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**SCANNING GRAPHIC DATA USING A PERSONAL COMPUTER**

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## SCANNING GRAPHIC DATA USING A PERSONAL COMPUTER

### ABSTRACT

Graphic data were scanned, vectorized, and converted into the DXF file transfer format by means of an off-the-shelf PC-based system consisting of a Datacopy model 612F scanner, CAD/camera vectorizer (by Autodesk), and autoCAD software used on an IBM-AT. The data were then loaded onto a Prime 9955 minicomputer where the ARC/INFO geoprocessing software was used to convert the files into coverages. This publication outlines the entire procedure used from scanning the initial document to editing the final product. It also includes the FORTFRAN 77 and CPL programs used on the Prime computer that automated much of the processing.

### BACKGROUND

Scanning graphic data is a relatively common procedure for inputting graphic data. However, most purchased scanning systems cost over \$100,000 and do not run on personal computers (PCs). The PC-based system used for this project consisted of a Datacopy model 612F scanner, CAD/camera vectorizer (by Autodesk) and autoCAD software running on an IBM-AT personal computer. This entire system was purchased for approximately \$20,000.

For scanning to be cost-effective, it is necessary to have as little human intervention as possible in the entire process. It takes approximately the same amount of time to scan and process each scanned file; therefore, the reduction in human intervention is especially necessary if a large document is scanned in sections (one section = one file). The programs DOALL.OPL, DOALL2.CPL, and DOALL3.CPL do many of the repetitive tasks on the Prime computer (see appendix).

The following procedure is used for scanning a document with the Datacopy 612F scanner and converting it into an ARC/INFO coverage on the Prime computer.

1. Prepare document for scanning.
2. Datacopy - scans document,
3. CAD/camera - vectorizes scanned image.
4. AutoCAD - creates readable ASCII file of coordinates.
5. Kermit - moves file(s) to Prime computer.
6. Program DOALL.CPL - creates coverage from coordinates.  
Use digitizer to add tics to scanned document (if necessary).  
Create clipboxes (if necessary).  
Use ARCEDIT to add tics to newly created coverages.
7. Program DOALL2.CPL - transforms the coverage to Lambert conformal projection - use if the document was scanned in one piece.
8. Program DOALL3.CPL - transforms each coverage to Lambert conformal projection and appends the sections into one coverage if the document was scanned in sections.  
Use ARCEDIT to clean up the coverage.  
Add labels (if required).

The above steps are elaborated in the following sections.

#### APPROPRIATE MATERIAL. FOR SCANNING

1. The most appropriate documents for scanning are those containing deuse line or polygon data. The most suitable lines for scanning are lines that are relatively long and nonlinear.
2. If lines require the attachment of ID numbers, it is questionable whether there is any time-saving benefit to scanning them as opposed to digitizing them. If it is necessary to attach TD numbers to a scanned document, the easiest and quickest method is to use a table matching the existing ID to the desired ID and then use the ARC command JOINITEM, rather than to change the ID numbers one by one in ARCEDIT.
3. Polygon labels have to be added separately whether the document is scanned or digitized, so their existence does not affect the decision regarding scanning.
4. Point coverages are not appropriate for scanning.

#### PREPARATION OF DOCUMENT FOR SCANNING

1. If necessary, trace the document, putting each layer of data on a separate mylar.
2. Red ink or pencil will not scan well. Therefore, this color is useful for writing on the document if it is used very lightly. Blue and black are detected by the scanner in a similar way. Ball-point pen, felt markers, and pencil lead scan similarly.
3. Lines should be dark and uniform. When tracing a document, use a per; or pencil which makes consistent, solid, dark lines. Thin or light places in the lines will appear as holes after the processing is complete, These holes are often not evident in either the Datacopy image or the CAD/camera image. This attention to line quality becomes more important as the camera is used farther from the document, i.e., on larger documents.
4. The largest document that can be scanned in one piece is 12 , 19 inches. If it is necessary to scan a document in pieces, it can be sectioned off by using opaque white paper and removable Scotch tape or by using adjacent clipboxes on the Prime computer. The clipboxes would be the faster way if much material was being scanned. Indicate the placement of the divisions with small pencil marks on the edge of the document. These marks aid rapid and accurate placement of the paper masks or indicate the area accurately if clipboxes will be used.
5. If the document is scanned in sections, each section must have at least four tics that are scanned. These are most conveniently placed within the document (rather than at the edges). If the tics are placed at the edges, CLIP may remove them. Add them as +'s on the document before it is scanned and place them in relatively open areas so that they can easily be removed later. This placement also facilitates scanning since the edges of the document tend to cause the most problems when cleaning up the final product.
6. Care taken on the preparation of the document and the scanning of the document eliminates much of the final cleanup work and saves lots of time.

