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description

1. INTRODUCTION

1.1 General

The 479S-6 VOR/ILS Signal Generator is a new generation, solid-state, VOR/ILS signal generator. The signal generator produces both rf and audio signals for use in testing VOR, localizer, glideslope, and marker beacon receivers. Refer to figure 1.

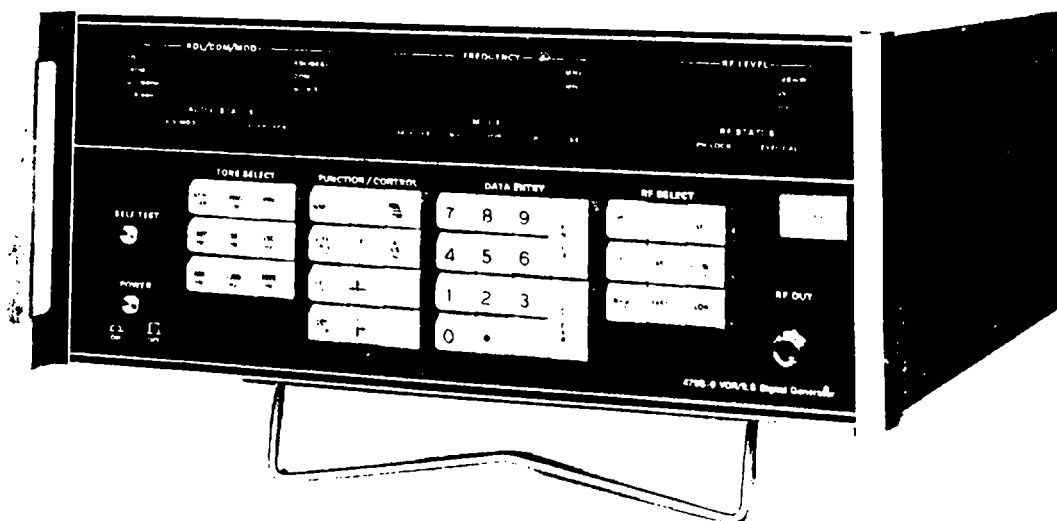
1.2 Electromagnetic Interference

Signal generators used for maintenance and other activities can be a source of electromagnetic interference. Aviation receivers are highly sensitive. Consequently, even a very low-level radiated signal can cause disruption and interference to aeronautical services out to a substantial distance. Users should therefore take adequate precautions to ensure that their operations do not cause disruption or interfer-

ence to aeronautical services. The following precautions are recommended:

- Do not connect an antenna to a signal generator operating at aeronautical communication/navigation (COMM/NAV) frequencies.
- Load operating signal generator outputs while in use. The 479S-6 VOR/ILS Signal Generator contains an rf output on/off feature which can be used to turn off the rf output when desired.
- Use minimum output power levels and limit duration of use.
- Note local COMM/NAV frequencies in use and avoid signal generator operation in those frequency ranges.

The 479S-6 VOR/ILS Signal Generator is capable of operating at the following aviation COMM/NAV frequencies. Precautions must be used when operating at these frequency ranges in an air traffic control environment.



T.25-2869-017

479S-6 VOR/ILS Signal Generator
Figure 1

Marker beacon	75.0 ±0.4 MHz
VOR/LOC	108.0 to 118 MHz
Glideslope	329 to 335 MHz
Communications	118 to 152 MHz

For further information on the use of radio-naviga-
tion land test stations and signal generators refer to
Department of Transportation Advisory Circular
170-6().

1.3 Abbreviations

The following nonstandard abbreviations are used
throughout this instruction book:

<u>ABBREVIATION</u>	<u>DEFINITION</u>
COMP	Composite
CPU	Central processing unit
dBc	Decibel below carrier
D/R	Down/right
DDM	Difference in depth of modulation
DEG	Degree
DEMOD	Demodulation
GS	Glideslope
LSB	Least significant bit
MB	Marker beacon
MOD	Modulation
MSB	Most significant bit
PCB	Printed circuit board
ROM	Read only memory
RSVD	Reserved
TCXO	Temperature-compensated crystal oscillator
T/F	TO/FROM

<u>ABBREVIATION</u>	<u>DEFINITION</u>
TI	Test instrument
U/L	Up/left
VCXO	Voltage controlled crystal oscillator
ΔF	Variable frequency

2. DESIGN FEATURES

- Microprocessor control and keyboard entry —
providing efficiency, versatility, adaptability, and
convenience.
- Digital audio waveform synthesizer provides in-
creased accuracy, stability, and longer calibration
intervals.
- Synchronous detection and advanced design
modulation loop generates precise, stable, modula-
tion levels.
- Low noise rf frequency synthesizer allows accurate
selectivity measurements.
- Extended life, digitally controlled attenuator.
- "Preset" operation for convenience and timesaving
test setups.
- Complete digital readout of test parameters.
- Microstrip rf modulator.

