

WCS-100/WCS-200

WR-100 Receiver Specifications

Frequency Range..... 118-136 MHz
 Number of Channels..... 1
 Operating Temperature Range.... -40°C to + 60°C
 Sensitivity..... 4 uv hard, 30% modulation
 for 10 db $\frac{S+N}{N}$, 3 uv hard typical

Selectivity

Standard BW unit..... +9.8 KHz Min, 6db
 ± 21 KHz, Max, 80db
 Wide BW unit..... ± 14.8 KHz Min, 6db
 ± 28 KHz Max, 80db
 Image and Spurious Responses... More than 100 db down
 Intermodulation..... More than 70 db above threshold
 sensitivity, 25 KHz spacing std. BW unit,
 50 KHz spacing wide BW unit
 Cross Modulation (ARINC
 characteristic 566A method)..... 80 db above threshold for audio 10 db
 down at ± 25 KHz (Std. BW unit)
 ± 50 KHz (Wide BW unit)

AGC

Dynamic Range..... ± 3 db from 3 to 300,000 uv
 1 V maximum
 Response Time..... Attack time 10 milliseconds
 Release time 20 milliseconds
 Squelch..... $\frac{S+N}{N}$ squelch with carrier
 N squelch backup — panel adjustable; or
 carrier squelch only — internally
 adjustable

Audio

Outputs..... Local speaker and balanced audio to a
 remote line
 Local Speaker Power..... 2 watts into 4 ohms (built in speaker), less
 than 6% distortion
 Remote Line Power..... + 6 dbm into 600 ohms, less than 6%
 distortion
 Frequency Response..... ± 3 db, 300-3000 Hz, both outputs
 Power Requirements
 AC or DC..... 115/230 V 50/400 Hz 25 VA 28 V dc
 negative ground, 0.25 amps standby, 0.75
 amps receive
 Size..... 8"W (20.3 cm), 3 1/4"H (8.4 cm), 12"D
 (30.5 cm)
 Weight..... 6 pounds (2.724 kg)

WT-100 Transmitter Specifications

Frequency Range..... 118 to 136 MHz
 Number of Channels..... 1
 Power Output..... 5 to 20 watts adjustable
 Load Impedance..... 50 ohms, burnout-proof infinite VSWR
 Duty Cycle..... 50% at + 60°C
 Frequency Stability..... ± 0.0003% -40°C to + 60°C
 Modulation..... 100%

Emission..... 6A3 (voice) 13A9 (data)
 Audio Frequency Response..... 3 db 300-3000 Hz
 Audio Distortion..... Less than 7% at 90% modulation
 Audio Input..... - 30 to 0 dbm 600 ohm remote line or
 local dynamic microphone
 Spurious..... 110 db below carrier
 Harmonics..... More than 70 db below carrier
 Keying Time..... Full power output in 15 milliseconds
 Time-Out Provision..... Adjustable transmitter time out circuit —
 range 30 to 180 seconds
 Audio Compressor..... 3 db rise in output with 20 db increase in
 audio input
 Tone Keying Circuit
 Frequency..... 2300 Hz (adjustable)
 Input Level..... 0 dbm to - 40 dbm
 Power Requirements..... 115/230 VAC 50/400 Hz 150 VA or 28
 V dc negative ground, 0.1 amps standby,
 4 amps transmit
 Size..... 8"W (20.3 cm), 3 1/4"H (8.4 cm), 13 1/4"D
 (33.8 cm)
 Weight..... 11 pounds (5 kg)

WCS System Specifications

Battery backup provisions (internally diode switched)
 Command loop-back provision when using 4 wire (2 pair) telephone line
 Telephone Line Options
 Single pair, voice grade, without d-c return
 Tone receiver built in. Tone key reject filters available as an option
 Single pair with 5000 ohm maximum d-c return (floating d-c keying
 power supply provided)
 Two Pair, voice grade, without d-c return
 Two Pair with d-c return
 Receiver Muting..... 50 db muting of receiver when using
 single pair configuration.
 Mounting..... Optional desk-top or 3 1/2" (8.9 cm) high
 relay rack configurations with
 microphone hanger provided
 WCS-100 Dimensions..... 3 1/4"H (8.8 cm), 19"W (48.3 cm),
 13 1/4"D (33.8 cm)
 (allow 1" (2.5 cm) for plugs)
 WCS-200 Dimensions..... 8"W (20.3 cm), 7"H (17.8 cm), 13 1/4"D
 (33.8 cm) (allow 2", 5 cm for plugs)

NOTE: *Prices, delivery and specifications are subject to change without notice.