## USING THE DATACOPY SCANNER

1. Use a white piece of cardboard under the document to increase the contrast between the lines and the background.
2. Hold down the document with magnets placed at the edges or with a piece of glass. The glass is preferable since it forces the center of the document to be flat.
3. To adjust the sensitivity of the scanner, initially scan the document on the 'auto' setting. Then change to 'manual', decrease the number by 10%, and rescan. By adjusting this number and using as small a number as possible, much of the later cleanup work of 'black areas' can be avoided, especially at the edges. This same number can be used for similar documents (if the scanner height is kept constant) so that it doesn't have to be determined for each item.
4. The Fi key can be used to adjust the limits of the saved image and eliminate some of the 'dirt' on the edges. You want to have as little 'dirt' or dark places as possible since this takes a very long time to vectorize and isn't wanted anyway.
5. To run Datacopy, type RUN900.
6. Save the image, using a consistent naming convention.
7. The saved image is stored at \IMAGES and has the extension IMG.

## USING THE CAD/CAMERA VECTORIZING SOFTWARE

1. No clean-up or adjusting is done here. The .IMG file is just vectorized and turned into a .DXB file.
2. CAD/camera can be run in interactive mode or batch mode. Batch mode eliminates drawing the image on the monitor and answering the questions associated with it. Also, more than one drawing can be submitted to batch mode at one time. It is convenient to run batch mode overnight? a dense image can take more than half an hour to vsctorize.
2. To run the files in batch mode, type:  
CD \CC (get to the appropriate directory)  
CCAM -b \IMAGES\FILE1.IMG \IMAGES\FILE2.IMG \IMAGES\FILE3.IMG  
(It is mandatory that a lowercase 'b' be used.)
3. The vectorized output is stored at \CC\FILE#.DXB.

## USING AUTOCAD

1. All attempts at edgematching in autoCAD were unsuccessful. The problem is that there isn't only horizontal or vertical adjustment of the images or adjustment of different-sized images to contend with. There is also an angular rotation of the images, and this is particularly difficult to adjust accurately. (All of these problems are easily and automatically handled by the ARC/INFO software when the tics are accurately entered.)
2. To run autoCAD: CD \ACAD (reach appropriate directory)  
ACAD (start autoCAD)

### 3. Steps in autoCAD

Choose option .1 Begin a NEW drawing

Name the drawing the same as the vectorised image - with no extension

Use command DXBIN

Filname is \CC\FILE.DXB

Use command DXFOUT

New file is at \ACAD\FILE.DXF

Don't save the file when you quit

DUIT and go back to 'create new file' for each file so

that each file is treated separately rather than overlain

Q to exit autoCAD

### MOVING THE .DXF FILES FROM THE IBM-AT TO THE PRIME COMPUTER

1. Copy the DXF -files onto a diskette,

2. Use Kermit to move the files to the Prime computer. On the Prime computer, be in the user file directory (ufd) you will be working in when doing further processing of the documents. This new ufd is most easily set up by copying SWS>SINCLAIR>TOGLS.DIR>SCANNING.DIR to your new ufd name. This ufd contains the programs that will be needed on the Prime computer. It also contains a documentation file.

### CONVERTING THE .DXF FILE TO AN ARC/INFO COVERAGE

1. Run the program DOALL.CPL by typing

R DOALL filename (coverage.DXF file without the .DXF)

This program will input the .DXF file and output coverages named coverage, coverageCL, and TICMAP. The coverage TICMAP was specially created to contain all the statewide tics, with numbers 1-4 having been renumbered. This was necessary because the ARC SENERATE command uses tic numbers 1-4.

