point (MAP) or threshold and be within the limitations of the procedural protected area.

Approved Procedure. This procedure applies to the front course (and back course if it is used for an approach or missed approach). Measure the course sector width and symmetry between 6 and 10 miles from the localizer antenna at the lower standard altitude of 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest. Flight Inspection Policy must approve measurements inside 6 nm. On periodic checks, course width may be checked at distances from 10 to 14 nm from the localizer antenna. Verify any unusual/ out-of-tolerance indications at a distance of 10 nm or less. If the condition repeats, or if unable to verify due to weather or ATC restrictions, take appropriate NOTAM/ restriction action.

> **NOTE:** In some cases on commissioning type checks when the normal width does not repeat CW/ CCW within 2.5% of actual width measurements, it may be necessary to perform width measurements at an altitude higher than the lower standard altitude of 1,500 ft, or 500 ft above intervening terrain, for repeatability. In these cases, perform a width validation at a higher altitude(s). If CW/ CCW normal width can be validated at a higher altitude, all width measurements must be made at the validated higher altitude. Document the altitude on the AVNIS Datasheet. If CW/ CCW normal width difference exceeds 2.5% of actual width measurements at the higher altitude(s), the inspection should be terminated until cause of non-repeatability can be determined.

On periodic checks, higher altitudes may be used, provided a course width comparability check in the normal configuration is made (usually at commissioning) at the lower standard altitude of 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest, and a higher altitude is used for the comparison. If comparability results are in tolerance and within ± 0.2°, subsequent inspections may be made at any altitude between the lower and higher altitudes used for comparability. If a comparability check has not been completed, an altitude 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest, must be used to evaluate course width.

If the commissioned width is changed, reestablish width monitor references at the lower standard altitude of 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest. If clearance comparability was satisfactory prior to the course width change, re-check the Procedure 1/ 2 configurations at the lower standard altitude. Further comparability checks at the desired higher altitude are not required if these minimum clearance levels are met.

(1) Basic Method. A crossing, perpendicular to the on-course, must be made in each direction, maintaining a constant airspeed (to average out any wind component) over a checkpoint of a known distance from the localizer antenna, i.e., outer marker, FAF, etc. If ground speed or along-track outputs are available, only one crossing is required. Measure the course sector width and calculate the symmetry (use the appropriate formulas in Appendix 2).

(2) Theodolite or Tracking Device Method. Position the theodolite or tracking device in accordance with Paragraph 15.11f, Theodolite Procedures. Only one crossing is required at the maximum distance that permits theodolite tracking. Maintain a constant airspeed. Reference the course sector width to the azimuth reference marks of the theodolite (usually spaced 5° apart). Measure the course sector width, using a device such as 10-point dividers, and calculate the symmetry.

NOTE: An RTT may be used to track an aircraft throughout the course sector. Apply the course sector width received to the calibration of the RTT.

(3) Width Requirements. Localizers, offset localizers, and LDA(s) must be tailored to a course sector width not greater than 6° and a linear sector width of 700 ft at the following points:

(a) Point C for LDA and SDF

(b) Point B for runways less than 4,000 ft long and for runways which do not conform to precision instrument design standards.

(c) Point T for facilities supporting all other applications.

The tailoring requirement may be waived for facilities supporting other than CAT II or III operations if tailoring cannot be achieved due to siting constraints, performance derogation etc.; however, the final width must be established as close as possible to the optimum. The justification must be included in the flight inspection report. The decision to have other than a tailored course width is not a flight inspection function and must be made at the applicable Region or comparable military level. If the course sector width on a facility which supports a precision approach will not provide for at least 400 ft linear width at the runway threshold, the course must be restricted as unusable inside the point where the linear width is 400 ft. The commissioned course width of an SDF must be no greater than 12.0°. If the course width is adjustable, it must be tailored.

Some facilities with course widths less than 3.00° have had problems associated with aircraft overshooting turns to the approach course; pay particular attention to flyability with narrow widths.

g. Course Alignment and Structure. These checks measure the quality and alignment of the on-course signal. The alignment and structure checks are usually performed simultaneously; therefore, use the same procedures to check alignment and structure.

Approved Procedure. This procedure applies to the front course (and the back course) if it is used for an approach or missed approach).

(1) General. Evaluate the course along the designed procedural azimuth from the furthest point required by the type of inspection being conducted throughout the remaining zones. Maintain the published or proposed procedural altitudes through each approach segment until intercepting the glidepath and then descend on the glidepath to Point C or runway threshold.

NOTE: For FAA and U.S. Non-Federal civil facilities, the alignment must meet "Initial" tolerances IAW Paragraph 15.60c any time alignment is adjusted, or at the end of a Periodic with Monitors inspection.

(a) For a localizer-only approach, the published or proposed procedural altitudes must be maintained in each segment, except the final segment must be flown as follows: Upon reaching the FAF inbound, descend at a rate of approximately 400 ft per mile (930 ft per minute at 140 knots; 800 ft per minute at 120 knots) to an altitude of 100 ft below the lowest published MDA and maintain this altitude to Point C, which is the MAP.

NOTE: See Appendix 1 definition of Point C for localizer only approaches.

(b) For ILS approaches which support localizer-only minima, the procedure specified in (a) above must be used in addition to the run on normal glidepath during the following inspections: Site, Commissioning, and Specials for antenna system change, user complaint or site modifications, and on a periodic inspection any time there is a significant deterioration of localizer structure.

(c) For localizers which are aligned along the runway centerline, the aircraft may be positioned along the runway centerline by visual cues or theodolite. When RTT or AFIS equipment is used, the localizer on-course signal must be flown.

(d) Theodolite, RTT, or AFIS must be the method of evaluation for facilities which are not aligned along the runway centerline.

(e) For LDA(s) oriented toward a non-descript point-in-space where adequate visual checkpoints are not available and AFIS runway updates are impractical, the alignment may be determined to be either Satisfactory (S) or Unsatisfactory (U), in lieu of course alignment values (refer to Paragraph 6.14d). The initial monitor evaluation, if performed, must establish an equality of modulation reference for subsequent alignment and monitor comparison. Pseudo runway development based on surveyed airport checkpoints (runway ends, taxiways, etc.) approved in advance by Flight Inspection Policy, or a Differential GPS AFIS "truth system" should be considered prior to a "S/ U" alignment.

(2) Roll-Out Procedures. The procedures below are required for all Category II/ III localizers. They are also required for all Category I localizers installed at Part 139 airports with runway lengths of 5,000 ft or greater. Offset localizers, localizers installed without glide slopes, SDF(s), LDA(s), and facilities currently with a classification of I/ A, B, or C, need not be checked. Rollout checks and the 50 ft ILS-3 comparison checks are required on both transmitters.

(a) Site, Commissioning, Reconfiguration and Categorization Inspections of centerline oriented facilities. Use the procedures in Paragraph 15.20g(1) until reaching Point C. Cross Point C at 100 ft, runway threshold at approximately 50 ft, and continue on the extended glidepath angle to the touchdown point. Continue the landing roll and determine the actual course alignment for ILS Zones 4 and 5.

Measure the course structure from the actual alignment. If the actual alignment for Zones 4 and 5 cannot be determined using this method, taxi the aircraft along the runway centerline from abeam the glide slope to Point E. Record the raw crosspointer information and mark, abeam the glide slope, Point D and Point E. Manually calculate the actual course alignment and structure for each of the required zones.

This is also a comparison check intended to authorize the 50 ft run as a periodic check of Zone 4 and 5 structure. A comparison of structure results found on Rollout and on the 50 ft ILS-3 run is needed to determine if the expedient method of checking Zones 4 and 5 structure on the 50 ft run is valid for periodic checks. Satisfactory comparability must be defined as 3 μA or less difference between the results in each zone with both Rollout and 50 ft results being in-tolerance for that zone. Maximum structure in either zone does not have to occur at the same point on the runs to be comparable. Apply the 95% rule as specified in Paragraph 15.51a to results outside normal tolerance.

The Zone 4 and Zone 5 structure analysis determined during Rollout procedures is the definitive pass/ fail criteria, taking precedence over the results of the 50 ft ILS-3 maneuver.

Document the Rollout and ILS-3 50 ft structure comparability results IAW Order 8240.36, Appendix 8. Submit Form VN 200 8240-20, NAVAID Restriction/ Checkpoint Transmittal to the Aviation System Standards Flight Inspection Technical Services Sub-Team (TSS) to effect ILS Classification changes to the National Flight Data Center (NFDC).

When the Rollout check is found satisfactory on a Category I ILS and the comparability check is unsatisfactory, the TSS must contact the National Flight Procedures Office Procedures Specialist and the regional All-Weather Operations representative to determine if any users are authorized IFR use below Category I minima. The TSS will make the final determination as to the requirement for future Zone 4 and 5 rollouts on that facility, and transmit the appropriate ILS classification to NFDC.

Refer to the Rollout flow chart and associated Rollout code legend for the Zones 4 and 5 structure comparison process.

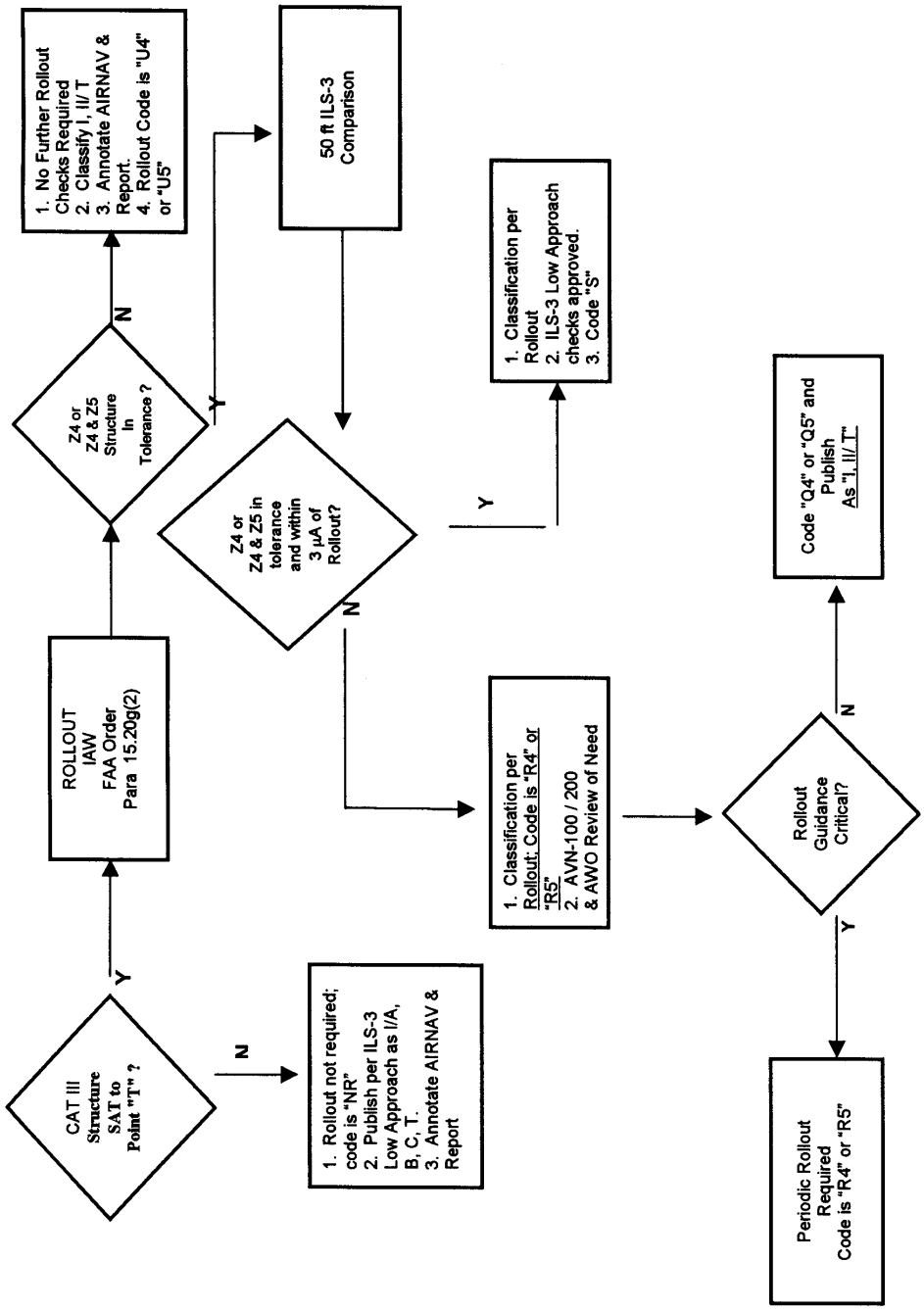
(b) Periodic or Special Inspections which require Structure Analysis. Except for those facilities that have been identified as "Rollout Required", use the procedures in Paragraph 15.20g(1) until reaching Point C. Cross Point C at 100 ft, runway threshold at 50 ft, and then conduct a low approach at 50 to 100 ft, on runway centerline, throughout the required zones. If the aircraft cannot be maintained on centerline for evaluation of Zones 4 and 5 due to wind conditions, the evaluation may be conducted by taxiing the aircraft down centerline throughout Zones 4 and 5.

On a facility previously checked satisfactory for Zone 4 and Zone 5 Rollout / ILS-3 50 ft run structure comparability, if Zone 4 or Zone 5 structure appears to have deteriorated since the previous inspection, or if out-of-tolerance structure is found, verify the results of this check by flying the rollout procedure listed in 15.20g(2) above. If that structure has deteriorated to below Category III standards for facilities with published classification of I, II, III/ T, D, or E (as applicable), initiate NOTAM action and send VN 200 Form 8240-20, NAVAID Facility Restriction/ Checkpoint Transmittal, to Aviation System Standards Technical Services Sub-Team.

When periodic ILS-3 50 ft runs indicate improved Zone 4 and Zone 5 structure on localizers previously documented as "Rollout required" (due to unsatisfactory Zone 4 and Zone 5 Rollout / ILS-3 50 ft run comparability) identify the improvement to the Aviation System Standards Technical Services Sub-Team (TSS). The TSS must review the facility historical results to determine if the improvement is based on seasonal changes or long-term structure improvements, prior to any publication or NOTAM action.

As indicated in the chart below, periodic rollout checks are only required on localizers that have failed the comparability check, Zone 4 and Zone 5 Rollout is satisfactory, and a documented requirement exists where users are authorized IFR use below Category I minima.

CATEGORY	CODE	INSPECTION
I/ II/ III	S	Z4 & Z5 inspect via 50 ft run and report airborne results in Field 8
I/ II	NR, U4, or Q4	Z4 & Z5 no inspection or reported results
I/ II	Q5 or U5	Z4 inspect via 50 ft run; no Z5 inspection or reported results
I/ II/ III	R4 or R5	Z4 & Z5 inspect via Rollout and report Rollout results in Field 8; report results of the 50 ft run in Remarks.



1. Use this criteria for CAT I, II, and III localizers.
2. 354 ft structure exemption applies.
3. Do not accomplish a Rollout if the localizer is restricted prior to Point "T", is offset, is classified I, II/ A, B, or C; or the runway length is less than 5,000 ft.
4. Complete a Rollout comparison of Z4 only if Z4 structure is SAT and Z5 structure is OT.
5. The 3 µA comparison value applies only if both the Rollout and low approach structure are in tolerance.
6. Rollout comparison checks on all existing facilities must be scheduled via Special Inspection.
7. Existing facilities retain present classification, pending Rollout analysis.
8. After the Rollout comparison, Resource and Data Management will change the "AC" Rollout code to the appropriate code on the Data Sheet. Resource and Data Management sends the data to NDFC, based on crew input

Aviation System Standards Technical Services Sub-Team (TSS) assigns the following codes to AVNSIS Facility Data Sheets to indicate Localizer eligibility for a Rollout check:

NR = Check is not required.

AC = Awaiting Rollout Check

Flight inspectors assign the following codes on the flight inspection report and via form VN 200 8240-20 to change AVNSIS Facility Data Sheets to indicate the status of Rollout checks:

S = Rollout accomplished; results of both the Rollout and the 50 ft run are within Category III tolerance and compare within 3 μA.

U4 = Rollout accomplished; Zone 4 results do not meet Category II/ III tolerances.

U5 = Rollout accomplished; Zone 5 results do not meet Category III tolerances.

R4 = Rollout required for evaluation of Zone 4 and Zone 5. Rollout was accomplished; ground results meet Category II/ III requirements but do not compare with results of the 50 ft run in Zone 4.

R5 = Rollout required only for evaluation of Zone 5. Rollout was accomplished; ground results meet Category III requirements; comparison with the 50 ft run was Satisfactory in Zone 4 but Unsatisfactory in Zone 5.

Aviation System Standards Technical Services Sub-Team assigns the following codes to the AVNSIS Facility Data Sheets post flight inspection after contact with the National Procedures Office Procedures Specialist and regional All-Weather Operations representative:

Q4 = Periodic Rollout not required. Rollout accomplished; results meet Category II/ III requirements, but Zone 4 ground results do not compare with results of the 50 ft run. This code means that future evaluations of Zone 4 and Zone 5 must be through a Rollout Check but that <u>it need not be done on periodic inspections</u>, as these zones are not currently used for IFR. This code is only applied by the Aviation System Standards Flight Inspection Technical Services Sub-Team and does not apply to Category III. Application to Category II is only appropriate IAW Order 8200.1, Paragraph 15.20g(3) Note 2.

