This is a sample propagation prediction map of a hypothetical 3 kW/100m HAAT FM Station at Oakland Airport.
Green represents signal strengths above 50 dBμV/m; Blue, between 50 and 45 dBμV/m; and Red, between 45 and 40 dBμV/m.
• Based on 3 arc second terrain data and vegetation cover data • Available for FM, TV, and Land Mobile Services •
• Plot any signal strength ranges you specify (or use standard values) •

Real World Propagation™ Studies
Communications Data Services, Inc.   800 - 441 - 0034

PROPAGATION PREDICTIONS

3 second Digital Terrain Data for the entire U.S. on a single CD-ROM

The Defense Mapping Agency and United States Geological Survey have made terrain elevation data available for a number of years. This information is extremely useful to the RF engineer, providing a ready means for retrieval of terrain elevations in any portion of the contiguous United States, Hawaii, Alaska, and some U.S. territories.

CDS provides 3 second digital terrain data produced by DMA/USGS. Elevation measurements are recorded at 90 meter intervals with 1 meter vertical resolution.

Sophisticated compression algorithm

Until the CDS release, it was necessary to have multiple CD-ROM drives or a magnetic tape drive to access the full 9 gigabytes of DMA/USGS 3 second terrain data. Advanced data compression technology developed by CDS for use with the 3 second data allows us to compress the entire terrain database into 640 megabytes, which conveniently fits onto a single CD-ROM. No sacrifices were made in quantity or quality of data, and retrieval time from the CDS ROM is actually faster than retrieval from uncompressed data because there is less information to process.

Features of CDS 3 second terrain data
- Entire United States on a single CD-ROM
- Retrieval and analysis software included
- Use CDS data with proprietary software from other vendors
- NAD27 to NAD83 translation constants embedded (a CDS exclusive)
- Also available in 1 x 1 degree blocks at low cost
- Use your programs with our data

RF Engineering software provided

CDS includes proprietary software at no extra charge with the purchase of our CD-ROM terrain data. You can immediately put terrain data to use without the additional time required to write software or the expense of purchasing retrieval software from another vendor.
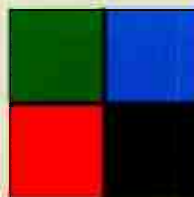
The software included allows you to:
- Retrieve terrain data and averages directly to the screen
- Write data in other proprietary formats (EDX, H2A, Applied Spectrum, Rocky Mountain and others) for use with their software

- Link our subroutines directly into your software for direct access within your program.
- Retrieve a single point height
- Retrieve complete radials
- Use CDS data with your own programs without restriction

NAD 83 Conversion and Coordinate Correction

Almost all topographic maps distributed by USGS are based on the North American Datum of 1927 (NAD27). 3 Arc Second Terrain Data corresponds to the new NAD83 coordinate system. Only CDS has embedded its 3 Arc Second Terrain Data with coordinate correction constants to retrieve the correct terrain height values. The CDS data provides ready access to the offset values necessary to go from one coordinate system to the other, eliminating an otherwise complex and time-consuming problem.
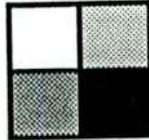
Communications Data Services, Inc.
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Falls Church, VA 22044
(703) 534-0034 / (800) 441-0034
Telefax (703) 534-7884
E-mail: root@comm-data.com

SPECIAL INFORMATION FOR INTERNATIONAL USERS

The CDS line of RF Engineering Tools described in this book are available to international customers, provided CDS has access to digital terrain data (DTD) in the desired study area. DTD must not only be available, but also compressed, indexed, and retrieval programs must be written to allow communications analysis programs to access the data.

If terrain data is not currently available, the following will serve as a list of areas which must be addressed:

AVAILABILITY OF DTM DATA

Presently terrain data for the entire United States is available. Terrain data for other countries can be obtain by three ways.

1. The U.S. Department of Defense (USDOD) has compiled terrain data for the world. The data is in a format which makes it very convenient to be used in the analysis of communications systems.

The data is virtually inaccessible, with one major exception. Governments of a country with which the USDOD has a bilateral exchange agreement can authorize the USDOD to release the data. This method is the most cost effective, quickest and accurate, but most difficult. Check with the geographical, mining, natural resource management or similar organizations in your country or area of interest to determine if data is available. If you are affiliated with a government agency, this approach is probably the easiest way to obtain data.

2. Satellite imaging technology has increased in efficiency and financial feasibility in recent months. Satellite images are approximately 64 km by 64 km on a side and are available at a cost of approximately $9,000. This is not a particularly cost effective method to obtain data. In many circumstances, CDS may be willing to share expenses to obtain data.

3. Scanning of existing paper maps. This technique is far more cost effective than satellite imaging, and can be completed more quickly. The process is simple: A map is scanned into a computer memory, the elevation contours are identified and then converted to a suitable digital elevation model (DEM). This will generate data for use in communications systems engineering. Maps of scales from 1:50,000 to 1;1,000,000 are suitable to economically generate digital terrain data.

COMPRESSION OF DTD and RETRIEVAL PROGRAMS

Once DTD is available, programs must be written to allow the data to be accessed. Typical DTD is a grid of elevations, usually 3 seconds of latitude by 3 seconds of longitude. Depending on the availability and quality of existing maps, 6 second, 9 second, or even greater data can effectively be used. Regardless of the scale, the data files are usually quite large (5-10 Megabytes).

Compression programs generate a smaller set of data for use with the analysis programs. This will reduce the size of the files that need to be distributed, reduce the access time (small files can be read more quickly) and index the file for faster data retrieval.

Many organizations also wish Compact Disk Read Only Memory (CD-ROM) disks to be generated. This will allow the data to be distributed with great ease. CDS has published several CD-ROMs to date, and openly welcomes the opportunity to publish more.

INTEGRATION OF DATA and PROGRAMS

Once DTD is gathered and compressed, the final task is to integrate the communications analysis programs with the data. This is a straight forward task, and has been accomplished many times by CDS. If CDS is contracted to perform the DTD acquisition and compression task, but not the analysis programs, the integration process may require additional work on the part of both parties. Integration of DTD into the existing line of CDS RF Engineering Tools is rather simple and would require no additional time.

COST OF ACQUIRING DIGITAL TERRAIN DATA

The cost of acquiring DTD can be shared by CDS depending on the location and size of the project. CDS is willing to share costs depending on issues of ownership of the data and the expected size of the project. There are three plausible situations.

1. Ownership remains with the customer. In this case, you pay for all costs of acquiring and compressing the terrain data and it is your property. In this case, CDS would certainly be willing to refer additional requests for DTD in that area to you. CDS can either supply you with data, CD-ROMs or maintain the data on our computers for your access.

2. Ownership remains with the customer, CDS uses and resells the data. In the situation where you have made the investment to acquire and process the data, CDS can act as a sales and distribution agent for you. We can supply others with data or make it available for access on our computer systems. This will allow you to hopefully recoup much of the expenses of generating data, and provide CDS with the opportunity of doing business with others.

3. CDS acquires and owns the DTD. Obviously, the most cost effective for the customer, CDS pays for all expenses to acquire DTD. The ownership of the data would remain with CDS and CDS would be free to do with the data as it wishes.

IN SUMMARY

CDS now has the ability to acquire Digital Terrain Data anywhere in the world. We are now able to offer our services to you regardless of where you are on the globe. Please contact us for specific details.

The CDS Real World Propagation™ Workstation

Now you can have the unmatched power and accuracy of CDS Real World Propagation™ in your office!

The CDS propagation workstation includes everything necessary, including plotter and laser printer, to produce propagation studies with unmatched CDS accuracy.

The workstation package includes:
- All of the proprietary software CDS uses in-house to produce propagation predictions for our customers.
- USGS digital 3 second digital terrain data on CD-ROM
- USGS digital land use and land cover CD-ROM
- Sun Microsystems SPARC workstation with 200mb hard disk, 2- CD-ROM drives, and 19" color monitor

Proprietary CDS software included with the system:
- Standalone programs to perform area propagation analysis
- Subroutines to link into your software
- Profile (single radial) or point-to-point analysis routines
- Structure for display and analysis of multiple sites at once
- Programs to compute Undesired to Desired ratios

Specifications and features of the system are identical to the CDS Real World Propagation™ studies described on the opposite page.

Advantages
- Everything needed for complete propagation predictions
- Produce RF propagation, "what if" models, and site analysis immediately when needed
- one year software updates and technical support included at no additional cost
- no limit on number of analyses or propagations run
- documented CDS accuracy

Development of the CDS Real World Propagation™ model

Consideration of the impact of land use and vegetation cover (often referred to as "clutter data") on signal attenuation is crucial when attempting to achieve accurate radiowave propagation predictions from computer modeling. Prior to the CDS model, there was no reliable and methodical means of predicting attenuation from differing amounts of building and vegetation clutter.

It is possible to make manual adjustments for signal attenuation in the presence of specific forms of vegetation or building clutter, but such adjustments, unless based on field measurements, cannot be relied upon to produce accurate results. (In most cases, the collection of field signal strength readings to produce a given RF propagation prediction will not yield completely reliable results, and the cost makes it impractical.) The CDS model uses a complex algorithm developed from thousands of actual field signal strength readings collected from a number of different FM, cellular and public safety radio systems nationwide. Measurements were taken in areas of varying terrain and land use/vegetation cover environments. This data was then analyzed and correlated to existing models. Disparities between predicted and actual signal strength as measured in the field were recorded. Ultimately, the data produced by this analysis enabled CDS engineers to develop precise data on additional signal attenuation and multipath fading characteristics in the presence of many different forms of vegetation or building clutter.
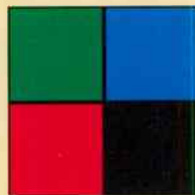
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Falls Church, VA 22044
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Telefax (703) 534-7884
E-mail: root@comm-data.com

Attached is a sample radiowave propagation prediction map. It consists of a black and white reproduction of a 1:500,000 base map and part of a transparent overlay that represents graduated values of predicted signal strength by different colors. For our example, we chose to show the coverage of a hypothetical Class A FM station at the north end of the Oakland airport; it clearly shows the effects of the wide range of terrain, urbanization, and vegetation that are found in the San Francisco Bay area.

The following provides background about previous works on radiowave propagation modeling, and outlines how the CDS model was created. It also discusses in detail the meaning of the colored area representations on the sample map. However, for quick reference; green has been used to represent those areas in which indoor reception on portable receivers should be adequate; blue shows those areas in which portables are likely to perform poorly indoors, but adequately out-of-doors; and red shows those areas in which automobile receivers (but not portables) should provide adequate reception.

Your prediction map will be affixed to a full-color original base map. In general, our program chooses the map scale that is most appropriate for the area being depicted, but if you want us to use a particular base map, please let us know.

To place an order, complete and return the attached "PROPAGATION ORDER FORM". If you have further questions or need assistance in completing the order form, please call.

Signal Strength Prediction Maps

Communications Data Services, Inc. (CDS) provides "real life" depictions of the signal coverage of FM, Television and Land Mobile stations. The CDS product, in the form of transparent overlays and associated standard published base maps, uses different colors to indicate the predicted signal strength in each of thousands of small areas (pixels), surrounding the transmitter site. The effect is to paint a vivid, easily understandable picture of the station's coverage.

The CDS prediction maps are based on the National Telecommunications and Information Administration (NTIA) "Longley-Rice" radiowave propagation model, corrected for the effects of surface (building) clutter and vegetation cover, used in conjunction with the most advanced terrain database now available. Predictions can be based on a wide range of map scales, from 1:24,000 (7.5 minute topographic map) to 1:1,000,000. The size of each pixel is 3 millimeters, as plotted on the map, which corresponds to a distance (on the ground) of approximately 72 meters (236 feet) on a 7.5 minute topographic map, and about 3 kilometers (1.9 miles) on a 1:1,000,000 scale map. Plots of greater (or lesser) resolution can be provided on special order.

Computer Models of Radiowave Propagation

There are a number of published computational procedures which can be used to predict the loss of radiowave signal strength between source and destination, particularly from a fixed (broadcast) station to a mobile receiver. Examples of quality efforts to characterize the enigmatic nature of terrestrial radiowave propagation include the works of Bullington, Egli, Okumura, Reudink and the U. S. Department of Commerce team of Rice, Longley, Norton and Baris. (A bibliography of these and other important publications is appended to this report.)

Each of these authors or groups of authors has classified the types of path which may be encountered by a radio signal (e.g., "line-of-sight", "diffracted" over an obstacle such as the curvature of the earth or a hill, or "scattered" by atmospheric turbulence or other mechanisms) and has provided either graphical or computational methods of estimating transmission loss.

Possibly the most complete of these efforts is the product of a team of scientists and engineers at the National Bureau of Standards. (Transmission Loss Predictions for Tropospheric Communication Circuits, NBS Tech. Note No. 101, Volumes I and II 1967). Unfortunately, many of the approaches set forth in NBS 101 are too lengthy and tedious to be particularly attractive, even with the availability of modern computers.

The Longley-Rice Computer Model

One year after the publication of NBS 101, two of its authors, Anita G. Longley and Phillip L. Rice, published a simplified version of the techniques discussed in that and other earlier papers. The "ITS Irregular Terrain Model" (commonly called "the Longley-Rice Model") has the significant advantages of being compact; of being able to operate in either an "area" mode or in a point-to-point mode; and of providing reasonably accurate answers. It is possible (though perhaps somewhat exhausting) to generate detailed maps of station coverage by using the Longley-Rice model in the point-to-point mode from a given transmitter location to a large number of receiving locations.

Practical Implementation of the Longley-Rice Model

The Longley-Rice Model, operated in the point-to-point mode, requires a source of terrain profile data for each path to be studied. It is clearly impractical to provide data derived manually from topographic quadrangle maps or a similar source for the hundreds (or thousands) of paths needed to represent a typical station's service area.

Fortunately, terrain data files in computer readable format are now available for the forty-eight contiguous United States, Alaska, Hawaii, and Puerto Rico. The particular terrain data file used by CDS in these studies, the Defense Mapping Agency (DMA) 3 Arc Second Terrain Database, contains an elevation value (to the nearest meter) every three seconds of latitude by three seconds of longitude. At a latitude of 39 degrees (roughly through Washington, DC), the distance between these terrain elevation points is about 93 meters (300 feet) in the north-south direction, and about 72 meters (235 feet) in the east-west direction. The terrain database presently being maintained by CDS contains approximately 1.4 billion individual height values.

Effects of Clutter and Vegetation Cover

Signal strength predictions made with the Longley-Rice Model, for good clear line-of-sight paths devoid of urban clutter and vegetation cover, are generally accurate enough for practical purposes. However, such paths are the rare exception, not the rule, for most broadcast and land mobile communications links.

For example, the median attenuation observed at FM Broadcast frequencies (about 100 MHz) in heavily urbanized area is typically about 16 decibels (dB) greater than predicted by Longley-Rice. What is needed, then, is a method of correlating excess path loss (and the companion multipath fading effects) to various types of land clutter/cover.