2. Add tics to coverageCL in ARCEDIT at the tic locations. For statewide tics, use the same tic number as on the topo map. For added tics that were penciled in, it is mandatory that the tic numbers be unique and that they be five-digit numbers beginning with 99 so that they will not conflict with the statewide tic numbers. CoverageCL is in digitizer inches at this stage.

3. Add tics to TICMAP. Use the same numbers and relative locations as were used for the tics in step 2 above. TICMAP is in Lambert conformal projection.

4. If the document was scanned in one piece, run the program DOALL2.CPL, which will transform the coverage. The coverage is now ready to be cleaned up with ARCEDIT.

5. If the document was scanned in sections, the clipboxes must be created before running DOALL3.CPL. When naming the clipboxes, name them the same as the coverage that will be clipped, but add the extension BND to the CLIP coverage name.

6. Run the program DOALL3.CPL by typing:

```
R DOALL.3 cover1 cover2 cover3 cover4
```

This program will transform all coverages from digitizer inches to Lambert conformal projection (transform coverageCL to coverageLM) and append the coverages with the creation of APPEND.COV.

#### TIDYING UP THE ARC/INFO COVERAGE APPEND.COV

1. Use CLEAN with a dangle distance of .05 (digitizer inches) to remove some of the dirt - done by the program DOALL.CPL.
2. Use ARCEDIT to remove the lines that indicated the placement of the tics - SEL BOX is helpful here.
3. Use the ARCEDIT command EXTEND to lengthen any lines that don't quite meet - done by the program DOALL2.CPL.
4. The major problem with CAD/camera is that it doesn't completely vectorize all the intersections containing non-perpendicular lines. It leaves 'holes' at these intersections. These 'holes' can be patched up with the snapping commands in ARCEDIT:

- A. Create a point: cover over the holes

```
BACK-COVER the appended cover
CREATE pointcov appended cover (for tics)
EDHC pointcov
EDITF label
ADD (add points at the 'holes' )
    (Use zoom to locate precisely)
SAVE (the pointcov)
```

8. Snap the appended cover to the places on the point

```
cover
EDITC appended cover containing the holes
EDITF arc
SNAPC pointcov
SNAPFEATURES ARC LABEL (this order)
SNAPPING CLOSEST 50 (mapscale 24,000)
SELECT ALL (arcs)
SNAP
```

(use OOPS if there is a lot of distortion and then reenter the SNAPPING command using a smaller number.)

5. Tidy up all gaps (sometimes present in polygons) and other problems that need to be corrected.
6. Check that all nodes are correctly placed and correct them (especially necessary if a line coverage is to have data attached to particular line segments).
7. Add ID numbers if required. Line ID numbers would probably be added most quickly by making a table of the existing ID and the desired ID and then using JOINITEM rather than changing each one in ARCEDIT or INFO.
8. Edgematching doesn't seem to be much of a problem. Precise masking of the edges using paper strips during scanning or using clipboxes at a later time seems to allow the fuzzy tolerance to snap the nodes together.

## SUGGESTIONS

1. Each document that is scanned in sections should be processed in a separate ufd and the finished appended coverage copied over when the processing is complete, This eliminates the problems associated with the coverages having non-unique names which are created by the programs DOALL.CPL and DOALL3.CPL.

## BRIEF TYPING INSTRUCTIONS

1. SCANNING USING Datacopy  
RUN900 A??nywhere on AT)  
ESC key gets you out of most troubles  
Location of raster images: \IMAGES\FILE. IMG
2. VECTORIZING USING CAD/camera  
D9\CC (location of software)  
CCAM -b \IMAGES\FILE1.IMG \IMAGES\FILE2.IMG \IMAGES\FILE3.IMG  
Location of vector binary files: \CC\FILE.DX8
3. CREATING ASCII FILE OF COORDINATES WITH autoCAD  
CD \ACAD (location of software)  
ACAD  
1 (option 1 on menu - create NEW drawing)  
FILENAME (name of new file without an extension)  
DXBIN (name of command)  
\CC\FILE.DXB (file coming in)  
ZOOM ALL (optional - to look at entire file)  
DXFOUT (name of command)  
Press return (already gave it the filename)  
Press return (save it with default option)  
QUIT (exit to menu)
4. CREATE COVERAGE FROM COORDINATES  
COPY SWS>SINCLAIR >TOOLS.DIR>SCANNING NEWUFD  
(get the necessary programs and coverages)  
You will be doing all work in NEWUFD  
Use Kermit and get the FILE.DXF files  
R DOALL FILENAME (without the .dxf)  
FILENAME.DXF (when asked for)  
Name of coverage created: FILENAMECL  
(done for each DXF file)
5. ADD TICS TO NEWLY CREATED COVERAGE USING ARCDIT  
Use zoom and add tics at the +'s used to indicate the tics  
Use. the coverage FILENAMECL
6. ADD TICS TO SCANNED DOCUMENT IF NECESSARY  
Use the coverage TICMAP for this



