

CD Radio Contour Plot  
S-Band Transmit, Left Hand Circularly Polarized  
960 min after ascending node

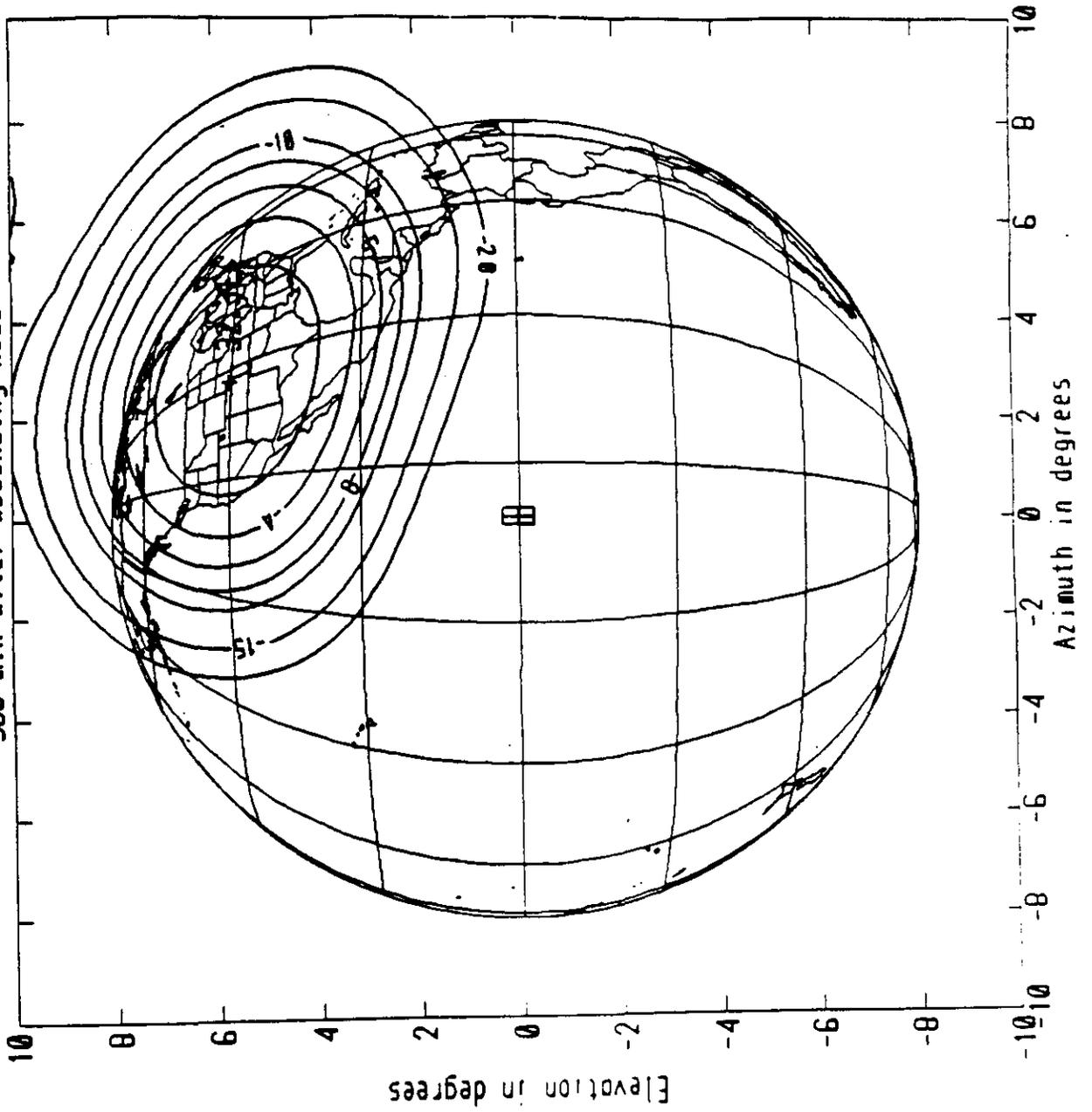


Figure 11

**25.114(c)(8).** A broad range of broadcast services will be provided to fixed and mobile users throughout the 48 contiguous United States. The predominant service will be digital quality stereo music and 50 such channels will be provided. These will be compressed from the 1.44 Mb/s CD output to 64 kb/s rate by a Perceptual Audio Coding (PAC) algorithm developed by Lucent Technologies. The 64 kb/s rate information streams will be convolutionally encoded with two-third rate  $k=9$  error coding, interleaved, divided into blocks and block error encoded with a 10% depth Reed-Solomon code (128, 120). Another 50 voice channels will also be provided. They will be compressed and encoded similarly to the music channels, except that the compressed information rate will be 24 kb/s.

CD Radio will use time division multiplexing (TDM) for its spacecraft-to-earth down-link. Each satellite's data stream will occupy approximately 4.2 MHz and will have an information rate of 4.4 Mb/s. Final radio frequency modulation will be Quadrature Phase Shift Keyed (QPSK).

Pursuant to the *Satellite DARS Order*, CD Radio is planning to offer some additional services. One of these is a channel to perform operations associated with its subscription service such as turning on and off mobile radios and displaying operational information to customers. The information rate will be low and encryption will be employed. Flexibility on some channels will be maintained to sub-divide them further (i.e., 16 kb/s, 8 kb/s, 4 kb/s, 2 kb/s, 1 kb/s and 0.5 kb/s) for providing auxiliary services such as paging, light aircraft weather advisory, GPS differential data, national emergency alerting, etc. Compression of this type information, if such is provided, would be use specific. At least some of such auxiliary service information would be encoded LPC (linear predictive coding).