WULFSBERG
 ELECTRONICS, INC.
 unit of Sundstrand Corporation



11300 WEST 89TH STREET • OVERLAND PARK, KANSAS 66214
 TELEPHONE (813) 492-3000 • TELEX WUO 424242 WULFSBERG OLPK

EXHIBIT 1

4.3 Bandwidth

Bandwidth measurements were conducted in accordance with applicable parts of FCC Rules & Regulations, Part 2.989.

4.3.1 Emission Limitations

- a.) Figures 4 and 5 show spectrum analyzer displays of the transmitter occupied bandwidth for 20 and 5 watt outputs. The transmitter was modulated with 2500 Hz of sufficient level to produce 50% modulation, then increased 16 db to produce the spectrums shown.

Table 4.3.1

Power Output (unmodulated) = 20 watts

<u>Sideband Frequency</u>	<u>Power</u>
Carrier (f_c)	17.8 watts
$f_c \pm 2.5$ KHz	3.16 watts
$f_c \pm 5.0$ KHz	63.1 mw
$f_c \pm 7.5$ KHz	5.62 mw
$f_c \pm 10.0$ KHz	0.224 mw
$f_c \pm 12.5$ KHz	70.8 uw
$f_c \pm 15.0$ KHz	11.2 uw
$f_c \pm 17.5$ KHz	8.91 uw
$f_c \pm 20.0$ KHz	3.55 uw
$f_c \pm 22.5$ KHz	1.0 uw

- b.) Requirement: From Part 87 Aviation Services, 87.71 (a), the mean power of emissions shall be attenuated below the level indicated in Figure 4-1.
- c.) Conclusion: The specification was met.

4.3.2 Occupied Bandwidth - Tone Modulation

- a.) Table 4.3.1 shows the power contained in the carrier and sidebands for 20 watts output.

The total power is:

$$\begin{aligned}
 &P_{\text{carrier}} + P_{\text{lower sideband \#1}} + P_{\text{lower sideband \#2}} + \dots \\
 &\quad + P_{\text{upper sideband \#1}} + P_{\text{upper sideband \#2}} + \dots \\
 &= 17.8 + 2(3.16) + 2(.0631) + 2(.00562) \\
 &\quad + 2(.224 \text{ mw}) + 2(.0708 \text{ mw}) + 2(.0112 \text{ mw}) \\
 &\quad + 2(.00891 \text{ mw}) + 2(.00355 \text{ mw}) + 2(.0010 \text{ mw}) \\
 &= 24.25808 \text{ watts}
 \end{aligned}$$

From Part 87.69 (a), the occupied bandwidth is the bandwidth that contains at least 99.0% of the total power. (99% of total power = 24.015 w). However, the carrier and first adjacent sidebands contain $17.8 \text{ w} + 2(3.16 \text{ w}) = 24.12 \text{ watts}$. Therefore, the occupied bandwidth is 5.0 KHz.

In a similar manner, the occupied bandwidth for 5 watts output was calculated and found to be 5.0 KHz.

- b.) Requirement: From Part 87 Aviation Services, 87.67 (b), the maximum allowable occupied bandwidth is 25 KHz.

Conclusion: The specification was met.

4.3.3 Occupied Bandwidth - Data Modulation

Test Method: The transmitter was modulated with an actual data signal, the format having been previously described in paragraph 2.1.1. The level of the input was adjusted to produce 90% modulation during audio peaks. The bit rate was 2400 per second.