7. CREATE THE CLIPBOXES IF NECESSARY  
Use SETQUAD.CPL to get the topomap boundary  
R GETQUAD QUAD# QUADLETTER - produces 'quadcover'  
Use CLIPBOX.CPL to produce the clipboxes from 'quadcover'  
R CLIPBOX quadcover OUTCOVER ID#
8. TRANSFORM THE COVERAGE TO. LAMBERT CONFORMAL AND APPEND IF  
REQUIRED  
R DOALL2 COVER (document scanned in one piece)  
R DOALL3 COVER1 COVER2 COVER2 COVER4 (scanned in sections)  
Name of coverage created: APPEND.COV
9. USE ARCEDIT TO CLEAN UP THE COVERAGE  
Use the coverage APPEND.COV  
Remove the +'s indicating the tics  
Fill in gaps at intersections or within arcs  
Add missing lines
10. ADD LABELS IF NECESSARY

APPENDIX

DOALL.CPL (PROGRAM #1)

```
/* USAGE OF THIS PROGRAM: R DOALL coverage
/*
/* (THE coverage NAME IS THE .DXF FILE NAME WITHOUT THE '.DXF')
/*
/* THIS PROGRAM MUST BE RUN FOR EACH coverage.DXF FILE
/*
/* THE COVERAGE NAME IS CARRIED ALL THE WAV THROUGH, USING DIFFERENT
/* EXTENSIONS TO DENOTE THE DIFFERENT PRODUCTS. THEREFORE,
/* THE COVERAGE NAME MUST BE 10 CHARACTERS OR LESS
/*

/* INPUT: THE .DXF FILE FROM AUTOCAD
/*
/* OUTPUT: %COVERAGE% - UNCLEANNED COVERAGE, RAW DATA
/*          %COVERAGE%.CL - CLEANED COVERAGE WITH .DXF CONTENT
7*          TICMAP - TICS FOR SCANNED DOCUMENT WILL BE PUT INTO HERE
/*          %COVERAGE%GEN.CPL - A PROGRAM CREATED AND RUN DURING
/*                               THIS PROGRAM
/*

/* PURPOSE OF THIS PROGRAM:
/* 1. REFORMATS THE .DXF FILE INTO A FORM WHICH CAN BE READ BY
/*    ARC 'GENERATE'. IT ALSO ADDS THE COMMANDS SO THAT ARC
/*    'GENERATE' CAN BE RUN. THIS OUTPUT IS CALLED:
/*    %COVERAGE%.GEN.CPL
/* 2. RUNS THE PROGRAM %COVERAGE%.GEN.CPL AND THIS CREATES THE
/*    COVERAGE CALLED %COVERAGE%
/* 3. CLEANS THE COVERAGE TO REMOVE 'DIRT'
/*    ( %COVERAGE% BECOMES %COVERAGE%.CL )
/* 4. BUILDS THE COVERAGE TO CREATE THE LINES
/* 5. CREATES THE COVERAGE TICMAP - THIS COVERAGE WILL BE USED IF
/*    ADDITIONAL TICS WERE DRAWN INTO THE SCANNED DOCUMENT
/*
/*
/* ***** PROGRAMMING NOTES
/* EACH CPL PROGRAM THAT IS RUN MUST END IN &RETURN
/* EACH CPL PROGRAM THAT IS RUN MUST NOT HAVE &TTY IN IT
/* EACH &DATA MUST BE PAIRED WITH AN &END
/*

&ARGS COVERAGE
COMO %COVERAGE%.COMO
/* CREATES A FILE CONTAINING THE COVERAGE NAME SO THAT THE
/* FORTRAN PROGRAM CAN GET THE COVERAGE NAME
```

```

/*
&DATA ED
ED INFILENAME

PO1
D
1 %COVERAGE%.DXF
FILE INFILENAME
&END
/* DXFARC.F77 INPUTS THE FILE coverage.DXF AND
/* CREATES THE PROGRAM coverage.BEN.CPL
/*RESUME F77 DXFARC
RESUME DXFARC
&DATA ARC
/* THE PROGRAM coverage.GEN.CFL IS RUNNING GENERATE
RESUME %COVERAGE%.GEN.CPL
CLEAN %COVERAGE% %COVERAGE%. CL .05 .002
/* ELIMINATES THE 'DIRT' BUILD %COVERAGE%.CL LINE
/* CREATES LINES
/* LAMBERT CONTAINS THE STATEWIDE TICS
/* BUT HAS HAD TIC NUMBERS 1 - 4 RENUMBERED. THIS IS
/* NECESSARY BECAUSE THE ARC GENERATE COMMAND AUTOMATICALLY
/* CREATES TICS AND NUMBERS THEM 1, 2, 3, 4. THIS RENUMBERING
/* ENABLES THE ARC COMMAND 'TRANSFORM7' TO WORK CORRECTLY LAIER ON.
/* COPY LAMBERT TICMAP &TTY &END COMO -E