Q5 = Periodic Rollout not required. Rollout accomplished; results meet Category II/ III requirements, but Zone 5 ground results do not compare with results of the 50 ft run. This code means that future evaluations of Zone 5 must be through a Rollout Check but that <u>it need not be done on periodic inspections</u>, as these zones are not currently used for IFR. This code is applied only by Aviation System Standards Flight Inspection Operations Office and is only used to easily display the non-comparable zone.

(3) Zones to be inspected for structure. All ILS localizers sited on the extended runway centerline must be inspected and analyzed through Zones 1, 2, 3, 4, and 5 (runways less than 5,000 ft long do not have Zone 5) on all inspections requiring alignment or structure validation. These localizers must be classified according to the furthest point at which the structure conforms to Category III tolerance.

Specific reporting instructions are contained in Order 8240.36. This classification is for autoland authorization. Other facilities must be inspected and analyzed in Zones 1, 2, and 3. See Appendix 1 and Figure 15-1 for zone identification.

Type Approach/ Facility	Zones Required for Unrestricted Service (1)
Category III	Zones 1, 2, 3, 4, 5
Category II ILS	Zones 1, 2, 3, and 4 (see Paragraph 5.12i(9)
Category I ILS	Zones 1, 2, 3
Other types of facilities or approaches	Zones 1, 2, 3

NOTE 1: During site, commissioning, reconfiguration, categorization, antenna, and/or frequency change inspection—check all of Zone 1. All other inspections (i.e., periodic, periodic with monitors, etc.) evaluate structure from GSI or the FAF (whichever is further) through all other required zones. For After Accident Inspections, see Paragraph 5.12i(9).

NOTE 2: Category II localizers failing to meet structure tolerance in Zone 4 will not be shown as restricted on the flight inspection report; however, a NOTAM will be issued. See Chapter 5, Section 1.

(4) Alignment Areas. Determine the course alignment in the following areas:

Front Course	From	To
CAT I, II, III	One mile from runway threshold	Runway threshold
ILS Zone 4	Runway threshold	Point D
ILS Zone 5	Point D	Point E
Offset Localizers	One mile from runway threshold	Runway threshold or abeam runway threshold
LDAs and SDFs	One mile from Point C	Point C
Back Course		
All Types of Facilities	Two miles from the antenna	One mile from the antenna

NOTE: When a restriction occurs in an area where alignment is normally analyzed, measure alignment through manual or AFIS analyzation of the average course signal in the following areas:

From	To
One mile from the start of the restriction	The start of the restriction.

h. Glide Slope Signal on Localizer Back Course. Evaluation of localizer back course approaches must also include an evaluation for active glide slope signals. Glide slope signals that result in flag or CDI activity must be cause for immediate action to alert pilots to disregard all glidepath indications on the back course approach (i.e., NOTAM). Ensure the alert will be printed on the localizer back course instrument approach chart.

i. Monitor References. The inspector must ensure that the facility is set at the monitor reference prior to each check. Monitor references must be checked IAW Paragraph 15.12a(3) when prescribed by the checklist and when applicable on special inspections. At the conclusion of any width monitor inspection, return the facility to normal, and check and report the resulting course sector width and symmetry.

Approved Procedure—Width Reference. Use the flight procedure and methods described in Paragraph 15.20(f). At the conclusion of any width monitor inspection, return the facility to normal, and check and report the resulting course sector width and symmetry.

Approved Procedure—Alignment Reference. This check is performed to assure that the monitors will detect a specific shift of the localizer course, and must only be accomplished upon special request from the FAA region or appropriate military authority. This check may be accomplished on the front course without the waveguide transmitter radiating or on the back course, using the procedures described in Paragraph 15.20g.

It is not necessary to verify ground alignment monitor checks in the air or to verify airborne alignment monitor checks on the ground. Request the course be misaligned to the monitor alarm limits each side (90 Hz/ 150 Hz) of the operational course. Both the recorder and the visual display must be used to verify course alignment shifts. During any inspection, the monitor limits must be referenced to the designed on-course alignment according to facility category.

(1) Ground. After the airborne localizer alignment has been determined, position the aircraft near the runway threshold where the stable crosspointer is received. The aircraft may be displaced as much as 75µA from the on-course signal. (This option is authorized, providing the sensitivity of the course sector width is linear.) The received course indication must be referenced to the alignment found airborne. Request that maintenance shift the course to both of the monitor limit points and then return to normal.

At facilities that are installed offset to the runway, the alignment monitor limits may be established with the aircraft on the ground within 75µA of the on-course signal; but the aircraft must not be positioned closer than 3,000 ft from the antenna array. If these two conditions cannot be met, perform this check in the air.

If monitors are initially checked on the ground and alignment is then adjusted based on airborne analysis, a monitor re-check is not required, providing the following criteria are met:

- In-tolerance flag/ modulation and AGC exist.
- Crosspointer is stable.
- Crosspointer data are recorded as found during adjustment and at the final setting.

- The monitor shift on the ground, when applied to the new airborne alignment, is in tolerance.
- Monitor settings are not changed after the alignment is adjusted.

(2) Airborne. Perform airborne alignment monitor checks while inbound on the designed procedural azimuth (on localizers aligned along runway centerline, the aircraft should be aligned with the centerline extended). Measure the alignment shifts to monitor limits by recording the instantaneous course displacements or course shifts as referenced to runway centerline extended. If feasible, this may be accomplished on one run during which both limit points and a return to normal are recorded.

(3) Equality of Modulation. When course alignment is satisfactory and a monitor inspection is required, localizers may be evaluated for monitor references using equality of modulation method. This method may be used on all categories of localizers with the concurrence of maintenance personnel. All facilities must be flown to establish the alignment in a normal operating configuration. Once the alignment has been established, maintenance will set up an equality of modulation configuration. The equality used to establish the alignment will become the reference for the subsequent monitor readings. When requested, maintenance personnel will unbalance the modulation to achieve the monitor reference point. Measure the displacement in microamps, repeat the procedure in the other direction, then restore to normal. This may be accomplished in the air or on the ground and need not be performed on centerline. Use of this method will be noted in the remarks section of the flight inspection report.

WARNING
HAZARDOUSLY MISLEADING INFORMATION
Misleading information is produced by this configuration. Ensure NOTAM is active. Monitor ATC communications for improper clearances to other aircraft.
WARNING

NOTE: FAA Glide Slopes must be OFF when the localizer is producing HMI

j. RF Power Monitor Reference. This inspection is conducted to determine that the localizer meets specified tolerances throughout the service volume while operating at reduced power.

Approved Procedure. This procedure applies to the front course (and the back course if it is used for an approach or missed approach). This check must be conducted with the facility operating at reduced power. Check for interference, signal strength, clearances, flag alarm, identification, and structure as follows. **Steps:**

(1) Fly an arc across the localizer course at 18 miles* from the antenna at 4,500 ft above site elevation throughout Sector 1. If there is intervening terrain higher than 4,500 ft above site elevation, the localizer must be restricted. Determine a distance where terrain clearance is within the SSV for a localizer restriction distance.

(2) Fly an arc across the localizer course at 18 miles* from the antenna at 2,000 ft above the threshold elevation or 1,000 ft above intervening terrain, whichever is highest. If 1,000 ft above intervening terrain is higher than 4,500 ft above site elevation, the localizer must be restricted. Determine a distance where terrain clearance is within the SSV for a localizer restriction distance. The facility must have an ESV for use outside the SSV.

(3) Fly an arc throughout Sectors 1 and 2 (and 3, if procedurally required) across the localizer course 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest, at 10 miles** from the antenna. Altitude is intended to be single altitude. If unable to maintain minimum terrain clearance outside the intermediate approach area, restrict the facility accordingly.

(4) Proceed on course inbound from 10 miles**, maintain a level altitude 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest, until reaching 7° above the horizontal (measured from the localizer antenna).

NOTE: See Chapter 22 for additional ESV requirements. If the ESV altitude is within the SSV distance, special consideration will be applied to localizer support.

* 25 miles from the antenna for ICAO Service Volumes.
** 17 miles from the antenna for ICAO Service Volumes.

k. Clearance. Clearances are measured to ensure that the facility provides adequate off-course indications throughout the service volume (or ESV, whichever is greater).

Approved Procedure. This check applies to the front course (and the back course if it is used for an approach or missed approach). The clearance orbit will be conducted at a radius between 6 to 10 miles from the antenna at the lower standard altitude of 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest. On periodic checks, clearances may be checked to a distance of 14 nm from the localizer antenna. Verify any unusual/ out-of-tolerance indications at a distance of 10 nm or less. If the condition repeats, or if unable to verify due to weather or ATC restrictions, take appropriate NOTAM/ restriction action.

(1) Clearance Comparability. In some cases it may be necessary to perform clearance measurements at altitudes higher than the lower standard altitude of 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest (e.g., weather, restricted airspace, or ATC limitation). After commissioning, higher altitudes may be used, provided a comparability check is made (usually at commissioning) documenting clearances at the lower standard altitude of 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest, and higher altitude. If comparability results are satisfactory, subsequent inspections may be made at any altitude between the lower and higher altitudes used for comparability. If a comparability check has not been completed satisfactorily, altitudes above the lower standard altitude of 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest, must not be used to evaluate clearances.

On commissioning/ reconfiguration type checks, to include new type antenna installations/ replacements, this comparison must be accomplished.

> **NOTE:** The lower altitude is recommended and should be attempted on all inspections. Clearance checks above the lower standard altitude of 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest, should be the exception.

The difference between Procedures 1 and 2 involve airborne analysis only. Procedure 1 will be used for all facilities, unless the lowest clearance condition configuration at the desired higher altitude produces clearances higher than the same configuration at the lower standard altitude of 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest. Procedure 2 authorizes checks above the lower standard altitude of 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest, if slightly higher clearances are measured at the desired higher altitude than at the lower standard altitude. However, this procedure can only be used if the more stringent clearance tolerances are applied at the lower standard altitude of 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest. See the clearance comparability flow charts in this paragraph for clarification. Comparability is required in unrestricted areas of coverage and on one transmitter only. If comparability is unsatisfactory, clearly document the reason.

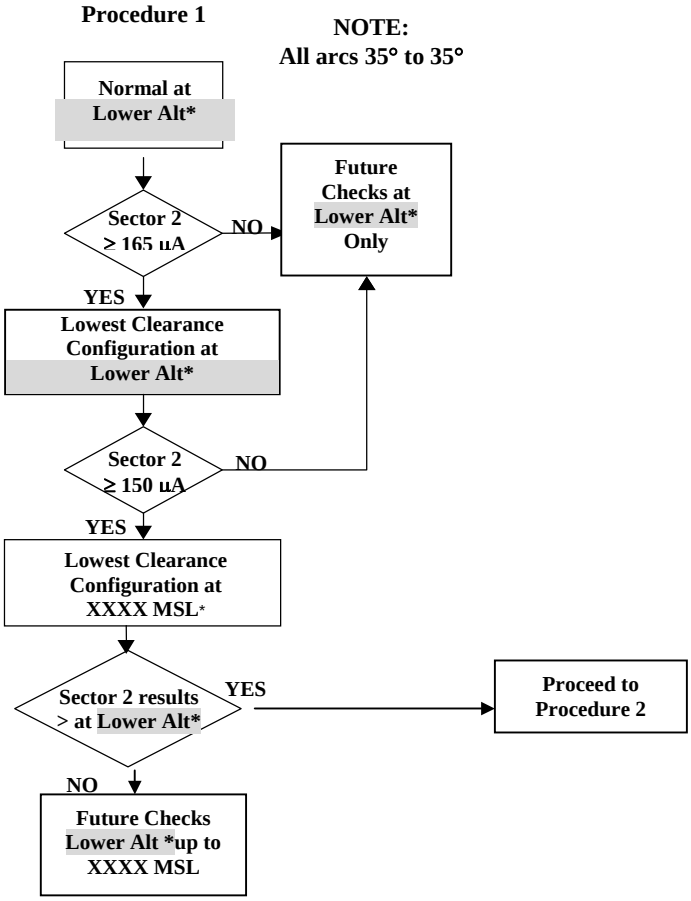
(a) Procedure 1. Perform the following clearance runs to ± 35°. Lower standard altitude is defined as 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest.

1 Evaluate clearances in Normal Configuration at the lower standard altitude. If the lowest Sector 2 clearances are less than 165 µA, the check is UNSAT.

2 Evaluate clearances at the lower standard altitude in the wide or narrow alarm reference configuration which produced the lowest measured clearances. If the lowest Sector 2 clearances are less than 150 µA, the check is UNSAT.

NOTE: If either Step 1 or 2 is UNSAT, no further comparability checks (including Procedure #2) are required.

3 **Evaluate Clearances In The Lowest Clearance Configuration At Desired Higher Altitude.** At the desired altitude, repeat the configuration from Paragraph (a)(1) or (a)(2) above that produced the lowest Sector 2 clearances. If the lowest clearances as measured at the higher altitude are greater than those found at the lower standard altitude, the check is UNSAT, proceed to comparability Procedure #2.



***Lower Alt = 1,500 ft above the antenna, or 500 ft above intervening terrain, whichever is highest.**

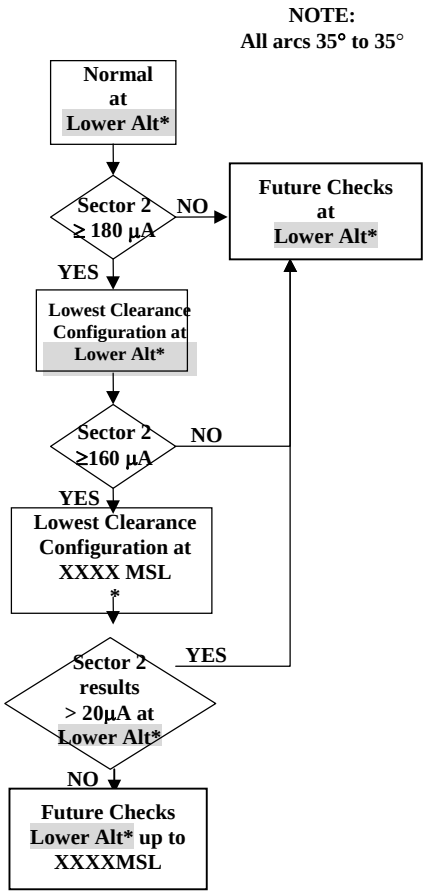
(b) Procedure 2. Perform the following clearance runs to ± 35°. Lower standard altitude is defined as 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest.

1 Evaluate clearances in Normal Configuration at the lower standard altitude. If the lowest Sector 2 clearances are less than 180 µA, the check is UNSAT.

2 Evaluate clearances in Lowest Clearance Configuration (wide or narrow alarm reference) at the lower standard altitude. If the lowest Sector 2 clearances are less than 160 µA, the check is UNSAT.

NOTE: If Step (b)2 is UNSAT, further comparability checks are not required.

Procedure 2



***Lower Alt = 1,500 ft above the antenna, or 500 ft above intervening terrain, whichever is highest.**

3 **Evaluate Clearances In The Lowest Clearance Configuration At Desired Higher Altitude.** At the desired altitude, repeat the configuration from Paragraph (b)(1) or (b)(2) above that produced the lowest Sector 2 clearances. If the lowest clearances measured at the higher altitude are more than 20 μA greater than those found at the lower standard altitude, the check is UNSAT, and subsequent checks must be conducted at the lower standard altitude of 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest.

NOTE: The normal or alarm reference condition that causes the lowest clearances will not always be a periodic monitor check condition. Document the flight inspection report and the data sheet with the configuration that produces the lowest clearance values. Inspections to remove a restriction based on clearances must include a check of all clearance commissioning configurations. See Paragraph 15.12a(7).

(c) Additional Clearance Comparability Requirements. If Procedure 1 or 2 clearance comparability is SAT, perform the following checks on one transmitter for historical reference.

1 Course and Clearance Transmitters Wide (dual frequency)/ Course Transmitter Wide (single frequency) at the lower standard altitude of 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest.

2 Course and Clearance Transmitters Wide (dual frequency)/ Course Transmitter Wide (single frequency) at Desired Higher Altitude.

3 Normal Configuration at the Desired Higher Altitude (if this altitude is different from the Paragraph 15.20k(3) High Angle Clearance Check).

NOTE: Evaluate the configurations in 2 and 3 above only if Procedure 1 or 2 clearance comparability is SAT.

COMMISSIONING TYPE CLEARANCE CHECKS

Normal at Lower Alt*	High Angle 4500 ft above LOC	Normal at XXXX MSL	Wide (Single Freq) Lower Alt* and XXXX MSL	Wide/Wide (Dual Freq) Lower Alt* and XXXX MSL

***Lower Alt = 1,500 ft above the antenna, or 500 ft above intervening terrain, whichever is highest.**

(2) Inspections

(a) Commissioning. Check clearances in both the normal and the monitor limit configurations described in the appropriate checklist.