The resultant spectrums are shown in Figure 6 for 20 watts output and Figure 7 for 5 watt output. This spectrum was strip integrated to determine the occupied bandwidth.

In this manner, the occupied bandwidth was determined to be 5100 Hz for 20 watts output and 7500 Hz for 5 watts output.

GRANT OF CERTIFICATION

Wulfsberg Electronics, Inc.
11300 West 89th St.
Overland Park, KS 66214

Attention: Cole E. Cunningham

Data of Grant: December 16, 1977 File No: 6130/TD EQU 4-3-4

Application dated: November 3, 1977 Label pursuant to Section 15.71

Class of equipment: Communications Receiver
(118.000-135.975 MHz) Aeronautical

Trade name: WULFSBERG

Model No.(s): WR-100

Mfr. Wulfsberg Electronics, Inc. (USA)

Certification is hereby granted for equipment listed above. The equipment covered by this certification must bear the identical trade name(s) and model number(s) listed above. Equipment bearing a different trade name or model number must be certificated separately.

Each piece of equipment bearing the listed trade name(s) and model number(s) shall be labeled pursuant to the provisions of the rule section listed above to show that the equipment complies with the technical standards in the FCC Rules.

In corresponding concerning this Grant of Certification, please refer to date of grant, the file number and the model number(s) of the equipment.

#A7921

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FEDERAL
COMMUNICATIONS
COMMISSION



FCC Form 731
March 1976

FEDERAL COMMUNICATIONS COMMISSION
Washington, D. C. 20554

Approved By GAO
B-180227(R0351)

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side of this application.

APPLICATION FOR EQUIPMENT AUTHORIZATION-
RADIOFREQUENCY DEVICES

INSTRUCTIONS

- A. Use this form as a cover sheet and attach the information required by Subpart J of Part 2, Part 15, or Part 18 of FCC Rules, enumerating the exhibits in Item 9 below.
B. Submit ONE COPY of the completed application, together with the fee required (See §§ 1.1102 and 1.1130 of FCC Rules) to: Federal Communications Commission, P. O. Box 19302, Washington, D. C. 20036.

1. Application is for (check only one box) ☒ Certification ☐ Type Acceptance ☐ Type Approval

2. (a) Name of Applicant

WULFSBERG ELECTRONICS, INC.

(b) Address of Applicant
(number, street,
city, state,
zip code)

11300 West 89th St.
Overland Park, KS 66214

(c) To the attention of

Cole E. Cunningham

3. Name and address of person to whom authorization is to be sent (if different from Item 1)

Same

4. Name and address of manufacturer of equipment (if different from Item 1)

Same

5. (a) Kind of equipment

Receiver

(b) Power Supply (check one)

☐ AC

☐ Battery

☒ Other (specify) AC/DC

(c) Trade Name(s)

WULFSBERG

(d) Model Number(s) or Type Number

WR-100

6. (a) Is this application for a modification of a previously type approved equipment or for a change in its identification?

YES NO

☐ ☒

(b) If "YES," state the previous identification of the equipment

7. EQUIPMENT SPECIFICATIONS

(a) Frequency range

118.000-135.975 MHz

(b) Rated RF power output (if variable, give range)

N/A

(c) Power input to final RF amplifier (if applicable)

N/A

(d) Rated frequency tolerance

N/A

APPLICANT SHOULD NOT USE THIS BLOCK

ACCOUNTING CLASSIFICATION

FCC Form 731

7. (a) Emission designation(s) N/A		(f) Type number of associated transmitter WT-100
		(g) Model number of associated receiver N/A
8. Operation under FCC Rules Part 87		
9. Total number of EXHIBITS attached to this application: <u>1</u> (Attach List of Exhibits)		
10. Person to be contacted for technical information concerning this application		
(a) Name Ralph J. Crumrine		(d) Mailing address WULFSEBERG ELECTRONICS, INC. 11300 W. 89th Street Overland Park, KS 66214
(b) Title Engineer		
(c) Area Code 913	Telephone Number 888-7645	

CERTIFICATION

I certify that I am authorized to sign for the applicant and that all the statements in this application and in the exhibits attached hereto are true and correct to the best of my knowledge and belief.