The U.S. Geological Survey provides maps, in both printed and digital formats, of land use and vegetation cover for most of the contiguous United States. The availability of such data in digital form makes it possible for a computer program to fetch a Federal Information Processing Standard ("FIPS") code number indicative of the land use/cover at a given set of geographic coordinates. Here then, is the key to correlating observed "excess" signal attenuation to the types of vegetation and/or building clutter along the propagation path.

Clutter/Cover Attenuation and Multipath Fading Factors

There being no known source of data regarding the median attenuation and multipath fading characteristics of each class of land use/cover, it became necessary to develop a method of making those determinations. Communications Engineering Services, P. C. (CES), in cooperation with CDS, has assembled a set of measurement equipment, designed to collect signal strength data, which can then be processed to obtain the desired attenuation and multipath ("fast") fading statistics characteristic of each type of land use/cover encountered.

In the CES system, a portable computer is used in conjunction with a field strength meter and a LORAN-C receiver. In operation, the computer sets the field strength receiver to the desired frequency, initiates a calibration procedure within the receiver, and then monitors the data stream from the LORAN receiver to determine the latitude/longitude. Once the location is known, the computer collects 100 individual field strength readings from the calibrated receiver. These measurements are taken at such time intervals as to represent a total distance of about ten to twenty wavelengths at the measurement frequency.

The field strength data, together with the geographic coordinates, measurement frequency, date and time, are recorded on a computer disk file. If the signal source is continually available, as is true for broadcast stations, data sets can be obtained at normal road speeds. It is possible to compile hundreds of such data sets, gathered over many road miles, in a matter of several hours.

The set of "experience" data on which the CDS prediction model is founded includes a large base of over 1,200 measurement sets made on a group of eleven Washington, DC area FM stations, over 3,000 measurement sets on eleven "low-band" (45 MHz) public safety radio sites in California; and thousands of measurements sets gathered for 450 MHz and 800 MHz public safety and Cellular systems throughout the country. Each such measurement set included at least 100 individual point signal strength measurements.

The extensive set of data collected through the means just described was processed by a computer program that predicts the received signal level (by the Longley-Rice Model) and then correlates the observed difference between predicted

and observed signal strengths with the type of land use/cover surrounding each individual measurement location. In addition, the extent of multipath fading effects ("fast fading") are determined for each type of clutter/cover encountered during the measurement program.

By these methods, median attenuation and multipath fading range, characteristic of different frequencies and different types of vegetation and urban clutter, have been developed from a large base of measured signal strength data sets. Those factors can be used in conjunction with the Longley-Rice Model to predict the received signal strength at each of a very large set of locations, in such a manner as to generate an easily understandable map-picture of a station's coverage.

A typical CDS prediction map is based on almost 30,000 individual signal paths (pixels) and uses three or more colors to depict different values of signal strength.

General Discussion of Studies Supplied

In the particular case of FM Broadcast stations, the CDS maps are based on predicted received signal power, assuming a dipole receiving antenna six feet above ground level. Studies conducted by CDS and others indicate that a signal strength such that a dipole antenna delivers -60 dBm (decibels relative to a milliwatt) to a matched load will result in good reception on a typical portable receiver ("boom box") inside a typical urban building. Stated differently, if one were to experimentally determine a location in which the signal strength was just enough to provide good (indoor) reception on a typical portable receiver, it would be found that a "proper" antenna (i.e., a dipole) at that location would deliver approximately -60 dBm to a matched load. This statement is, of course, only an attempt to arrive at a rational and quantifiable (and thereby computable) description of the signal strength necessary to provide service to a certain class of receivers as operated in a specific environment.

Similarly, it is estimated that a signal strength such that a dipole would delivery -65 dBm into a matched load will provide reception on a portable receiver outside of buildings; -70 dBm will provide good-to-adequate reception on a typical automobile receiver; and that signals much below -70 dBm will fail to provide even acceptable automobile reception.

It is recognized that these estimates of required signal strength are, perhaps, somewhat precarious. However, it is necessary that some such connection between the subjective and the calculable be made before rational estimates of FM station coverage are possible.

In the example (attached hereto), different colors have been used to indicate predicted signal strength for a (hypothetical) FM broadcast station in the San Francisco Bay area. Each small area, 2 millimeters square in the example at hand, has been drawn by the computer plotter in green if the signal strength is predicted to be equal to or greater than the value necessary for indoor reception on a portable receiver; in blue for those areas where indoor reception on a receiver with no external antenna might be difficult but in which adequate reception could be expected out-of-doors; and in red where poor reception is expected for portable receivers, but where a typical automobile receiver will likely provide adequate reception.

In addition to signal coverage plots for a single station, CDS has employed the mylar overlay format to present coverage of multiple FM, Television or Land Mobile facilities. This comparision of coverages, given a signal strength threshold, may be performed on as many as three stations, each represented by a different pixel color.

The signal coverage of two stations may be plotted with a specified color indicating the interference between the two facilities. Similarly, a plot may be created displaying the complete coverage of one station with the resulting interference from another station.

The CDS prediction maps for one or two facilities may be supplemented with area and population information within the service area.

References

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Nylund, H. W. (1968) Characteristics of Small-Area Signal Fading on Mobile Circuits in the 150 MHz Band, IEEE Trans. Veh. Technol., Vol. VT-17, pp 24-30, Oct. 1968

Okumura, Y. and Others (1968), Field Strength and Its Variability in VHF and UHF Land-Mobile Radio Service, Rev. Elec. Commun. Lab., Vol.16, pp 825-873, Sept-Oct. 1968

Reudink, D. O. (1974), Properties of Mobile Radio Propagation Above 400 MHz, IEEE Trans. Veh. Technol., Vol. VT-23, pp. 143-159, Nov. 1974.

PC PROGRAMS / PC DATABASES

The FCC's AM, FM and TV data files are available monthly. The AM file is almost 17 MBytes uncompressed; the FM is about eight MBytes and the TV is approximately five MBytes. The FCC Directional TV data file, occupying about 1.5 MBytes, and the FCC Tower Survey data file, requiring approximately 33 MBytes, are released quarterly. The FAA's Man-Made Obstructions to Navigation and NAVAID data files are also available quarterly.

A small part of the FM data file, and two files containing the record structure of the FM and AM files are available for your review. The TV data file is similar in structure to that of the FM. You may dial our computer to download these samples or we can mail them to you on disk.

To receive this program via remote access, dial our computer at the phone number seen in this section. When you are prompted for an account name, type "demo," and downloading procedures will begin.

Upon completion, you will have a file DEMO.EXE on your hard disk. This is an archive file consisting of DATA.EXE, CDSCOMM.EXE, CONTOUR.CON and READ.1ST. Type "demo" to extract these files. The text file READ.1ST describes the contents of each file and how to uncompress them. DATA.EXE is a file which contains other data files and the program to decompress files within itself. Thus, DATA.EXE is a self-extracting program/data file. Just type "DATA" to automatically decompress all of the files within DATA.EXE.

Once the decompression program is completed, there should be a total of four files in your directory:

DATA.EXE
FM.DAT
FMDICTIO.MEM
AMDICTIO.MEM

The two ".MEM" files contain detailed record structure information. You can print these files, or use word processor software to format them as you wish.

When you purchase the data (AM, FM and/or TV), .EXE files are transferred ("restored") to your system using a public domain program SPLICE. These files are also decompressed by the method discussed above.

If you have any problems or questions, please call.

Data File Content

The data files released by the FCC and FAA contain the technical information necessary to complete distance/separation, interference and other technical studies. The files contain the owner's name, but DO NOT CONTAIN MAILING ADDRESSES.

Data Availability

Data is released to NTIS by the FCC on the last Friday of each month. The files are made available for public release within five working days (five days is a working guideline for the NTIS. They are not required to meet any deadline). CDS has a messenger deliver the tapes from NTIS as soon as they become available. Usually, the tapes arrive early in the day, so they can be processed in time to be shipped that night by Federal Express.

Current NTIS floppy customers should note that the NTIS subcontracts all floppy work, adding 3-4 weeks to the age of the files before they are finally shipped to the customer.

Disk Formats

CDS can supply 360K 5.25", 1.2M 5.25", 720K 3.5", or 1.44M 3.5" disks. The data is first compressed using PKZIP. The resulting file is executable. It is then transferred to floppy disks as a single file using a public domain program SLICE. This avoids having to break the file into smaller segments, with the related complications on the user's end. Using SPLICE, the data file will be restored as one contiguous file on the customer's machine. Executing this file will prompt decompression.

Tape Formats

The AM, FM and TV files fit onto one 1600 BPI tape, with a block size of 4096. The largest file, the FCC's Tower Survey file, will fit onto a single 6250 BPI tape. An additional charge of $15 per tape is applied to cover the cost of the tape.

UNIX and Macintosh

CDS can write UNIX cartridge tapes with DD or TAR and APPLE MACINTOSH formats are also available. Contact CDS to discuss UNIX and MACINTOSH formats before ordering.

Price Structure

The following are the current NTIS prices and the CDS prices. It must be made clear that the FCC data is public information, free of cost to the public. The NTIS charges for its expenses, not for the data. CDS charges only for the effort of converting the data to formats not provided by the NTIS, and/or reorganizing the records within the file. CDS liability is limited to the work we perform. CDS cannot be responsible for the content of the file(s).

	NTIS 360K disk	NTIS Tape	CDS Tape or Floppy
AM	$530	$340	$200 first + $75 additional
FM	325	340	200 first + 75 additional
TV	590	340	200 first + 75 additional
	$1445	$1020	$350

The first file ordered each month is $200. Each additional file is $75. If you order the AM and FM files, the total will be $275, just the FM file, $200.

The "Directional TV Antenna Data File" and the "Antenna Survey Data File" are $150 and $200, respectively, regardless of other items on order.

Shipping Charges

USPS First Class postage and handling are included. Federal Express charges may be billed to customer's account.

Using PKZIP™ and Slice™

While CDS routinely compresses databases for shipment to our customers, the reduction is often not sufficient to fit certain files on a single floppy disk. The public domain program SLICE™ is used to copy a database onto the required number of disks. SPLICE™ is used to restore the compressed file on your hard disk. This program is included with all of our sliced databases. The FM database is restored in the following example:

Your disk drives may have different labels, but in the following example, Drive A should contain the database to be spliced and Drive C is the receiving hard disk.

- Now insert the disk marked "1/2" into drive A.
- Change to drive A and run a directory listing.

```
c: >cd a:
a: >dir
```

Name	suffix	Size(k.bytes)	Date	Time
SPLICE	COM	1090	11-20-91	142p
FM	E01	1456128	11-20-91	144p

- This is the correct disk for initiating the splice.
- To initiate the splice type:

```
a:> splice A: C:
```

- The following message will appear:

```
SPLICE. 1.1 - (c)   1989 Ziff Communications Co.
PC Magazine • Bob Flanders & Michael Holmes
Restoring: FM.EXE
```

- Eventually, the computer will prompt you for the next disk:

```
Next diskette, press any key. . .
```

- Insert the disk marked "2/2" and press any key.
- Once the restoration has been completed, switch to your hard drive and run a directory listing:

```
FM          EXE    2169987      Date (today)       Time (today)
```

- To uncompress the file, simply type:

```
FM
```

ON-LINE COMPUTER SERVICES

You have a variety of means for viewing program output stored in disk audit files. This arrangement has proven versatile in accommodating the needs of our On-line customers.

Upon completion of a program, you must select an option from the Output-menu.

```
Ready to display report.
1..Display using MORE          2..Display entire text
3..Print and mail report       4..Copy to disk and mail report
5..Send XMODEM COMPRESSED      6..Exit

Option?  Enter 1->6 or "?" for help :
```

The report will be displayed on your screen by entering "1" which envokes the UNIX command "more." A "return" allows you to advance line-by-line through the report for close inspection. Pressing the space bar advances through the file, screen-by-screen. The entire report will be transmitted at once by entering a "2" at the Output-menu prompt. When finished, the Output-menu will again be displayed upon entry of a "return." The audit files are stored on disk for thirty days. This allows you to access your lengthy audit files at night when the telephone rates are low.

This feature was expanded upon to include audit file hardcopy. By entering a "3," CDS will print the audit file using an HP LaserJet III Printer. The report will be mailed or sent by FEDEX to you at the address you specify when setting up an On-line account. Similarly, you may have the audit files mailed or sent by FEDEX on IBM PC or MACINTOSH diskettes by typing "4." Refer to the "PRICE LIST" section for charges associated with these services. These options may be particularly useful to you because long distance phone charges may be minimized and error-free data is guaranteed.

For the advanced DOS user, these files can be compressed (with ARC) and sent via XMODEM automatically by entering a "5." The CDS computer will await the appropriate receive commands from your communications software. If the public-domain software, PROCOMM™, available free from CDS is used, the "Pg Dn" key invokes the download window. Upon selecting the "XMODEM" option, PROCOMM™ will display the download status. When this procedure is complete, you will have a self execute/self extract file on the drive you specified. Simply type the file name to uncompress your audit file. Typical compressions in excess of 50% result in big long distance savings.

You will be returned to the Main-menu when "6" is entered.

CDS is pleased to offer remote users access to our databases and programs. Here is a list of the programs we presently offer online:

TERRAIN FETCH/AVERAGE (3 or 30 Arc Second Terrain Data)
BROADCAST CONTOURS
STAND ALONE POPULATION COUNT
WITHIN STUDY
FM STUDY
Several Free Utility Programs

Setting Up an Account

Call CDS to have an account set up for your company. You will be assigned a user name and a password. All new users receive a $100 introductory credit toward On-line services. This credit is intended to allow you to explore our services, without having to worry about a bill.

Communications Protocols

CDS uses standard full duplex asynchronous, eight data bit, one stop bit, no parity communications protocol. We presently support 300, 1200, 2400 and 9600 Bauds.

We have copies of the public-domain communications program, PROCOMM™, available upon request. This program may be mailed to you or downloaded from our computer. To receive this program via remote access, dial our computer at the phone number seen in this section. When you are prompted for an account name, type "demo," and downloading procedures will begin.

Upon completion, you will have a file DEMO.EXE on your hard disk. This is an archive file consisting of DATA.EXE, CDSCOMM.EXE, CONTOUR.CON and READ.1ST. Type "demo" to extract these files. The text file READ.1ST describes the contents of each file and how to uncompress them. Typing "cdscomm" will extract a copy of PROCOMM™ that has been has been configured to call CDS via your PC's modem. The command "Alt-z" invokes the automatic-dailing window. Entering a "1" on the command line begins the calling function.

Logging In

You many login at any Baud rate by dialing (703) 532-3744. If you are using a 2400 Baud modem, you should see the login message immediately upon modem connection (carrier detect). If you do not see this, or you are not using 2400 Baud

---

modems, press "return" once. DO NOT PRESS "RETURN" MORE THAN ONCE! The single "return" is used to match the CDS modem's Baud rate to yours.