The CD Radio transmission system will use both satellite spatial diversity and time diversity (approximately 4 seconds) to avoid outages from blockage, multipath and tree foliage. The satellites will provide good elevation angles to mobile receivers in the contiguous United States and radiate high power transmissions as described earlier. It is still necessary in core urban areas and tunnels to provide service by terrestrial repeaters as noted in the previous paragraph (c)(4). The combination of the above techniques and facilities will result in high quality service continuity throughout the 48 contiguous United States for outdoor locations. For indoor reception, an antenna unit on a southfacing window will be normally required.

Several types of customer receivers are to be implemented specifically for mobile, portable and fixed applications. For mobile application, versions of such receivers will be available as adapter units, as integrated after-market radios and, subsequently, as integrated radios delivered with new cars and other automotive vehicles. Receivers for recreational boats and light aircraft are also planned.

The receivers for mobile applications have a G/T of -19 dBK based on a minimum antenna gain of 3 dBi. Table 3 is the receiver's system noise budget. The normal version of the receiver has three demodulator channels, one for each satellite to achieve spatial diversity with one of these two channels containing a 4 second buffer used to achieve time diversity. Each satellite channel will be 4.2 MHz wide and spaced 8 MHz apart providing frequency diversity. The center 4.1 MHz of the frequency band will be used for the terrestrial repeaters. The terrestrial repeaters will use Coded Orthogonal Frequency Division Modulation (COFDM) for transmission modulation, which is similar to Eureka-147. The receivers for other applications will be almost electronically identical, except for a version in fixed applications which will have no diversity demodulator channels and will have a remote unit which will re-transmit the signal.

received by the antenna unit to a differently located player unit in the home using an ISM frequency band.

**Table 3: SDARS Receiver Noise Temperature**

Antenna-Receiver Losses	7° K
Receiver Total Noise	65° K
Antenna Earth Pickup	<u>86° K</u>
Total	158° K

The up-link earth station also includes the CD Radio programming center and the on-orbit TT&C facilities. Two stations will be built, one in the northeast and a second one subsequently in the west. The radio facilities of the up-link station will be comprised of four 4.5 meter diameter antennas and 200 watt 7 GHz transmitters. Full electronic and electrical redundancy are planned.

Regarding noise and interference sources, the 2320.0-2332.5 MHz radio frequency band has no other significant terrestrial users in the United States. Canada uses the band for terrestrial radio relay and some aeronautical telemetry and Mexico for terrestrial radio relay as well documented elsewhere by the FCC. The United States has already concluded a coordination agreement with Canada for the use of the band and CD Radio's provision of satellite DARS complies with the power flux density levels established in that agreement. Coordination with Mexico, including border situations with mobile receivers and with terrestrial repeaters, is currently being negotiated. The earth station switches up-link illumination and frequency between the ascending node satellite and the descending node satellite which occurs at 8 hour intervals. The satellite design is such that a non-illuminated satellite does not radiate significant S-band flux density (i.e., below -152 dBW/m<sup>2</sup>/4 kHz.).

Interference between SDARS systems is also being coordinated with XM Satellite Radio. Adjacent band interference will be coordinated with applicable WCS operators recognizing that the FCC has set an out-of-band interference requirement on these operators. Noise sources such as microwave ovens and ISM out-of-band radiation have been analyzed and are tolerable. Some of these sources, which may be significant in urban core areas, including self-interference, are mitigated by properties of the terrestrial transmitter modulation which is COFDM.

The overall transmission link performance analysis is contained in Table 4.

**Table 4: Transmission Link Performance**

Satellite EIRP <sup>16</sup>	61.1 dBW
Single Channel EIRP <sup>17</sup>	-18.4 dB
Path Loss <sup>18</sup>	-193.7 dB
Mobile Receiver Antenna Gain <sup>19</sup>	<u>+3.5 dB</u>
Received Power	-147.5 dBW
Received Noise Power <sup>20</sup>	<u>-158.5 dBW</u>
Single Satellite S/N	11.0 dB
Required S/N <sup>21</sup>	<u>5.0 dB</u>
Single Satellite Power Margin <sup>22</sup>	6.0 dB
Diversity Gain <sup>23</sup>	12.0 dB
Effective Multipath Margin	18.0 dB

**25.114(c)(8).** Two-degree orbital spacing coordination, if applicable, will be accomplished through direct discussions with XM Satellite Radio, the other Region 2 S-band satellite DARS provider, once the precise frequencies and up-link locations are known.

Coordination of TT&C frequencies will be accomplished with the geostationary satellite operators at the equator longitude crossings previously noted over the short transit periods involved.

---

<sup>16</sup> Edge-of-coverage EIRP.

<sup>17</sup> Individual music channel (64 kb/s).

<sup>18</sup> Geosynchronous elliptic inclined orbit for 2326 MHz at apogee to mobile receiver with 35° elevation angle.

<sup>19</sup> Worst case orientation, including ohmic and polarization losses at 35° elevation angle.

<sup>20</sup>  $B_v = 64$  kHz,  $T_s = 158^\circ\text{K}$  (Table 3), up-link noise contribution is negligible (>26 dB S/N).

<sup>21</sup> Music decompression achieved by PAC decoder with  $\leq 10^{-5}$  BER.

<sup>22</sup> Dual satellite reception with maximal ratio combiner S/N = 8.5 dB.