3. PURPOSE OF EQUIPMENT

The 479S-6 VOR/ILS Signal Generator produces all
required audio modulation and rf carrier signals to
test and troubleshoot VOR, ILS, and marker beacon
navigation receivers.

4. OPERATIONAL CAPABILITIES

- "Preset" condition sets signal generator parameters
to standard outputs for selected mode of operation.
- Standard VOR and ILS localizer frequencies, with
50-kHz spacing. Standard glideslope frequency
spacing of 150 kHz.
- Selectable VOR radials from 000.00 to 359.99
degrees.

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IDENTIFYING TECHNICAL PUBLICATION SHEET

T.O. 33A1-8-843-1P
30 JUNE 1985

THIS PUBLICATION SUPPLEMENTS T.O. 33A1-8-843-1 DATED 22 SEPTEMBER 1981. Reference to this supplement will be made on the title page of the basic publication by personnel responsible for maintaining the publication in current status.

2
I. IDENTIFICATION DATA

1. PURPOSE: This technical publication is issued for the purpose of identifying and authorizing the following commercial manual for Air Force use.

MANUFACTURER: Collins Government Avionics Division/Rockwell International

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EQUIPMENT: Collins 479S-6

REQUISITION NO.:

FEDERAL STOCK NUMBER: 6625

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ADDITIONAL IDENTIFICATION:

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2. FILE LOCATION: The above described commercial manual is filed in

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II. SUPPLEMENTAL DATA

1. LIST OF AFFECTED PAGES IN BASIC MANUAL.

2

2. SUPPLEMENTAL INFORMATION. The information contained in the above identified commercial manual is supplemented as follows:

Page 2, change Index 1, Part No. 266-7571-580 to read 266-7571-570.

"DISTRIBUTION STATEMENT — THIS PUBLICATION IS REQUIRED FOR OFFICIAL USE OR FOR ADMINISTRATIVE OR OPERATIONAL PURPOSES ONLY. DISTRIBUTION IS LIMITED TO U.S. GOVERNMENT AGENCIES. OTHER REQUESTS FOR THIS DOCUMENT MUST BE REFERRED TO SAN ANTONIO ALC/MMEDT, KELLY AFB, TEXAS 78241-5000."

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IDENTIFYING TECHNICAL PUBLICATION SHEET

THIS PUBLICATION SUPPLEMENTS T.O. 33A1-8-843-1 DATED 1 JUNE 1983 AND REPLACES SUPPLEMENT T.O. 33A1-8-843-1M DATED 15 OCTOBER 1984. Reference to this supplement will be made on the title page of the basic publication by personnel responsible for maintaining the publication in current status.

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II. SUPPLEMENTAL DATA

1. **LIST OF AFFECTED PAGES IN BASIC MANUAL.**
Maintenance Section 523-0767900, Pages 12, 94 and 95; Calibration-Verification Section 523-0768200, Page 17;
Parts List Section 523-0768803, Pages 12 and 13.
2. **SUPPLEMENTAL INFORMATION.** The information contained in the above identified commercial manual is supplemented as follows:

Maintenance Section 523-0767900, page 12, step 4.3.6b add Note under b paragraph as follows:

NOTE

Alignment tolerances in this procedure are tighter than specified accuracy listed in table 1, page 4 of the Description section. The purpose is to achieve the highest possible reliability and accuracy of this instrument.

Page 94, paragraph 8.6.2b change to read:

Check for 11110.56 to 11116.6 μ S (90.0045 to 89.9556 Hz).

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Page 97, paragraph 8.6.3f - Delete values 333.167 to 333.500 μ s (3001.4977 to 2998.5007 Hz).

Add - 333.32 to 333.35 μ s (3000.15 to 2999.85 Hz).

Parts List Section 523-0768803, page 13, figure 2, delete index numbers 1 thru 41 and add index 1, Part No. 266-757-580 lens, switch set.

Add:

NOTE

Lens, switch for tone select, function/control, data entry and RF select functions are available as a set only.

Parts List Section, page 14, figure 2, delete index numbers 1 thru 41 and add index 1, Part No. 266-7571-580 lens, switch set.