If you fail to get a carrier detect indicator, and have pressed "return" once, press it again. Should this prove unsuccessful, check the number of data bits, stop bits, and parity. If you are unable to get it working, please call, there are a few more suggestions we may have.

After the modems have exchanged greetings, and the carrier detect has been established, you should get the following message:

```
Communications Data Services, Inc.
User lower case letters to log in.
Login:
```

At this prompt, enter your account name, using lower case letters. The system you are logging into is a UNIX based machine and requires lower case letters only at login. Once you have logged in, you may use upper or lower case.

You will now be prompted for your password. As you type this, the characters will not be printed. If everything was successful, you will now see:

```
Last login: Wed May 1 09:51:37 from dss
SunOS Release 4.1 (cds) #1: Fri 3 14:10:45 EST 1991

                Welcome to
        Communications Data Services, Inc.
          (703) 534-0034 (800) 441-0034


Enter number of program to run, 0 to review list:
```

Congratulations! You are now logged in!

The CDS On-line Philosophy

When we designed the CDS On-line environment, we focused on the needs of the remote user. With efficiency in mind, we did a few things differently.

• We do not charge more for a long report. If you need the data, and have paid for the use of the data files, or the computations, why should you be charged more to get 100 records than the charge for 50? If you run a WITHIN STUDY which retrieves 100 records, the price is the same as a study which retrieves 20 records. You are paying for the telephone charges, and once the task of actually going through the databases has been completed, you are not using much of our computer resources.

• Before your account is charged for something, you are told exactly how much you are being charged, and ALWAYS given a chance to change your mind. However, once you say "yes", the billing records are created. If you entered bad coordinates, sorry - we have given you a fair chance to check and change them.

• You can check your account status at any time. No more guessing how much your monthly statement will be. This also helps you track your changes so that your billings will more accurately reflect your expenses on a job.

• Every report you run is stored in a disk audit file. If you run a TERRAIN FETCH/AVERAGE today, the report you generate will be on disk for fourteen days. This allows you to run a report during the day, get summary data, call back at night when the long distance charges are less, and retrieve the complete report, including detailed data.

• Because your reports are saved on our computer's disk, we can copy these files onto IBM P.C. or MACINTOSH diskettes and mail them to you. Big reports no longer need to be transmitted at slow speeds, adding to a large long distance bill! You can arrange for CDS to copy reports to diskette and mail or FEDEX them to you.

• For the advanced DOS user, data files can be compressed (with ARC) and sent via XModem automatically. Typical compressions in excess of 50% result in big long distance savings.

As you read through the On-line documentation, you will see how CDS has tried to make the On-line environment the most efficient for you. If there is anything you feel we could do to improve our programs, user interfaces, or use of our system, please call. Your comments, suggestions, and constructive criticisms are always welcome. We will even pay for the call.

Here is a list of the Main-menu as it exists (5/1/92).

```
Enter number of program to run, 0 to review list: 0
 Programs currently available:
 1 ..Terrain Averages
 2 ..Population Count
 3 ..Within Study
 4 ..Broadcast Contours
 5 ..FM Study
 6 ..FCC's FMTVDX (distance to contour) -- $free
 7 ..Get Coordinates Given Dist & Bear -- $free
 8 ..Distance and Bearing -- $free
 9 ..Review this month's bill -- $free
10..Review last month's bill -- $free
11  Review AUDIT Files -- $free
12..Upload to CDS
13..Log Off
```

To run a program just enter the number and return. For example, to run a WITHIN STUDY, press "3" and the return key.

```
Enter number of program to run, 0 to review list: 3
```

The following program explanations were written using a standard notation designed for a clear and concise exchange of information.

All text that appears on CDS On-line Services are presented in nine-point Monaco font. For example, after login, the following message will appear on your screen:

```
Last login: Wed Jun 1 09:51:37 from dss
SunOS Release 4.1 (cds) #1: Mon 18 14:10:45 EST 1991

                Welcome to
        Communications Data Services, Inc.
          (703) 534-0034 (800) 441-0034


Enter number of program to run, 0 to review list:
```

Any text entered from the keyboard at an On-line prompt appears in bold. For example, to view the Main-menu at the prompt seen above, enter "0."

```
Enter number of program to run, 0 to review list: 0
```

Each program is accessed through the Main-menu as seen in the "ON-LINE COMPUTER SERVICES" section. When the program has finished running, the Output-Menu is displayed. These output options are discussed in "THE OUTPUT MENU" section.

On-line programs may be terminated at most prompts by typing "menu." The user will be returned to the Main-menu.

```
Enter reference latitude : menu
STOP: User chose alternative exit from program

Enter number of program to run, 0 to review list:
```

In several instances, the user may wish to edit the input program parameters. As seen below, each program will display these values before creating bill and audit files. The user is required to verify the parameters. To modify any of these values, the user may type the number corresponding to the incorrect line. The program will display the existing value and prompt for a new entry. '

```
AUDIT FILE NAME: pcx05010.A02

1 .. Job identification: demo
2 .. Detailed population listings  not printed
3 .. Reference latitude  :  39-00-00
4 .. Reference longitude :  77-00-00

Enter item to be changed, or 0 to continue :  3
Enter reference latitude  : ]390000[  39 00 01

AUDIT FILE NAME: pcx05010.A02

1 .. Job identification: demo
2 .. Detailed population listings  not printed
3 .. Reference latitude  :  39-00-01
4 .. Reference longitude :  77-00-00

Enter item to be changed, or 0 to continue :
```

As an On-line customer, you are only charged for completed jobs. There are no connection or CPU charges. As seen in the following pages, the job cost is calculated upon entry of all input parameters. You have the option to edit these values or cancel the program. Upon verifying these values, the job identification, audit file name, cost, date and time are appended to your bill file.

At any time, you may inspect your bill by indicating the "REVIEW THIS MONTH'S BILL" option at the Main-menu prompt. This feature of On-line service allows you to track job expenses. Refer to the "PRICE LIST" section for individual program charges.

Each month, an invoice and statement are generated and mailed to you.

This program displays the audit files created when running TERRAIN FETCH/AVERAGES, STAND ALONE POPULATION COUNT, etc. The audit files are stored on our computer for fourteen days. During this time, you may access the audit files.

The REVIEW AUDIT FILES program is found in the Main-menu.

```
              M A I N     M E N U
Enter number of program to run, 0 to review list: 0
 Programs currently available:
 1 ..Terrain Averages
 2 ..Population Count
 3 ..Within Study
 4 ..Broadcast Contours
 5 ..FM Study
 6 ..FCC's FMTVDX (distance to contour) -- $free
 7 ..Get Coordinates Given Dist & Bear  -- $free
 8 ..Distance and Bearing  -- $free
 9 ..Review this month's bill -- $free
 10  Review last month's bill -- $free
 11..Review AUDIT Files -- $free
 12..Upload to CDS
 13..Log Off

Enter number of program to run, 0 to review list:  11
Working....

To display list, enter LIST, to exit enter EXIT, or
Enter item number of file to be displayed :
```

The audit files are numbered in list form. To review the list of files, enter "list".

```
To display list, enter LIST, to exit enter EXIT, or
Enter item number of file to be displayed : list

 Item  Date    Time     Size     Name
 ────  ──────  ──────   ──────   ──────────
   1   Jun 18  11:29     2039    con06180.A01
   2   Jun 18  11:44    18557    fms06180.A01
   3   Jun 18  11:46    13224    fms06180.A03
   4   Jun 18  11:07     4929    pcx06180.A01
   5   Jun 18  10:46    13919    ter06180.A01
   6   Jun 18  10:14     6023    wit06180.A01
   7   Jun 18  10:19     6084    wit06180.A02

To display list, enter LIST, to exit enter EXIT, or
Enter item number of file to be displayed :
```

To review a particular file, the index number is entered.

```
To display list, enter LIST, to exit enter EXIT, or
Enter item number of file to be displayed :  1
```

The choice entered above will result in access to the audit file created in the BROADCAST CONTOURS example, con06180.A01.

```
Going to display/print : con06180.A01
Pages :   1 Size in bytes :   2039
Ready to display report.
1..Display using MORE          2..Display entire text
3..Print and mail report       4..Copy to disk and mail report
5..Send XMODEM COMPRESSED       6..Exit

Option?  Enter 1->6 or "?" for help : 2
```

By entering a "2" at the prompt, the file is transmitted as seen on the following page.

```
                    Communications Data Services, Inc.          Page   1
                            Falls Church, VA               Jun 18, 1990

                            Distance to Contour

Title: demo                                              Latitude:   38-52-47
                                                         Longitude:  77-10-18

   True                Radiation Center    Effective      Distance to Contour
   Radial    Average    Height Above       Radiated       70.0 dBu    40.0 dBu
   Bearing   Elevation  Average Terrain     Power         F(50,50)    F(50,10)

  Degrees     Meters       Meters        kW.     dBk        km          km
    0.00       71.3         28.7       50.000   16.990     15.00      115.03
   38.00       78.9         21.1       48.600   16.866     14.89      114.40
   45.00       83.0         17.0       45.200   16.551     14.62      112.79
   90.00       35.9         64.1       43.700   16.405     21.43      120.54
  113.00       32.3         67.7       42.600   16.294     21.83      120.64
  135.00       46.8         53.2       42.100   16.243     19.47      117.29
  180.00       73.9         26.1       41.500   16.180     14.31      110.90
  225.00       94.1          5.9       42.100   16.243     14.36      111.22
  270.00      111.7        -11.7       43.700   16.405     14.49      112.04
  315.00      109.7         -9.7       45.200   16.551     14.62      112.79

Radiation Center (AMSL):     100.0 Meters      328.1 Feet
Average Terrain  (AMSL):      78.3 Meters      256.9 Feet
Radiation Center (HAAT):      21.7 Meters       71.2 Feet
Area Within 70.0 dBu F(50,50) Contour is      320.2 Sq Mi or      829.4 Sq Km
Population Within  70.0 dBU F(50,50) Contour is     1427375
Area Within 40.0 dBu F(50,10) Contour is  15796.4 Sq Mi or    40912.6 Sq Km
Population Within  40.0 dBU F(50,10) Contour is     6172479
Contour distance  26.5 km. is outside permissible range 39.0 km. to 52.0 km.

Repeat file transmission? <cr>=NO, Yes=Repeat : n

Ready to display report.
1..Display using MORE         2..Display entire text
3..Print and mail report      4..Copy to disk and mail report
5..Send XMODEM COMPRESSED      6..Exit

Option?  Enter 1->6 or "?" for help : 6
```

The REVIEW AUDIT FILES program is terminated by typing "exit" at the prompt.
This entry returns you to the Main-menu.

```
To display list, enter LIST, to exit enter EXIT, or
Enter item number of file to be displayed :  exit
STOP: Normal Termination

          M A I N    M E N U
Enter number of program to run, 0 to review list:
```

This option allows you to upload files to CDS's computer using XModem. The POPULATION COUNT program features the ability to utilize existing text files containing azimuths and distances. These files may be created on your PC and uploaded to be used as required.

The UPLOAD TO CDS option is found in the Main-Menu.

```
          M A I N     M E N U
Enter number of program to run, 0 to review list: 0
 Programs currently available:
 1 ..Terrain Averages
 2 ..Population Count
 3 ..Within Study
 4 ..Broadcast Contours
 5 ..FM Study
 6 ..FCC's FMTVDX (distance to contour) -- $free
 7 ..Get Coordinates Given Dist & Bear  -- $free
 8 ..Distance and Bearing  -- $free
 9 ..Review this month's bill -- $free
.10..Review last month's bill -- $free
11..Review AUDIT Files -- $free
12..Upload to CDS
13..Log Off

Enter number of program to run, 0 to review list:  12

Upload protocol: XModem

Enter name of file you are uploading: demo.con

rz: ready to receive demo.con
```

The CDS computer will await the appropriate send commands from your communication software. If the public-domain software, PROCOMM™, available free from CDS, is used, the "Pg Up" key invokes the upload protocol window. You then select the "XModem" option, and indicates the file name to be uploaded. PROCOMM™ will display the upload status and, upon completion, return to the CDS Main-menu prompt.

```
          M A I N     M E N U
Enter number of program to run, 0 to review list:
```

This program is used to retrieve terrain heights from the USGS (DMA) 3 Arc Second or 30 Arc Second Terrain Databases and calculate height averages as specified by FCC rules for FM, TV, LM, or a format of your choice.

First, enter the job identification. This will appear on the report, and in the bill to identify this specific run.

```
                 Terrain Fetch/Average 9/27/90
        This program retrieves terrain data and computes averages
              according to the FCC rules for FM, TV or LM or
                     according to user specifications.

Enter job identification :   demo
```

You must specify which database is desired. The USGS (DMA) 3 Arc Second Terrain Database, contains an elevation value (to the nearest meter) every three seconds of latitude by three seconds of longitude. In Alaska, these values occur every three seconds of latitude and six seconds of longitude. Similarly, the 30 Arc Second Terrain Database is composed of elevation values (to the nearest ten feet) for every 30 seconds of latitude by 30 seconds of longitude.

```
Use 3 Second or 30 Second Terrain Data?   (3/30) :   3
```

You are next required to enter the number of evenly spaced radials. Valid entries range from 8 to 72 and determine the angular interval at which each average is computed.

```
Enter number of equally spaced bearings : 8
```

Elevation retrieval and averages may be performed for a chosen number of additional special bearings.

```
How many special bearings do you want to enter? 2
Enter each bearing followed by a RETURN.
Bearing 1 : 38
Bearing 2 : 113
```

Next, the reference coordinates are entered. The input may incorporate spaces or commas between degrees, minutes and seconds.

```
Enter reference latitude  : 38 52 47
Enter reference longitude : 77 10 18
```

The averages are calculated according to your specifications. The program allows you to choose FM, TV and LM parameters as dictated by the FCC for the computation of averages. Terrain averages used for FM stations are obtained using 101 points from 3.0 to 16.0 kilometers along the radial. Similarly, TV and LM terrain averages are determined between distances 3.2 to 16.1 kilometers and 2.0 to 10.0 miles respectively. You may also choose to enter special distances along a radial as offered by item (1) in the menu below. The selection of this option will prompt you for the distance in either metric or English units between the reference coordinates and a termination point. Along this path, the point spacing or interval between elevation points may be specified. This value and the termination distance have common units.

```
Compute averages for :
(1) User     : 0.0 ; User specified
(2) FM rules: 3.0 ; 16.0 km
(3) TV rules: 3.2 ; 16.1 km
(4) LM rules: 2.0 ; 10.0 mi
Enter option (1-4): 1
Will the distance be [M]iles or [K]m? : k
Enter termination distance: 10
Enter point spacing (.1, .2, etc.) : .5
```