I further certify that, if the applicant is not the actual manufacturer of the equipment listed above, appropriate arrangements have been made with the manufacturer to assure that production units of this equipment bearing the applicant's brand and type number will continue to comply with the Commission's requirements.

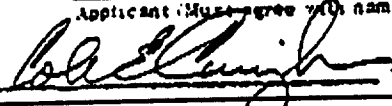
APPLICATION MUST BE SIGNED AND DATED

WULFSEBERG ELECTRONICS, INC.

Applicant (Must agree with name as shown in item 1)

WILLFUL FALSE STATEMENTS
MADE ON THIS FORM ARE
PUNISHABLE BY FINE AND
IMPRISONMENT, U. S. CODE,
TITLE 18, SECTION 1001.

Signed by



Title: Vice Pres., Engineering

Date Nov 2, 1977

NOTICE TO INDIVIDUALS REQUIRED BY THE PRIVACY ACT

The solicitation of the personal information requested in this form is to determine if your equipment is suitable for an equipment authorization pursuant to Parts 2, 15, and 18 of the Commission's Rules. The information will be used by the FCC staff to evaluate the equipment and to maintain a computer data base of authorized equipment. No authorization can be granted unless all information requested is provided.

DISCLOSURE OF INFORMATION

Unless otherwise determined, all data submitted will be made available for public inspection. Sec. 47 C.F.R. Sec. 0.457(d) (2); 5 U.S.C. Sec. 552.

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2. That private companies reproducing the form refrain from including therein or attaching thereto any advertising matter or deleting any material from the form;
3. That private companies reproducing the form exercise care to assure that the form being reproduced or distributed is the current edition presently used by the Commission for the type of application involved; such private company to be advised that, though the Commission will endeavor to keep the public advised of revisions in the form, it cannot assume responsibility to the extent of eliminating any element of risk against overstocking, etc.

FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D. C. 20554

GRANT OF TYPE ACCEPTANCE

Wulfsberg Electronics, Inc.
11300 W. 89th Street
Overland Park, KS 66214

Attention: Cole E. Cunningham

Re: Application dated November 3, 1977
Name of grantee Wulfsberg Electronics, Inc.
Equipment Type Number WT-100
Manufacturer Wulfsberg Electronics, Inc.

Pursuant to the above referenced application, TYPE ACCEPTANCE of the equipment specified IS
HEREBY ISSUED to the above-named GRANTEE for use under the Commission's Rules and Regula-
tions as shown herein.

DATE OF GRANT: December 9, 1977

<u>Note(s)</u>	<u>Rule(s) Part Number(s)</u>	<u>Frequency Range (MHz)</u>	<u>Input Watts</u>	<u>Output Watts</u>	<u>Frequency Tolerance</u>	<u>Emission</u>
<u>2G, TV</u>	<u>37</u>	<u>118-136</u>	<u>-</u>	<u>20</u>	<u>.0003</u>	<u>5A3</u>
<u>3G, TV</u>	<u>37</u>	<u>118-136</u>	<u>-</u>	<u>20</u>	<u>.0003</u>	<u>13A3</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

Remarks:

3G: The output power is continuously variable from the value listed in this
entry to 25%-30% of the value listed.

TV: Capable of operation within 25 kHz authorized bandwidth.

C-7
SJT

FEDERAL
COMMUNICATIONS
COMMISSION



FCC Form 723-A
October 1977

FCC Form #31
March 1974

FEDERAL COMMUNICATIONS COMMISSION
Washington, D. C. 20534

Approved By GAO
6-180227(R0351)