Calibration Procedures Section 523-0768200, page 17, paragraph 4.2.8.2, steps 2d and e are amended and steps 2f and g are added as follows:

d. Depress horizontal display B delayed; jitter at end of 5th cycle should be displayed on scope. Record jitter values.

e. Repeat step 2c for first half of 6th cycle.

f. Repeat step 2d for the start of 6th cycle.

g. Average readings obtained in 2d and 2f. For the 9960 FM signal to be deviated ± 480 Hz $\pm 5\%$ the average of the two readings must be between 46.1 and 50.6 μ sec.

TECHNICAL ORDER SHEET

AN 6 - 100

T.O. 33A1-8-843-1M
15 OCTOBER 1984

IDENTIFYING TECHNICAL PUBLICATION SHEET

THIS PUBLICATION SUPPLEMENTS T.O. 33A1-8-843-1 DATED 22 SEPTEMBER 1981. Reference to this supplement will be made on the title page of the basic publication by personnel responsible for maintaining the publication in current status.

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1. **PURPOSE:** This technical publication is issued for the purpose of identifying and authorizing the following commercial manual for Air Force use.

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II. SUPPLEMENTAL DATA

1. **LIST OF AFFECTED PAGES IN BASIC MANUAL.**

6

2. **SUPPLEMENTAL INFORMATION.** The information contained in the above identified commercial manual is supplemented as follows:

Page 6, Operation Section, paragraph 3.1a is amended as follows:

a. Press POWER switch to ON. Verify that Blower Fan A5B1 is operating.

IDENTIFYING TECHNICAL PUBLICATION SHEET

~~COPY~~ THIS PUBLICATION SUPPLEMENTS T.O. 33A1-8-843-1 DATED 22 SEPTEMBER 1981 AND REPLACES SUPPLEMENTS T.O. 33A1-8-843-1G DATED 30 SEPTEMBER 1981, T.O. 33A1-8-843-1J DATED 31 AUGUST 1983 AND T.O. 33A1-8-843-1K DATED 30 DECEMBER 1983. Reference to this supplement will be made on the title page of the basic publication by personnel responsible for maintaining the publication in current status.

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II. SUPPLEMENTAL DATA

1. LIST OF AFFECTED PAGES IN BASIC MANUAL.
12, 13, 16, 94, 95

2. SUPPLEMENTAL INFORMATION. The information contained in the above identified commercial manual is supplemented as follows:

Maintenance Section 523-0767900, page 12, step 4.3.6b add Note under b paragraph as follows:

NOTE

Alignment tolerances in this procedure are tighter than specified accuracy listed in table 1, page 4 of the Description section. The purpose is to achieve the highest possible reliability and accuracy of this instrument.

Maintenance Section, page 12, Figure 2, Front Panel Assembly, delete index numbers 1 thru 41.

Add: 1 index number to incorporate switch lens in tone select, function/control, data entry and RF select as a set.

Add:

NOTE

Lens, switch for tone select, function/control, data entry and RF select functions are available as a set only.

Maintenance Section, page 13, Figure 2, delete index numbers 1 thru 41 and add index 1, Part No. 266-7571-580 lens, switch set.

Page 16, Calibration Procedures, paragraph 4.2.8.2, steps 2d and e are amended and steps 2f and g are added as follows:

d. Depress horizontal display B delayed; jitter at end of 5th cycle should be displayed on scope. Record jitter values.

e. Repeat step 2c for first half of 6th cycle.

f. Repeat step 2d for the start of 6th cycle.

g. Average readings obtained in 2d and 2f. For the 9960 FM signal to be deviated ± 480 Hz $\pm 5\%$ the average of the two readings must be between 46.1 and 50.6 μ sec.

Page 94, paragraph 8.6.2b change to read:

Check for 11110.56 to 11116.6 μ S (90.0045 to 89.9556 Hz).

Page 95, paragraph 8.6.3f - Delete values 333.167 to 333.500 μ s (3001.4977 to 2998.5007Hz).

Add - 333.32 to 333.35 μ s (3000.15 to 2999.85 Hz).

- VOR radial adjustable in $+30^\circ$, $+10^\circ$, -10° , $+0.01^\circ$, and -0.01° increments.
- Deletion of modulation tone or tones for flag checks.
- 1020-Hz audio tone for identification signal.
- Variable rf output level to check receiver sensitivity.
- Variable rf frequency to check receiver selectivity.
- Variable percent modulation to check receiver response.
- Variable DDM in 0.001 increments.
- Standard localizer and glideslope rf frequency pairings.
- Single key provides switching between localizer and glideslope paired frequencies and vice versa.
- Standard marker beacon frequency of 75.000 MHz, with provisions for simulation of interference-type rf frequencies from 74.6 to 75.4 MHz.
- 400-Hz (outer marker), 1300-Hz (middle marker), and 3000-Hz (inner marker) marker beacon audio tones.
- Functionally grouped controls and displays.
- 115/230-volt, 50/60 Hz input power capability.