Detailed terrain height data may be displayed for each radial. This output includes the distance from the reference position and elevation for each point along the radial. Note that the detailed terrain height is available at no additional charge.

```
Do you want the detailed terrain height data for each radial?
A separate page will be generated for each radial.
This option is currently offered at no additional charge.
Print detailed terrain data? (Y/N) : y
Print the terrain details in (M)etric or (E)nglish units?
(M or E) : m
```

You may opt to compute the radiation center. Given reference elevation Above Mean Sea Level (AMSL), the corresponding value for Height Above Average Terrain (HAAT) will be calculated. Conversely, given a desired HAAT, the appropriate AMSL will be determined. These values may be entered in either metric or English units. Output will display the AMSL and HAAT in both meters and feet.

```
Do you want the radiation center to be computed: (Y/N) : y
 (1) Given radiation center AMSL, compute HAAT
  (2) Given desired HAAT, compute radiation center AMSL
Which (1) or (2) : 1
Enter radiation center AMSL: 100
In [M]eters or [F]eet? : m
```

Having entered the desired parameters, the TERRAIN FETCH/AVERAGE audit file name is displayed. The input parameters are also displayed and you are prompted to verify the values. To change an input value, the number corresponding to the incorrect line should be entered. The resulting questions will allow you to alter the specified item. If no changes are required, you may enter a "0" to continue.

```
AUDIT FILE NAME: ter06180.A01
1 .. Job identification : demo
2 .. 3 Arc Second Terrain Data will be used
3 .. Number of evenly spaced radials :  8
4 .. Number of special bearings :  2
     Special bearing #  1  38.00 Degrees True
     Special bearing #  2 113.00 Degrees True
5 .. Reference latitude  :  38-52-47
6 .. Reference longitude :  77-10-18
7 .. Compute averages for :
     User specified : 0.0 ;  10.0 km  in 0.50 km  steps
                            6.2 mi. in 0.31 mi. steps
8 .. Detailed terrain data wILL be printed
9 .. Radiation center AMSL will be computed
     Radiation center   100.0 meters AMSL

Enter item to be changed, or 0 to continue :  0
```

The program calculates the job cost and permits you to decide whether or not to perform the computations. If the TERRAIN FETCH/AVERAGE program is cancelled, the Main-menu will be displayed.

```
Total costs for this job :  $ 12.00
Billing records will now be created. Do you want to continue? (Y/N) : y

Running....
Ready to display report.
```

The contents of the audit file corresponding to this TERRAIN FETCH/AVERAGE, ter06180.A01, are seen on the following pages.

For more information on the billing and output options, see the sections "BILLING" and "THE OUTPUT MENU."

Terrain Fetch/Average

Title: demo   Latitude: 38-52-47
Radiation Center AMSL 100.0 meters   328.1 feet   Longitude: 77-10-18
Radiation Center HAAT   9.6 meters   31.5 feet
Based on 3 Second Terrain Data

Bearing (Deg-true)	0.0-10.0 km 0.0- 6.2 mi. Average Elevation		Radiation Center Above Radial Average	
	(meters)	(feet)	(meters)	(feet)
* 0.0	86.0	282.1	14.0	46.0
38.0	80.1	262.9	19.9	65.2
* 45.0	83.6	274.3	16.4	53.8
* 90.0	71.7	235.1	28.3	93.0
113.0	67.8	222.6	32.2	105.5
* 135.0	82.8	271.7	17.2	56.3
* 180.0	82.7	271.2	17.3	56.8
* 225.0	89.7	294.3	10.3	33.7
* 270.0	106.5	349.5	-6.5	-21.4
* 315.0	120.1	394.1	-20.1	-66.1
Average (8 directions)	90.4	296.6	9.6	31.5

*=Radial Included in Average

3 Second Terrain Fetch/Average

Title: demo   Latitude: 38-52-47
Radial   1 of 10   Longitude: 77-10-18
Radial   0.0 Degrees True
NOTE: 1/2 first and last points used to compute radial average

Point Number	Dist (km)	Elev (m)	Point Number	Dist (km)	Elev (m)	Point Number	Dist (km)	Elev (m)
1	0.00	96.1	2	0.50	105.0	3	1.00	101.9
4	1.50	106.0	5	2.00	106.0	6	2.50	106.7
7	3.00	106.9	8	3.50	103.4	9	4.00	91.0
10	4.50	81.0	11	5.00	76.0	12	5.50	76.0
13	6.00	88.9	14	6.50	88.3	15	7.00	91.0
16	7.50	91.0	17	8.00	76.0	18	8.50	66.8
19	9.00	61.0	20	9.50	41.0	21	10.00	15.0

This program will retrieve population profiles within a specified contour from the 1990 or 1980 US Census databases. You may choose to have the program determine only the total population in a contour or include a print out of each contributive population entity.

First, enter the job identification. This will appear on the report, and in the bill to indicate this specific run.

```
          Stand Alone Population Count   7/10/91
   This program computes population inside a user specified contour.
        Population data is from the 1990 or 1980 US Census.
            Curve fitting is done between contour points.

Enter job indentification : demo
```

A frequently needed contour pattern may be stored in a file to be loaded into this program, thus, saving time and long distance phone charges. A template to construct contour files is seen following the output example of this section. The UPLOAD TO CDS option in the Main-menu, allows you to upload such contour files to our computer via XModem. This program will ask for the contour file name if it is to be used.

```
Enter contour from existing file? (Y/N) : n
```

This program utilizes 1990 or 1980 U.S. Census data.

```
1990 or 1980 Census Data? (80/90):   90
```

The program will prompt you to specify whether or not to display detailed population information or just division subtotals. If the user enters "1," the program output will only consist of county and state population within the specified contour. The user has the option of counting by Block Group level or by Block level. Detailed population output, indicated by entering "3," includes Block level population located at each entity within the contour. Block Group population may be displayed by entering "2," and the option of counting by Block is again available. Coordinates of census entites will be printed in the cases of Block Group output where Block Groups were counted and Block output where Blocks were counted.

```
Population output:
 1) County & State totals
 2) Block Group Totals -- same as DETAILED 1980
 3) Block level -- VERY LARGE OUTPUT VOLUME!
Select (1-3): 2

Count by:
 1) Block Groups
 2) Blocks
Select (1-2): 1
```

Next, the reference coordinates are entered. The input may incorporate spaces or commas between degrees, minutes and seconds.

```
Enter reference latitude  : 38 52 47
Enter reference longitude : 77 10 18
```

You are next required to enter the number of evenly spaced radials. Valid entries range from 8 to 72 and determine the angular interval at which each average is computed.

```
Enter number of evenly spaced radials : 8
```

The program will prompt you for the distance from reference location to a termination location at each radial. Typing "return" after each entry will advance through the azimuth list. Upon completion, the entire list is displayed and you are asked to confirm the values. A spline fit algorithm uses these distances to construct the contour.

```
Enter distances to contour, in km :
   0.0...   1.5
  45.0...   2.5
  90.0...   3.1
 135.0...   2.1
 180.0...   4.6
 225.0...   3.4
 270.0...   1.5
 315.0...   2.5

  8 Total azimuths:
Azimuth  Distance(km)
   0.00  ...   1.500
  45.00  ...   2.500
  90.00  ...   3.100
 135.00  ...   2.100
 180.00  ...   4.600
 225.00  ...   3.400
 270.00  ...   1.500
 315.00  ...   2.500
```

```
To change a value, enter the azimuth and the corrected value.
To add a value, enter azimuth and value.
To delete a value, enter the negative of the azimuth.
To reprint the list, enter PRINT.
When contour is entered correctly, press RETURN.
Command:
```

Upon entry of a "return," the program will query whether the distances to contour are correct. If you respond with "n," the edit menu seen above is again displayed. An entry of "y" will advance the program.

```
Contour complete? (Y/N) : y
```

Next you are asked to choose which Interpolation Method you desire. You must choose one or the other.

```
Choose Interpolation Method:
1) Cubic Spline Interpolation
2) Linear Interpolation
Select (1-2): 1
```

Having entered the desired parameters, the STAND ALONE POPULATION COUNT audit file name is displayed. The input parameters are also displayed and the user is prompted to verify the values. To change an input value, the number corresponding to the incorrect line should be entered. The resulting questions will allow you to alter the specified item. If no changes are required, the user may enter a "0" to continue.

```
AUDIT FILE NAME: pcx07151.A02
1 .. Job identification: demo
2 .. 1990 Census Data - Counting by BLOCK GROUPS
3 .. Output: State & County
4 .. Reference latitude :   38-52-47
5 .. Reference longitude:   77-10-18

Enter item to be changed, or 0 to continue :   0
```

The program calculates the job cost and permits you to decide whether or not to perform the study. If the STAND ALONE POPULATION COUNT program is cancelled, the Main-Menu will be displayed.

```
Total costs for this job:  $ 65.00
Billing records will now be created. Do you want to continue? (Y/N) y

Running....
md
  Baltimore city
va
  Arlington County
  Fairfax County
```

```
Alexandria city
Falls Church city
Winchester city
```

The contents of the audit file corresponding to this STAND ALONE POPULATION COUNT, pcx07151.A02, are seen on the following pages.

For more information on the billing and output options, see the sections "BILLING" and "THE OUTPUT MENU."

1990 Population Count

Title: demo   Latitude: 38-52-47
Audit File: pcx07151.A02   Longitude: 77-10-18
County Subdivision, Tract, Block Group

	White	His	Black	AmIn	Asian	other

Virginia, Arlington County

Arlington CDP (pt.), Tract 1011.98 (pt.), BG 3

	White	His	Black	AmIn	Asian	other
Total Blocks :	890	40	7	3	52	2

Arlington CDP (pt.), Tract 1011.98 (pt.), BG 4 (pt.)

	White	His	Black	AmIn	Asian	other
Total Blocks :	295	9	1	2	20	0

Arlington CDP (pt.), Tract 1012 (pt.), BG 1

	White	His	Black	AmIn	Asian	other
Total Blocks :	336	5	0	1	42	0

Arlington CDP (pt.), Tract 1012 (pt.), BG 3

	White	His	Black	AmIn	Asian	other
Total Blocks :	659	58	6	1	41	0

Arlington CDP (pt.), Tract 1001.98 (pt.), BG 1

	White	His	Black	AmIn	Asian	other
Total Blocks :	132	3	3	0	8	0

Arlington CDP (pt.), Tract 1001.98 (pt.), BG 4 (pt.)

	White	His	Black	AmIn	Asian	other
Total Blocks :	184	6	2	0	6	0

Arlington CDP (pt.), Tract 1001.98 (pt.), BG 5

	White	His	Black	AmIn	Asian	other
Total Blocks :	392	31	3	0	15	0

Arlington CDP (pt.), Tract 1001.98 (pt.), BG 6

	White	His	Black	AmIn	Asian	other
Total Blocks :	284	31	6	0	32	0

Arlington CDP (pt.), Tract 1011.98 (pt.), BG 5 (pt.)

	White	His	Black	AmIn	Asian	other
Total Blocks :	100	2	5	0	10	0

Arlington CDP (pt.), Tract 1009 (pt.), BG 5

	White	His	Black	AmIn	Asian	other
Total Blocks :	138	3	5	1	0	0

Arlington CDP (pt.), Tract 1010 (pt.), BG 1 (pt.)

	White	His	Black	AmIn	Asian	other
Total Blocks :	67	3	1	4	6	0

Arlington CDP (pt.), Tract 1010 (pt.), BG 2

	White	His	Black	AmIn	Asian	other
Total Blocks :	361	26	1	3	14	0

Arlington CDP (pt.), Tract 1001.98 (pt.), BG 2

	White	His	Black	AmIn	Asian	other
Total Blocks :	300	9	4	0	13	0

Arlington CDP (pt.), Tract 1001.98 (pt.), BG 3

	White	His	Black	AmIn	Asian	other
Total Blocks :	114	8	4	3	9	0

1990 Population Count

Title: demo   Latitude: 38-52-47
Audit File: pcx07151.A02   Longitude: 77-10-18
County Subdivision, Tract, Block Group

	White	His	Black	AmIn	Asian	other
Arlington CDP (pt.), Tract 1001.98 (pt.), BG 4 (pt.)						
Total Blocks :	520	16	3	0	23	1
Arlington CDP (pt.), Tract 1010 (pt.), BG 1 (pt.)						
Total Blocks :	206	9	4	3	5	0
Arlington CDP (pt.), Tract 1010 (pt.), BG 4 (pt.)						
Total Blocks :	328	1	1	0	13	0
Arlington CDP (pt.), Tract 1011.98 (pt.), BG 1						
Total Blocks :	889	46	18	0	37	1
Arlington CDP (pt.), Tract 1011.98 (pt.), BG 2 (pt.)						
Total Blocks :	482	6	9	1	44	0
Arlington CDP (pt.), Tract 1011.98 (pt.), BG 4 (pt.)						
Total Blocks :	410	27	1	2	20	0
Arlington CDP (pt.), Tract 1011.98 (pt.), BG 5 (pt.)						
Total Blocks :	566	11	11	0	37	0
Arlington CDP (pt.), Tract 1009 (pt.), BG 4 (pt.)						
Total Blocks :	413	150	32	6	28	3
Arlington CDP (pt.), Tract 1010 (pt.), BG 3 (pt.)						
Total Blocks :	736	90	39	4	39	0
Arlington CDP (pt.), Tract 1010 (pt.), BG 4 (pt.)						
Total Blocks :	183	6	3	3	15	0
Arlington CDP (pt.), Tract 1011.98 (pt.), BG 2 (pt.)						
Total Blocks :	221	29	3	0	8	0
County Total :	9206	625	172	37	537	7

Virginia, Fairfax County

	White	His	Black	AmIn	Asian	other
Lake Barcroft CDP (pt.), Tract 4512, BG 1						
Total Blocks :	756	49	19	3	39	0
Lake Barcroft CDP (pt.), Tract 4512, BG 2						
Total Blocks :	197	22	1	0	15	0
Lake Barcroft CDP (pt.), Tract 4511, BG 2						
Total Blocks :	521	20	0	0	17	1

Title: demo   Latitude: 38-52-47
Audit File: pcx07151.A02   Longitude: 77-10-18
County Subdivision, Tract, Block Group