(b) Monitor Reference Evaluations. Check clearances in the monitor limit configurations described in the appropriate checklist. It is not necessary to check clearances in the normal configuration if the clearances found during the monitor checks are equal to or greater than the tolerances required for normal.

(c) Facilities documented with Procedure 2 comparability must be re-checked at the lower standard altitude of 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest when clearances are found at less than 160 μA in any configuration on any periodic check. If the re-check at the lower standard altitude is satisfactory, the comparability check must be reaccomplished, or higher altitudes will not be used to check clearances.

(d) Verify clearances at the lower standard altitude of 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest, at least every 1,080 days. This check determines if environmental changes affect clearances at the lower standard altitude of 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest, while not affecting clearances at the higher altitudes. Fly one clearance run (normal or monitor reference) at the lower standard altitude of 1,500 ft above the antenna or 500 ft above intervening terrain, whichever is highest. Values less than 200 μA may indicate a potential clearance problem; however, if the minimum clearances required to authorize checks at higher altitudes are maintained at the lower standard altitude, higher altitudes may continue to be used.

(3) High Angle Clearance. This check determines that the transmitted signals provide proper off-course indications at the upper limit of the service volume and must be conducted during a site evaluation, commissioning inspection, or when a change in location, height, or type of antenna is made.

Approved Procedure. This check applies to the front course (and the back course if it is used for an approach or missed approach). This check is only required on one transmitter.

(a) Fly a 10-mile arc through Sectors 1 and 2 (and 3, if procedurally required), at 4,500 ft above the antenna.

(b) If clearances are out-of-tolerance, additional checks will be made at decreasing altitudes to determine the highest altitude at which the facility may be used.

l. Coverage. Coverage must be evaluated concurrently with each required check during all inspections.

m. Reporting Fixes, SID(s)/ DP(s) STAR(s), and Profile Descents. Refer to Figure 15-4. The localizer, SDF, or LDA may be used to support fixes, or departure, en route, and arrival procedures. Under these circumstances, navigation is accomplished by using some other facility such as VOR or an NDB. Facility performance of all facilities involved must be checked to ensure that all coverage parameters are within tolerance.

This must be accomplished during a commissioning inspection, when new procedures are developed or redescribed, or on appropriate special inspections (e.g., user complaints). When fixes are located within the RHO-THETA FISSV and ILS SSV (see definitions in Appendix 1), coverage throughout the fix displacement area can be predicted (fix displacement evaluation is not required).

NOTE: If the procedural altitude is below 1,500 ft above the antenna and higher than 500 ft above intervening terrain within the ILS SSV, evaluate the localizer at the procedural altitude. Out-of-tolerance indications must result in denial of the procedure but will not affect localizer service volume.

If the fix is not contained within the localizer and/or glide slope SSV, an ESV must be established to support the procedure IAW Chapter 22.

(1) Required Coverage

(a) LOC (A) B1 to B2. This requirement is satisfied by service volume validation and need not be repeated.

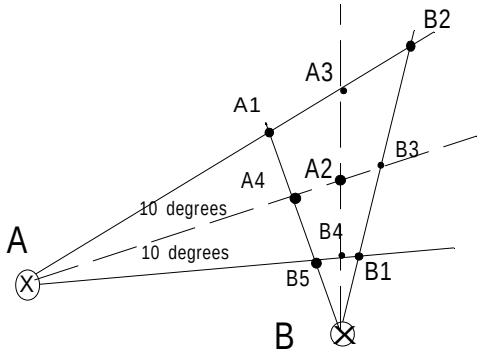
(b) VOR (B) A1 to B2 (R ± 4.5°). Does not need to be checked if within the VOR/ NDB FISSV.

(c) VOR (B) A3 to B4.

(2) SID(s)/ DP(s). Check on-course structure throughout the area of intended use. Check clearance in Sector 1 at the termination point at the minimum authorized altitude.

(3) STAR(s) and Profile Descents. Fly these procedures as proposed or as published. Check facility performance when checking STAR(s) and profile descents in accordance with Paragraph (1) above, with fixes.

Figure 15-4



n. Polarization Effect. The purpose of this check is to determine the effects that vertical polarization may have on the course structure.

Approved Procedure. This check applies to the front course (and the back course if it is procedurally used), and may be accomplished concurrently with the course structure check. This check is only required on one transmitter.

Fly inbound on-course within unrestricted coverage prior to the FAF and roll the aircraft to a 20° bank left and right. Actuate the event mark at the maximum banked attitude.

o. Identification and Voice. This check is made to ensure identification and voice (if installed) is received throughout the coverage area of the localizer.

SDF(s) have a three-letter coded identifier. Localizers and LDA(s) have a three-letter coded identifier preceded by the code letter I.

Approved Procedure. This procedure is applicable to the front course (and the back course if it is procedurally used).

Record the identification during all checks. Check voice transmissions when on-course and at the maximum distance at which course structure is being evaluated.

A localizer must be restricted if identification cannot be received in all areas of required coverage.

A localizer must not be restricted solely because the voice/ ATIS cannot be received. In this event, advise the procedures specialist and/or Air Traffic Operations personnel.

SECTION 3. GLIDE SLOPE FLIGHT INSPECTION PROCEDURES

15.30 Detailed Procedures—Glide Slope.

a. Spectrum Analysis. (Reserved)

b. Modulation Level. This check measures the modulation of the radiated signal.

Approved Procedure. Measure the modulation of the glidepath while inbound on the localizer/ glidepath course between 7 and 3 miles from the glide slope antenna with a signal strength of 150 μV or greater.

c. Modulation Equality. This check establishes the balance of the carrier signals. This check should be made prior to any phasing checks and will be used as the reference for phasing.

WARNING
HAZARDOUSLY MISLEADING INFORMATION
Misleading information is produced by this configuration. Ensure NOTAM is active. Monitor ATC communications for improper clearances to other aircraft.
WARNING

NOTE: FAA Localizers must be OFF when Glide Slopes are transmitting HMI.

Approved Procedure. Have maintenance personnel configure the facility to radiate carrier signal only. When checking capture effect facilities, the primary transmitter radiates this configuration while the clearance transmitter is off or in dummy load.

Use the procedure described in Paragraph 15.30b, Modulation Level. While descending, call out the balance to Facilities Maintenance personnel. Zero μA is optimum. An imbalance in excess of 5μA must be adjusted towards optimum.

d. Phasing. This check determines that the correct carrier and sideband-only phase relationship are distributed to the antennas.

WARNING
HAZARDOUSLY MISLEADING INFORMATION
Misleading information is produced by this configuration. Ensure NOTAM is active. Monitor ATC communications for improper clearances to other aircraft.
WARNING

NOTE: FAA Localizers must be OFF when Glide Slopes are transmitting HMI

Approved Procedure. Phasing may be performed on the ground (by maintenance) or in the air. Consult the appropriate checklist in Paragraph 15.12h. Proceed inbound from 10 miles from the glide slope antenna along the localizer procedural ground track at 1/3 to 1/2 of the glidepath angle. Maintain this angular descent until reaching runway threshold. Do not make facility adjustments inside 4 miles during the angular descent. Record the crosspointer throughout the phasing run. The flight inspection technician should relay the microammeter indications to the Facilities Maintenance personnel. Have maintenance adjust the phaser until the crosspointer is approximately the same value found during the modulation equality check.

Analysis. Analyze the crosspointer trace during the descent. If the microammeter value varies from the average between 1/2 mile from the threshold and runway threshold, the antenna offset may be incorrect and should be checked (antenna offset is most accurately established and set by maintenance).

NOTE: A comparison of airborne and ground phasing data should be made by maintenance personnel in order to determine if optimum phasing has been established.

(1) Null Reference Phasing. Make the following checks and phase the facility in the configurations listed below:

Sidebands Radiating in Quadrature to Carrier. Perform the maneuver described in "Approved Procedure" above.

(2) Sideband Reference Phasing. Make the following checks and phase the facility in the configuration listed below:

(a) Upper Antenna Feed in Dummy Load. Have Facilities Maintenance personnel insert a 90° section in the main sideband line. Conduct a level run at 1,000 ft above site elevation between 10 to 5 miles from the glide slope antenna. Adjust the phaser to the value found during the modulation equality check.

When phasing is completed, remove the 90° section and check for fully fly-down signal. This indicates that the lower antenna sensing is correct. If full fly-up signal is indicated, sensing is incorrect and the facility must be adjusted.

(b) Radiate Upper and Lower Antennas with a 90-degree section in the Main Sideband Phaser. Use the procedure described in Paragraph 15.30d, Phasing. Have maintenance adjust the upper antenna phaser to the value found during the modulation equality check. When this value is attained, remove the 90° section from the main sideband line. Ensure that a fly-up signal is received when the aircraft is below the glidepath.

(3) Capture Effect. Capture effect glide slopes are normally phased on the ground by maintenance personnel; however, they may request airborne phasing. The airborne phase verification procedure must be accomplished on commissioning inspections and when requested by maintenance. This procedure confirms that correct phasing has been achieved.

(a) Airborne Phase Verification Procedure. This procedure helps maintenance to determine if proper phasing exists. Both transmitters may be checked if standby equipment is installed.

Airborne Phase Verification Procedures

		PARAMETER						
Steps	**Checks**	**Modulation**	**Width**	**Angle**	**Symmetry**	**Structure Below Path**	**Clearance**	**Path Structure**
(a)	Modulation (7)	X						
(b)	Modulation Equality (7)	X						
(c)	Normal Configuration (8)	X	(1)	(2)	X	X	(6a)	X
(d)	Main Sideband Phaser Dephased Advance* Retard* (8)(9)		(3) (3)	(4) (4)		X X		
(e)	Middle Antenna Phaser Dephased Advance* Retard* (8)		(3) (3)	(5) (5)		X X	(6b) (6b)	
(f)	Normal (8)	X	X	X		X		

FOOTNOTES:

(1) Adjust glidepath width to 0.70° ± 0.03°.
(2) Facility must be adjusted to within 0.05° of commissioned angle for commissioning type inspections.
(3) Width— 0.1° sharper or 0.2° wider than normal.
(4) Angle—± 0.1°.
(5) Angle—± .05°.
(6) Clearance—At a recommended angle of 1.0° from 4 miles to runway threshold, maintaining at least the minimum microamp level.
If obstruction clearance is a limiting factor, an acceptable higher fixed angle may be used.

(a) 180 µA or better.
(b) 150 µA or better

(7) Maintenance request

(8) Clearance transmitter is energized throughout steps (c) – (f).

Footnotes (3), (4), (5), and (6) are expected results only. The tolerances in Paragraph 15.60b apply. The "INITIAL" tolerances of Paragraph 15.60d apply if establishing a reference.

* Actual degrees advance or retard to be determined by Maintenance.

(9) Required on commissioning checks; may be accomplished at Maintenance Request on other type checks.

(b) Airborne Phasing. When airborne phasing is requested, use the procedure described in Paragraph 1 or 2 below, or other alternate procedures specified by maintenance. Facilities Maintenance personnel must determine which procedure is to be used.

1 Airborne Phasing Procedure No.1. Confirm that maintenance has established normal carrier sideband ratios and that ground phasing is complete.

NOTE: The clearance transmitter is de-energized throughout Steps (1)-(4).

Airborne Phasing Procedure No. 1

Steps	Type Check	Reference Paragraph	Configuration	Unit of Interest
(1)	Modulation Level	15.30b	Carrier Only	In Tolerance
(2)	Modulation Equality	15.30c	Carrier Only	Crosspointer 0μA ± 5μA
(3)	Phasing	15.30d	*Upper to Middle Antenna* Lower Antenna—Dummy Load Middle Antenna—Radiate Carrier + Sidebands Upper Antenna—Radiate Sidebands Main Sideband Phaser—Quadrature	Crosspointer centered about the value found in step (2).
(4)	Phasing	15.30d	*Lower to Upper and Middle Antenna* Lower Antenna—Radiate Carrier + Sidebands Middle Antenna—Radiate Carrier + Sidebands Upper Antenna—Radiate Sidebands Main Sideband Phaser—Quadrature	Same as above.
(5)	Phase Verification	15.30d(3)(a) Steps (c)-(f)	Clearance Transmitter Energized	

2 Airborne Phasing Procedure No. 2. This procedure only applies to those facilities in which it is possible to separate carrier and sideband signals in the APCU (Amplitude and Phase Control Unit). Confirm that Facilities Maintenance personnel have established normal carrier sideband ratios and that ground phasing is complete.

NOTE: The clearance transmitter is de-energized throughout Steps (1)-(4).

Airborne Phasing Procedure No. 2

Steps	Type Check	Reference Paragraph	Configuration	Unit of Interest
(1)	Modulation Level	15.30b	Carrier Only	In Tolerance
(2)	Modulation Equality	15.30c	Carrier Only	Crosspointer 0μA ± 5μ A
(3)	Phasing	15.30d (See Note a below)	*Lower to Middle Antenna Phasing* Lower Antenna—Radiate Carrier Only Middle Antenna—Radiate Sidebands Only Upper Antenna—Dummy Load Main Sideband Phaser—Quadrature	Crosspointer centered about the value found in step (2).
(4)	Phasing	15.30d (See Note b below)	*Lower to Upper Antenna Phasing* Lower Antenna—Radiate Carrier Only Middle Antenna—Dummy Load Upper Antenna—Radiate Sidebands Only Main Sideband Phaser—Quadrature	Crosspointer centered about the value found in step (2).
(5)	Phase Verification	15.30d(3)(a) Steps (c)-(f)	Clearance Transmitter Energized	

NOTES:

a) Step (3) phasing runs should be accomplished at an elevation angle of 1/2 the glidepath angle (or up to 2/3 of the angle if terrain prevents the lower angle.)

b) Step (4) Phasing runs should be accomplished at an elevation angle equal to the glidepath angle.

3 Alternate Phasing Procedure. Unlike airborne phasing, ground maintenance may dephase an antenna and ask flight inspection to provide data from a level run, expecting a symmetrical change in the width or angle. The results are factored into a formula to determine optimum phasing settings. Maintenance may dephase lower-to-upper and/or lower-to-middle antennas.

a Upper antenna Procedures. Maintenace will dephase the upper antenna a known amount (e.g., 57°). Fly a level run (standard ILS-2 profile) and provide the following values: path angle, path width, SBP, and symmetry. Expect a symmetrical lowering of the path angle for equal amounts of advance and retard. The ideal amount of glide angle change, i.e., an expected typical value is 0.2 – 0.3°.

b Middle Antenna Procedures. Dephasing the middle antenna should result in a symmetrical widening of the path width and lowering of the structure below path angle for equal amounts of advance and retard. Fly a level run (standard ILS-2 profile) and provide the following values: path angle, path width, SBP, and symmetry.

NOTE: These procedures alleviate the "chasing of the plane" when trying to adjust the facility phasing with the aircraft on a descent path. It is sometimes easier to make calculated phase adjustments on the ground than it is to adjust real-time as the aircraft relays microampere readings on final approach.

e. Engineering and Support Tests. These tests are made at maintenance request, on one transmitter only. Their purpose is to assist the Facilities Maintenance personnel to make measurements that they are not able to make and/or confirm from the ground.

(1) Null Check. The antenna null check is an engineering support check and is not conducted unless requested by engineering/ maintenance personnel. This check is conducted to determine the vertical angles at which the nulls of the individual glidepath antennas occur. It can be conducted on all image array systems. No procedures exist for the non-image arrays.

WARNING
HAZARDOUSLY MISLEADING INFORMATION
Misleading information is produced by this configuration. Ensure NOTAM is active. Monitor ATC communications for improper clearances to other aircraft.
WARNING

NOTE: FAA Localizers must be OFF when Glide Slopes are transmitting HMI

Approved Procedure. Use the level run method described in Paragraph 15.30f while the facility is radiating carrier only (sidebands dummy loaded) from one of the antennas. A level run and analysis must be made for each antenna.

Analysis. Compute the angles from the nulls, which appear on the recording as dips in the AGC. If the AGC dips are broad, as in the case of the first null of the upper antenna of a capture effect glide slope, angle measurements may have to be accomplished by measuring the second and/or third null.

(2) Antenna Offset. This check is performed to establish the horizontal antenna displacements on the mast. Offset affects the phase relationship of the glidepath signal as the aircraft approaches the runway threshold. Low clearances, and/or a fly-down signal between Point B and the runway threshold may be caused by improper offset. Antenna offsets can be accurately determined and positioned by Facilities Maintenance personnel without flight inspection assistance.

WARNING
HAZARDOUSLY MISLEADING INFORMATION
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WARNING

NOTE: FAA Localizers must be OFF when Glide Slopes are transmitting HMI

Approved Procedure. Perform a phasing check in accordance with Paragraph 15.30d. After optimum results are achieved in the far field (1/2 mile from the runway threshold and beyond), park the aircraft on centerline at the runway threshold. With the facility still in quadrature phase, have Facilities Maintenance personnel adjust the horizontal displacement in the antennas (the top most antenna should be closer to the runway than the bottom). As the antennas are being adjusted, relay crosspointer indications to Facilities Maintenance personnel. The optimum setting is the same as the displacement found during the quadrature phasing checks. Take a final reading when the antenna is secured and personnel are not on the mast. Check the effects of the antenna offset adjustment in the far and near fields by performing another phasing check.