<sup>23</sup> Satellite spatial and time diversity provide at least 12 dB multipath mitigation as well as mitigation against blockage and foliage attenuation

**25.114(c)(9).** Accuracy of maintaining longitudinal drift of the six daily geostationary equator longitude crossings will be maintained within  $\pm 2.0^\circ$ . The satellite's orbital inclination will be maintained within  $\pm 7.0^\circ$  and the antenna axis attitude will be maintained within  $\pm 0.4^\circ$  for pitch,  $\pm 0.4^\circ$  for roll, and  $\pm 2.0^\circ$  for yaw.

**25.114(c)(10).** The power flux density at the border of the coverage area, herein assumed as the -2 dB antenna gain contour, is -127.6 dBW/m<sup>2</sup>/4 kHz using a bandwidth spreading factor of 30.2 dB and a spatial spreading factor of -162.7 dB. Beam shaping has been used to minimize appreciable power flux density over other countries, except for Mexico where potential interference will be handled by bilateral coordination and for Canada where coordination has been completed. The satellite power flux density at the antenna beam center is -125.6 dBW/m<sup>2</sup>/4kHz.

**25.114(c)(11).** The satellite provider (Space Systems/Loral, Inc.) is responsible for launch and transfer orbit TT&C which will be accomplished through its own and leased facilities. The TT&C subsystem will operate at C-band via near-omnidirectional satellite antennas during launch, transfer orbit and on-orbit operations. The redundant command receivers and one telemetry transmitter will be permanently connected to the near-omnidirectional antennas. During normal on-orbit mode operation, one of the telemetry transmitters and the beacon transmitter will be connected to the telemetry directional antennas providing a higher gain coverage pattern towards the CD Radio TT&C ground stations near Quito, Ecuador and Lima, Peru. During normal on-orbit mode operation, both command receivers remain connected to the near-omnidirectional antennas.

The command up-link will be frequency modulated by a command subcarrier or by ranging tones. The nominal carrier deviation will be  $\pm 375$  kHz peak. The demodulated

command subcarrier will be routed to redundant command processors. The ranging tones will be connected to the telemetry transmitter for retransmission to the TT&C ground stations.

The addressable command processors will decode and process the commands.

Commands can be executed autonomously; or stored, verified by ground command, and executed by a subsequent command. Commands can also be time-tagged for autonomous execution at future times.

The telemetry data biphase will modulate a subcarrier. This subcarrier and/or ranging tones phase will modulate the telemetry transmitter.

**25.114(c)(12).** The physical characteristics of the space station will include a light-weight graphite-reinforced epoxy central cylinder and the surrounding equipment mounting panels that will form a cube of approximately 3 meters on a side. Solar panels will extend from the north and south faces and the transmit antenna reflector will be mounted on the west face. The receive antenna will be mounted on the earth face of the satellite. The structure also will provide a stable platform for preserving the alignment of critical elements of the spacecraft system such as earth sensors. The directional telemetry transmit antennas and one set of the near omnidirectional antennas will also be located on the earth face. The remaining set of telemetry antenna will be located on the anti-earth face.

The major heat dissipating systems, such as TWTAs, batteries, etc. will be located on the north and south equipment panels to radiate heat efficiently. The TWTAs will also employ direct radiating collectors. To provide maximum thermal efficiency, the outside of the north and south panels will be covered with optical solar reflectors (OSRs), and the panels contain heat pipes for spreading the heat over the total panel area.

This system design will fit comfortably within the constraints imposed by several launch

vehicles. The satellite will be compatible with the Proton, Atlas III and Sea Launch launch vehicles. Figure 12 is a view of the spacecraft, the dimensions of which will be 24.8 meters long, 5.6 meters wide and 5.2 meters tall. The first two satellites are scheduled for launch on a Proton and the third will be launched by one of the above launch vehicles.