	White	His	Black	AmIn	Asian	other
Jefferson CDP (pt.), Tract 4503.98 (pt.), BG 1						
Total Blocks :	335	17	14	0	11	0
Jefferson CDP (pt.), Tract 4503.98 (pt.), BG 2						
Total Blocks :	814	144	255	7	91	0
Jefferson CDP (pt.), Tract 4503.98 (pt.), BG 3						
Total Blocks :	637	284	154	5	245	1
Jefferson CDP (pt.), Tract 4503.98 (pt.), BG 4 (pt.)						
Total Blocks :	55	18	8	0	20	0
Jefferson CDP (pt.), Tract 4530.97, BG 1						
Total Blocks :	3	0	0	0	0	0
Jefferson CDP (pt.), Tract 4502 (pt.), BG 1 (pt.)						
Total Blocks :	434	29	2	3	39	0
Jefferson CDP (pt.), Tract 4502 (pt.), BG 2 (pt.)						
Total Blocks :	461	341	124	11	151	6
Jefferson CDP (pt.), Tract 4503.98 (pt.), BG 4 (pt.)						
Total Blocks :	422	40	3	0	77	0
Jefferson CDP (pt.), Tract 4501 (pt.), BG 1 (pt.)						
Total Blocks :	181	52	16	0	37	3
Jefferson CDP (pt.), Tract 4502 (pt.), BG 1 (pt.)						
Total Blocks :	538	50	23	1	43	5
Jefferson CDP (pt.), Tract 4502 (pt.), BG 2 (pt.)						
Total Blocks :	345	63	10	5	119	0
Jefferson CDP (pt.), Tract 4503.98 (pt.), BG 5						
Total Blocks :	508	57	5	2	71	0
McLean CDP (pt.), Tract 4709 (pt.), BG 5 (pt.)						
Total Blocks :	656	22	5	1	80	0
McLean CDP (pt.), Tract 4710 (pt.), BG 1 (pt.)						
Total Blocks :	509	22	20	1	37	0
Annandale CDP (pt.), Tract 4508 (pt.), BG 1						
Total Blocks :	222	13	1	0	21	0

1990 Population Count

Title: demo   Latitude: 38-52-47
Audit File: pcx07151.A02   Longitude: 77-10-18
County Subdivision, Tract, Block Group

	White	His	Black	AmIn	Asian	other
Annandale CDP (pt.), Tract 4510 (pt.), BG 2						
Total Blocks :	965	94	18	1	85	6
Lake Barcroft CDP (pt.), Tract 4513 (pt.), BG 1						
Total Blocks :	713	37	4	0	46	0
Lake Barcroft CDP (pt.), Tract 4513 (pt.), BG 2 (pt.)						
Total Blocks :	40	2	0	0	13	0
Annandale CDP (pt.), Tract 4510 (pt.), BG 1						
Total Blocks :	1216	63	31	10	78	0
Jefferson CDP (pt.), Tract 4504 (pt.), BG 3 (pt.)						
Total Blocks :	209	7	2	0	21	1
Jefferson CDP (pt.), Tract 4509, BG 1						
Total Blocks :	1325	98	19	10	154	1
Jefferson CDP (pt.), Tract 4504 (pt.), BG 1						
Total Blocks :	824	45	21	2	72	3
Jefferson CDP (pt.), Tract 4504 (pt.), BG 2						
Total Blocks :	772	114	9	5	109	0
Jefferson CDP (pt.), Tract 4504 (pt.), BG 3 (pt.)						
Total Blocks :	289	18	4	1	17	0
Jefferson CDP (pt.), Tract 4506 (pt.), BG 2 (pt.)						
Total Blocks :	177	8	1	0	35	0
Jefferson CDP (pt.), Tract 4506 (pt.), BG 3						
Total Blocks :	348	32	3	0	91	3
Jefferson CDP (pt.), Tract 4506 (pt.), BG 6 (pt.)						
Total Blocks :	198	6	0	0	9	0
Idylwood CDP (pt.), Tract 4710 (pt.), BG 2 (pt.)						
Total Blocks :	2	0	7	0	0	0
McLean CDP (pt.), Tract 4709 (pt.), BG 4 (pt.)						
Total Blocks :	275	21	10	1	13	0
McLean CDP (pt.), Tract 4709 (pt.), BG 5 (pt.)						
Total Blocks :	657	68	21	2	55	2

1.0   1990 Population Count Example - 4

1990 Population Count

Title: demo   Latitude: 38-52-47
Audit File: pcx07151.A02   Longitude: 77-10-18
County Subdivision, Tract, Block Group

	White	His	Black	AmIn	Asian	other
McLean CDP (pt.), Tract 4710 (pt.), BG 1 (pt.)						
Total Blocks :	33	0	1	0	4	0
McLean CDP (pt.), Tract 4710 (pt.), BG 2 (pt.)						
Total Blocks :	420	18	0	0	14	0
Jefferson CDP (pt.), Tract 4505, BG 1						
Total Blocks :	439	99	8	2	60	0
Jefferson CDP (pt.), Tract 4505, BG 2						
Total Blocks :	944	170	22	6	231	0
Jefferson CDP (pt.), Tract 4505, BG 3						
Total Blocks :	378	125	21	0	123	0
Jefferson CDP (pt.), Tract 4506 (pt.), BG 1						
Total Blocks :	587	51	14	10	114	0
Jefferson CDP (pt.), Tract 4506 (pt.), BG 2 (pt.)						
Total Blocks :	380	31	18	0	113	0
Jefferson CDP (pt.), Tract 4506 (pt.), BG 4						
Total Blocks :	578	114	89	7	203	1
Seven Corners CDP (pt.), Tract 4514.98 (pt.), BG 1 (pt.)						
Total Blocks :	531	.868	132	3	363	5
Annandale CDP (pt.), Tract 4506 (pt.), BG 6 (pt.)						
Total Blocks :	11	0	0	0	1	1
County Total :	19905	3332	1115	99	3137	39

Virginia, Falls Church city

	White	His	Black	AmIn	Asian	other
Falls Church city (pt.), Tract 5002.98 (pt.), BG 2 (pt.)						
Total Blocks :	15	0	0	0	0	0
Falls Church city (pt.), Tract 5002.98 (pt.), BG 3						
Total Blocks :	1275	109	109	7	124	2
Falls Church city (pt.), Tract 5002.98 (pt.), BG 4						
Total Blocks :	592	30	7	1	19	0
Falls Church city (pt.), Tract 5002.98 (pt.), BG 5 (pt.)						
Total Blocks :	167	3	0	1	3	0

1990 Population Count

Title: demo   Latitude: 38-52-47
Audit File: pcx07151.A02   Longitude: 77-10-18
County Subdivision, Tract, Block Group

	White	His	Black	AmIn	Asian	other
Falls Church city (pt.), Tract 5003.98 (pt.), BG 1 (pt.)						
Total Blocks :	185	4	3	0	2	0
Falls Church city (pt.), Tract 5003.98 (pt.), BG 2						
Total Blocks :	1590	51	34	10	78	2
Falls Church city (pt.), Tract 5007.97, BG 3						
Total Blocks :	4	0	1	1	4	0
Falls Church city (pt.), Tract 5002.98 (pt.), BG 1						
Total Blocks :	228	11	14	0	1	0
Falls Church city (pt.), Tract 5002.98 (pt.), BG 2 (pt.)						
Total Blocks :	513	242	13	2	62	7
Falls Church city (pt.), Tract 5002.98 (pt.), BG 6						
Total Blocks :	374	30	10	3	13	0
Falls Church city (pt.), Tract 5001 (pt.), BG 1 (pt.)						
Total Blocks :	693	24	12	1	31	0
Falls Church city (pt.), Tract 5003.98 (pt.), BG 1 (pt.)						
Total Blocks :	741	9	50	2	32	2
Falls Church city (pt.), Tract 5001 (pt.), BG 1 (pt.)						
Total Blocks :	586	12	3	2	30	0
Falls Church city (pt.), Tract 5001 (pt.), BG 2						
Total Blocks :	739	55	28	2	37	0
County Total :	7702	580	284	32	436	13
State Total :	36813	4537	1571	168	4110	59
Total Run Population :	36813	4537	1571	168	4110	59
Total Run Population : 47258						

Contour files to be uploaded to CDS must conform to the following format. Comment lines, beginning with "#," may be included for your reference, but will be ignored by the program. The number of radials should be entered after the "NUM:" line. Bearings and distances, in kilometers, are separated by commas. These values are real numbers.

```
# This file illustrates the POPULATION COUNT
# contour file format
NUM:8
0.0,2.3
45.,5.0
090.,4.5
135.,3.
180.0,4.7
225.,3.1
270.,3.
315.,2.7
```

This program is to retrieve facilities (from the FCC database) which are within a user specified distance from a reference point. All WITHIN STUDIES include facility characteristics such as call letters, FCC authorization and file number, city and country of license, frequency or channel, class, power, position, and the computed bearing and distance from the reference location. AM WITHIN STUDIES also display hours of operation, and the field strength at one kilometer for non-directional stations. FM and TV WITHIN STUDIES will provide Class, the radiation center at Above Mean Sea Level (AMSL), and Height Above Average Terrain (HAAT).

First, the job identification is entered. This will appear on the report, and in the bill to identify this specific run.

```
            WITHIN Study  11/26/90
      List facilities within a specified distance.
   All distances computed by FCC Rules Part 73.208.


Enter job identification :  Demo
```

Next, the reference coordinates are entered. The input may incorporate spaces or commas between degrees, minutes and seconds.

```
Enter reference latitude  : 38 52 47
Enter reference longitude : 77 10 18
```

You may retrieve FCC AM, FM, TV or Tower facilities or FAA Tower Facilities from the relevant databases. Entered in any order ("afr," "rfaot," etc.), the program will produce AM, FM, TV & Tower WITHIN studies appearing on individual pages.

```
Locate FCC's AM, FM, TV, Tower(R) or FAA's Tower(O) facilities?
Which? (A/F/T/R/O or  any combination) : aftro
```

To specify channel or frequency ranges, "yes" should be entered at the specific channel/frequency prompt. For example, to find all of the TV records on channel 4, or in channels 2 through 5, you should respond "yes" here. A response of "no" will result in the retrieval of all records in the FM range of 200 to 300, AM range of 540 KHz to 1700 KHz, and TV range of 2 to 83.

```
Do you want to specify channel/frequency ranges for facilities? (Y/N) : y
```

World Radio History

If you specified a range of channels/frequencies, the range values are entered for the chosen facility types. `Enter the lesser value, followed by the larger. Commas may be used to separate the two entries.

```
Enter AM frequency range (EX: 540,1600 or 580,730) : 540,1100
Enter FM channel range (EX: 200,223 or 218,250) : 210,220
Enter TV channel range (EX: 2,13 or 14,20) : 2,15
```

If the TV database is to be searched, you will be prompted whether or not to include translator and LPTV records in the report. If the FM database is to be searched, a prompt will indicate whether or not to include translator records. The request for an FM data search also provides the option to print the facility's owner (or applicant), docket number, and the date of last modification (FCC's last modification date).

```
Include TV translators/LPTV records? (Y/N) : y
Include FM translators records? (Y/N) : y
Print FM facility/application owner, docket number, and
last modification date? (Y/N) : y
Include tower contact address? (Y/N) : y
```

Next, the search radius is entered in kilometers.

```
Search within what radius (km) : 20
```

The reference city may be entered (up to 40 characters), followed by a prompt for a two character state abbreviation. This data will appear on the resulting report.

```
Enter reference city : Falls Church
Enter reference state (2 character abbreviation) : VA
```

Finally, the program allows you to sort the facilities by distance, or by ascending channel/frequency number. The former is chosen by specifying "d" for distance and the latter, "c" for channel.

```
Sort facilities by (D)istance or (C)hannel ? (D/C) : d
```

Having entered the requested parameters, the WITHIN STUDY audit file name is displayed. The input parameters are also displayed and you are prompted to verify the values. To change an input value, the number corresponding to the incorrect line should be entered. The resulting questions will allow you to alter the specified item. If no changes are required, you may enter a "0" to continue.

```
AUDIT FILE NAME:  wit05091.A01
1 .. Job identification: demo
2 .. Reference latitude  :  38-52-47
3 .. Reference longitude :  77-10-18
4 .. Locate which facilities?
     AM Frequency :  540 through 1100
     FM Channels  :  210 through  220
     TV Channels  :    2 through   15
     FCC Towers
     FAA Towers
5 .. Search For facilities within 20 km
6 .. Reference city : Falls Church
7 .. Reference state: VA
8 .. Facilities will be sorted by  channel
     TV translator/LPTV records will be printed
     FM translator records will be printed
     Owner name and last update will be printed
     Tower contact address will be printed

Enter item to be changed, or 0 to continue : 0
```

The program calculates the job cost and permits you to decide whether or not to perform the study. If the WITHIN STUDY program is cancelled, the Main-menu will be displayed.

```
Total costs for this job:  $ 72.00
Billing records will now be created. Do you want to continue? (Y/N) : y

Running....
AM
FM
TV
FCC Tower Survey
FAA Man-Made Obstructions to Navigation

Ready to display report.
```

The contents of the audit file corresponding to this WITHIN STUDY, wit05091.A01, are seen on the following pages. Only one page of the Tower output is shown due to the size of the audit file. Note that the output includes the FCC Date indicating the date the database was released. The example has an FCC Date of April 19, 1991.

For more information on the billing, and output options, see the sections "BILLING" and "THE OUTPUT MENU."