```

DOALL2.CPL (PROGRAM #2)

```
/* THIS PROGRAM IS USED WHEN THE DOCUMENT WAS SCANNED AS
/* ONE ENTIRE PIECE - RATHER THAN IN SECTIONS

/* TO USE THIS PROGRAM:
/* R DOALL2 COVER
/*
/*
/* PURPOSE OF THIS PROGRAM:
/* THIS IS RUN AFTER THE TICS HAVE BEEN MANUALLY ADDED
/* TO THE %COVERAGE%.CL
/* 1. COPIES TICS FROM TICMAP TO THE %COVERAGE%. LM COVERAGE
/* 2. TRANSFORMS THE SCANNED COVERAGE TO LAMBERT CONFORMAL
/* (TRANSFORMS %COVERAGE%. CL TO %COVERAGE%. LM )
/* 3. COPIES %COVERAGE%.LM TO FINAL.COV
/* 4. CREATES SOME NODES WHERE THE LINES WERE SCANNED TOO SHORT
/*
/*
/* INPUT: THE SCANNED COVERAGE WHICH HAD THE TICS MANUALLY
/* ADDED ( %COVERAGE%.CL )
/*
/* OUTPUT: FINAL.COV
/*
/*
/* COMO DOALL2.COMO
/* &ARGS COVER
/* &DATA ARC
/*
/* GET TICS FROM TICMAP AND CREATE %COVERAGE%.LM
/*
/* COPY TICMAP %COVER%.LM
/*
/* CHANGE THE COVERAGES FROM DIGITIZER INCHES TO APPROPRIATE PROJECTION
/*
/* TRANSFORM %COVER%.CL %COVER%.LM
/*
/*
/* THE 'COPY' IS DONE SO THAT THIS PROGRAM IS SIMILIAR TO DOALL3.CPL
/* COPY %COVER%.LM FINAL.COV
/* BUILD FINAL.COV LINE
/*
/*
/* CREATE NODES WHERE THE LINES HAVE BEEN CREATED TOO SHORT,
/* CREATES INTERSECTIONS THAT SHOULD EXIST BY EXTENDING THE LINES
/* SLIGHTLY
```

```
/*
ARCEDIT
EDITC FINAL.COV
EDITF ARC
3EL ALL
EXTEND 20
SAVE
QUIT
/*
/*
/*   CREATES A PLOT OF FINAL.COV AND SENDS IT TO THE PLOTTER
/*   SO THAT IT CAN BE COMPARED TO THE SCANNED DOCUMENT AND
/*   CORRECTIONS MADE
/*
ARC PLOT
DISPLAY 1039
#FINAL.COV
MAPEXTENT FINAL.COV
MAPUNITS FEET
MAPSCALE 24000
MAPPOSITION LL 2 2
/*
LINECOLOR 1
ARCS FINAL.COV
MARKERCOLOR 3
TEXTCOLOR 3
TICS FINAL.COV IDS
QUIT
WPLOF #FINAL.COV
/*
/*
&TTY
&END
COMO -E
```