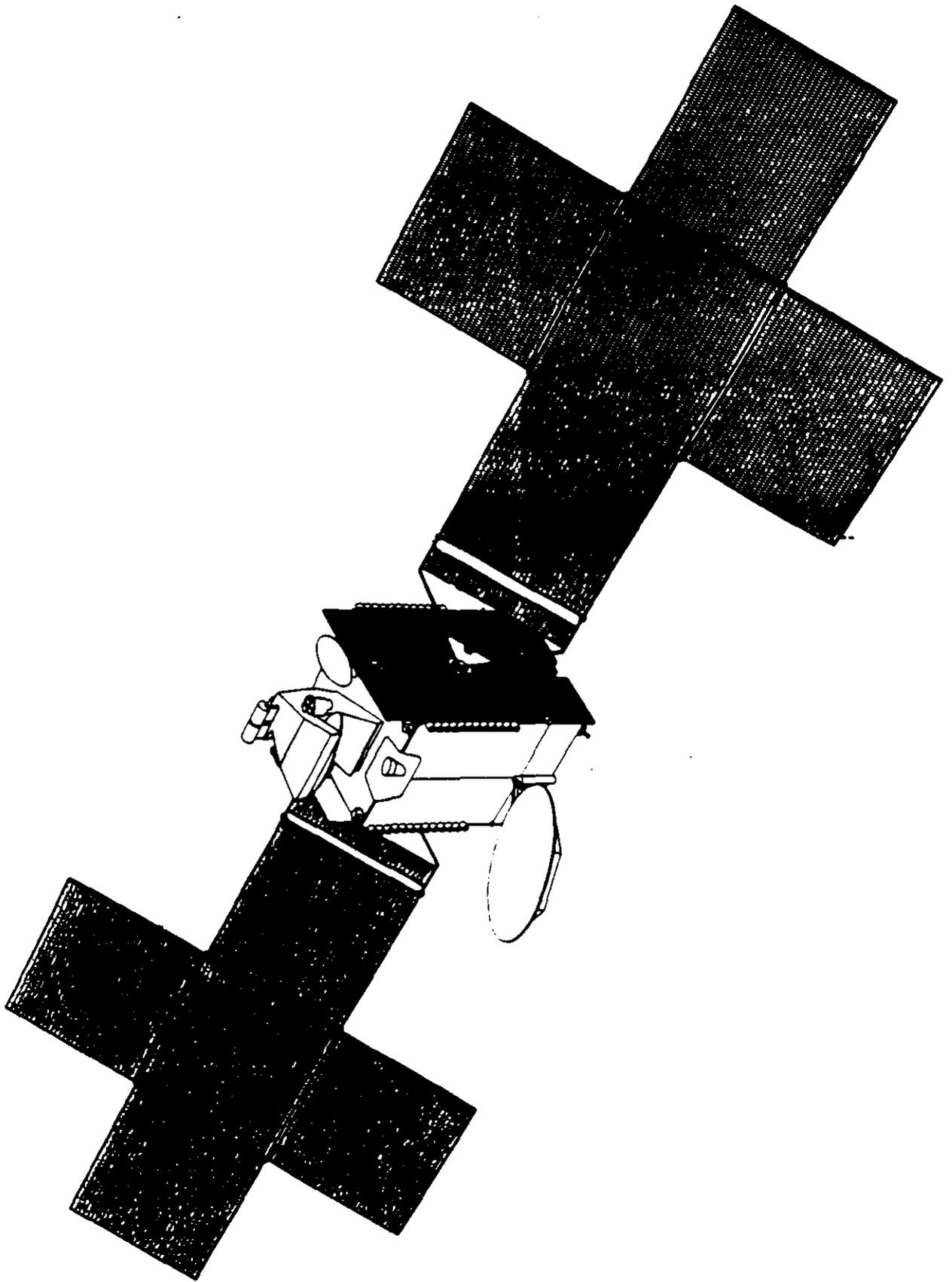


Figure 12

The spacecraft has an estimated operational lifetime of 15 years with a 15 year probability of survival of greater than 0.66. The lifetime and reliability estimates are based on the reliability performance estimates of production, space-qualified components used in the FS-1300 series satellites. The TWTA reliability estimates are based on space-qualified members of the same TWTA design family.

Table 5 is the mass budget reflecting on-ground and in-orbit mass in kilograms. Table 6 is the power budget showing beginning and end-of-life power in watts.

**Table 5 - Mass Budget**

<b>Component</b>	<b>Mass (kg)</b>
<b>Payload</b>	<b>285</b>
<b>Bus and Electrical Power</b>	<b>1332</b>
<b>Margin</b>	<b>82</b>
<b>Subtotal: On-ground dry mass</b>	<b>1700</b>
<b>Propellant &amp; Pressurant</b>	<b>2220</b>
<b>Subtotal: On-ground separation mass</b>	<b>3920</b>
<b>In Orbit beginning-of-life mass</b>	<b>2734</b>
<b>In Orbit end-of-life mass</b>	<b>1734</b>

Table 6

SUMMARY	Winter Solstice Sun normal, no Eclipse	Summer Solstice Sun 14' off-normal no eclipse	Summer Solstice Sun normal, eclipse	Summer Solstice Sun 11' off- normal, eclipse
PAYLOAD @ SATURATION	6876	6876	6876	6876
PAYLOAD BACKOFF	0	0	-64	-208
SCE TOTAL	204	204	204	204
ADCS TOTAL	52	52	52	52
TC&R TOTAL	36	36	36	36
POWER TOTAL	234	234	234	234
PROPULSION TOTAL	5	5	5	5
THERMAL TOTAL	519	519	138	138
All SUBSYSTEMS TOTAL	7926	7926	7481	7337
Harness loss	40	40	37	37
Battery charging (High rate)	0	0	1219	1219
Battery charging (Trickle)	81	81	0	0
Battery harness	0	0	0	0
Low Voltage converter loss	46	46	46	46
Discharge converter loss	0	0	0	0
Charge converter loss	20	20	166	166
TOTAL POWER CONSUMPTION	8113	8113	8949	8805
ARRAY POWER AVAILABLE (15 yrs )	8735	8735	8977	8812
POWER MARGIN (15 yrs )	62	622	28	7

A-32

**25.114(c)(15).** Construction of the satellites commenced last year and the first is scheduled for completion with delivery at the launch site in November 1999. Three launches are scheduled in the November 1999-March 2000 time period. Estimated date of placement into system operational service is March 2000.

**EXHIBIT 1**

**EXHIBIT 2**

READ INSTRUCTIONS CAREFULLY  
BEFORE PROCEEDING

FEDERAL COMMUNICATIONS COMMISSION

APPROVED BY OMB 3060-0589

# REMITTANCE ADVICE

(1) LOCKBOX # 358210

PAGE NO 1 OF 1

FCC/MELLON

SPECIAL USE

FCC USE ONLY JUL 02 2001

## SECTION A - PAYER INFORMATION

(2) PAYER NAME (if paying by credit card, enter name exactly as it appears on your card) Satellite CD Radio, Inc.		(3) TOTAL AMOUNT PAID (dollars and cents) \$ 22,010.00
(4) STREET ADDRESS LINE NO 1 1180 Avenue of the Americas		
(5) STREET ADDRESS LINE NO 2 14th Floor		
(6) CITY New York	(7) STATE NY	(8) ZIP CODE 10036
(9) DAYTIME TELEPHONE NUMBER (include area code) (212) 899-5000	(10) COUNTRY CODE (if not in U.S.A.)	