AM Facilities Within 20 km

Title: demo   Latitude: 38-52-47
Channels: 540 to 1100   Longitude: 77-10-18
Reference City: Falls Church, VA   FCC Database: 910419
Audit File: wit05091.A01

Call Auth	City of License, St FCC File No.	Field (mV/M)	Freq Cntry	Class Oper	kW Day/Ngt	Latitude Longitude	Bear From	Dist (km)
WABS LIC	ARLINGTON, VA BL-890925AE	319	0780 US	D II NDD	5.00 D	38-53-44 77-08-04	61.3 241.4	3.7
WMAL LIC	WASHINGTON, DC BL-850515AC		0630 US	U III DA2	5.00 N	39-00-55 77-08-30	9.8 189.8	15.3
WCPT LIC	ALEXANDRIA, VA BL-14219		0730 US	U II DA2	5.00 D	38-44-41 77-05-57	157.3 337.3	16.3
WCPT LIC	ALEXANDRIA, VA		0730 US	U II DA2	0.03 N	38-44-41 77-05-57	157.3 337.3	16.3
WCPT APP	ALEXANDRIA, VA BP-900405CM		0730 US	U II DA2	0.38 N	38-44-41 77-05-57	157.3 337.3	16.3
WGMS LIC	BETHESDA, MD BL-880104AI		0570 US	U III DA2	5.00 D	39-02-07 77-10-11	0.6 180.6	17.3
WGMS LIC	BETHESDA, MD BL-880104AI		0570 US	U III DA2	1.00 N	39-02-07 77-10-11	0.6 180.6	17.3
WCTN LIC	POTOMAC-CABIN JOHN, MD BL-850628AA		0950 US	U III DA2	2.50 D	39-02-12 77-12-09	351.3 171.3	17.6
WNTR LIC	SILVER SPRING, MD	307	1050 US	U II ND1	0.04 N	39-00-50 77-01-46	39.5 219.5	19.3
WNTR LIC	SILVER SPRING, MD	307	1050 US	U II ND1	1.00 D	39-00-50 77-01-46	39.5 219.5	19.3
WWRC LIC	WASHINGTON, DC		0980 US	U III DAN	5.00 N	38-57-41 76-58-27	61.9 242.1	19.4
WWRC CP	WASHINGTON, DC BP-880909AE		0980 US	U III DA2	5.00 D	38-57-41 76-58-27	61.9 242.1	19.4

--> End of Facilities <--

FM Facilities Within 20 km

Title: demo   Latitude: 38-52-47
Channels: 210 to 220   Longitude: 77-10-18
Reference City: Falls Church, VA   FCC Database: 910423
Audit File: wit05091.A01

Call Auth Owner	City of License, St FCC File No. Channel Class	H-AMSL V-AMSL Docket No.	H-AAT V-AAT	H-kW V-kW Last Update Date	Latitude Longitude	Br-to -from	Dist (km)
WETAFM LIC The Greater Wa Educ. Tele. Assn.,Inc	Washington, DC BMLED-900315KB 215 B	252 252	186 186	75. 75. 01/29/91	38-53-30 77-07-55	68.9 248.9	3.7
WDCU LIC The Univ of the District of Columbia	Washington, DC BLED-820518AM 211 B1	199 199	137 137	6.8 6.8 03/26/87	38-57-44 77-01-36	53.8 233.9	15.6
WDCU CP The Univ of the District of Columbia	Washington, DC BPED-870317KD 211 B	199 199	138 138	50.* 50. 11/28/90	38-57-44 77-01-36	53.8 233.9	15.6
WGTSFM LIC Columbia Union College B/Cing., Inc.	Takoma Park, MD BLED-717 220 B	117	50	29.5 02/23/90	38-59-12 77-00-04	51.1 231.2	19.0
WGTSFM APP Columbia Union College B/Cing., Inc.	Takoma Park, MD BPED-890921NQ 220 B	168 168	100 100	50.* 50. 06/19/90	38-59-30 76-59-50	50.4 230.5	19.6

Application Dismissed 900206-Petition For Recon Fld & Reinstatement NP

--> End of Facilities <--

TV Facilities Within 20 km

Title: demo   Latitude: 38-52-47
Channels: 2 to 15   Longitude: 77-10-18
Reference City: Falls Church, VA   FCC Database: 910422
Audit File: wit05091.A01

Call Auth	City of License, St FCC File No. Docket No.	Channel Zone	ERP (kW)	HAMSL-m HAAT-m	Latitude Longitude	Br-to -from	Dist (km)
WTMW CP MOD	ARLINGTON, VA BMPCT-900905KE	14 1	2750	308 219	38-52-28 77-13-24	262.5 82.5	4.5
ALLOCATED TO WASHINGTON, D.C.							
WRCTV LIC	WASHINGTON, DC BLCT-891122KM	04 1	100	307 237	38-56-24 77-04-54	49.3 229.3	10.3
WJLATV LIC	WASHINGTON, DC BLCT-2199	07 1	316	308 235	38-57-01 77-04-47	45.4 225.4	11.2
WUSA LIC	WASHINGTON, DC BLCT-2207	09 1	316	308 235	38-57-01 77-04-47	45.4 225.4	11.2
WTTG LIC	WASHINGTON, DC BLCT-1308	05 1	100	306 235	38-57-21 77-04-57	42.3 222.4	11.5
	WASHINGTON, DC	14 1			38-53-30 77-02-00	83.6 263.7	12.1
ALLOCATION USED ARLINGTON, VA.							

--> End of Facilities <--

FCC TOWER Facilities Within 20 km

Title: demo
Reference City: Falls Church, VA
All data in meters/kilometers
Audit File: wit05091.A01

Latitude: 38-52-47
Longitude: 77-10-18

Date/Action Tower Number	FCC FAA	AMSL (m)	AGL (m)	Date	File Number	Latitude Longitude	Dist Bear
740109 OLD		177.7	83.2		(WFAX)	38-52-47	0.00
033996A		0.0	0.0			77-10-18	0.00
Paint/Light : 001003011021							
870825 ADD		155.4	45.7	080187	284631-LJ	38-52-36	2.24
077231A		0.0	0.0			77-08-46	98.72
BROWNING-FERRIS, INC.							
2813 JUNIPER ST., FAIRFAX, VA							
Paint/Light : NOM							
710517 OLD		245.1	103.3	040571	BMLH-381 (WMOD)	38-53-12	2.69
034008A		245.1	103.3	040577	77-AEA-292-OE	77-12-05	286.72
7330 RONALD ST, FALLS CHURCH, VA							
Paint/Light : 001003012021							
870409 ADD		173.1	61.0	040887	BP870219AE	38-54-15	2.77
075038A		173.1	61.0	120584	84-AEA-1843-OE	77-09-54	11.98
VIACOM BROADCASTING, INC							
Paint/Light : NOM							
870902 MOD		173.1	61.0		BP-870219AE WMZQ	38-54-15	2.77
034067A		173.1	61.0	120584	84-AEA-1843-OE	77-09-54	11.98
VIACOM BROADCATING							
2131 CRIMMONS LANE, ARLINGTON, VA							
Paint/Light : NOM							
780106 OLD		174.7	62.5		(WEAM)	38-54-15	2.77
034068A		174.7	62.5	111477	FAA LTR	77-09-54	11.98
Paint/Light : 001							
850620 MOD		211.8	89.9	102877	1-CF-ML-77	38-53-45	3.63
034044A		211.8	89.9	013074	73-EA-1178-OE	77-08-07	60.36
5301 22ND ST., ARLINGTON, VA							
Paint/Light : 001003011021							
850116 MOD		239.3	120.4	112784	BPH-840127AI	38-53-44	3.68
034043A		239.3	120.4	100983	82-AEA-1122-OE	77-08-04	61.33
DOUBLEDAY BROADCASTING CO., INC							
5232 LEE HWY GARDEN CITY, ARLINGTON, VA							
Paint/Light : 001003011021							

FAA Towers Within 20 km

Title: demo   Latitude: 38-52-47
                                                      Longitude: 77-10-18

Reference City : Falls Church, VA   Date : 02/07/91
Audit File : wit05091.A01

Type Number Verified	Marked Freq Lighting	Last Action Action Date	AGL AMSL ft.	m	Vert +/- Hor +/- ft.	m	Lat Lon	Dist (km) Bear City, State
STACKS 7 70DC0076 Y	Y	CHANGED 09/03/74	238 257	72.6 78.4			38-53-59 76-57-35 WASHINGTON, DC	18.48 83.02
BLDG 2 80EA1122 N		CHANGED 05/26/81	90 230	27.5 70.2			38-55-17 76-57-20 WASHINGTON, DC	19.27 76.02
TOWER 82EA1062 Y	Y RED STROBE	CHANGED 09/13/84	280 313	85.4 95.5	50 500	15.2 153.0	38-53-52 76-57-10 WASHINGTON, DC	19.05 83.88
TOWER Y	Y RED STROBE	CHANGED 12/18/79	275 433	83.9 132.1			38-55-11 76-59-46 WASHINGTON, DC	15.83 73.63
TOWERS 3 99TR0000 Y	Y RED STROBE	ADDED 12/15/81	413 454	126.0 138.5	125 50	38.1 15.2	38-57-41 76-58-25 HYATTSVILLE, MD	19.39 62.02
TANK 99HC0000 N		ADDED 06/17/78	100 0	30.5 0.0			38-58-57 76-58-59 HYATTSVILLE, MD	19.92 54.93
TOWER 79EA0872 Y	NO LIGHTS	CHANGED 05/07/80	190 460	58.0 140.3			38-48-48 76-57-44 NORTH BARNABY, MD	19.58 112.08
BLDG 88EA0166 Y	N NO LIGHTS	CHANGED 06/11/90	154 414	47.0 126.3	50 500	15.2 153.0	38-48-20 76-58-41 OXON HILL, MD	18.69 116.13
TANK 99LM0000 Y	Y RED STROBE	CHANGED 07/12/88	176 436	53.7 133.0	50 250	15.2 76.3	38-48-42 76-58-19 PHELPS CORNER, MD	18.88 113.57
TOWER Y	Y	DISMANTLED 03/06/78	300 590	91.5 179.9			38-50-38 76-56-50 SILVER HILL, MD	19.84 101.52

This program predicts the distance to a given field strength contour for an FM, TV, or LM (Land Mobile) facility in the manner prescribed in Parts 22 or 73 of the FCC's Regulations. The FCC has made available algorithms corresponding to the F(50,50) and F(50,10) curves of Sections 73.333 (FM) and 73.699 (TV). Algorithms have been developed independently of the FCC but based on the "Carey" curves of Section 22.504 (LM). Distances to contours may be computed for either directional or non-directional antennas. The program also allows you to obtain detailed terrain tabulations and a population count within the contours.

First, enter the job identification. This will appear on the report, and in the bill to indicate this specific run.

```
                    Distance to Contour   5/7/91
              This programs determines distances to contours
                      for FM, TV, and LM facilities.

Enter job identification : demo
```

You must specify which database is desired. The USGS (DMA) 3 Arc Second Terrain Database contains elevation values (to the nearest meter) spaced every three seconds of latitude by three seconds of longitude. In Alaska, however, these values occur every three seconds of latitude and six seconds of longitude. Similarly, the 30 Arc Second Terrain Database is composed of elevation values (to the nearest ten feet) for every 30 seconds of latitude by 30 seconds of longitude.

```
Use 3 Second or 30 Second Terrain Data?   (3/30):   3
```

You must specify the service for which the program will perform computations. The input should be the two character abbreviation seen at the prompt.

```
Enter service (FM, TV, LM (Land Mobile)) : fm
```

If FM or TV is chosen, the channel number must be entered. Valid input ranges from 200 to 300 for FM and 2 to 69 for TV.

```
Enter channel number : 215
```

Each FM station has a rated class as specified by the FCC. Valid inputs include "A,", "B1", "B", "C3", "C2" ,"C1", "C", and "D". If TV is chosen, the program will prompt you for a specific zone. Valid inputs are "I", "II", and "III." If the desired service is LM, you will be required to enter either the VHF or UHF frequency band.

```
Enter FM Class (A, B, B1,...) : a
```

The reference city may be entered (up to 40 characters), as well as a two character state abbreviation. This city will appear on the resulting report.

```
Enter reference city : Falls Church
Enter reference state (2 character abbreviation) : VA
```

Next, the reference coordinates are entered. The input may incorporate spaces or commas between degrees, minutes and seconds.

```
Enter reference latitude  : 38 52 47
Enter reference longitude : 77 10 18
```

The radiation center, located at the reference coordinates, is entered in either English or metric units. The distance specified may be either Above Mean Sea Level (AMSL) or Height Above Average Terrain (HAAT).

```
Will radiation center be in feet or meters? (F/M) : m
Enter radiation center (either AMSL or HAAT) : 100
HAAT or AMSL? : haat
```

You are next required to enter the number of evenly spaced radials. Valid entries range from 8 to 72 and determine the angular interval at which each average is computed.

```
Enter number of evenly spaced radials : 8
```

Elevation retrieval and averages may be performed for a chosen number of additional special bearings. Any special bearing that equals one of the evenly spaced radials is ignored.

```
How many special bearings do you want to enter? 2
Enter each bearing followed by RETURN
Bearing 1 : 38
Bearing 2 : 113
```

The program requires you to indicate whether or not the antenna is directional.

```
Directional antenna  (Y/N) : y
```

The station's effective radiated power (ERP) may be entered in dBk (decibels relative to a kiloWatt), kiloWatts, or Watts. The maximum ERP may be entered at the program prompt.

```
Will ERP be dBk, kiloWatts, or Watts? (D/K/W) : k
Enter maximum effective radiated power : 6
```

Because a directional antenna was specified, you must choose the units with which to express the directive horizontal plane pattern. As seen below, this value may be in gain, dB off peak, relative field, dBk, Watts or kiloWatts.

```
Do you want to express the directive horizontal plane pattern
in terms of antenna gain, dB off peak, relative field, dBk,
watts or kilowatts?
(G/O/R/D/W/K) : r
```

These units are used for entry of bearing pattern values. After displaying the number of special bearings, the program will prompt you for a value at each azimuth. Typing "return" after each entry will advance through the azimuth list. Upon completion, the entire list is displayed and you asked to confirm the values.

```
Enter pattern values in terms of relative field.
    0.0...  1
   38.0...  1
   45.0...  1
   90.0...  1
  113.0...  1
  135.0...   .98
  180.0...   .978
  225.0...   .985
  270.0...   .991
  315.0...  1

  10 Total azimuths:
    0.00...  1.000
   38.00...  1.000
   45.00...  1.000
   90.00...  1.000
  113.00...  1.000
  135.00...  0.980
  180.00...  0.978
  225.00...  0.985
  270.00...  0.991
  315.00...  1.000


To change a value, enter the azimuth and the corrected value.
Addition/deletion of values is not allowed.
To reprint the list, enter PRINT.
When contour is entered correctly, press RETURN.
Command:
```

Upon entry of a "return," the program will confirm if the antenna pattern is correct. If you respond with "n," the edit menu seen above is again displayed. An entry of "y" will advance the program. The next prompt allows you to see a final summary of the antenna pattern with ERP displayed in both kW and dBk.

```
Contour complete? (Y/N) : y
Print summary of directional antenna? (Y/N) : y

Number of equally spaced radials : 8
Number of special radials:        2

     Azimuth      Field       ERP        ERP
     Deg True     Ratio       kW         dBk
         0.0      1.0000      6.000      7.782
        38.0      1.0000      6.000      7.782
        45.0      1.0000      6.000      7.782
        90.0      1.0000      6.000      7.782
       113.0      1.0000      6.000      7.782
       135.0      0.9800      5.762      7.606
       180.0      0.9780      5.739      7.588
       225.0      0.9850      5.821      7.650
       270.0      0.9910      5.892      7.703
       315.0      1.0000      6.000      7.782
```

You must next enter the number of contours. The FCC notation for service contours containing a specific field strength is given as F(50,50) meaning 50 percent of the location points, 50 percent of the time. Interference contours are F(50,10) indicating 50 percent of the location points, 10 percent of the time. The program allows you to enter both the field strength and time variability. These values may be separated by a comma or a space.

```
Enter number of contours : 2
Enter time variability as 50 or 10 (percent)
Example: Enter "60, 10" for 60 dBu, F(50,10)
Enter dBu and variability for contour 1 : 60 50
Enter dBu and variability for contour 2 : 40 10
```

Detailed terrain height data may be displayed for each radial. This output includes the distance from the reference position and elevation for each point along the radial.

```
Detailed terrain data? (Y/N) : n
```

You may choose to perform a population count which computes the population within a specified contour. If the user enters "n" at the detailed population count output prompt, the program output will only print the total population within the specified contour. Detailed population output, indicated by entering "y," includes

population associated with individual divisions and block groups located within the contour.

```
Do a population count? (Y/N) : y
Count population for the 60.0 dBu contour? (Y/N) : y
Count population for the 40.0 dBu contour? (Y/N) : y
Provide details of the count? (Y/N) : n
```

The contours may be plotted and mailed to the customer.

```
Plot contours? (Y/N) : n
```

Having entered the desired parameters, the BROADCAST CONTOURS audit file name is displayed. The input parameters are also displayed and you are prompted to verify the values. To change an input value, the number corresponding to the incorrect line should be entered. The resulting questions will allow you to alter the specified item. If no changes are required, you may enter a "0" to continue.

```
AUDIT FILE NAME: con05141.A02
  1 .. Job identification : demo
  2 .. 3 Arc Second Terrain Data will be used.
  3 .. Service (FM, TV, LM) : FM
  4 .. Channel : 215 Class : A
  5 .. City  : Falls Church
  6 .. State : VA
  7 .. Latitude  : 38-52-47
  8 .. Longitude : 77-10-18
  9 .. Radiation center (HAAT) :     100 meters
 10 .. Directional antenna
 11 .. Number of equally spaced radials :  8
        Number of special bearings : 2
 12 .. Peak ERP :        6 kW
 13 .. Number of contours :  2
        Contour    dBu      Time
            1      60.0      50
            2      40.0      10
 14 .. Details of terrain profiles will not be printed.
 15 .. Population count will be performed.
        Population will be computed for all contours.
        Details of the count will not be printed.
 16 .. Contours will not be plotted.

Enter item to be changed, or 0 to continue :  0
```

The program calculates the job cost and permits you to decide whether or not to perform the study. If the BROADCAST CONTOURS program is cancelled, the Main-menu will be displayed.

```
Total costs for this job:   $ 78.00
Billing records will now be created. Do you want to continue? (Y/N)   y


Running....
Getting terrain data
Counting Population
 District Of Columbia
 Virginia
 Maryland
 District Of Columbia
 Virginia
 West Virginia
 Maryland

Ready to display report.
```

The contents of the audit file corresponding to this BROADCAST CONTOURS, con05141.A02, are seen on the following pages.