NOTE: If the crosspointer is not stable when the aircraft is parked at the runway threshold, then the antenna offset cannot be established on the ground. In this case: (1) have maintenance readjust the antenna offset based on the final phasing run; (2) re-fly the last 3,000 ft from the runway threshold in accordance with Paragraph 15.30d, and analyze the results based on the "Analysis" section of the paragraph.

(3) Spurious Radiation. This check is performed to determine if any glide slope signal exists in the final approach segment with the facility configured in dummy load.

Approved Procedure. Fly a low approach on runway centerline, commencing at least 4 miles from the facility. Using a spectrum analyzer or the glide slope receiver traces, compare any signals that are received during the approach with the results found while the facility is transmitting normally.

f. Angle Width, Symmetry, and Structure Below Path. These parameters may be measured from the results of one level run, except when the actual path angle is required (for specific ILS categories and on various types of inspections). In this case, determine the angle by the actual path angle method.

(1) Angle. Two methods are used to determine the glidepath angle. They are the level run method and the actual path a ngle method, as explained in this section. The actual path angle method must be used to measure the path angle during site, commissioning, after-accident inspections, special inspections at maintenance request, and confirmation of out-of-tolerance conditions for Category I glide slopes. It must also be used during any inspection to determine the reported angle for Category II and III glide slopes. The level run method may be used for measuring the glidepath angle of CAT I facilities subsequent to the commissioning inspection. It should be used for measuring the glidepath angle during monitor checks (for any ILS category), engineering support checks, etc.

> **NOTE:** During any inspection in which actual path angle is measured, the angle found on the level run, in normal configuration, must be compared to the actual path angle. The difference between these angles must become a correction factor that must be applied to all subsequent monitor angles determined by the level run method. Where actual path angle is greater, add the difference to the level run angle; where actual path angle is less, subtract the difference from the level run angle.

Prior to beginning a site or commissioning inspection, obtain the commissioned angle from ground/ procedures personnel. Do not change it without their concurrence.

Approved Procedures--Level Run. Position the aircraft beyond the 190 μA/ 150Hz glidepath point on the localizer on-course or procedural designed azimuth. Maintain a constant airspeed. The altitude selected for the level run is usually the GSI altitude. Altitude may be adjusted approximately 200 ft above and below the GSI altitude due to ATC request, weather, unmeasurable crosspointer transitions, comparability to actual path angle, or a lower altitude to obtain 190 μA. Altitudes beyond the 200 ft above/ below criteria must be approved by the Aviation System Standards Flight Inspection PolicyTeam.

(a) Theodolite Method. Position the theodolite or tracking device in accordance with Paragraph 15.11f, Theodolite Procedures. Proceed inbound recording 1,020 Hz reference marks from the theodolite. Measure width, angle, symmetry, and structure below path by referencing the recording at the 190µA/ 150Hz, 75µA/ 150Hz, on path, 75µA/ 90Hz points with the theodolite 1,020 Hz marks which are usually spaced at 0.2° intervals.

> **NOTE:** An RTT may be used to track an aircraft through the path sector. Apply the path sector width received to the calibration of the RTT.

(b) Altimeter and Ground Speed Method. Fly inbound. Mark checkpoints with the event mark and identify them on the recording. Checkpoints are normally the outer marker and the glide slope antenna; however, any two checkpoints separated by a known distance may be used. A distance for each point (i.e., 190µ A, 75 µA, 0 µA, and 75 µA) is determined by using time/ distance ratios. The appropriate angle, width, symmetry, and structure below path are calculated from these values.

Approved Procedures – Zone 2 Actual Path Angle

- **AFIS Method.** See appropriate AFIS manual.

- **RTT Method.** Determine the actual path angle from the straight line arithmetic mean of all deviations of the differential trace occurring in ILS Approach Zone 2. The arithmetic mean can be determined either by using a compensating polar planimeter or by averaging 2-second samples of the deviations in Zone 2 (smaller sampling interval may be used, e.g., 1-second samples).

- **Standard Theodolite Method.** Sufficient positioning information must be obtained to determine the actual path angle, and the presence of bends, reversals, and shorter term aberrations; therefore, more than one run may be required.

(2) Width. Path width is the width in degrees of the Half ILS Glide Path Width Sector. Path width measurements are obtained from level runs.

Some facilities have step characteristics of the crosspointer transition which may preclude the use of the 75 µA points.

When steps are encountered, the following procedure is recommended to determine which level run measurement points should be used for path width analysis:

(a) Perform a mean width check IAW Paragraph 15.30h.

(b) Fly a normal level run using 60 µA measurement points.

(c) Fly a normal level run using 90 µA measurement points.

(d) On subsequent level runs, use the measurements points, from (b) or (c) above, which most closely match the path width results measured on the mean width check.If the steps continue to affect the level run results, consider another altitude, or evaluate all Normal and monitor reference widths using the mean width method.

If a point other than 75 μA is used to measure path widths, that point must be used on all subsequent checks and inspections.

(3) Symmetry. Symmetry is determined from the data obtained during level run angle and/or width measurements. If points other than the 75 μA points are used for measuring the path width, they must also be used for the symmetry measurements. Symmetry is the balance of the 2 sectors, 90Hz/ 150Hz. The glidepath should be as symmetrical as possible; however, there normally is some imbalance. If the level run symmetry is not acceptable, the AFIS, RTT, or theodolite must be used to determine the mean symmetry (see Mean Width). Apply the mean symmetry as a correction factor to level runs; annotate on AMIS. If the symmetry still remains out-of-tolerance, the facility must be removed from service.

(4) Structure-Below-Path. This check determines that the 190μA/150Hz point occurs at an angle above the horizontal which is at least 30 percent of the commissioned angle. The structure below path is determined from the data obtained during the level run angle or width measurements. Altitudes lower than GSI may be required to make this measurement.

> **NOTE:** The structure-below-path point does not have to occur within the service volume of the facility to be a valid check, provided the AGC and flag alarm current indications are within appropriate tolerances.

If the 190 μA/ 150Hz point, in any facility configuration, cannot be found, conduct a clearance below path check starting at the edge of the service volume. Apply the appropriate tolerance. During monitor dephase checks, the structure-below-path angles, as compared to the normal SBP, indicate performance of the below path sensitivity of the glide slope. The information may be used by maintenance for system optimization.

g. Clearance. This check is performed to assure that positive fly-up indications exist between the bottom of the glidepath sector and obstructions. Clearances above the path are checked to ensure that positive fly-down indication is received prior to intercepting the first false path.

Approved Procedure

(1) Clearance Below the Path. Starting at the FAF or GSI distance (whichever is further), fly along the localizer centerline (and the areas specified by the checklists). For glide slopes associated with offset localizers or LDA(s), check to Point “C”. For the 5 and 8° endfire checks, check only to Point “B”. For all glide slopes with runway centerline localizers, check centerline clearances to runway threshold. Check that the required amount of fly-up signal exists (180 μA in normal, 150 μA in any monitor limit condition) from the FAF/ GSI to the following points:

(a) CAT I not used below 200 ft Decision Altitude (DA) -- ILS point "C" for an unrestricted glide slope; or the point at which the glide slope is restricted. When clearances are checked to threshold, document the results as satisfactory or unsatisfactory between Points “C” and “T” on the flight inspection report.

(b) CAT I used below 200 ft DH and all CAT II/ III --Runway threshold.

(2) Clearance Above the Path. Check that 150 μA fly-down occurs prior to the first false path. Perform this check during all level runs in accordance with the approved procedure, Paragraph 15.30f.

h. Mean Width. This check, performed on all commissioning inspections, and per maintenance request to verify questionable path width and/or symmetry results induced by inconsistent level runs, is used to determine the mean width of a glidepath between ILS Points "A" and "B". This check may also be used to determine the mean symmetry of the glidepath. Theodolite, RTT, or AFIS must be used. The path width should be established, as nearly as possible, to 0.7° prior to the check.

Approved Procedure. Fly inbound on the localizer on-course maintaining 75 μA above the glidepath between ILS Point "A" and "B". Repeat the same run at 75 μA below the glidepath, and again while on the glidepath.

Determine the mean width from the angle found above and below the glidepath and calculate symmetry from the on-path angle.

i. Tilt. This check verifies that the glidepath angle and clearances are within the authorized tolerance at the extremities of the localizer course sector. Apply the actual angle correction factor to the level run angles in the Tilt check.

Approved Procedure. With the glide slope facility in normal, measure clearances below the path at the localizer 150 μA point either side of centerline from the GSI to Point B. At the GSI altitude, measure the path angle, modulation, and clearance above path at the localizer 150 μA point either side of centerline, using the level run method. This check is only required on one transmitter.

j. Structure and Zone 3 Angle Alignment. These checks measure structure deviations and Zone 3 angle alignment. Measurements are made while the facility is operating in a normal configuration, except for special structure evaluations on waveguide facilities.

Approved Procedure. Fly inbound on the glidepath and localizer course from 10 miles from the glide slope antenna through all zones. See Chapter 22 for ESV requirements. The structure must be evaluated in all zones and the CAT II and III angle alignments in Zone 3. Angle alignment must be evaluated using the RTT or AFIS. The angle alignment (or deviation of the mean angle from Point B to Point T) is affected by siting, phasing, and antenna offset factors that may not affect the measured Zone 2 angle.

(1) Inspections

(a) During site, commissioning, reconfiguration, categorization, antenna, and/or frequency change, evaluate the structure by using the entire procedure described above.

(b) During all other inspections (i.e., periodic, periodic with monitors, etc.) this evaluation can be accomplished from the GSI or FAF (whichever is further) by using the procedure described above.

k. Transverse Structure--Endfire Glide Slope. This is a measurement of the horizontal structure of the glidepath and is directly related to on-path structure, tilt, and clearance. On any inspection after commissioning, where transverse structure is checked, compare the course and clearance normal results with those from the last results on file. Notify maintenance of any significant changes (see "Analysis" below). Perform a tilt check on the affected side(s) if the glide slope microamp deflection at the localizer 150 μA point exceeds angle tolerances.

Approved Procedure. Fly an arc of at least 12° each side of localizer centerline at the FAF distance and FAF altitude corrected to true altitude. The arc must be referenced laterally to localizer centerline abeam the glide slope antenna. If the FAF is less than 5.0 miles from the glide slope, the arc distance must be changed to at least 5 miles. (*As the received glidepath is affected by aircraft distance and altitude, it is critical that these parameters do not vary during the arc.)* The arc may be flown either clockwise or counter-clockwise. Record both localizer and glide slope crosspointers: The AFIS plot sensitivity should be set to allow ease of trace analysis.

Analysis. No tolerance is applied to transverse structure, but the following results are expected for all facility configurations in the checklist where the transverse structure is recorded. Results exceeding the expected values will require engineering analysis prior to final resolution. Engineering uses results of these checks to adjust antenna pedestal locations and signal levels. Multiple runs may be required to optimize the antenna arrays. See Figure 15-5 for a sample plot.

(1) Within the localizer course sector, the change of the glide slope signal should not exceed *64 μA of 150 Hz or *48 μA of 90 Hz from the crosspointer value found on the localizer on-course. *This analysis applies to a 3.0° commissioned glide slope angle. See the following table:

+10%/-7.5% ANGLE ALARM/TRANSVERSE STRUCTURE MICROAMP VALUE

Commissioned Angle	Low Angle (°/μA)	High Angle (°/μA)
2.5°	2.32°/ 38 μA (90 Hz)	2.75°/ 53 μA (150 Hz)
3.0°	2.78°/ 48 μA (90 Hz)	3.30°/ 64 μA (150 Hz)
3.5°	3.24°/ 55 μA (90 Hz)	3.85°/ 75 μA (150 Hz)

(2) From the edge of the localizer course sector to 8° from the localizer on-course, signals should not exist that are greater than 48 μA in the 90 Hz direction from the glide slope crosspointer value found on the localizer on-course.

(3) In the event any part of the transverse structure does not meet the recommended value due to a deflection into the 90 Hz direction, verify that adequate 150 Hz fly-up signal exists in this area while clearing obstructions. These data should be included in the engineering analysis prior to final resolution.

l. Coverage. Coverage must be evaluated concurrently with each required check during all inspections.

m. Monitors. The purpose of these checks is to measure glidepath parameters when the facility is set at the monitor reference. The inspector must ensure that the facility is set at the monitor reference prior to each check. Monitor references must be checked when prescribed by the checklist, and when applicable on special inspections. At the conclusion of any monitor inspection, the facility must be returned to normal, and the following checks performed and results reported: Angle, Width, Symmetry, and Structure Below the Path.

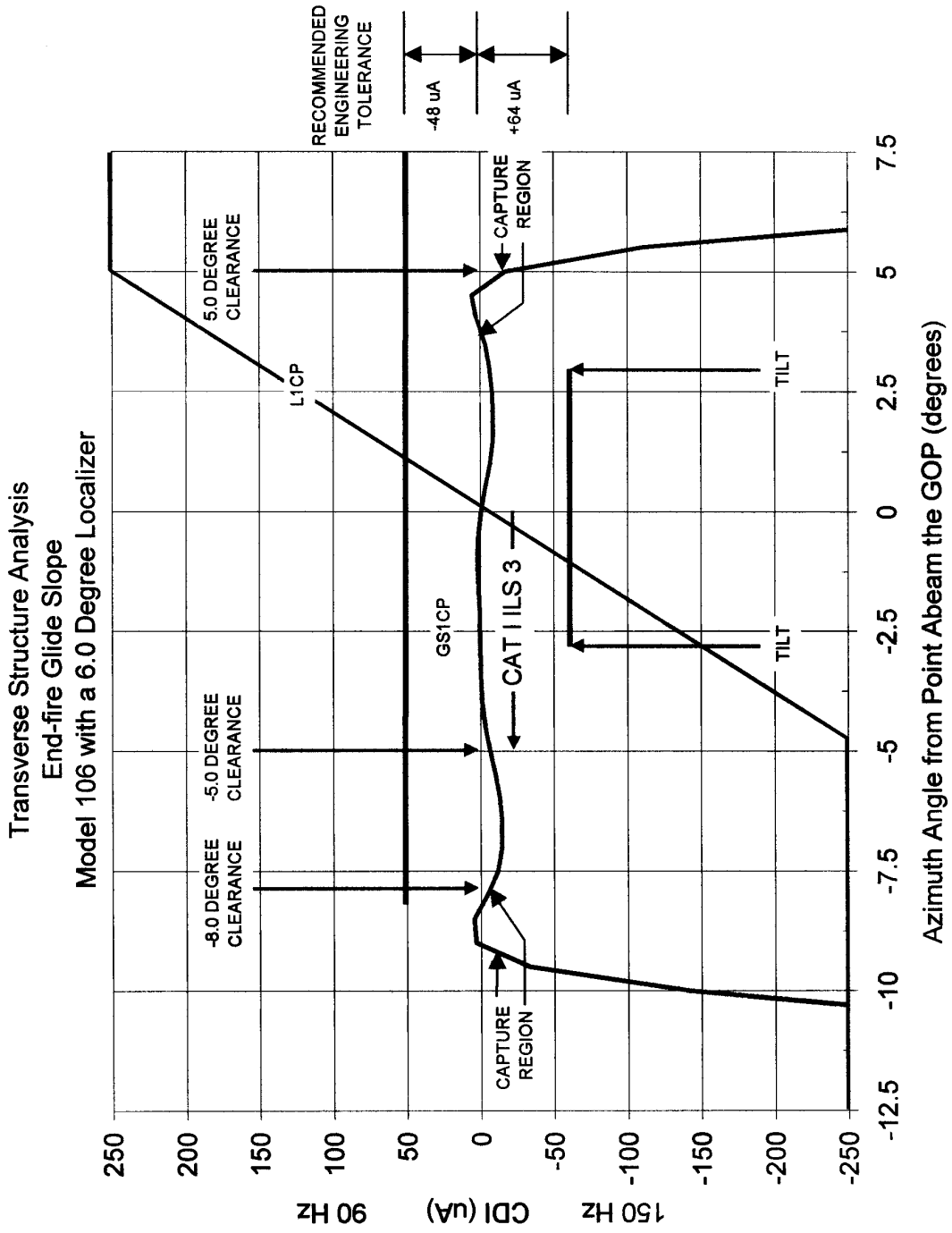
Approved Procedure. Use the level run method (Paragraph 15.30f) to measure width, angle, and structure below the path in the monitor limit conditions. Check clearances in accordance with Paragraph 15.30g.

n. RF Power Monitor Reference. This check is conducted to determine that the glide slope meets specified tolerances throughout its service volume while operating at reduced power.

Approved Procedure. The glidepath transmitter must be placed in reduced power setting for this check (both primary and clearance transmitters for capture effect and endfire glide slopes). This check must be made on the localizer on-course and 8° each side of a point on localizer centerline abeam the glide slope origination point. While maintaining the GSI altitude, fly inbound from 10 nm from the facility to the interception of the lower sector of the glidepath (i.e., the point nearest the glidepath at which 150 μA occurs). Fly through the glidepath sector and check clearances above the path.