IF PAYER NAME AND THE APPLICANT NAME ARE DIFFERENT, COMPLETE SECTION B  
IF MORE THAN ONE APPLICANT, USE CONTINUATION SHEETS (FORM 159-C)

## SECTION B - APPLICANT INFORMATION

(11) APPLICANT NAME (if paying by credit card, enter name exactly as it appears on your card)		
(12) STREET ADDRESS LINE NO. 1		
(13) STREET ADDRESS LINE NO. 2		
(14) CITY	(15) STATE	(16) ZIP CODE
(17) DAYTIME TELEPHONE NUMBER (include area code)	(18) COUNTRY CODE (if not in U.S.A.)	

COMPLETE SECTION C FOR EACH SERVICE, IF MORE BOXES ARE NEEDED, USE CONTINUATION SHEETS (FORM 159-C)

## SECTION C - PAYMENT INFORMATION

(19A) FCC CALL SIGN/OTHER ID	(20A) PAYMENT TYPE CODE (PTC)	(21A) QUANTITY	(22A) FEE DUE FOR (PTC) IN BLOCK 20A	FCC USE ONLY
	C G W	1	\$ 22,010.00	
(23A) FCC CODE 1		(24A) FCC CODE 2		
(19B) FCC CALL SIGN/OTHER ID	(20B) PAYMENT TYPE CODE (PTC)	(21B) QUANTITY	(22B) FEE DUE FOR (PTC) IN BLOCK 20B	FCC USE ONLY
			\$	
(23B) FCC CODE 1		(24B) FCC CODE 2		
(19C) FCC CALL SIGN/OTHER ID	(20C) PAYMENT TYPE CODE (PTC)	(21C) QUANTITY	(22C) FEE DUE FOR (PTC) IN BLOCK 20C	FCC USE ONLY
			\$	
(23C) FCC CODE 1		(24C) FCC CODE 2		
(19D) FCC CALL SIGN/OTHER ID	(20D) PAYMENT TYPE CODE (PTC)	(21D) QUANTITY	(22D) FEE DUE FOR (PTC) IN BLOCK 20D	FCC USE ONLY
			\$	
(23D) FCC CODE 1		(24D) FCC CODE 2		

## SECTION D - TAXPAYER INFORMATION (REQUIRED)

(25) PAYER TIN 0 5 2 1 7 0 0 2 0 7	(26) COMPLETE THIS BLOCK ONLY IF APPLICANT NAME IN 8-11 IS DIFFERENT FROM PAYER NAME APPLICANT TIN 0
---------------------------------------	--

## SECTION E - CERTIFICATION

(27) CERTIFICATION STATEMENT  
I, Robert D. Briskman, Certify under penalty of perjury that the foregoing and supporting information  
(PRINT NAME)  
are true and correct to the best of my knowledge, information and belief. SIGNATURE Robert D. Briskman

## SECTION F - CREDIT CARD PAYMENT INFORMATION

(28) MASTERCARD	MASTERCARD/VISA ACCOUNT NUMBER	EXPIRATION DATE
		MONTH YEAR
VISA	hereby authorize the FCC to charge my VISA or MASTERCARD for the service(s) authorization(s) herein described.	AUTHORIZED SIGNATURE DATE

CD RADIO INC.  
PH. 212-899-5000  
1180 AVENUE OF THE AMERICAS  
NEW YORK, NY 10036

NATIONSBANK  
WASHINGTON, DC 20037  
15-120/540

6022

006022

\*TWENTY TWO THOUSAND TEN DOLLARS AND NO CENTS

DATE

AMOUNT

12/09/98

\*\*\*\*22,010.00\*

PAY  
TO THE  
ORDER  
OF

Federal Communications Comm  
2000 M STREET, N.W.  
Washington DC 20554

FCC



AUTHORIZED SIGNATURE

⑈006022⑈ ⑆054001204⑆ 2086790904⑈

SECURITY FEATURES INCLUDED DETAILS ON BACK

**FCC 312**  
Main Form

**FEDERAL COMMUNICATIONS COMMISSION**

**APPLICATION FOR SATELLITE SPACE AND EARTH STATION AUTHORIZATIONS**

Approved by OMB  
1060-0678

Est. Avg. Burden Hours  
Per Response: 10 Hrs.

**FCC Use Only**  
File Number:

Call Sign:

**PAYOR AND FILING FEE INFORMATION**

a. Payor Name Satellite CD Radio, Inc.				b. Daytime Telephone Number (212) 899-5000	
c. Mailing Street Address or P.O. Box 1180 Avenue of the Americas, 14th Floor				d. FCC Account Number 0521700207	
e. City New York		f. State NY	g. Zip Code 10036		h. Country Code (if not U.S.A.)
i. Payment Type Code CGW	j. Quantity 1	k. Fee Due for Payment Type Code in (i) \$22,010.00	l. Total Amount Paid \$22,010.00		<b>FCC Use Only</b>

**APPLICANT INFORMATION**

1. Legal Name of Applicant Satellite CD Radio, Inc.			2. Voice Telephone Number (212) 899-5000		
3. Other Name Used for Doing Business (if any)			4. Fax Telephone Number (212) 899-5036		
5. Mailing Street Address or PO Box 1180 Avenue of the Americas, 14th Floor ATTENTION Robert D. Briskman			6. City New York		8. Zip Code 10036
			7. State / Country (if not U.S.A.) NY		
9. Name of Contact Representative (if other than applicant) Richard E. Wiley			10. Voice Telephone Number (202) 429-7000		
11. Firm or Company Name Wiley, Rein & Fielding			12. Fax Telephone Number (202) 429-7049		
13. Mailing Street Address or PO Box 1776 K Street, N.W. ATTENTION Richard E. Wiley			14. City Washington		16. Zip Code 20006
			15. State / Country (if not U.S.A.) DC		