DOALL3.CPL (PRGGRAM #2)

```
/*
/* THIS PROGRAM IS USED IF THE DOCUMENT WAS SCANNED IN SECTIONS
/*
/*
/* TO USE THIS PROGRAM:
/*     R DOALL3 COVER1 COVER2 COVER3 COVER4 (WITHOUT .CL)
/*
/*
/* PURPOSE OF THIS PROGRAM:
/*     THIS IS RUN AFTER THE TICS HAVE BEEN MANUALLY ADDED
/*     TO TICMAP AND TO THE %COVERAGE%.CL COVERAGES
/*     1. COPIES TICS FROM TICMAP TO THE %COVERAGE%.LM COVERAGES
/*         AND CREATES THE %COVERAGE%.LM COVERAGES
/*     2. TRANSFORMS ALL SCANNED COVERAGES TO LAMBERT CONFORMAL
/*         ( TRANSFORMS %COVERAGE%. CL TO %COVERAGE%.LM )
/*     3. CLIPS %COVERAGE%. LM TO CREATE %COVERAGE%. CC
/*     4. APPENDS THE TRANSFORMED, CLIPPED COVERAGES
/*         TO CREATE FINAL.COV
/*     5. BUILDS THE APPENDED COVERAGE
/*     6. CREATES SOME NODES WHERE THE LINES WERE SCANNED TOO SHORT
/*
/*
/* INPUT:  SCANNED COVERAGES (UP TO FOUR)
/*
/* OUTPUT: FINAL.COV - APPENDED COVERAGE SLIGHTLY CLEANED UP
/*
/*
COMO DOALL3.COMO
&ARGS COVER1; COVER2; COVER3; COVER4
&DATA ARC
/*
/* COPY TICMAP TO THE %COVERAGE%.LM COVERAGES
/* THESE ARE EMPTY COVERAGES; THE TICS ARE NEEDED FROM TICMAP
/*
COPY TICMAP %COVER1%.LM
COPY TICMAP %COVER2%.LM
COPY TICMAP %COVER3%.LM
COPY TICMAP %COVER4%.LM
/*
/* CHANGE THE COVERAGES FROM DIGITIZER INCHES TO LAMBERT PROJECTION
/*
TRANSFORM %COVER1%.CL %COVER1%.LM
TRANSFORM %COVER2%.CL %COVER2%.LM
TRANSFORM %COVER3%.CL %COVER3%. LM
TRANSFORM %COVER4%.CL %COVER4%.LM
/*
/*
```

```

/* CLIP THE SCANNED SEGMENTS SO THAT EDGES MATCH
/*
CLIP %COVER1%.LM %COVER1%BND %COVER1%.CC LINE
CLIP %COVER2%.LM %COVER2%BND %COVER2%.CC LINE
CLIP %COVER3%.LM %COVER3%BND %COVER3%.CC LINE
CLIP %COVER4%.LM %COVER4%BND %COVER4%.CC LINE
/*
/*
/* CREATE ONE COVERAGE FROM THE MAP WHICH WAS SCANNED IN SECTIONS
/*
APPEND FINAL.COV LINE
%COVER1%.CC
%COVER2%.CC
%COVER3%.CC
%COVER4%.CC
END
/*
BUILD FINAL.COV LINE
/*
/* CREATES INTERSECTIONS THAT SHOULD EXIST BY EXTENDING THE LINES
/* SLIGHTLY
/*
ARCEDIT
EDITC FINAL.COV
EDITF ARC
SEL ALL
EXTEND 20
SAVE
QUIT
/*
/*
/* CREATES A PLOT OF FINAL.COV AND SENDS IT TO THE PLOTTER
/* SO THAT IT CAN BE COMPARED TO THE SCANNED DOCUMENT AND
/* CORRECTIONS MADE
ARC PLOT
DISPLAY 1039
#FINAL.COV
MAPEXTENT FINAL.COV
MAPUNITS FEET
MAPSCALE 24000
MAPPOSITION LL 2 2
/*
LINECOLOR 1
ARCS FINAL.COV
MARKERCOLOR 3
TEXTCOLOR 3
TICS FINAL.COV IDS
QUIT
WPLOT #FINAL.COV
/*
/*
&TTY
&END
CCMD -E