> **NOTE 1:** In situations where less than 150 μA fly-up signal is received, descend to an altitude which will provide at least 150 μA fly-up while providing adequate obstacle clearance at 10 miles.
>
> **NOTE 2: Endfire.** The endfire glide slope antenna array is orientated toward the runway. The normal fly-up/ fly-down signal ends at approximately 5° on the antenna side of the runway; therefore, you will have only 150 Hz clearance signal at 8° on the antenna side of the runway. The provisions of Paragraph 15.51d will apply to this situation.

Figure 15-5


Transverse Structure Analysis
End-fire Glide Slope
Model 106 with a 6.0 Degree Localizer
RECOMMENDED ENGINEERING TOLERANCE
-48 uA
+64 uA
5.0 DEGREE CLEARANCE
-5.0 DEGREE CLEARANCE
-8.0 DEGREE CLEARANCE
L1CP
GS1CP
CAT I ILS 3
CAPTURE REGION
CAPTURE REGION
TILT
TILT
250
200
150
100
50
0
-50
-100
-150
-200
-250
90 Hz
CDI (uA)
150 Hz
-12.5
-10
-7.5
-5
-2.5
0
2.5
5
7.5
Azimuth Angle from Point Abeam the GOP (degrees)

SECTION 4. 75 MHz MARKER BEACON FLIGHT INSPECTION PROCEDURES

15.40 INTRODUCTION

a. Spectrum Analysis. (Reserved)

b. Identification and Modulation Tone. The purpose of this check is to ensure that the correct modulation tone and keying code are transmitted without interference throughout the area of required coverage. Keying rate is checked by Facility Maintenance personnel.

Approved Procedure. Record and evaluate the keying code while flying in the radiation pattern at the proposed or published altitude(s). Check that the audio modulation tone is correct by noting that the proper light comes on for the type marker being inspected, e.g., the OM illuminates the blue lamp.

c. Coverage. This check is conducted to assure that the facility will provide a radiation pattern that supports operational requirements without interfering with other facilities or instrument flight procedures. All of the commissioning coverage requirements must be completed with any adjacent marker beacons removed from service to preclude a misrepresentative coverage analysis caused by signal intermixing. The aircraft marker beacon sensitivity must be set at the low position for all checks.

(1) Minor Axis. This check is performed to measure the actual width and quality of the radiation pattern along the procedural course where it will be used.

Approved Procedure. Fly through the marker beacon signal while inbound on the electronic course providing approach guidance. Maintain the published minimum altitude to check marker beacons that support nonprecision approaches. For markers that support precision instrument flight procedures, the preferred method is to fly down the glidepath. An alternate procedure is to maintain the altitude at which the glide slope intersects the marker location. If the facility supports both precision and nonprecision procedures and the difference between the respective intercept altitudes exceeds 100 ft, conduct the initial check at both altitudes. Thereafter, either altitude may be used.

NOTE: Outer Marker Coverage will be considered satisfactory when the width is between 1,350 and 4,000 ft; 2,000 ft is the optimum width.

(2) Major Axis. This measurement is conducted to verify that the marker beacon provides adequate coverage by measuring the width of the minor axis at the extremities of a predefined off-course sector. There is no requirement to flight inspect major axis coverage for inner markers. It is not necessary to obtain the limits of actual coverage unless requested as an engineering assist.

Approved Procedure. Fly though the marker beacon signal while positioned on the course or microamp displacement which defines the required coverage limits (see Figure 15-3). Maintain the altitudes required for the minor axis measurements.

(a) Coverage Limits. The required coverage limits are predicated upon the type facility providing course guidance.

(b) Unidirectional facilities (e.g., LOC/ LDA/ SDF). Coverage must be provided 75 μA each side of the localizer on-course signal, with the facility in Normal.

(c) Omnidirectional facilities (e.g., VOR, NDB). Coverage must be provided 5° each side of the on-course signal.

d. Proximity Check. These inspections supplement the basic coverage checks to assure operational compatibility between a marker beacon sited in close proximity to another marker beacon(s). The check may be performed prior to the commissioning inspection as a type of a site evaluation. It must be performed on each applicable marker beacon prior to authorizing operational use.

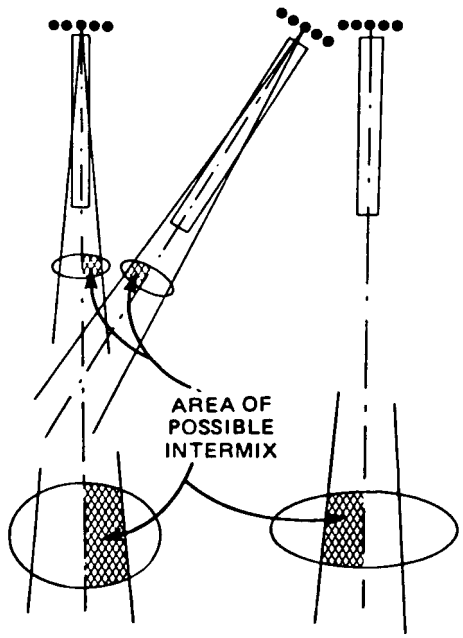
(1) Marker Beacon Signal Intermix. This check is conducted to determine if there is unacceptable signal derogation caused by the simultaneous operation of two or more marker beacons in close proximity.

Approved Procedure. Perform periodic checklist items with all marker beacons operating as proposed. In addition, check the major axis at the lowest procedural altitude on the side of the marker beacon closest to the adjacent marker. Assure that in-tolerance parameters and the following conditions are met:

(a) No adverse audio interference, i.e., heterodyne.

(b) Distinct fix indication that is not vague or distorted.

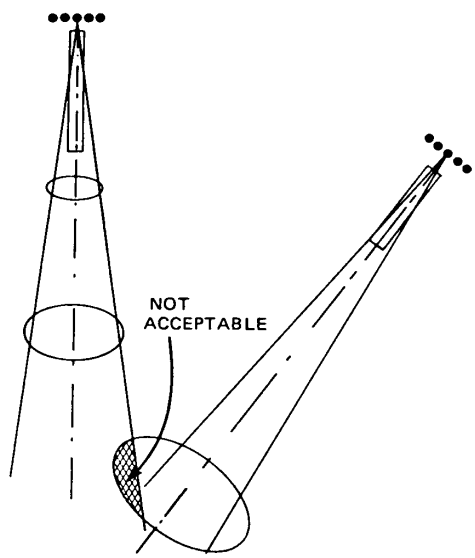
Figure 15-6
MARKER BEACON/ PROCEDURE INTERMIX



(2) Marker Beacon/ Procedure Overlap. This check is conducted to assure that there are no false marker beacon indications present along an instrument approach course, which would authorize a premature descent prior to the point at which the actual fix position/ marker beacon occurs. This situation could exist if the "intruding" marker beacon signal had the same modulation, even though the identifications may differ. Conduct this check only if it is suspected that this condition exists.

Approved Procedure. The flight inspector will position the aircraft at the extremity of the approach course (150 μA or 5°, as appropriate) nearest the potentially misleading marker beacon at the minimum procedural altitude. If the signal intrusion into the approach area is at or above 1,700 μV, the procedure must be suspended until the signal intrusion can be reduced to less than 1,700 μV. If the signal cannot be reduced, the procedure must be denied or the misleading marker removed from service.

Figure 15-7
MARKER BEACON OVERLAP



e. Measurement Methods. Formulas appropriate to the following measurement methods are listed in Appendix 2.

(1) Ground Speed. Using an approved unit that provides a ground speed readout, derive the average ground speed and note it on the recording. Ascertain the time required to traverse the pattern, then calculate the width using time and ground speed.

(2) True Airspeed. Maintaining a constant true airspeed and altitude, traverse the marker beacon pattern on the appropriate course. A reciprocal flight must be made in the opposite direction to eliminate the effects of wind. Calculate the width using the true airspeed and time for each crossing.

(3) Known Distance. When the distance between two points on, or reasonably close to, the desired track are known (marker to runway, etc.), maintain a constant indicated airspeed and altitude throughout the segment and calculate the width by proportioning the marker distance to the known distance.

f. Holding Fixes. Marker beacons which will be used as a fix for holding or any other instrument flight procedural use, at altitudes above those noted in Paragraph 15.40c must be checked for major and minor axis coverage at the highest proposed altitude. If performance is not satisfactory and cannot be corrected by facility adjustment, the operational altitudes will have to be revised or procedural use denied.

g. Standby Equipment. See Chapter 4, Section 3. This equipment must be checked in the same manner as the main equipment.

h. Standby Power. Refer to Chapter 4, Section 3. If the check is required, complete periodic checklist requirements on one set of equipment while operating on standby power.

SECTION 5. ANALYSIS (ILS and MARKER BEACONS)

15.50 ANALYSIS. A detailed analysis of the measurements and calculations made during the course of the flight inspection provides an overall picture and permanent record of facility performance.

15.51 ILS ANALYSIS

a. Structure Tolerances (95% Rule). Application of course structure analysis contained in this paragraph applies to all zones (1, 2, 3) of glidepaths and all zones of localizers (1, 2, 3, 4, & 5) and SDF(s), including back courses. This provision does not apply to glide slope rate of change/ reversal (see Paragraph 15.51b). For Category II/ III facilities, the applicable region or military command engineering staff must be notified of initial application of this criteria. If course or path tolerances are exceeded, analyze the course/path structure as follows:

(1) Where course/ path structure is out-of-tolerance in any region of the approach, the flight recordings will be analyzed in distance intervals of 7,089 ft (1.17 nm) centered about the region where the out-of-tolerance or aggregate of out-of-tolerance condition(s) occurs. Two 7,089 ft areas must not overlap.

(2) Where necessary to avoid overlap, centering the interval about the out-of-tolerance region may be disregarded.

(3) It is not permissible to extend the 7,089 ft segment beyond the area checked, i.e., service volume or ESV, whichever is greater, or the point closest to the runway where analyzation stops.

(4) The course/ path structure is acceptable if the aggregate structure is out of tolerance for a distance equal to or less than 354 ft within each 7,089 ft segment.

b. Rate of Change/ Reversal in the Slope of the Glidepath. The following analysis of the path angle recording must be accomplished during all inspections where AFIS, RTT, or other tracking devices are being used. It applies to all categories of ILS.

(1) Inspect the glidepath corrected error trace/ differential trace in Zones 2 and 3 for changes and/or reversals in the trend of the slope of the path trace.

(2) If the trace (or trend), on either or both sides of the point where a change in direction occurs, extends for at least 1,500 ft along the approach with an essentially continuous slope (see Figure 15-11), this qualifies as a "measurable reversal", subject to further analysis.

(3) If one or more changes/ reversals meets the condition in b(2). above, draw a straight line through the average slope that covers at least a 1,500 ft segment **each side of the point of change.** It is permissible to extend the straight line of the average slope to inside Point C if required, in order to obtain the 1,500 ft segment. Determine the change-in-slope by measuring the divergence of the two lines at a point 1,000 ft from their intersection.

(4) NOTAM Action. The use of facilities which do not meet the change/ reversal tolerance must be limited by a NOTAM (see Chapter 5, Section 1) that withholds authorization for autopilot coupled approaches below an altitude (MSL) which is 50 ft higher on the glidepath than the altitude at which the out-of-tolerance condition occurs. Compute the MSL altitude for such a restriction based on the commissioned angle of the facility.

(a) Category I facilities that do not meet the change/ reversal tolerance must not be classified "restricted" due to the change/ reversal. However, NOTAM action must be taken and the National Flight Procedures Office advised.

(b) Category II and III facilities are required to meet the established change/ reversal criteria. If a change/ reversal is found, the facility must be classified “restricted” and the Cat II/ III procedures NOTAMed. Additional NOTAM action per Chapter 5, Section 1 also applies.

c. Application of Localizer Coverage Requirements. The maneuvering areas described in the approved procedures of this chapter define the standard service volume in which coverage tolerances must be maintained in order for a localizer to be assigned a facility classification of "UNRESTRICTED". The localizer may still be usable when coverage does not meet tolerances throughout the standard service volume, depending on the effect of the restriction on procedural use. In evaluating such effects, all coverage criteria must be considered; however, for an UNRESTRICTED classification, the following criteria must also be met:

(1) Clearances

(a) Tolerance Application. Deviations in any sector to less than 100 μA are not acceptable. In Sectors 2 and 3, momentary deflections of the crosspointer to less than the tolerances are acceptable, provided that the aggregate area does not exceed 3° of arc in Sectors 2 and 3 combined in one quadrant. Such an area is acceptable on both sides of the localizer. Additionally, all the above criteria are applicable to the back course.

NOTE: One quadrant is defined as that area between the localizer on-course and a point 90° to the antenna.

(b) Restrictions. If a localizer is restricted in Sector 2, it must not be used for a procedure turn on the restricted side, unless the inbound procedure turn course guidance is provided by some other facility, such as a VOR, NDB, etc.

(c) Momentary deviations of the localizer cross pointer in Sector 1 can be averaged without further evaluation, provided the cross pointer deviation does not present a noticeable effect on flyability or create a possible false course. Questionable reversals of trend or excessive irregular flattening of the course ("steps") require an evaluation of the effect on the procedure. When this condition occurs, refly the Sector 1 arc on one transmitter at the service volume limit at 2,000 ft above the threshold elevation, or 1,000 ft above intervening terrain, whichever is highest, at a maximum ground speed of 170 knots. Evaluate for noticeable effects on flyability and possible false course indications. The procedure must be removed if reversals of trend have noticeable effects on flyabililty or flyable false course indications occur. If the arc at the service volume limit at 2,000 ft above the threshold elevation or 1,000 ft above intervening terrain, whichever is highest, is satisfactory for flyability, document the check on the facility data sheet (e.g., "Deviations in Sector 1 clearance linearity evaluated on the front course/ back course (as appropriate) and the results found satisfactory IAW 8200.1 Paragraph 15.51c(1)(c); Date mm/dd/yr").

(2) Distance Requirements

(a) Restrictions to localizer coverage at distances less than the standard service volume are permitted, provided the localizer meets all coverage tolerances throughout all procedural approach segments and at the maximum distance at which the procedure turn may be completed.

(b) Restrictions above the prescribed width, clearance, and coverage altitudes are acceptable, provided a step-down fix, etc., can be added to the appropriate approach segment which restricts descent to within the altitude/ distance at which acceptable coverage was achieved.

(3) Vertical Angle Requirements

(a) If in-tolerance coverage cannot be maintained up to 7° or point C as required in the RF power monitor check, the localizer may still be used for CAT I and nonprecision operations on a restricted basis; however, the localizer must be classified as "unusable" if in-tolerance coverage cannot be maintained up to 4° or 1° greater than the commissioned glidepath angle, whichever is greater (both measured from the localizer).

(b) If vertical angle coverage is limited but the localizer can be used on a restricted basis as outlined above, a NOTAM must be issued which restricts the localizer as "unusable" above a specified altitude, both at the threshold and at least one other point, usually the FAF (see example in Chapter 5, Section 1). Note the angle at which unsatisfactory coverage occurred and evaluate its effect on the nonprecision MDA, maximum holding altitudes, and missed approach instructions/ protected areas.

d. Application of Glide Slope Coverage Requirements. The RF Power Monitor check described in Paragraph 15.30n defines the lateral and longitudinal standard service volume of the glide slope. The approved procedure specifies to check for clearances above the path. If there is no defined glidepath or clearance above path, the glide slope must be restricted as unusable beyond a point referenced angularly to runway centerline at which no glidepath or clearance above path is provided. See an example in Chapter 5, Section 1. The glide slope must meet the tilt tolerance and the RF power monitor tolerance.

e. ILS Maintenance Tolerances and Alerts. To prevent out-of-tolerance results, some maintenance activities have more restrictive requirements than the tolerances listed in Paragraph 15.60.

NOTE: The "Initial" alignment tolerance must be applied as the "As Left" value on **all** Periodic with Monitor type checks.

(1) CAT III Adjust and Maintain. Normal localizer width/ alignment and glide slope angle checks on Category III ILS systems are required to be maintained at tighter than monitored values. Results that exceed these values but do not exceed flight inspection tolerances IAW Paragraph 15.60a and b should not be considered out-of-tolerance, and no discrepancies should be noted on the Daily Flight Log. Remain on-station until all "adjust and maintain" parameters are within limits unless Maintenance determines otherwise. Issue an ILS Maintenance Alert IAW Paragraph 15.51e(3)(b) and document the circumstances on the flight inspection report when a value exceeds the "adjust and maintain" limits.

(a) Inspections Not Involving Maintenance Personnel. When CAT III facilities are found operating beyond these tighter values, repeat the run(s) to confirm the measurement and, if repeatable, advise Maintenance immediately. If Maintenance is unable to respond to make adjustments, the facility must remain CAT III unless downgraded by Maintenance.

(b) Inspections Requiring Maintenance Personnel. Do not leave the facility operating CAT III beyond the "adjust and maintain" values. Take action to NOTAM the CAT III procedure IAW Paragraph 5.12 if the "as left" condition exceeds the "adjust and maintain" values.