**CLASSIFICATION OF FILING**

17. Place an "X" in the box next to the classification that applies to this filing for both questions a. and b. Mark only one box for 17a and only one box for 17b.					
<input type="checkbox"/> a1. Earth Station	<input type="checkbox"/> b1. Application for License of New Station	<input checked="" type="checkbox"/> b4. Modification of License or Registration	<input type="checkbox"/> b5. Assignment of License or Registration	<input type="checkbox"/> b7. Notification of Minor Modification	
<input checked="" type="checkbox"/> a2. Space Station	<input type="checkbox"/> b2. Application for Registration of New Domestic Receive-Only Station	<input type="checkbox"/> b6. Transfer of Control of License or Registration	<input type="checkbox"/> b8. Other (Please Specify) _____		
18. If this filing is in reference to an existing station, enter Call sign of station			19. If this filing is an amendment to a pending application enter (a) Date pending application was filed (b) File number of pending application		

### TYPE OF SERVICE

20. NATURE OF SERVICE: This filing is for an authorization to provide or use the following type(s) of service(s). Place an "X" in the box(es) next to all that apply.

a. Fixed Satellite     b. Mobile Satellite     c. Radiodetermination Satellite     d. Earth Exploration Satellite     e. Other (please specify) Satellite Digital Audio Radio

---

21. STATUS: Place an "X" in the box next to the applicable status. Mark only one box.

a. Common Carrier     b. Non-Common Carrier

22. If earth station applicant, place an "X" in the box(es) next to all that apply.

a. Using U.S. licensed satellites     b. Using Non-U.S. licensed satellites

---

23. If applicant is providing INTERNATIONAL COMMON CARRIER service, see instructions regarding Sec. 214 filings. Mark only one box. Are these facilities:

a. Connected to the Public Switched Network     b. Not connected to the Public Switched Network

---

24. FREQUENCY BAND(S): Place an "X" in the box(es) next to all applicable frequency band(s).

a. C-Band (4/6 GHz)     c. Other (Please specify) 2320.0-2332.5 MHz

b. Ku-Band (12/14 GHz)

### TYPE OF STATION

25. CLASS OF STATION: Place an "X" in the box next to the class of station that applies. Mark only one box.

a. Fixed Earth Station     b. Temporary-Fixed Earth Station     c. 12/14 GHz VSAT Network     d. Mobile Earth Station     e. Space Station     f. Other (Specify) \_\_\_\_\_

If space station applicant, go to Question 27.

---

26. TYPE OF EARTH STATION FACILITY: Mark only one box.

a. Transmit/Receive     b. Transmit-Only     c. Receive-Only

### PURPOSE OF MODIFICATION OR AMENDMENT

27. The purpose of this proposed modification or amendment is to: Place an "X" in the box(es) next to all that apply.

- a -- authorization to add new emission designator and related service
- b -- authorization to change emission designator and related service
- c -- authorization to increase EIRP and EIRP density
- d -- authorization to replace antenna
- e -- authorization to add antenna
- f -- authorization to relocate fixed station
- g -- authorization to change assigned frequency(ies)
- h -- authorization to add Points of Communication (satellites & countries)
- i -- authorization to change Points of Communication (satellites & countries)
- j -- authorization for facilities for which environmental assessment and radiation hazard reporting is required
- k -- Other (Please specify) authorization to change orbits to non-geostationary

### ENVIRONMENTAL POLICY

28. Would a Commission grant of any proposal in this application or amendment have a significant environmental impact as defined by 47 CFR 1.1307?

YES     NO

29. Attach to this application or amendment a copy of the environmental report required by Sections 1.1308 and 1.1311 of the Commission's rules, 47 CFR §§ 1.1308 and 1.1311, as Exhibit A to this application.

30. Attach to this application or amendment a copy of applications for Federal EIR for any transmitting facilities, major modifications, or major amendments. Refer to OF 1 Bulletin 65.

## ALIEN OWNERSHIP

29. Is the applicant a foreign government or the representative of any foreign government?	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
30. Is the applicant an alien or the representative of an alien?	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
31. Is the applicant a corporation organized under the laws of any foreign government?	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
32. Is the applicant a corporation of which more than one-fifth of the capital stock is owned of record or voted by aliens or their representatives or by a foreign government or representative thereof or by any corporation organized under the laws of a foreign country?	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
33. Is the applicant a corporation directly or indirectly controlled by any other corporation of which more than one-fourth of the capital stock is owned of record or voted by aliens, their representatives, or by a foreign government or representative thereof or by any corporation organized under the laws of a foreign country?	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
34. If any answer to questions 29, 30, 31, 32 and/or 33 is Yes, attach as Exhibit C an identification of the aliens or foreign entities, their nationality, their relationship to the applicant, and the percentage of stock they own or vote.		