5. SPECIFICATIONS

Table 1 is a list of the specifications for the 479S-6 VOR/ILS Signal Generator.

6. CIRCUIT CARD AND MODULE ASSEMBLY LOCATION (Refer to figure 2.)

The signal generator contains six major assemblies: front panel assembly A1, controller/audio assembly A2, rf modulator assembly A3, synthesizer assembly A4, power supply assembly A5, and chassis assembly A6. Front panel assembly A1 consists of keyboard/driver board A1A1 and display board A1A2. Controller/audio assembly A2 consists of CPU assembly A2A1, analog board A2A2, and TDM board A2A3. Rf modulator assembly A3 consists of rf strip line assembly A3A1, demodulator/ALC assembly A3A2, and counter-I/O board A3A3. Synthesizer A4 consists of divider board and filter assembly A4A1, output amplifier board A4A2, VCXO assembly A4A3, and TCXO assembly A4A4. Power supply assembly A5 consists of power supply terminal board assembly A5A1, power supply PCB assembly A5A2, heat sink assembly no 1 A5A3, heat sink assembly no 2 A5A4, and a blower. Chassis assembly A6 contains the interconnect wiring harness and a digitally controlled attenuator.

The front panel contains the switches, keyboard, displays, and type N coaxial connector required for operation of the signal generator and connection of receivers to be tested.

The rear of the signal generator contains a COMP BNC coaxial connector, an AUX BNC coaxial connector, a DEMOD BNC coaxial connector, fuse F1, a 115/230-V ac, 50/60-Hz connector, and an input power identification plate.

479S-6 units with Collins part number 622-3337-010 are equipped with a protective bracket. This bracket provides protection for the heat sinks and rear connectors, allowing the unit to be set on end.

Table 1. Equipment Specifications.

CHARACTERISTIC	SPECIFICATION
Physical and mechanical specifications	
Weight	19.5 kg (43 lb)
Dimensions	
Width	432 mm (17.0 in)
Height	178 mm (7.0 in)
Length	508 mm (20.0 in)
Connectors	
Front panel (RF OUT)	Type N, female
Rear panel (AUX, DEMOD, COMP)	Type BNC, female
Cooling requirements	Internal blower
Environmental specifications	
Temperature	
Operating	+10 to +40 °C (+50 to +104 °F)
Storage	-20 to +85 °C (-4 to +185 °F)
Humidity	< 95 percent, relative
Electrical specifications	
Power requirements	
Voltage	115/230 volts ac, ±10 percent
Frequency	47 to 63 Hz
Power	300 VA, maximum
Warmup time	30 minutes, maximum, for specified performance
Rf outputs	
Frequencies	
VOR/LOC	108.00 to 117.95 MHz, selectable in 50-kHz steps
Glideslope (GS)	329.15 to 335.00 MHz, selectable in 150-kHz steps
Marker beacon	75.0 MHz, fixed. 74.6 to 75.4 MHz, selectable in 25-kHz steps
Frequency vernier	Varies selected output frequency > ±0.025 percent
Frequency resolution	Fixed, 1 kHz; vernier, 100 Hz
Frequency accuracy	< ±2 ppm, (+10 to +40 °C (+50 to +104 °F)), including aging

Table 1. Equipment Specifications (Cont).

CHARACTERISTIC	SPECIFICATION
Output level	
Range	
dB mW	-6 to -120 dB mW, variable in 1-dB increments
Voltage	112 mV to 0.22 μ V, variable in 1-dB increments
Accuracy	
-6 to -60 dB mW	± 1.5 dB
-60 to -120 dB mW	± 2.0 dB
Vswr	< 1.5 : 1
External attenuation	Not required. Microvolt output is "hard microvolts" and eliminates 6-dB external attenuation requirement
Spectral purity	
Harmonics	
VOR/LOC or marker beacon	≥ 30 dB below carrier
Glideslope	≥ 25 dB below carrier
Spurious signals (excluding frequencies within ± 15 kHz of carrier)	> 80 dB below carrier
Broadband noise (SSB)	
	Note
	Broadband noise is specified in units of "dBc/Hz". dBc/Hz = dB below carrier level measured in a 1-Hz noise bandwidth.
74.60 to 75.40 MHz (marker beacon)	> 115 dBc/Hz > 40 kHz from carrier
108.00 to 117.95 MHz (VOR/LOC)	> 122 dBc/Hz > 40 kHz from carrier
329.15 to 335.00 MHz (glideslope)	> 115 dBc/Hz > 120 kHz from carrier
VOR mode	
Modulation tones	
Frequencies	30-Hz reference, 30-Hz variable, 9960 Hz, and 1020 Hz (ident)
Frequency accuracy	± 0.005 percent
Distortion (audio)	
30-Hz reference and 30-Hz variable	< 0.25 percent
9960 Hz and 1020 Hz	< 0.5 percent
9960-Hz FM deviation	480 Hz ± 2 Hz peak
Radial range	000.00 to 359.99 degrees (selectable in 0.01-degree increments, variable in preset steps of +30 degrees, ± 10 degrees, and ± 0.01 degree)