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2. (a) Name of Applicant WULFSBERG ELECTRONICS, INC.				
(b) Address of Applicant (number, street, city, state, zip code) 11300 W. 89th Street Overland Park, KS 66214				
(c) To the attention of Cole E. Cunningham				
3. Name and address of person to whom authorization is to be sent (if different from Item 1) Same				
4. Name and address of manufacturer of equipment (if different from Item 1) Same				
5. (a) Kind of equipment Receiver				
(b) Power Supply (check one) ☐ AC ☐ Battery ☒ Other (specify) AC/DC				
(c) Trade Name(s) Wulfsberg				
(d) Model Number(s) or Type Number WT-100				
6. (a) Is this application for a modification of a previously type approved equipment or for a change in its identification?				YES NO ☐ ☒
(b) If "YES," state the previous identification of the equipment				
7. EQUIPMENT SPECIFICATIONS				
(a) Frequency range 112.000-135.975 MHz		(b) Rated RF power output (if variable, give range) 5-20 Watts, variable		
(c) Power input to final RF amplifier (if applicable) 40 Watts		(d) Rated frequency tolerance + .0003%		
APPLICANT SHOULD NOT USE THIS BLOCK				
		ACCOUNTING CLASSIFICATION		

7. (e) Emission designation: 6A3, 6A9		(f) Type number of associated transmitter N/A
		(g) Model number of associated receiver WR-100
8. Operation under FCC Rules Parts 87		
9. Total number of EXHIBITS attached to this application: <u>None</u> (Attach List of Exhibits)		
10. Person to be contacted for technical information concerning this application		
(a) Name Ralph J. Crumrine		(d) Mailing address WULFSBERG ELECTRONICS, INC. 11300 W. 89th Street Overland Park, KS 66214
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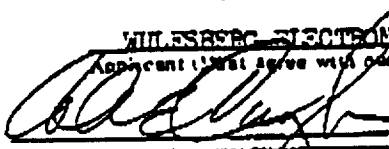
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MADE ON THIS FORM ARE
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IMPRISONMENT, U. S. CODE,
TITLE 18, SECTION 1001.

Signed by



As: **Vice Pres., Engineering**

Date **Nov 3, 1977**

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NARRATIVE STATEMENT

- (a) The complete program of research and experimentation proposed including description of equipment and theory of operation:

This radio station will provide an RF line between ACARS (Aircraft Communication Addressing and Reporting System) management units under test with the SITA Terrestrial Network. The ACARS management units will be delivered on Boeing 767 and 747 aircraft. This system provides a datalink between the aircraft and the ground.

- (b) The specific objectives sought to be accomplished:

Testing will provide a basis to demonstrate the intended function of each ACARS management unit to the FAA for the purpose of type certification. The use of this station will be limited to ACARS management units provided by airlines that will be using them with the SITA network.

- (c) How the program of experimentation has a reasonable promise of contribution to the development, extension, expansion, or utilization of the radio art, or is along line not already investigated:

Existing equipment allow a connection to the ARINC Terrestrial network. This station will allow testing with SITA, which provides service throughout Europe and the South Pacific. The SITA station will operate as a category B station, which permits the aircraft to uniquely identify the ground station it wants to address, whereas the ARINC Station operates as a category A station, which does not.

VHF 3 dB glassfibre colinear Type 7074

Type number	7074
Frequencies available	140—175 MHz (state exact frequency required)
Input impedance	50 ohms
V.S.W.R.	Less than 1.5/1 over the band
Maximum power	200 watts
Beamwidth (as a % of centre frequency)	Typically $\pm 1.5\%$
Gain over $\lambda/2$ dipole	3 dB
Half-power beamwidth	Typically 31°
Connection	'N' type socket
Mounting	Supplied with a pair of hot dipped galvanised steel clamps suitable for mounting alongside standard scaffold tubing $1\frac{7}{8}$ " (48.41 mm) outside diameter)
Elements	Brass rod
Shroud	Glassfibre laminate tapering from $1\frac{1}{2}$ " (38.1 mm) to $1\frac{1}{4}$ " (31.75 mm)
Weight	2.7 kg
Wind loading @ 160 kph	11.7 kgf
Length	10' (3048 mm)

Jaybeam reserve the right to supply antennas or components with an operational bandwidth, as outlined on this data sheet, which includes but does not necessarily centre on the frequency or frequencies specified on the order.
The device can be supplied where the frequency specified is the centre of the bandwidth providing this requirement is clearly stated at time of enquiry or ordering.