For more information on the billing and output options, see the sections "BILLING" and "THE OUTPUT MENU."

Distance to Contour

Title: demo   Latitude: 38-52-47
Audit File: con05141.A02   Longitude: 77-10-18
Based on 3 Second Terrain Data
Reference City: Falls Church, VA

True Radial Bearing	Average Elevation	Radiation Center Height Above Average Terrain	Effective Radiated Power		Distance to Contour 60.0 dBu F(50,50)	40.0 dBu F(50,10)
Degrees	meters	meters	kW	dBk	km	km
0.00	71.3	107.0	6.000	7.782	29.20	87.82
38.00	78.9	99.4	6.000	7.782	28.22	86.57
45.00	83.0	95.3	6.000	7.782	27.66	85.86
90.00	35.9	142.4	6.000	7.782	33.22	93.21
113.00	32.3	146.0	6.000	7.782	33.63	93.72
135.00	46.8	131.5	5.762	7.606	31.66	91.00
180.00	73.9	104.4	5.739	7.588	28.59	86.71
225.00	94.1	84.2	5.821	7.650	25.91	83.40
270.00	111.7	66.6	5.892	7.703	23.37	80.12
315.00	109.7	68.6	6.000	7.782	23.78	80.86

Radiation Center (AMSL):   178.3 meters   585.0 feet
Average Terrain   (AMSL):   78.3 meters   256.9 feet
Radiation Center (HAAT):   100.0 meters   328.1 feet
Area Within 60.0 dBu F(50,50) Contour is   958.7 sq. mi. or   2483.1 sq. km
Population Within 60.0 dBU F(50,50) Contour is   2436614
Area Within 40.0 dBu F(50,10) Contour is   9019.1 sq. mi. or   23359.4 sq. km
Population Within 40.0 dBU F(50,10) Contour is   5404379

This program conducts a spacing feasibility study for a planned FM station by retrieving pertinent channel FM facilities from the FCC database. Provided a safety radius from specified coordinates, the program will indicate whether or not the reference position is clear of existing or proposed stations based on commercial spacing requirements outlined by FCC 72.207 and non-commercial prohibited contour requirements dictated by FCC 72.509. The output includes the station characteristics and distance from the reference location. The distance to the nearest television channel 6 facility is provided at no additional cost for non-commercial interference studies.

First, enter the job identification. This will appear on the report, and in the bill to indicate this specific run.

```
       FM Channel Search/Study Program 4/10/92
        This program tests the feasibility for a planned
         station given proposed and existing facilities.
         Spacing studies use spacing requirements dictated
      by FCC 72.207.  Interference studies test for prohibited
         contour overlap as prescribed by FCC 72.509 and
            determine the nearest TV channel 6 facility.

Job identification :  demo
```

The reference city may be entered (up to 40 characters), followed by a prompt for a two character state abbreviation. This data will appear on the resulting report.

```
Reference city : Falls Church
Reference state (2 character abbreviation) : VA
```

Next, the reference coordinates are entered. The input may incorporate spaces or commas between degrees, minutes and seconds.

```
Enter reference latitude  : 38 52 47
Enter reference longitude : 77 10 18
```

Each FM station has a rated class as specified by the FCC. Valid inputs include "A," "B1", "B", "C3", "C2" ,"C1"and"C."

```
Enter Class of channel (A, B1, B, C3, C2, C1, C): b1
```

An FM STUDY may be performed for a single channel, specified channels or all channels.

```
This program can:
  (1) Study constraints for a single channel
  (2) Study constraints all commercial or educational channels
  (3) Study constraints for a list of specific channels
Which?  3
```

If options (1) or (2) are chosen, the program will prompt the user for the desired channel(s). Valid entries range from 200 to 300 followed by a "return" to expand the list. A "return" is entered to cease channel entry.

```
List the channels to be studied.
 Terminate the list by entering just a RETURN.
Channel number:  217
Channel number:  218
Channel number:
```

The program may perform either spacing or interference studies.

```
Perform 1) Spacing or 2) Interference study: 2
```

The program allows the user to include translators in the FMSTUDY.

```
Include translators (Y/N)?  : y
```

A non-commercial FM feasibility study tests for prohibited contour overlap, and, therefore, requires radiation center parameters.   Given AMSL, FM STUDY will calculate HAAT according to the TERRAIN FETCH/AVERAGE price schedule seen in this manual. If the user knows the HAAT of the proposed station, no charges will be incurred.

```
Radiation Center: (no charge for HAAT)
Feet or meters? (F/M) : m
Enter radiation center : 100
HAAT or AMSL? : h
```

The effective radiated power for the proposed omni-directional antenna may be entered in decibels relative to a kiloWatt, kiloWatts, or Watts.

```
Will ERP be dBk, kiloWatts or Watts? (D/K/W) : k
Enter ERP : 25
```

The FM STUDY will include all FM facilities clear of the specified separation. This distance is entered in kilometers. Note the default value is 65.0 km.

```
Safety distance (km) :  ]65.[  12
```

Having entered the desired parameters, the FM STUDY audit file name is displayed. The input parameters are also displayed and the user is prompted to verify the values. To change an input value, the number corresponding to the incorrect line should be entered. The resulting questions will allow the user to alter the specified item. If no changes are required, the user may enter a "0" to continue.

```
AUDIT FILE NAME: fms04102.A10
 1 .. Job identification : demo
 2 .. City  : Falls Church
 3 .. State : VA
 4 .. Latitude  :  39-52-47
 5 .. Longitude :  77-10-18
 6 .. Channel Class : B1
 7 .. Study each of the following  2 channels:
       217  218
      Mode: Interference
 8 .. Translators will be included
 9 .. Safety distance (km) :  12.0
10 .. Radiation center (HAAT) :    328 feet
11 .. ERP :   25.0 kW


Enter item to be changed, or 0 to continue :0
```

The program calculates the job cost and permits the customer to decide whether or not to perform the study. If the FM STUDY program is cancelled, the Main-Menu will be displayed.

```
Total costs for this job:  $ 30.00
Billing records will now be created. Do you want to continue? (Y/N)  y
```

```
Running....
Ready to display report.
```

The contents of the audit file corresponding to this FM STUDY, fms04102.A10, are seen on the following pages. Note that the output includes the FCC Date indicating the date the database was released. The example has an FCC Date of March 23, 1992. An asterix may appear before the channel number indicating that it is an

educational facility. When an asterisk appears after the ERP, the facility has employed a directional antenna.

For more information on the billing and output options, see the sections "BILLING" and "THE OUTPUT MENU."

Nearest Channel 6 Station

Title:		Latitude:	39-52-47
Channels: 6 to 6		Longitude:	77-10-18
Reference City: Falls Church	FCC Database: 920323 10		
Audit File:			

Call Auth	City of License, St FCC File No. Docket No.	Channel Zone	ERP (kW)	HAMSL-m HAAT-m	Latitude Longitude	Br-to -from	Dist (km)
WTVRTV	RICHMOND, VA	06	100	320	37-34-00	196.2	156.0
LIC	BLCT-193	1		256	77-28-36	15.9	

World Radio History

Constraints Study FM Channel 217B1

Title: demo   Latitude: 39-52-47
Reference City: Falls Church, VA   Longitude: 77-10-18
Translators Are Included   FCC Database: 920327
Audit File: fms04102.A10   ERP: 25.0 kW; HAAT: 100.0 m

Call City of License	Auth	Licensee Name St FCC File No.	Chan Freq	ERP-kW EAH-m	Latitude Longitude	Az-to -from	Dist (km)	Req (km)

```
Call    Auth   Licensee Name      Chan ERP-kW  Latitude Az-to   Dist  Req
City of License   St FCC File No.  Freq EAH-m Longitude -from    (km)  (km)
```

```
WGRC    LIC    Salt & Light Media Mi  *217B1  5.0   40-59-58  11.4 126.89   129
Lewisburg          PA BLED-880517KB    91.3    27   76-52-24 191.6  -1.74 SHORT
Proposed F(50,10)  40.0 dBu =113.63 km; WGRC   F(50,50)  60.0 dBu =  15.00 km
Proposed F(50,50)  60.0 dBu = 39.08 km; WGRC   F(50,10)  40.0 dBu =  64.03 km

WVMM    CP     Messiah College        *214A   .100  40-09-34  27.2  34.97    40
Grantham           PA BPED-870114MB    90.7    50   76-59-00 207.3  -4.80 SHORT
Proposed F(50,10) 100.0 dBu =  4.06 km; WVMM   F(50,50)  60.0 dBu =   7.25 km
Proposed F(50,50)  60.0 dBu = 39.08 km; WVMM   F(50,10) 100.0 dBu =   0.70 km

WZBT    LIC    Gettysburg College     *216A   .130  39-50-15 229.4   7.22    66
Gettysburg         PA BLED-821126AC    91.1    -9   77-14-09  49.4 -58.96 SHORT
Proposed F(50,10)  54.0 dBu = 60.17 km; WZBT   F(50,50)  60.0 dBu =   6.01 km
Proposed F(50,50)  60.0 dBu = 39.08 km; WZBT   F(50,10)  54.0 dBu =   8.58 km

WMSS    LIC    Middletown Area Schoo   *216A  0.65  40-11-52  46.9  51.97    69
Middletown         PA BLED-851021KB    91.1   -27   76-43-30 227.2 -17.32 SHORT
Proposed F(50,10)  54.0 dBu = 60.17 km; WMSS   F(50,50)  60.0 dBu =   9.11 km
Proposed F(50,50)  60.0 dBu = 39.08 km; WMSS   F(50,10)  54.0 dBu =  12.76 km

WMSS    CP     Middletown Area Schoo   *216A  1.35  40-11-52  46.9  51.97    71
Middletown         PA BPED-890110IB    91.1   -21   76-43-30 227.2 -19.13 SHORT
Proposed F(50,10)  54.0 dBu = 60.17 km; WMSS   F(50,50)  60.0 dBu =  10.93 km
Proposed F(50,50)  60.0 dBu = 39.08 km; WMSS   F(50,10)  54.0 dBu =  15.37 km

WHFC    LIC    Harford Community Col   *216A  1.10  39-33-22 115.0  84.48    76
Bel Air            MD BLED-910418KC    91.1    69   76-16-48 295.5   8.82 CLEAR
Proposed F(50,10)  54.0 dBu = 60.17 km; WHFC   F(50,50)  60.0 dBu =  15.49 km
Proposed F(50,50)  60.0 dBu = 39.08 km; WHFC   F(50,10)  54.0 dBu =  23.13 km

WLCH    LIC    Spanish Amer. Civ. As   *217A  .160  40-04-13  74.0  78.35   121
Lancaster          PA BLED-910128KC    91.3    41   76-17-19 254.6 -42.63 SHORT
Proposed F(50,10)  40.0 dBu =113.63 km; WLCH   F(50,50)  60.0 dBu =   7.35 km
Proposed F(50,50)  60.0 dBu = 39.08 km; WLCH   F(50,10)  40.0 dBu =  24.63 km

WXAC    LIC    Albright College        *217A  .220  40-21-39  63.1 120.07   120
Reading            PA BLED-850204KR    91.3    -7   75-54-37 243.9  -0.43 SHORT
Proposed F(50,10)  40.0 dBu =113.63 km; WXAC   F(50,50)  60.0 dBu =   6.87 km
Proposed F(50,50)  60.0 dBu = 39.08 km; WXAC   F(50,10)  40.0 dBu =  22.98 km
```

                   Constraints Study FM Channel 217B1

Title: demo   Latitude: 39-52-47
Reference City: Falls Church, VA   Longitude: 77-10-18
Translators Are Included   FCC Database: 920327
Audit File: fms04102.A10   ERP: 25.0 kW; HAAT: 100.0 m

Call	Auth	Licensee Name	Chan	ERP-kW	Latitude	Az-to	Dist	Req
City of License		St FCC File No.	Freq	EAH-m	Longitude	-from	(km)	(km)

WXDR   LIC   The University of Del *217A 1.00   39-41-26 99.4 123.04   125
Newark   DE BLED-830421AD   91.3   41   75-45-23 280.3 -2.32 SHORT
Proposed F(50,10) 40.0 dBu =113.63 km; WXDR   F(50,50) 60.0 dBu = 11.74 km
Proposed F(50,50) 60.0 dBu = 39.08 km; WXDR   F(50,10) 40.0 dBu = 42.12 km

WTRM   LIC   Timber Ridge Ministri *217B   6.1* 39-10-59 233.8 130.19   166
Winchester   VA BLED-910508KA   91.3   411   78-23-23 53.1 -35.77 SHORT
Proposed F(50,10) 40.0 dBu =113.63 km; WTRM   F(50,50) 60.0 dBu = 52.18 km
Proposed F(50,50) 60.0 dBu = 39.08 km; WTRM   F(50,10) 40.0 dBu = 126.88 km