## BASIC QUALIFICATIONS

35. Does the applicant request any waivers or exemptions from any of the Commission's Rules? If Yes, attach as Exhibit D, copies of the requests for waivers or exceptions with supporting documents.	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
36. Has the applicant or any party to this application had any FCC station authorization or license revoked or had any application for an initial, modification or renewal of FCC station authorization, license, or construction permit denied by the Commission? If Yes, attach as Exhibit E, an explanation of the circumstances.	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
37. Has the applicant, or any party to this application, or any party directly or indirectly controlling the applicant ever been convicted of a felony by any state or federal court?	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
38. Has any court finally adjudged the applicant, or any person directly or indirectly controlling the applicant, guilty of unlawfully monopolizing or attempting unlawfully to monopolize radio communication, directly or indirectly, through control of manufacture or sale of radio apparatus, exclusive traffic arrangement or any other means or unfair methods of competition?	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
39. Is the applicant, or any person directly or indirectly controlling the applicant, currently a party in any pending matter referred to in the preceding two items?	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
40. By checking Yes, the undersigned certifies, that neither the applicant nor any other party to the application is subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Act of 1988, 21 U.S.C. Section 862, because of a conviction for possession or distribution of a controlled substance. See 47 CFR 1.2002(b) for the meaning of "party to the application" for these purposes	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

41. Description. (Summarize the nature of the application and the services to be provided).

This application seeks modification of CD Radio's existing authorization to provide satellite digital audio radio service in the 2320.0-2332.5 MHz frequency band. Three system enhancements are requested: (1) an increase in the number of satellites from two to three, plus a ground spare; (2) operation of all three satellites in inclined and elliptical (non-geostationary) orbits; and (3) use of the 6/4 GHz frequency band on a non-interfering basis for telemetry, tracking and

**CERTIFICATION**

The Applicant waives any claim to the use of any particular frequency or of the electromagnetic spectrum as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise, and requests an authorization in accordance with this application. The applicant certifies that grant of this application would not cause the applicant to be in violation of the spectrum aggregation limit in 47 CFR Part 20. All statements made in exhibits are a material part hereof and are incorporated herein as if set out in full in this application. The undersigned, individually and for the applicant, hereby certifies that all statements made in this application and in all attached exhibits are true, complete and correct to the best of his or her knowledge and belief, and are made in good faith.

42. Applicant is a (an): (Place an "X" in the box next to applicable response.)

a. Individual     b. Unincorporated Association     c. Partnership     d. Corporation     e. Governmental Entity     f. Other  
(Please specify)

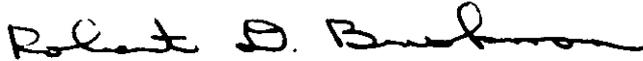
43. Typed Name of Person Signing

Robert D. Briskman

44. Title of Person Signing

President, Satellite CD Radio, Inc.

45. Signature



46. Date

12/11/98

**WILLFUL FALSE STATEMENTS MADE ON THIS FORM ARE PUNISHABLE BY FINE AND/OR IMPRISONMENT (U.S. Code, Title 18, Section 1001), AND/OR REVOCATION OF ANY STATION AUTHORIZATION (U.S. Code, Title 47, Section 312(a)(1)), AND/OR FORFEITURE (U.S. Code, Title 47, Section 503).**

Before the  
**FEDERAL COMMUNICATIONS COMMISSION**  
Washington, D.C. 20554

In the Matter of:

**Satellite CD Radio, Inc.**

Application to Modify Authorization  
to Launch and Operate a Digital  
Audio Radio Satellite Service in the  
2320.0-2332.5 MHz Frequency Band

49/50-DSS-P/L-90

58/59-DSS-AMEND-90

44/45-DSS-AMEND-92

**Application of Satellite CD Radio, Inc.  
to Modify Authorization**

Robert D. Briskman  
Satellite CD Radio, Inc.  
1180 Avenue of the Americas  
14th Floor  
New York, New York 10036  
(212) 899-5000

Dated: December 11, 1998

## TABLE OF CONTENTS

	Page
I. INTRODUCTION.....	1
II. THE PROVISION OF SATELLITE DARS USING THREE NON- GEOSTATIONARY SATELLITES IN INCLINED AND ELLIPTICAL ORBITS AND USING THE 6/4 GHz BAND FOR TT&C WILL CONFORM TO THE COMMISSION'S TECHNICAL REQUIREMENTS AND WILL RAISE NO ADDITIONAL INTERFERENCE ISSUES.....	3
A. Modification of the CD Radio Authorization Conforms to Section 25.114(c).....	4
B. CD Radio's Requested System Enhancements Will Raise No Additional International Coordination Or Other Interference Issues.....	6
C. Use of Three Non-Geostationary Satellites to Provide Satellite DARS Complies With All Other Technical Aspects of CD Radio's Authorization.....	8
III. CD RADIO'S SATELLITE SYSTEM ENHANCEMENTS WILL SERVE THE PUBLIC INTEREST BY PROVIDING IMPROVED SERVICE, ADDITIONAL CHANNELS AND FEWER TERRESTRIAL REPEATERS.....	9
IV. CONCLUSION.....	11
APPENDIX A: Section 25.114(c) Information .....	A-1

Before the  
**FEDERAL COMMUNICATIONS COMMISSION**  
Washington, D.C. 20554

In the Matter of:

**Satellite CD Radio, Inc.**

Application to Modify Authorization  
to Launch and Operate a Digital  
Audio Radio Satellite Service in the  
2320.0-2332.5 MHz Frequency Band

49/50-DSS-P/L-90

58/59-DSS-AMEND-90

44/45-DSS-AMEND-92

**Application of Satellite CD Radio, Inc.  
to Modify Authorization**

**I. INTRODUCTION**

Satellite CD Radio, Inc. ("CD Radio") submits this application to modify certain technical parameters of its space station authorization to provide satellite digital audio radio services ("satellite DARS") in the 2320.0-2332.5 MHz (space-to-Earth) frequency band.<sup>1</sup> Three satellite system enhancements are requested by this application: (1) an increase in the number of satellites from two to three, plus a ground spare; (2) placement of all three satellites into inclined and elliptical (non-geostationary) orbits; and (3) use of the 6/4 GHz frequency band on a non-interfering basis for telemetry, tracking and command ("TT&C").