Table 1. Equipment Specifications (Cont).

CHARACTERISTIC	SPECIFICATION
Radial accuracy	± 0.01 degree of selected radial <div style="text-align: center;">Note</div> Audio accuracy is referenced to accuracy of standard used in calibration.
Amplitude modulation	
Range (per tone)	
Preset (1020 Hz, 30-Hz variable, 9960 Hz)	30.0 percent
Variable	10.0 to 35.0 percent in 0.1-percent increments
Accuracy	± 2.5 percent of indicated modulation for preset mode
Tone distortion (at 30 percent modulation)	
30-Hz variable	< 1.0 percent
9960 Hz	< 1.5 percent
1020 Hz	< 1.0 percent
Total VOR demodulated error	< ± 0.05 degree of selected radial (referenced to accuracy of standard used in calibration)
ILS mode	
Modulation tones	
Frequencies	
Localizer	90, 150, and 1020 Hz
Glideslope	90 and 150 Hz
Frequency accuracy	± 0.005 percent
Distortion (audio)	
90 and 150 Hz	< 0.25 percent
1020 Hz	< 0.5 percent
90- and 150-Hz phase	
Fixed	0.0 degree
Selectable	60 degrees
	<div style="text-align: center;">Note</div> The 90- and 150-Hz waveforms pass through 0 in the same direction with 0 or 60 degrees of phase relative to the 150-Hz component, every half-cycle of the combined 90- and 150-Hz waveform.

Table 1. Equipment Specifications (Cont)

CHARACTERISTIC	SPECIFICATION
Amplitude Modulation	
Range (per tone)	
Localizer	
Preset	20.0 percent
Variable (at beam center only)	5.0 to 40.0 percent, in 0.1-percent increments
Glideslope	
Preset	40.0 percent
Variable (at beam center only)	10.0 to 80.0 percent, in 0.1-percent increments
1020 Hz (localizer only)	30.0 percent, fixed
Accuracy	±2.5 percent of indicated modulation for preset mode
Tone distortion (rf)	
Localizer, 90 and 150 Hz	< 1.2 percent (20-percent modulation)
Glideslope, 90 and 150 Hz	< 1.2 percent (40-percent modulation)
1020 Hz (localizer only)	< 1 percent (30-percent modulation)
DDM	
Localizer	
Preset	0.000
Selectable settings	0.000, ±0.046, ±0.093, ±0.155, ±0.200
Variable range	±0.400, in 0.001 increments
Glideslope	
Preset	0.000
Selectable settings	0.000, ±0.045, ±0.091, ±0.175, ±0.400
Variable range	±0.800, in 0.001 increments
Audio error	
On-course	0.0001 DDM
Off-course	0.0002 DDM
Modulation error	
Localizer	
On-course	0.00046 DDM
Off-course	0.00046 DDM + 2.5 percent DDM

Table 1. Equipment Specifications (Cont).

CHARACTERISTIC	SPECIFICATION
Glideslope	
On-course	0.00092 DDM
Off-course	0.00092 DDM + 2.5 percent DDM
Total system error (audio + modulation)	
Localizer	
On-course	0.00056 DDM
Off-course	0.00056 DDM + 2.5 percent DDM
Glideslope	
On-course	0.00102 DDM
Off-course	0.00102 DDM + 2.5 percent DDM
Marker beacon	
Modulation tones	
Frequencies	
Outer marker	400 Hz
Middle marker	1300 Hz
Inner marker	3000 Hz
Frequency accuracy	±0.005 percent
Distortion (audio)	< 1.0 percent
Amplitude modulation	
Range	
Preset	95.0 percent
Variable	90.0 to 97.0 percent, in 0.1-percent increments
Accuracy	±5 percent
Tone distortion	< 4 percent