(c) Adjust and Maintain Values:

Localizer Alignment	± 4 μA
Localizer Width (Commissioned Width)	± 10%
Glide Slope Angle (Commissioned Angle)	±4%

(2) Reference Values. These values are the various power, modulation balance, phasing, and other settings established by Airway Facilities Maintenance personnel and evaluated during flight inspection. The "maintenance tolerances" used to establish these references are designed to ensure that ILS operation at the reference settings will not exceed flight inspection tolerances during normal operation. FAA Order 6750.49, ILS Maintenance Handbook, requires FAA and non-Federal U.S. civil facilities to meet “Initial” airborne tolerances at any time a reference value is established. When the ILS is maintained by using these reference values, Maintenance is permitted to replace and adjust facility components without benefit of a flight inspection, and the facility is allowed to exceed these “Initial” tolerances during normal conditions.

However, if maintenance chooses to adjust the ILS to a new reference setting, if the facility is found operating beyond the periodic tolerances in Paragraph 15.60a and b, or when reference values are to be validated, new values must be established. Advise Maintenance when results are beyond these values. If, after repeated attempts, the results are beyond the “Initial” tolerances but within Paragraphs 15.60a and b flight inspection tolerances, and Maintenance personnel desire to restore the facility, continue the inspection and document the circumstances on the flight inspection report and the Daily Flight Log. Figures 15-8A – F detail the airborne measurements required per specific maintenance adjustments should those maintenance actions invalidate or create reference values.

(a) Airborne Measurements of ILS References

1 Even though an abnormal condition is used primarily to evaluate one parameter, such as glide slope width, the secondary measurements of angle and structure below path (SBP) must also meet the "Initial" tolerances. Likewise, Width and SBP are also required to remain within "Initial" values when Angle references are adjusted.

2 Do not use the term "Alarm" on a reference inspection; instead use "Reference Value" when requesting the abnormal conditions.

3 Provide Width, Angle (corrected by ILS-3), Symmetry (no tolerance in abnormal conditions), and SBP on all ILS-2 runs. If the angle correction factor is not established at the beginning of the check, ensure the corrected values are transmitted to maintenance before flight inspection departs the area.

4 Provide width, symmetry (in Normal only), and low clearances on all ILS-1 runs.

5 Provide the marker minor axis measurements when establishing references for those facilities.

6 Request acknowledgement of all data transmitted to maintenance.

7 If any report value changes as a result of a review during report preparation or quality review, contact the ground technician and provide the corrected numbers. This is to ensure that the recorded maintenance data matches the flight inspection report. **If the ILS maintenance data does not match the corresponding flight inspection results, the maintenance data is invalid pending another flight inspection**.

8 Localizer back-course alignment values are for those facilities where the back course is subordinate to the front course. Independently monitored back-course alignment values = **≤ 10 µA**.

9 Localizer alignment monitor references are not based on airborne measurements, IAW Order 6750.49; AF Region approved special request is required.

10 Dual Transmitter Facilities. Standby transmitters should match the reference transmitter within the prescribed equality limits during the same flight inspection. Applies to any type inspection when both primary and standby transmitters are evaluated. If Maintenance is unable to adjust transmitter within equality limits and meets FAA Order 8200.1 tolerances, the transmitter may remain in service unless Maintenance elects to remove it from service.

(b) Figures 15-8A – F, Required Airborne Measurements per Facility Type

Figure 15-8A Single Frequency Localizer

ILS Reference Change	Required Airborne Measurements	Remarks / Tolerance
Alignment	Alignment & Structure FC & BC	(1) LDA and Offset ILS ≤ 8 µA
SBO Power: Normal or Width Monitor Ref ADJ	Normal Course Width/ Clearance (FC & IMBC*)	(2) (4)
	Wide Monitor Reference (FC& IMBC*)	(3) (5)
SBO Phase	Normal Course Width/ Clearance (FC & IMBC*)	(2) (4)
	Wide Monitor Reference (FC & IMBC*)	(3) (5)
Commissioning or Total References	Alignment & Structure (FC, BC& IMBC*)	(1) LDA and Offset ILS ≤ 8 µA
	Normal Course Width/ Clearance (FC & IMBC*)	(2) (4)
	Wide Monitor Reference (FC & IMBC*)	(3) (5)

*IMBC = Independently Monitored Backcourse
(1) Alignment ≤ 3 µA (FC), ≤ 65 µA (BC), ≤ 10 µA (IMBC*)
(2) Course Width ≤ 0.10° Commissioning Width
(3) Course Width ≤ 14 % Commissioned Width
(4) Clearances ≥ 165 µA
(5) Clearance ≥ 150 µA

Figure 15-8B Dual Frequency Localizer		
ILS Reference Change	**Required Airborne Measurements**	**Remarks / Tolerance**
Alignment	Alignment & Structure (FC, BC& IMBC*)	(1) LDA and Offset ILS ≤ 8 µA
Course/ Clearance SBO Power: Normal Or Width Monitor Ref ADJ	Normal Course Width/ Clearance (FC& IMBC*)	(2) (4)
	Wide Monitor Reference (FC & IMBC*)	(3) (5)
Course/Clearance SBO Phase	Normal Course Width/ Clearance (FC & IMBC*)	(2) (4)
	Course/Clearance Wide Monitor Reference (FC & IMBC*)	(3) (5)
Commissioning or Total References	Alignment & Structure FC & BC	(1) LDA and Offset ILS ≤ 8 µA
	Normal Course Width/ Clearance(FC & IMBC*)	(2) (4)
	Course/Clearance Wide Monitor Reference (FC & IMBC*)	(3) (5)

*IMBC = Independently Monitored Backcourse
(1) Alignment ≤ 3 µA (FC), ≤ 65 µA (BC), ≤ 10 µA (IMBC)
(2) Course Width ≤ 0.10° Commissioning Width
(3) Course Width ≤ 14 % Commissioned Width
(4) Clearances ≥ 165 µA
(5) Clearance ≥ 150 µA

Figure 15-8C Null-Reference Glide Slope

ILS Reference Change	Required Airborne Measurements	Remarks / Tolerance
SBO Power: Normal or Monitor Reference ADJ	Normal WAS*	(1) (4) (7) (8)
	Wide Monitor Reference	(2) (5) (9)
SBO Phase: Normal or Monitor Reference ADJ	Normal WAS*	(1) (4) (7) (8)
	Wide Monitor Reference	(2) (5) (9)
	Advance/ Retard main SBO Phase (1 TX)	(2) (6) (9) Phaser Setting 18 – 30°
Commissioning or Total References	Normal WAS*	(1) (4) (7) (8)
	Wide Monitor Reference	(2) (5) (9)
	Advance/ Retard main SBO Phase (1 TX)	(2) (6) (9) Phaser Setting 18 – 30°
	Actual Angle**	(3)
New Antenna Heights or **Modulation Balance ADJ**	Normal WAS*	(1) (4) (7) (8)
	Wide Monitor Reference	(2) (5) (9)
	Advance/Retard main SBO Phase (1 TX)	(2) (6) (9) Phaser Setting 18 – 30°
	Actual Angle**	(3)

*WAS = Width, Angle, Structure Below Path Level Run
**Region Approval Required to Change Angle

(1) Path Angle = +10 % / -7.5 %
(2) Path Angle = Commissioned Angle +8 % / -6 %
(3) Path Angle = Commissioned ± 0.05°
(4) Path Width = 0.65 – 0.75°
(5) Path Width = 0.75 – 0.87°
(6) Path Width = 0.53 – 0.87°
(7) Symmetry (CAT I) = 40 – 60%, (CAT II/III) = 45 – 55%
(8) Structure Below Path = ≥ 50% Commissioned Angle
(9) Structure Below Path = ≥ 40% Commissioned Angle

Figure 15-8D Capture Effect Glide Slope

ILS Reference Change	Required Airborne Measurements	Remarks / Tolerance
SBO Power: Normal or Monitor Reference ADJ	Normal WAS*	(1) (4) (7) (8)
	Course Wide/ Clearance Modulation Monitor Reference	(2) (5) (9)
Middle Antenna Phaser: Normal or Monitor Reference ADJ	Normal WAS*	(1) (4) (7) (8)
	Course Wide/ Clearance Modulation Monitor Reference	(2) (5) (9)
	ADV/ RTD Middle ANT Phaser Monitor Reference (1TX)	(2) (6) (9) Phaser Setting 10 – 20°
***Main SBO Phaser**: Normal or Monitor Reference ADJ	Normal WAS*	(1) (4) (7) (8)
	Course Wide/ Clearance Modulation Monitor Reference	(2) (5) (9)
	Advance/ Retard Main SBO Phase (1 TX)	(2) (6) (9) Phaser Setting 18 – 30°
Upper Antenna Attenuate Monitor Reference ADJ	Upper Antenna Attenuate Monitor Reference	(2) (5) (9) Attenuator ≤ 5 dB
Commissioning or Total References	Normal WAS*	(1) (4) (7) (8)
	Course Wide/ Clearance Modulation Monitor Reference	(2) (5) (9)
	ADV/RTD Middle ANT Phaser Monitor Reference (1TX)	(2) (6) (9) Phaser Setting 10 – 20°
	Advance/Retard Main SBO Phase (1 TX)	(2) (6) (9) Phaser Setting 18 – 30°
	Upper Antenna Attenuate Monitor Reference	(2) (5) (9) Attenuator ≤ 5 dB
	Actual Angle**	(3)
New Antenna Heights or **Modulation Balance ADJ**	Normal WAS*	(1) (4) (7) (8)
	Course Wide/ Clearance Modulation Monitor Reference	(2) (5) (9)
	ADV/ RTD Middle ANT Phaser Monitor Reference (1TX)	(2) (6) (9) Phaser Setting 10 – 20°
	Advance/Retard Main SBO Phase (1 TX)	(2) (6) (9) Phaser Setting 18 – 30°
	Upper Antenna Attenuate Monitor Reference	(2) (5) (9) Attenuator ≤ 5 dB
	Actual Angle**	(3)

*WAS = Width, Angle, Structure Below Path Level Run
**Region Approval Required to Change Angle
(1) Path Angle = +10 % / -7.5 %
(2) Path Angle = Commissioned Angle +8 % / -6 %
(3) Path Angle = Commissioned ± 0.05°
(4) Path Width = 0.65 – 0.75°
(5) Path Width = 0.75 – 0.87°
(6) Path Width = 0.53 – 0.87°
(7) Symmetry (CAT I) = 40 – 60%, (CAT II/III) = 45 – 55%
(8) Structure Below Path = ≥ 50% Commissioned Angle
(9) Structure Below Path = ≥ 40% Commissioned Angle

Figure 15-8E Sideband Reference Glide Slope

ILS Reference Change	Required Airborne Measurements	Remarks / Tolerance
SBO Power: Normal or Monitor Reference ADJ	Normal WAS*	(1) (4) (7) (8)
	Wide/ Clearance Modulation Monitor Reference	(2) (5) (9)
Upper Antenna Phaser Monitor Reference ADJ	Normal WAS*	(1) (4) (7) (8)
	Wide Modulation Monitor Reference	(2) (5) (9)
	ADV/RTD Upper ANT Phaser Monitor Reference (1TX)	(2) (6) (9) Phaser Setting 18 – 30°
	Actual Angle Check**	(3)
Low Angle Monitor Reference: Upper Antenna Attenuate or Sideband Power Divider	Normal WAS*	(1) (4) (7) (8)
	Wide Modulation Monitor Reference	(2) (5) (9)
	Upper Antenna Attenuate Monitor Reference (Low Angle)	(2) (5) (9) Attenuator ≤ 2 dB
	Actual Angle Check**	(3)
Commissioning or Total References	Normal WAS*	(1) (4) (7) (8)
	Wide Modulation Monitor Reference	(2) (5) (9)
	ADV/RTD Upper ANT Phaser Monitor Reference (1TX)	(2) (6) (9) Phaser Setting 10 – 20°
	Upper Antenna Attenuate Monitor Reference (Low Angle)	(2) (5) (9) Attenuator ≤ 5 dB
	Actual Angle**	(3)
New Antenna Heights or **Modulation Balance Change, normal SBO Power Divider, or Upper Antenna Phase ADJ**	Normal WAS*	(1) (4) (7) (8)
	Wide Modulation Monitor Reference	(2) (5) (9)
	ADV/RTD Upper ANT Phaser Monitor Reference (1TX)	(2) (6) (9) Phaser Setting 10 – 20°
	Upper Antenna Attenuate Monitor Reference (Low Angle)	(2) (5) (9) Attenuator ≤ 2 dB
	Actual Angle**	(3)

*WAS = Width, Angle, Structure Below Path Level Run
**Region Approval Required to Change Angle
(1) Path Angle = +10 % / -7.5 %
(2) Path Angle = Commissioned Angle +8 % / -6 %
(3) Path Angle = Commissioned ± 0.05°
(4) Path Width = 0.65 – 0.75°
(5) Path Width = 0.75 – 0.87°
(6) Path Width = 0.53 – 0.87°
(7) Symmetry (CAT I) = 40 – 60%, (CAT II/III) = 45 – 55%
(8) Structure Below Path = ≥ 50% Commissioned Angle
(9) Structure Below Path = ≥ 40% Commissioned Angle

Figure 15-8F Endfire Glide Slope

ILS Reference Change	Required Airborne Measurements	Remarks / Tolerance
SBO Power: Normal or Monitor Reference ADJ	Normal WAS*	(1) (4) (7) (8)
	Wide Monitor Reference	(2) (5) (9)
Main SBO Phaser: Normal or Monitor Reference ADJ	Normal WAS*	(1) (4) (7) (8)
	Wide Monitor Reference	(2) (5) (9)
	ADV/RTD SBO Phaser (1TX)	(2) (6) (9)
Main Antenna Array Phaser: (High/ Low) Angle Reference ADJ	Normal WAS*	(1) (4) (7) (8)
	Wide Monitor Reference	(2) (5) (9)
	High Angle Monitor Reference	(6) (9) (10)
	Low Angle Monitor Reference	(6) (9) (11)
	Actual Angle Check**	(3)
Commissioning or Total References	Normal WAS*	(1) (4) (7) (8)
	Wide Monitor Reference	(2) (5) (9)
	ADV/RTD SBO Phaser (1TX)	(2) (6) (9)
	High Angle Monitor Reference	(6) (9) (10)
	Low Angle Monitor Reference	(6) (9) (11)
	Actual Angle Check**	(3)
New Antenna Pedestal Positions (Transverse Structure ADJ), **Modulation Balance Change,** or **Normal Main Array Phaser (Z4) Setting Change**	Normal WAS*	(1) (4) (7) (8)
	Wide Monitor Reference	(2) (5) (9)
	ADV/RTD SBO Phaser (1TX)	(2) (6) (9)
	High Angle Monitor Reference	(6) (9) (10)
	Low Angle Monitor Reference	(6) (9) (11)
	Actual Angle Check**	(3)

*WAS = Width, Angle, Structure Below Path Level Run
**Region Approval Required to Change Angle

(1) Path Angle = +10 % / -7.5 %
(2) Path Angle = Commissioned Angle +8 % / -6 %
(3) Path Angle = Commissioned ± 0.05°
(4) Path Width = 0.65 – 0.75°
(5) Path Width = 0.75 – 0.87°
(6) Path Width = 0.53 – 0.87°
(7) Symmetry (CAT I) = 40 – 60%, (CAT II/III) = 45 – 55%
(8) Structure Below Path = ≥ 50% Commissioned Angle
(9) Structure Below Path = ≥ 40% Commissioned Angle
(10) Path Angle = Commissioned Angle +8 %
(11) Path Angle = Commissioned Angle -6 %

(3) ILS Maintenance Alert. Facilities serving the National Airspace System (NAS) and all U.S. Air Force facilities must be provided an ILS maintenance alert as follows:

(a) Category I/ II. An ILS maintenance alert must be provided by flight inspection following a normal periodic check without monitors or other check when maintenance is not present if a measured flight inspection parameter is 60 percent or more of the flight inspection tolerance. This applies to the following critical monitored parameters:

1 CAT I/ II Localizer course widths

2 Localizer alignment

a CAT I ILS, Localizer only, and SDF(s) aligned along runway centerline ≥ 9 μA

b CAT II ≥ 6 μA

c Offset localizers, Offset SDF(s), LDA(s), and Independently Monitored Back Courses ≥ 12 μA

d Other Back Courses ≥ 39 μA

3 Glide slope path widths ≤ 0.58° / ≥ to 0.82°

4 CAT I /II Glide Slope Angles

(b) Category III. An ILS maintenance alert must be provided by flight inspection when a CAT III facility is found operating beyond the "Adjust and Maintain" limits specified above, regardless if the value(s) were corrected.

(c) The flight inspector must forward the ILS maintenance alert results by FAX or telephone (when FAX is unavailable) to the central scheduling and dispatch facility. The central scheduling and dispatch facility must enter the results on FAA Form 8240-11, Appendix 11, FAA Order 8240.36 (current version) and forward the results by FAX or telephone (when FAX is unavailable) to the regional maintenance engineering branch within 24 hours. For U.S. Air Force facilities, notify the appropriate Major Command (MAJCOM) headquarters. When the results are forwarded by telephone, enter the name of the person contacted in the Remarks block on FAA Form 8240-11, which must be forwarded to the regional maintenance engineering branch.