WBJC   LIC   Community College of   *218B   50.* 39-23-11 145.3 66.56   117
Baltimore   MD BLED-781115AH   91.5   152   76-43-52 325.6 -50.92 SHORT
Proposed F(50,10) 54.0 dBu = 60.17 km; WBJC   F(50,50) 60.0 dBu = 52.46 km
Proposed F(50,50) 60.0 dBu = 39.08 km; WBJC   F(50,10) 54.0 dBu = 78.41 km

WJAZ   LIC   Temple University of   *219A 0.14   40-18-20 16.4 49.31   44
Summerdale   PA BLED-910109KA   91.7   210   77-00-27 196.5   5.38 CLEAR
Proposed F(50,10) 80.0 dBu = 12.86 km; WJAZ   F(50,50) 60.0 dBu = 16.29 km
Proposed F(50,50) 60.0 dBu = 39.08 km; WJAZ   F(50,10) 80.0 dBu =   4.85 km

              End of Constraints Study FM Channel 217B1

Constraints Study FM Channel 218B1

Title: demo   Latitude: 39-52-47
Reference City: Falls Church, VA   Longitude: 77-10-18
Translators Are Included   FCC Database: 920327
Audit File: fms04102.A10   ERP: 25.0 kW; HAAT: 100.0 m

```
Call    Auth    Licensee Name        Chan ERP-kW  Latitude Az-to   Dist  Req
City of License     St FCC File No.   Freq EAH-m Longitude -from    (km)  (km)
```

```
WZBT    LIC     Gettysburg College   *216A .130  39-50-15 229.4   7.22    41
Gettysburg          PA BLED-821126AC  91.1  -9   77-14-09  49.4 -33.80 SHORT
Proposed F(50,10)  80.0 dBu = 12.86 km; WZBT    F(50,50)  60.0 dBu =   6.01 km
Proposed F(50,50)  60.0 dBu = 39.08 km; WZBT    F(50,10)  80.0 dBu =   1.94 km

WMSS    CP      Middletown Area Schoo *216A 1.35  40-11-52  46.9  51.97    42
Middletown          PA BPED-890110IB  91.1  -21  76-43-30 227.2   9.49 CLEAR
Proposed F(50,10)  80.0 dBu = 12.86 km; WMSS    F(50,50)  60.0 dBu =  10.93 km
Proposed F(50,50)  60.0 dBu = 39.08 km; WMSS    F(50,10)  80.0 dBu =   3.39 km

WBJC    LIC     Community College of  *218B 50.*  39-23-11 145.3  66.56   177
Baltimore           MD BLED-781115AH  91.5  152  76-43-52 325.6 -110.5 SHORT
Proposed F(50,10)  40.0 dBu =113.63 km; WBJC    F(50,50)  60.0 dBu =  52.46 km
Proposed F(50,50)  60.0 dBu = 39.08 km; WBJC    F(50,10)  40.0 dBu = 137.99 km

NEW-T   APP     Antrim Faith Baptist  *219D .02*  39-43-30 237.6  32.06    64
Blue Ridge Summit, PA BPFT-910205TC   91.7       77-29-16  57.4 -31.85 SHORT
Proposed F(50,10)  54.0 dBu = 60.17 km; NEW-T    F(50,50)  60.0 dBu =   3.74 km
Proposed F(50,50)  60.0 dBu = 39.08 km; NEW-T    F(50,10)  54.0 dBu =   5.32 km
EAH assumed to be 30 m.

WJAZ    LIC     Temple University of  *219A 0.14  40-18-20  16.4  49.31    76
Summerdale          PA BLED-910109KA  91.7  210  77-00-27 196.5 -27.14 SHORT
Proposed F(50,10)  54.0 dBu = 60.17 km; WJAZ    F(50,50)  60.0 dBu =  16.29 km
Proposed F(50,50)  60.0 dBu = 39.08 km; WJAZ    F(50,10)  54.0 dBu =  24.51 km

WIXQ    LIC     Millersville State Co *219A .130  39-59-53  79.0  70.98    66
Millersville        PA BLED-810731AE  91.7  21   76-21-20 259.6   4.80 CLOSE
Proposed F(50,10)  54.0 dBu = 60.17 km; WIXQ    F(50,50)  60.0 dBu =   6.01 km
Proposed F(50,50)  60.0 dBu = 39.08 km; WIXQ    F(50,10)  54.0 dBu =   8.58 km
```

End of Constraints Study FM Channel 218B1

This program allows you to predict the distance to a specific field strength or the field strength at a specified distance, given ERP and antenna height. Note that program was written by the FCC and released to the public. CDS offers the program at no charge and is not responsible for the results.

The FCC'S FMTVDX program is found in the Main-menu.

```
            FCC's FMTVDX
Compute distance to contour, or contour at a distance.
This program was provided by the FCC to the public.
CDS assumes no liability for this program.
```

You may have the program compute the field strength at a specified distance or the distance to a given field strength. The former is chosen by entering a "1".

```
Compute field strength at a given distance (1), or
distance to given field strength (2)? : 1
```

The FCC notation for service contours depicting a specific field strength is given as F(50,50), meaning 50 percent of the location points, 50 percent of the time. Interference contours are F(50,10), indicating 50 percent of the location points, 10 percent of the time. You may specify service or interference field strengths by entering "1" or "2" respectively.

```
F(50,50) (1) OR F(50,10) (2) :  1
```

Next, the FM channel is entered. Valid entries range from 200 to 300.

```
Channel :  220
```

The station power in kiloWatts, center of radiation at Height Above Average Terrain (HAAT) in meters, and distance to contour in kilometers are entered, separated by a space. Upon entry of these values, the calculated field strength in dBu (decibels relative to a millivolt per meter) is displayed. To terminate the program, zeros must be entered for each input.

```
Enter 0 power to stop.
Power (kW), HAAT (m), and distance (km) :  3 50 20.5

Power(kW)  Height(m)  Channel  FS(dBu)  DIST(km)  FIND         Probability    Error
   3.000      50.0      220     57.054   20.500   Fld Strngth    50%

Power (kW), HAAT (m), and distance (km) :  0 0 0

STOP:
```

The program is run again here to demonstrate the computation of distance to contour for a specified field strength.

```
             M A I N     M E N U
Enter number of program to run, 0 to review list:  6

                 FCC's FMTVDX
 Compute distance to contour, or contour at a distance.
 This program is provided by the FCC to the public.
 CDS assumes no liability for this program.

Compute field strength at a given distance (1), or
distance to given field strength (2)? :  2

F(50,50) (1) OR F(50,10) (2) :  1

Channel :  220

Enter 0 power to stop.
Power (kW), HAAT (m), and field strength (dBu) :  3 50 57

Power(kW)  Height(m)  Channel  FS(dBu)  DIST(km)  FIND          Probability     Error
   3.000      50.0     220      57.000   20.564   Distance         50%

Power (kW), HAAT (m), and field strength (dBu) :  0 0 0

STOP:

             M A I N     M E N U
Enter number of program to run, 0 to review list:
```

This program determines the coordinates of a location given a distance and bearing from a reference point. This service is offered at no charge.

First, the reference coordinates are entered. The input may incorporate spaces or commas between degrees, minutes and seconds.

```
        Get Coordinates

This program computes the coordinates of a point specified
by a reference point, bearing, and distance
Enter coordinates as dd,mm,ss, EX: 34,12,47

Enter reference latitude  :  38 52 47
Enter reference longitude :  77 10 18
```

The program requires that the distance between termination and reference points be entered in kilometers. The bearing from the reference coordinates to the termination point is entered on the same line. These values may be separated by either a space or comma.

```
Enter distance (km) and bearing : 113 10
```

The reference position, distance and bearing to termination point are displayed. The program computes the termination coordinates in both decimal and angular units.

```
Reference latitude     38.8797  Reference longitude   77.1717
Distance              113.0000  Bearing               10.0000
End latitude           39.8820  End longitude         76.9413
End latitude         39-52-55   End longitude         76-56-28
```

Upon completion, a prompt allows you to compute additional coordinates or exit the program.

```
(1) Another point with new reference
(2) Another point with same reference
(3) Exit
Choice (1-3) :  3
STOP: User Terminated
```

Choosing the exit option returns the user to the Main-menu.

This program determines the distance and bearing from specified reference and destination coordinates located in the U.S. based on the method prescribed in Section 73.208 of the FCC Regulations. This service is offered at no charge.

First, the reference coordinates are entered followed by the termination coordinates. The input may incorporate spaces or commas between degrees, minutes and seconds.

```
        FCC Distance and Bearing

This program computes the distance and bearing between
two points, assuming both are in the U.S.

Enter coordinates as dd,mm,ss, EX: 34,12,47

Enter reference latitude   :   38 52 47
Enter reference longitude  :   77 10 18
Enter destination latitude :   39 0 0
Enter destination longitude:   77 0 0
```

The program computes the distance in kilometers by U.S. or FCC, and Great Circle methods.

```
Distance is    20.00 kilometers by US/FCC Rules
Distance is    29.98 kilometers by Great Circle
Bearing  is    47.93 degrees from True North
```

Upon completion, a prompt allows you to compute additional distances and bearings or exit the program.

```
(1) Another point with new reference
(2) Another point with same reference
(3) Exit
Choice (1-3) : 3
STOP: User Terminated
```

Choosing the exit option returns the user to the Main-menu.

PRICE LIST

On-Line

Terrain Fetch/Average 3 or 30 Second Data

8 Bearings FM, TV, LM or User Specified Averaging Rules	$10
Additional Bearing (Each) Up To 16	$1
Additional Bearing (Each) Above 16	$.50
Single Bearing (Profile Retrieval)	$2.50
Detailed Terrain Data	$Free
Profile Plot(Not Including Profile Retrieval)	$39

Broadcast Contours

(Terrain Data Is Retrieved According to Above Price Schedule)

First Contour F(50,50) or F(50,10)	$8
Additional Contour F(50,50) or F(50,10)	$4
Population (1990/1980) Within Contour(s), Per Contour	$65/$28
Detailed Population Audit	$Free
Plots (1:250k or 1:500k or 1:1M) Setup Fee	$20
Additional Plot (Same or Different Scale)	$20

FM Study

First Channel		$24
Additional Channels:	1-10	$6
	11-20	$4
	21 & over	$2

Stand Alone Population Count

Per Contour (1990/1980)	$65/$28
Detailed Population Audit	$Free

Within Study   (User Specified Distance)

AM, FM or TV	$12
FCC or FAA Tower	$18

Distance & Bearing/Intercept Calculations	$Free
FCC'S FMTVDX Single Point FCC Field Strength Prediction	$Free

Printing

Handling	$10
Per Page	$0.15

Reports on Magnetic Media

Handling	(PC Compatible)	$10
Handling	(MACINTOSH)	$20
First Disk Per Day (PC or MACINTOSH)		$10
Additional Disk		$5

Mailing

First Class Mail	$2
Federal Express Handling (Billed to Your Account)	$2

Not Available On-Line

Propagation Studies

Non-Broadcast (Land Mobile & Paging) $400

Broadcast (FM & TV) $600

(20% discount for 5 or more Propagation Studies per order.)

FCC Engineering Databases

AM, FM or TV on Floppy Disk (5.25" or 3.5" High or Low
    Density), Magnetic Tape, Unix Cartridge, or
    MACINTOSH Format $200

Additional File (AM, FM or TV) $75

All Three (AM, FM & TV) $350

FCC Tower Survey Data File

On Floppy Disk (5.25" or 3.5" High or Low Density), Magnetic
Tape, Unix Cartridge, or MACINTOSH format, Each File $200

Directional TV Antenna Data File & FAA Tower Data File

On Floppy Disk (5.25" or 3.5" High or Low Density), Magnetic
Tape, Unix Cartridge, or MACINTOSH format, Each File $150

3 Second Terrain Data

Two CD-ROMs containing the entire 48 states, Hawaii, Virgin
Islands, published areas of Puerto Rico, and certain populated
areas of Alaska. Also includes terrain retrieval program, and
subroutines to allow you to interface to your own programs.
Please call before ordering. $3000

East Half $1750

West Half $1750

One Degree Square Block of Data on Floppy Disk(s), Minimum
Order, Five blocks, Must Have Programs to Utilize Data $40

Programs (Included With CD-ROMs), Terrain Retrieval/
Averaging, and Subroutines to Link With Your Programs $400

ORDER FORMS
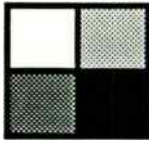
Communications Data Services, Inc.

6105-E Arlington Blvd. • Falls Church, VA 22044 • (703) 534-0034
(800) 441-0034 • Telefax (703) 534-7884 • root @ comm-data.com

PROPAGATION ORDER FORM
Page 1 of 2

1) Complete this page, one per order.
2) Copy page 2 as many times as necessary to complete the technical specification of each propagation prediction you want to order.

Ship to (name and address):   Bill to (name and address):

_____   _____

_____   _____

_____   _____

_____   _____

Phone: _____

Service	Quantity	Item	Amount
Broadcast (FM & TV):	_____	$600	_____
Non-Broadcast (Land Mobile & Paging):	_____	$400	_____
Federal Express Shipping:	_____	$ 20	_____
TOTAL ORDER			_____
DEPOSIT (50% if total is more than $1,000)			_____
BALANCE DUE UPON DELIVERY			_____

REFUNDS:
CDS offers a refund (up to the amount of one propagation prediction) at your request, provided that you return the map postmarked no later than 10 days from our shipment date, and state in writing your reasons for the return.

DEPOSITS:
A 50% deposit is required on orders of $1,000.00 or more. Personal or corporate checks will be accepted.
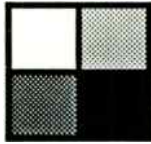
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6105-E Arlington Blvd. • Falls Church, VA 22044 • (703) 534-0034
(800) 441-0034 • Telefax (703) 534-7884 • root @ comm-data.com

PROPAGATION ORDER FORM
Page 2 of 2

System Title: _____

City, State: _____

Frequency (MHz) or Channel: _____

ERP: _____

Radiation Center AGL: _____ (meters or feet) circle which
Site Elevation AMSL: _____ (meters or feet)
Radiation Center AMSL: _____ (meters or feet)

Latitude: _____°_____'_____''

Longitude: _____°_____'_____''

Polarization (H or V): _____

Type of Map   "Real Life" or FCC   (circle which)

"Real Life" predictions are based on a vertically polarized receive antenna, six feet above ground, and show portable indoor, portable outdoor, and automobile reception areas. "FCC" predictions are based on a horizontal receive antenna, 30 feet above ground, and depict 70 dBu and 60 dBu service for FM, and City Grade, Grade A and Grade B for TV.

Predictions normally assume a non-directional antenna radiation pattern. If you have knowledge that your pattern is not circular, you should include a horizontal plane polar pattern for your antenna. CDS will digitize your pattern for use with our propagation model.

CDS CANNOT PROCESS YOUR ORDER
FOR A DIRECTIONAL TRANSMITTING ANTENNA
WITHOUT A HORIZONTAL POLAR PATTERN.