---

<sup>1</sup> *Satellite CD Radio, Inc., Application for Authority to Construct, Launch and Operate Two Satellites in the Satellite Digital Audio Radio Service*, 13 F.C.C. Rcd 7971 (1997) (Order and Authorization) ("CD Radio Authorization").

Modification of CD Radio's authorization is warranted because the proposed system changes will permit CD Radio to offer better quality satellite DARS from its spacecraft. Further, the improved satellite system developed by CD Radio will continue to comply with the Federal Communications Commission's (the "Commission" or the "FCC") technical requirements, including Sections 25.114(c) and 25.144 of the Commission's rules, and will not raise additional international coordination or other interference concerns. In short, grant of CD Radio's application will provide the public with an improved satellite DARS service that relies on fewer terrestrial repeaters and offers more channels within the existing spectrum allocation.

Last year, the FCC authorized CD Radio to launch and operate two geostationary satellites at 80° W. Longitude and 110° W. Longitude for the purpose of providing satellite DARS in the United States. Satellite DARS is a "radiocommunication service in which audio programming is digitally transmitted by one or more space stations directly to fixed, mobile, and/or portable stations and which may involve complementary repeating terrestrial transmitters, telemetry, tracking and control facilities."<sup>2</sup> CD Radio's authorization to provide satellite DARS was granted pursuant to CD Radio's winning bid in the FCC's satellite DARS auction,<sup>3</sup> payment of the full bid price, and submission of a formal amended application.<sup>4</sup>

---

<sup>2</sup> 47 C.F.R. § 25.201.

<sup>3</sup> CD Radio bid, and paid, \$83,346,000 for use of the 2320.0-2332.5 MHz frequency band. See Public Notice, *FCC Announces Auction Winners for Digital Audio Radio Service*, 12 F.C.C. Rcd 18727 (1997).

<sup>4</sup> Letter of Robert Briskman, Satellite CD Radio, Inc., to Regina Keeney, Chief International Bureau, Compliance with Satellite CD Radio, Inc. Authorization (Feb. 19, 1998); Letter of Robert Briskman, Satellite CD Radio, Inc., to Regina Keeney, Chief International Bureau, Compliance with Satellite CD Radio, Inc. Authorization (Feb. 17, 1998); Application of Satellite CD Radio, Inc. to Launch and Operate a Digital Audio Radio Satellite Service in the 2320.0-

(continued )

CD Radio's authorization permits it to offer continuous nationwide radio programming with digital quality sound. CD Radio intends to make available to consumers a state-of-the-art satellite DARS service in early 2000. By this application to modify the *CD Radio Authorization*, CD Radio proposes enhancements to its planned satellite system that will better fulfill the potential of satellite DARS, and thus serve the public interest, without raising additional technical or interference issues. Accordingly, CD Radio respectfully requests that the Commission grant this modification to its existing authorization.

**II. THE PROVISION OF SATELLITE DARS USING THREE NON-GEOSTATIONARY SATELLITES IN INCLINED AND ELLIPTICAL ORBITS AND USING THE 6/4 GHz BAND FOR TT&C WILL CONFORM TO THE COMMISSION'S TECHNICAL REQUIREMENTS AND WILL RAISE NO ADDITIONAL INTERFERENCE ISSUES**

Increasing the number of satellites available for the provision of satellite DARS from two to three, operating such satellites in geosynchronous inclined and elliptical orbits, and using the 6/4 GHz frequency band for TT&C will fully comply with the technical requirements established in the Commission's rules and the *CD Radio Authorization*.<sup>5</sup> In particular, CD Radio's use of three satellites in inclined and elliptical orbits will conform to the technical rules contained in

---

(continued . . .)

2332.5 MHz Frequency Band: Submission and Amendment to Application 71-SAT-AMEND-97 (filed May 16, 1997) ("*CD Radio Amendment*"); Application of Satellite CD Radio, Inc. for an All-Digital CD Quality Satellite Sound Broadcasting System. File Nos. 49-DDS-P/LA-90, 50-DDS-P/LA-90 (filed May 18, 1990) ("*CD Radio Application*").

<sup>5</sup> Indeed, the *CD Radio Amendment* originally requested geosynchronous orbits for its proposed DARS satellites. See *CD Radio Amendment* at 21.

# Payment Transactions Detail Report

Date: 01/16/2002

BY: FEE CONTROL NUMBER

Fee Control Number	Payor Name	Fcc Account Number	Payer TIN	Received Date							
0107038345114001	SIRIUS SATELLITE RADIO INC 1221 AVENUE OF THE AMERICAS 36TH FLOOR NEW YORK NY 10020	WP00038533	0521700207	7/02/2001 00:00:0							
Payment Amount	Current Balance	Seq Num	Payment Type Code	Quantity	Callsign Other Id	Applicant Name	Applicant Zip	Bad Check	Detail Amount	Trans Code	Payment Type
\$286,095.00	\$286,095.00	1	CLW	1		SIRIUS SATELLITE RADIO INC	10020		\$286,095.00	1	PMT
\$286,095.00	\$286,095.00	2	CLW	1		SIRIUS SATELLITE RADIO INC	10020		(\$286,095.00)	1	ADJ
\$286,095.00	\$286,095.00	3	CLW	1	CLW0100001	SIRIUS SATELLITE RADIO INC	10020		\$286,095.00	1	PMT
<b>Total</b>									<b>\$286,095.00</b>		