(d) When a measured flight inspection parameter exceeds the flight inspection tolerance, if Airway Facilities Maintenance is available and on site, request an evaluation of the parameter that has exceeded tolerance and determine whether it can be corrected. If the parameter that exceeded tolerance is corrected, leave the facility in service. Check the standby transmitter, if available. If not available, remove the facility from service and issue a NOTAM.

f. Glide Slope Snow NOTAM. During periods of heavy snow accumulation, Airway Facilities personnel may NOTAM glide slope facilities as "due to snow on the XXX (appropriate identifier), glide slope minima temporarily raised to localizer only." Category II/ III operations are not authorized during the snow NOTAM. The following guidance is to be followed when an ILS is scheduled for a periodic inspection when a snow NOTAM is in effect and the flight inspection window is exceeded. Localizer flight checks must be conducted as normally scheduled. Glide slope flight checks must be accomplished dependent upon the following conditions:

(1) If the NOTAM indicates localizer only for all categories of aircraft, then an approach evaluation must be made to determine angle and structure. All out-of-tolerance conditions must be reported to maintenance. After the snow NOTAM is canceled, flight inspection of the glide slope will be in accordance with Chapter 4, Section 2. On the Flight Inspection Daily Flight Log (DFL), FAA Form 4040-5, code the glide slope periodic inspection as incomplete. In the "Remarks" section of the DFL, indicate "Snow NOTAM".

(2) If the NOTAM indicates glide slope minima raised to localizer only for Category D aircraft, follow the procedure outlined in Paragraph 15.50f(1) above--the only exception being that any out-of-tolerance condition must generate a discrepancy and the appropriate NOTAM. Restoration flight check must be scheduled as an "Unscheduled Special (U)."

(3) If the glide slope supports Category II/ III approach procedures, the glide slope will only be evaluated to Category I tolerances. Restoration of Category II/ III facilities, after the snow NOTAM is removed, will be considered as a periodic overdue inspection in accordance with Chapter 4, Section 2.

(4) Monitor check must not be accomplished while the snow NOTAM is in effect. Flight inspection after the snow NOTAM is canceled must be considered as a periodic overdue in accordance with Chapter 4, Section 2.

(5) If the approach is satisfactory, a Category I periodic check will be complete when a level run to check width and symmetry is accomplished and no out-of-tolerances are found. Entries on the DFL must be normal.

g. CAT III Adjust and Maintain. Normal localizer width/ alignment and glide slope angle checks on Category III ILS systems are required to be maintained at tighter than monitored values. Results that exceed these values, but do not exceed flight inspection tolerances IAW Paragraph 15.60a and b, should not be considered out-of-tolerance, and no discrepancies should be noted on the Daily Flight Log.

(1) Inspections Not Involving Maintenance Personnel. When CAT III facilities are found operating beyond these tighter values, repeat the run(s) to confirm the measurement and, if repeatable, advise maintenance immediately.

(a) If maintenance is unable to respond and make adjustments, document the circumstances on the flight inspection report. A Maintenance Alert must be issued IAW Paragraph 15.51e. The facility will remain CAT III unless downgraded by maintenance.

(b) If maintenance is available, remain on-station to check the adjusted parameters and document the circumstances on the flight inspection report. Issue a Maintenance Alert IAW Paragraph 15.51e(2)(c). Do not leave the facility operating CAT III beyond the "Adjust and Maintain" values.

(2) Inspections Requiring Maintenance Personnel:

(a) Remain on-station until all "adjust and maintain" parameters are within limits, unless Maintenance determines otherwise. If the adjusted parameters are not corrected, document the circumstances on the flight inspection report. Issue a Maintenance Alert IAW Paragraph 15.51e(2).

(b) Do not leave the facility operating CAT III beyond the "Adjust and Maintain" values.

(3) Adjust and Maintain Values:

Localizer Alignment	± 4 μA
Localizer Width (Commissioned Width)	± 10%
Glide Slope Angle (Commissioned Angle)	± 4%

h. Threshold Crossing Height (TCH)/ Reference Datum Height (RDH).

(1) CAT I. FAA Order 8260.3, TERPS Instrument Procedures, limits the CAT I procedural TCH to a maximum of 60 ft. Minimum TCH varies per the wheel crossing height of the user aircraft. TCH is normally determined by procedures personnel and is not evaluated by flight inspection. If FAA Order 8240.47, Determination of ILS Glidepath Angle, RDH, and Ground Point of Intercept (GPI), is applied to a CAT I facility, the flight check derived RDH replaces procedural TCH.

NOTE: IAW Order 8240.47, specific requirements must be met prior to application of that order.

(2) CAT II/ III. FAA Order 8240.47 must be applied.

i. Adjustments. See Chapter 4, Section 3. When equipment performance characteristics are abnormal but within tolerances, they should be discussed with maintenance personnel to determine if adjustments will increase the overall performance of the systems. Following any adjustment to correct an out-of-tolerance condition, the appropriate monitor(s) must be checked and proper monitor operation verified.

15.52 75 MHz MARKER ANALYSIS:

a. There must be no "holes" in the area of coverage for middle and inner markers (See Figures 15-9A - C).

b. Momentary reductions in RF signal levels **for outer and fan markers are acceptable, provided the reduction is 300 ft or less in duration. The reduction is considered as part of the total width** (See Figure 15-9B).

c. Figure 15-9C illustrates an out-of-tolerance condition.

Figure 15-9A
Typical 75 MHz Marker Width Measurement

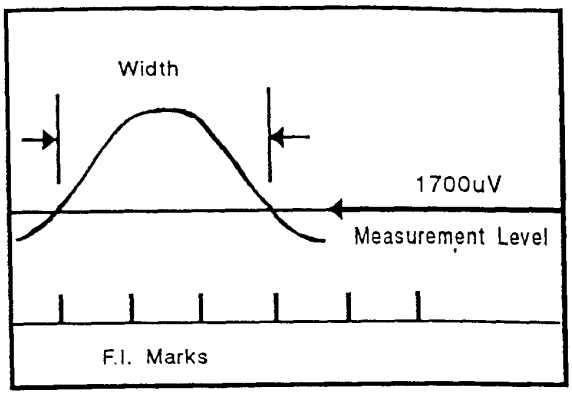


Figure 15-9B
75 MHz Marker Width Measurement
A to B Equals Width (includes the hole)

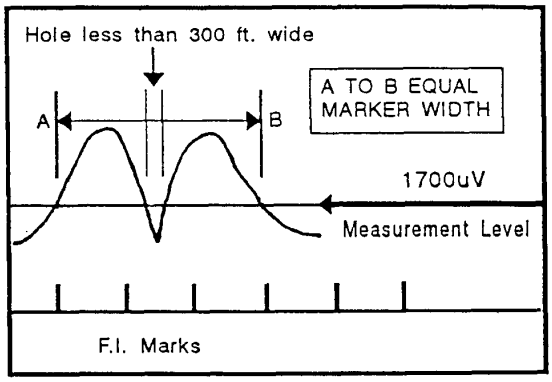
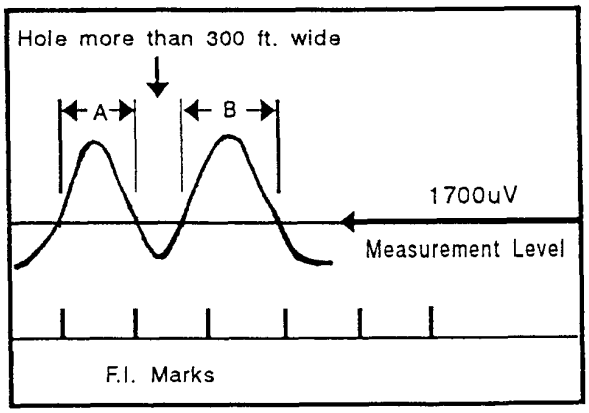


Figure 15-9C
Example of Patterns Not Meeting Criteria Widths
A & B Are Not Additive



(Manual Analysis of Raw Data)

Figure 15-10
APPLICATION OF STRUCTURE TOLERANCE -- CAT. II & III

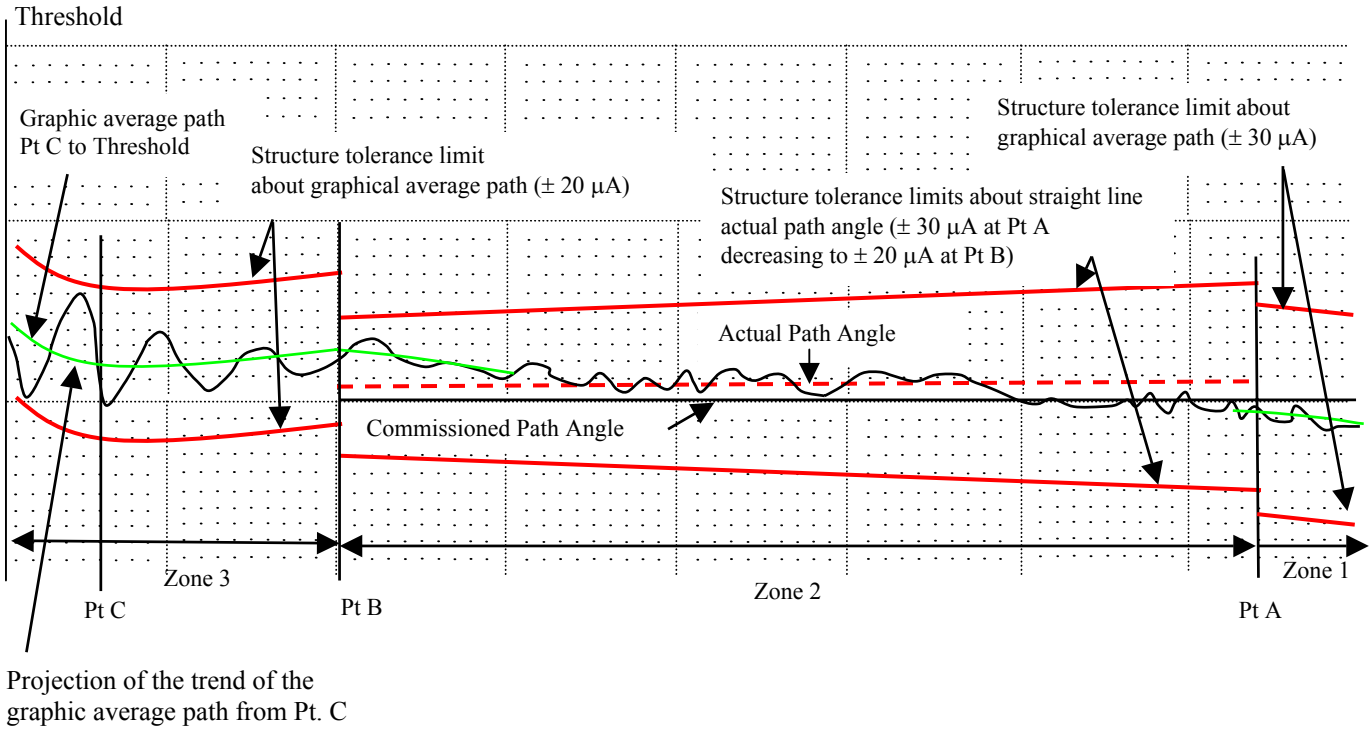
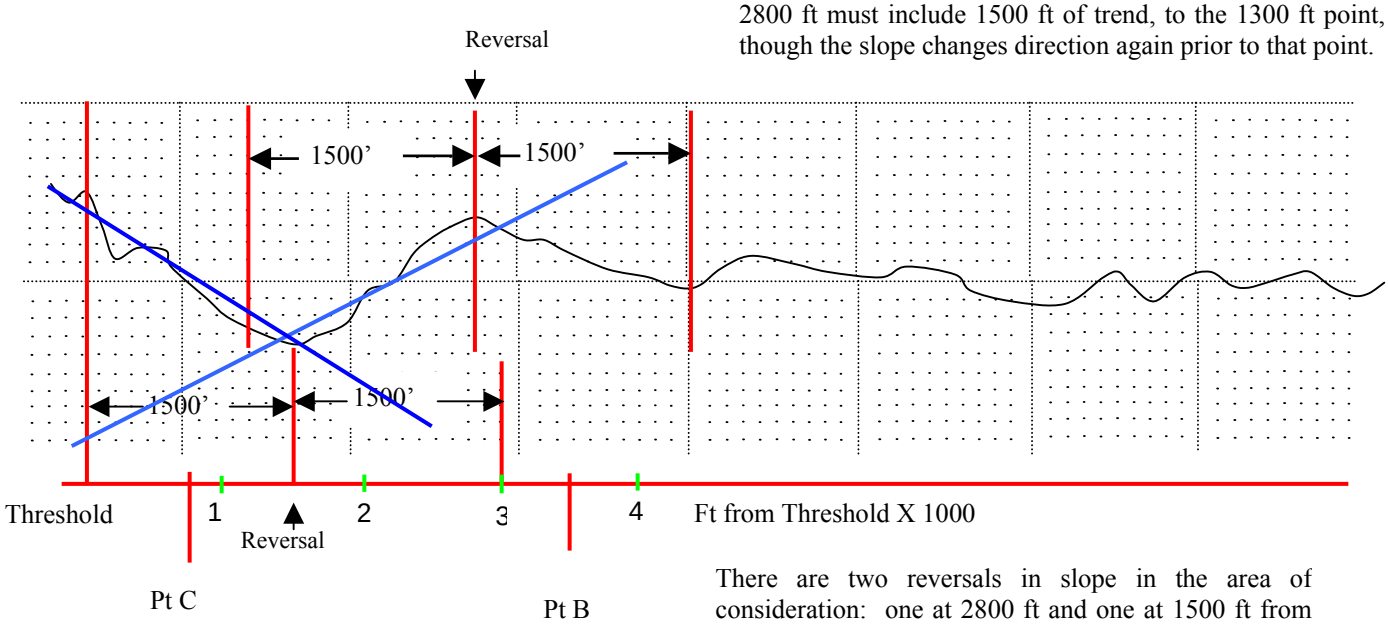


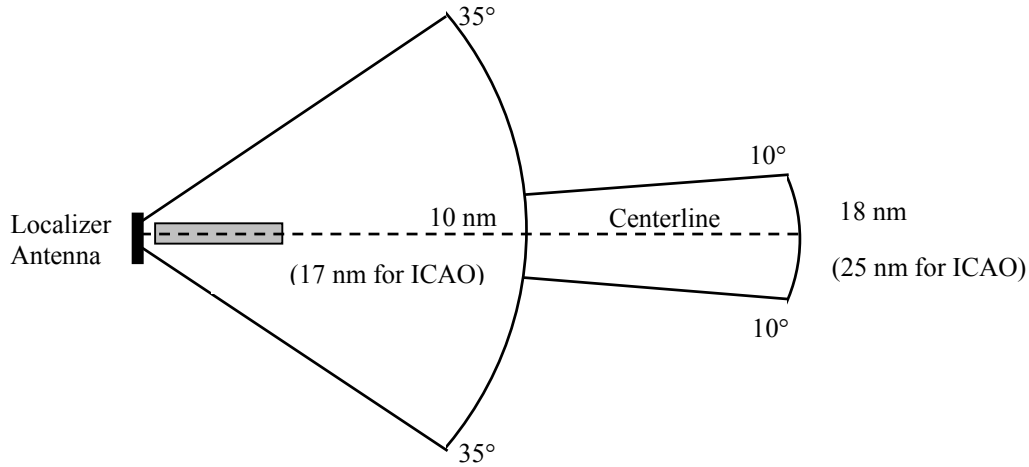
Figure 15-11
RATE OF CHANGE/REVERSAL IN THE SLOPE OF THE GLIDE PATH

Note the analysis line drawn to the left of the reversal located at 2800 ft must include 1500 ft of trend, to the 1300 ft point, even though the slope changes direction again prior to that point.



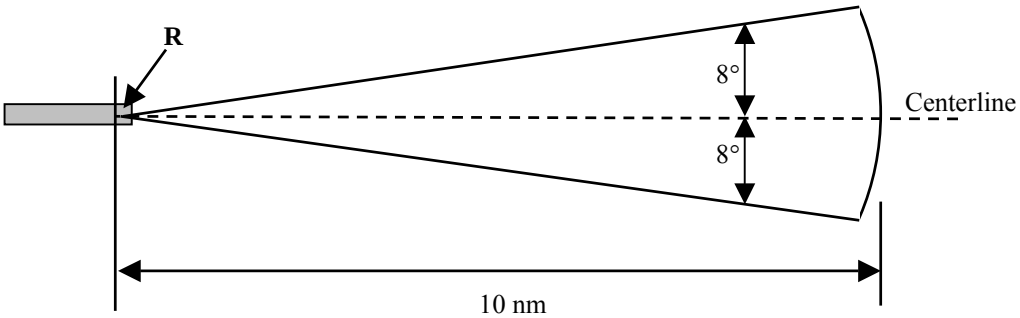
There are two reversals in slope in the area of consideration: one at 2800 ft and one at 1500 ft from the threshold. Each reversal meets the requirement that the slope or trend on at least one side of the break extends for at least 1500 ft.

FIGURE 15-12
LOCALIZER STANDARD SERVICE VOLUME

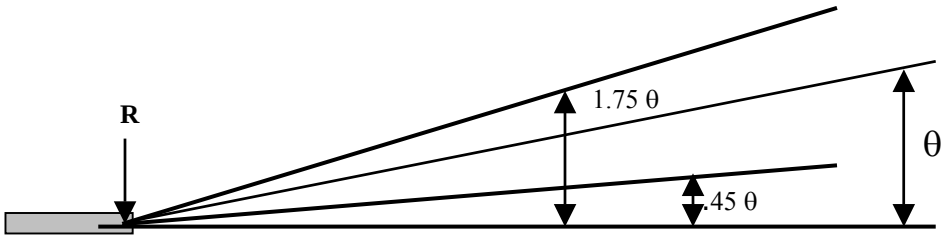


Front or Back Course

Figure 15-13
GLIDE SLOPE STANDARD SERVICE VOLUME



Azimuth Coverage



Lower Coverage may be as low as .30 θ

R = Point where downward extended glide slope intersects runway centerline.
θ = Glide Path Angle

SECTION 6. TOLERANCES

15.60 TOLERANCES

CODES:

C — Tolerances that are applied to site, commissioning, reconfiguration, and categorization inspection.

P — Tolerances that are applied to any inspection subsequent to the inspections outlined in Code C.

a. Localizers

PARAMETER	REFERENCE PARAGRAPH	INSPECTION		TOLERANCE/ LIMIT
		C	P	
Spectrum Analysis	Reserved			
Modulation Level	15.20b	X	X	36 – 44% as measured IAW Paragraph 15.20b
				30% - 60% throughout the service volume of all localizers installed or reconfigured with new type antennas after 01/01/2000. For existing systems, note in the flight inspection report areas where modulation exceeds 60%.
				For two-frequency systems, the standard for maximum modulation percentage does not apply at or near azimuth where the course and clearance signal levels are equal in amplitude (i.e., at azimuths where both transmitting systems have a significant contribution to the total modulation percentage).
		X	X	
Waveguide Clearance XMTR				36 – 44% as measured IAW Paragraph 15.20b
Power Ratio	15.20d	X		The course transmitter power level must be at least 10 dB greater than the clearance transmitter.
Phasing	15.20e	As Required		No tolerance.
Width—	15.20f			Maximum—6.0° (SDF-12.0°). CAT II & III tailored to 700 ft. Precision approach—400 ft minimum course width at the threshold.
Front Course		X		± 0.1° of the commissioned width.
			X	Within 17% of the commissioned width.
Transmitter Differential (Front Course)			X	The difference in the normal widths must not be greater than 0.5° or 10% of the commissioned width, whichever is least.
Back Course		X		Between 3.0° and 6.0°
			X	Between 2.49° and 7.02° in normal or monitor alarm condition.
		X	X	SDFs — Within 10% of the front course sector width.
Symmetry (Front Course Only)	15.20f	X	X	With the facility in normal: 45-55%.

PARAMETER	REFERENCE PARAGRAPH	INSPECTION		TOLERANCE/LIMIT
		C	P	
Alignment	15.20g			
Front Course and Independently Monitored Back Courses		X		Within ± 3 μA of the designed procedural azimuth.
			X	For ILS(s), localizer-only on centerline, and SDF(s) on centerline. From the designed procedural azimuth: CAT I ± 15 μA. CAT II ± 11 μA. CAT III ± 9 μA. Offset Localizers, Offset SDF(s), and LDA(s) ± 20μA Back Course ± 20 μA. At the conclusion of a monitor inspection or when alignment is adjusted, FAA and non-Federal civil localizers must be ≤ 3μA, LDA(s), offset localizers must be ≤ 8μA, and independently monitored back courses must be ≤ 10μA.
Back Course (Facilities subordinate to front course.)		X	X	Designed procedural azimuth ± 65 μA.
Course Structure	15.20g			
Front Course		X	X	Zone 1—From the graphical average course: CAT I, II, III: ± 30 μA to Point A SDF: ± 40 μA to Point A
NOTE: For localizer only approaches (ILS facilities), including RF alarm, and when alignment is determined as S/ U, structure may be measured from graphical average course				Zone 2—From the actual course alignment: CAT I: ± 30 μA at Point A; linear decrease to ± 15μA at Point B. CAT II, III: ± 30 μA at Point A; linear decrease to ± 5μA at Point B, SDF: ± 40 μA at Point A; linear decrease to ± 20μA at Point B. Zone 3—From the actual course alignment: CAT I: ± 15 μA at Point B; ± 15μA at Point C. SDF: ± 20 μA at Point C.
				Zones 3 & 4—From the actual course alignment. CAT II, III: ± 5 μA at Point B; ± 5 μA to Point D. Zone 5—From the actual course alignment. CAT III: ± 5 μA at Point D; linear increase to ± 10 μA at Point E.
Back Course		X	X	Zone 1—From the graphical average course: ± 40 μA to Point A. Zone 2—From actual course alignment: ± 40 μA at Point A; linear decrease to ± 20 μA at Point B. Zone 3—From actual course alignment ± 20 μA at Point B; ± 20 μA at Point C.
Front and Back Course	15.50a	X	X	Exception: An aggregate out-of-tolerance condition for 354 ft may be acceptable in a 7,089-foot segment.

PARAMETER	REFERENCE PARAGRAPH	INSPECTION C	INSPECTION P	TOLERANCE/LIMIT
Monitors	15.20i			
Alignment Front Course				The course alignment monitor must alarm when the actual course alignment signal shifts from the designed procedural azimuth by no greater than:
Facilities aligned along the runway		X	X	CAT I ILS and SDF(s) aligned along runway centerline ± 15 µA CAT II ± 11 µA CAT III ± 9 µA.
Offset Localizers, Offset SDFs, and LDAs		X	X	± 20 µA from the designed procedural azimuth when using actual course alignment references, i.e., AFIS, theodolite, etc..
Localizers, SDF's, and LDA's where alignment is determined to be satisfactory by visual observations		X	X	±20 µA from established equality of modulation reference.
Width Front Course & Independently Monitored Back Courses		X	X	Not more than ± 17% of the commissioned width.
Back Course		X	X	2.49 – 7.02°
RF Power	15.20j	X		Maintained at or above: Signal Strength—5 µV Flag Alarm—No Flag or indication of invalid signal Clearance and Structure—in tolerance.
Coverage	15.20j	X	X	At or greater than: Signal Strength—5 µV Flag Alarm—No Flag or indication of invalid signal Clearance and Structure — in tolerance Interference—must not cause an out-of-tolerance condition.
Clearances (Front and Back Course) Facility in Normal configuration	15.20k	X	X	As measured from the procedural designed azimuth: Sector — Minimum Clearance 1 — Linear increase to 175 µA then maintain 175 µA to 10°. 2 — 150 µA (see note). 3 — 150 µA (see note).
Facility in any alarm configuration		X	X	Clearances are reduced 15 µA from the clearance required in normal.
		X	X	NOTE: Exceptions are authorized in Sectors 2 and 3.
Polarization	15.20n	X	X	Polarization error not greater than: CAT I ± 15 µA CAT II ± 8 µA CAT III ± 5 µA
Identification and Voice	15.20o	X	X	Clear, correct; audio level of the voice equal to the identification level. The identification must have no effect on the course. Voice modulation must not cause more than 5µA of course disturbance.

b. Glide Slopes

PARAMETER	REFERENCE	INSPECTION C	INSPECTION P	TOLERANCE/LIMIT
Spectrum Analysis	Reserved			
Modulation Level	15.30b	X		78 – 82%
			X	75 – 85%
Modulation Equality	15.30c	As Required		Zero µA ± 5µA
Phasing and Airborne Phase Verification	15.30d	As Required		No Tolerance
Engineering & Support Tests	15.30e	As Required		No Tolerance
Width	15.30f	X		0.7° ± 0.05° (Site Survey, USAF test van: 0.7° ± 0.1°)
			X	0.7° ± 0.2°
Angle	15.30f	X		Within ± 0.05° of the commissioned angle. (Site Survey, USAF test van: ± 0.1° of the commissioned angle)
			X	Within + 10.0% to -7.5% of the commissioned angle.
Transmitter Differential		X		± 0.10°
			X	± 0.20°
Alignment	15.30j	X	X	CAT I — Not applicable CAT II and III (Also CAT I authorized use below CAT I minima) Zone 3 ± 37.5 µA about the commissioned angle at Point B; expanding linearly to ± 48.75 µA about the commissioned angle at Point C; expanding linearly to ± 75 µA about the commissioned angle at ILS reference datum.
Tilt	15.30i	X	X	Within + 10.0% to -7.5% of the commissioned angle. Clearance Above Path, Modulation Clearance Below Path - 180µA
Reference Datum Height (RDH)	15.51h	X		CAT I: Maximum 60 ft CAT II and III: 50 to 60 ft. (Also CAT I authorized use below CAT I minima)
Symmetry	15.30f	X	X	The following criteria are applied with the facility in a normal configuration: CAT I 67-33%. Broad sector either above or below path. CAT II 58-42%. Broad sector either above or below path. 67-33% If broad sector below path only (Also CAT I authorized use below CAT I minima) Cat III 58-42%. Broad sector either above or below path.
Structure below Path	15.30f	X	X	190 µA of fly-up signal occurs at an angle which is at least 30% of the commissioned angle.
		X	X	Exception: If this tolerance cannot be met, apply clearance procedures and tolerances.

PARAMETER	REFERENCE PARAGRAPH	INSPECTION		TOLERANCE/LIMIT
		C	P	
Clearance Below the Path	15.30g	X	X	Adequate obstacle clearance at no less than 180 µA of fly-up signal in normal (150 µA in any monitor limit condition).
Above the Path		X	X	150 µA of fly-down signal occurs at some point prior to the first false path.
Structure	15.30j			
With AFIS or Tracking Device.		X	X	
Zone 1 2 3				Category 1 30 µA from graphical average path. 30 µA from actual path angle. 30 µA from graphical average path
Zone 1 2 3				Category II and III (Also CAT I authorized use below CAT I minima) 30 µA from graphical average path. From actual path angle 30 µA at Point A, then a linear decrease to 20 µA at Point B. 20 µA from the graphical average path
Without AFIS or tracking device	15.30j		X	
Zone 1 2 3				Category 1 30 µA from the graphical average path. 30 µA from the graphical average path. 30 µA from the graphical average path.
	15.50a	X	X	Exception: An aggregate out-of-tolerance condition for 354 ft may be acceptable in a 7,089-foot segment.
Change/ Reversal	15.50b	X	X	25 µA per 1,000 ft in a 1,500-foot segment.
Coverage	15.30n	X	X	At or greater than: Signal Level: 15 µV Flag Alarm: No Flag or indication of invalid signal Fly-up/ Fly-down Signal: 150 µA Clearance and Structure in tolerance. Interference must not cause an out-of-tolerance condition.
Monitor Reference Values	15.30m			
Angle		X	X	Within + 10.0% to -7.5% of the commissioned angle
Width		X	X	0.9° maximum. 0.5° minimum.
RF Power	15.30n	X		Not less than: Signal Level—15 µV Fly-up/ Fly-down Signal: 150 µA Flag Alarm: No Flag or indication of invalid signal

c. Localizer Reference Tolerances

Parameter	Standard (Optimum)	"Initial" Tolerance
Width		
Normal	Commissioned Width	≤ 0.10°
Wide	≤ 10% of Commissioned Width	≤ 14% of Commissioned Width
Equality in Normal (Standby Transmitter) (2)	Equal to Reference Transmitter	Standard ± 0.10°
Clearances		
Normal	≥ 175 μA	≥ 165 μA
Wide	≥ 160 μA	≥ 150 μA
Equality in Normal (Standby Transmitter) (2)	Equal to Reference Transmitter	Standard ± 15 μA
Alignment (1)		
Front Course (CAT I/ II/ III), and SDF on CL	0 μA	≤ 3 μA
Back Course (Independently Monitored)	0 μA	≤ 10 μA
Back Course (Subordinate to Front Course)	0 μA	≤ 65 μA
Offset, Localizer, and SDF	0 μA	≤ 8 μA
LDA (3)	0 μA	≤ 8 μA
Equality in Normal (Standby Transmitter) (2)	Equal to Reference Transmitter	Standard ± 3 μA

(1) The "Initial" alignment tolerance must be applied as the "Final" value on all Periodic with Monitor type checks.

(2) Dual Transmitter Sites: Applies during any inspection where the reference and standby transmitters are both evaluated in normal. The standby transmitters should match the reference transmitter within the prescribed equality tolerances during the same flight inspection. If Maintenance is unable to adjust the transmitter within equality limits and meets FAA Order 8200.1 tolerances, the transmitter may remain in service unless Maintenance elects to remove it from service.

(3) The numerical value applies to those LDA(s) where alignment is measured by AFIS or theodolite. The SAT/ UNSAT criteria remains valid for those facilities such that AFIS is unsuitable and routine theodolite use is not warranted.

d. Glide Slope Reference Tolerances

Parameter	Standard (Optimum)	"Initial" Tolerance
Path Angle		
Normal	Commissioned Angle (CA)	CA ± 0.05°
High (EFGS)	CA + 0.05°	CA + 8.0%
Low (CEGS) (SBRGS)	CA – 0.05°	CA – 6.0%
Equality in Normal (Standby Transmitter) (1)	Equal to Reference Transmitter	Standard ± 0.03°
All other abnormal conditions	**CA ± 0.10°**	**CA - 6.0% to + 8.0%**
Path Width		
Normal	0.70°	0.65° to 0.75°
Wide	0.80°	0.75° to 0.87°
Equality in Normal (Standby Transmitter) (1)	Equal to Reference Transmitter	Standard ± 0.03°
All other abnormal conditions	**0.80°**	**0.53° to 0.87°**
Structure Below Path		
Normal	≥ 70% of CA	≥ 50% of CA
Equality in Normal (Standby Transmitter) (1)	Equal to Reference Transmitter	Standard ± 0.20°
All other abnormal conditions	**≥ 60% of CA**	**≥ 40% of CA**
Symmetry		
CAT I	50%	60 to 40%
CAT II, III	50%	55 to 45%
De-phase (Advance and Retard)		
Main Sideband	≤ 30°	18° to 30°
Mid Ant (CEGS)	≤ 20°	10° to 20°
Upper Ant (SBRGS)	≤ 30°	18° to 30°
Upper Antenna Attenuation		
Sideband Reference	1 dB	≤2 dB
Capture Effect	5 dB	≤ 5 dB

(1) Dual Transmitter Sites: Applies during any inspection where the reference and standby transmitters are both evaluated in normal. The standby transmitters should match the reference transmitter within the prescribed equality tolerances during the same flight inspection. If Maintenance is unable to adjust the transmitter within equality limits and meets FAA Order 8200.1 tolerances, the transmitter may remain in service unless Maintenance elects to remove it from service.

e. 75 MHz Marker Tolerances. Marker beacons must meet these tolerances or be removed from service. The following tolerances are applied with the receiver sensitivity in low.

Parameter	Reference Paragraph	Tolerance/Limit
Electromagnetic Spectrum	Reserved	Interference must not cause an out-of-tolerance condition.
Identification	15.40b	Distinct, correct, constant throughout the coverage area; and clearly distinguishable from any other markers.
Modulation	15.40b	The modulation must illuminate the following lights: OM - Blue Light (400 Hz) MM - Amber Light (1,300 Hz) IM - White Light (3,000 Hz) FM - White Light (3,000 Hz)
Coverage	15.40c	With a constant signal at or above 1,700 microvolts (μV), the following widths must be provided:
Minor Axis	15.40c(1)	
ILS Outer Marker		Width must not be less than 1,350 ft or more than 4,000 ft
ILS Middle Marker		Width must not be less than 675 ft or more than 1,325 ft
ILS Inner Marker		Width must not be less than 340 ft or more than 660 ft
Fan Markers Used for a missed approach or step-down fix in the final approach segment		Width must not be less than 1,000 ft or more than 3,000 ft
All others		Same as ILS Outer Marker
Major Axis	15.40c(2)	
ILS Outer Marker *		Minimum: 700 ft Maximum: 4,000 ft Those markers installed to serve dual runways must not exceed 4,000 ft within the normal localizer width sector of 150 μA, either side of the procedural centerline.
ILS Middle Marker *		Minimum: 350 ft Maximum: 1,325 ft
ILS Inner Marker *		Not Applicable
All Others *		Any duration not to exceed the respective minor axis tolerance.
Separation		A separation between the 1,700 μV points of succeeding marker patterns which provide a fix on the same approach course; e.g., MM to IM, must be at least 709 ft.

* As measured along the minor axis at the extremities of the pre-defined off-course sector.

15.61 ADJUSTMENTS. See Chapter 4, Section 3. When equipment performance characteristics are abnormal but within tolerances, they should be discussed with maintenance personnel to determine if adjustments will increase the overall performance of the systems. Following any adjustment to correct an out-of-tolerance condition, the appropriate monitor(s) must be checked and proper monitor operation verified.

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