```

DXFARC.F77 (RUN BY DOALL.CPL)

```
C REFORMATS THE .DXF FILE INTO A .GEN.GPL PROGRAM
C
C THIS TAKES THE .DXF FILE CREATED BY THE AUTOCAD DXFOUT COMMAND
C AND REFORMATS IT INTO A PROGRAM THAT INCLUDES BOTH THE DATA
C REFORMATTED INTO A FORM WHICH 'GENERATE' CAN USE, AS WELL AS
C THE NECESSARY COMMANDS TO RUN THE ARC COMMAND 'GENERATE'.
C THIS PROGRAM IS CALLED XXXX.GEN.CPL.
C (THE XXXX COMES FROM THE XXXX.DXF WHICH IS ENTERED IN)
C THE 'XXXX' HAS A LIMIT OF 10 CHARACTERS BECAUSE THIS NAME WILL
C BE CARRIED THROUGH THE ENTIRE PROCESS AND THE EXTENSION .CL WILL
C BE ADDED TO IT WHEN THE COVERAGE IS CLEANED.
C
C THIS ONLY WORKS ON THE AUTOCAD ENTITIES 'LINE' AND 'POLYLINE'7
C SINCE IT SEEMS THAT THE SCANNER AND CAD/CAMERA WILL PUT ALL
C LINE DATA INTO THESE TWO ENTITIES
C
C CHARACTER INPUT*10,XHOLD*10,YHOLD*10, COVERAGE*10
C CHARACTER DXFFILE*15, CPLFILE*19
C INTEGER ID,L,M,N
C
C GET THE .DXF FILENAME FROM FILE CALLED INFILENAME
C OPEN (UNIT=9,
X FILE='INFILENAME',
X STATUS='OLD')
77 READ (9,77) DXFFILE
12 FORMAT(A15)
CONTINUE
M = 2
N = 5
L = M - 1
11 CONTINUE
IF (DXFFILE(M:N) .EQ. '.DXF') THEN
CPLFILE = DXFFILE (:L)// '.GEN.CPL'
COVERAGE = DXFFILE (:L)
GOTO 10
ELSE
N = N + 1
M = M + 1
L = M - 1
GOTO 11
ENDIF
C
C
```



```

10    CONTINUE
      OPEN (UNIT=30,
X FILE=DXFFILE,
X      STATUS='OLD')
      OPEN (UNIT=81,FILE=CPLFILE)
      WRITE (81,61)
61    FORMAT ( '&DATA ARC' )
      WRITE (81,62)COVERAGE
62    FORMATS ( 'GENERATE ' , A10 )
      WRITE (81,63)
63    FORMAT ( 'LINES' )
      ID = 0
1     CONTINUE
      READ (30,50,END=99)INPUT
50    FORMAT(A10)
      IF (INPUT .EQ. 'POLYLINE') THEN
      ID = ID + 1
      WRITE (81,66) ID
66    FORMAT (17)
      GOTO 400
      ENDIF
      IF (INPUT .EQ. 'LINE ') THEN '
      ID = ID + 1
      WRITE (81,66)ID
      GOTO 500
      ELSE
      GOTO 1
      ENDIF
400   CONTINUE
C
C     THIS WRITES THE X AND Y COORDINATES FOR POLYLINE
C     THE 'X COORD' ALWAYS FOLLOWS A '10' .
C     THE 'Y COORD' ALWAYS FOLLOWS A '20'
C     THERE CAN BE MANY PAIRS OF X AND Y
C
      READ (30,50,END=99)INPUT
C     'SEQUEND' SIGNIFIES THE END OF A POLYLINE
      IF (INPUT .EQ. 'SEQUEND') THEN
      WRITE (81,67)
67    FORMAT ( 'END' )
      GOTO 1
      ENDIF
C

```

```

        IF (INPUT .EQ. 10') THEN
            READ (30,50,END=99) INPUT
            XHOLD = INPUT
C         THE FIRST READ IS THE '20'
C         THE SECOND READ IS THE 'Y COORD'
            READ (30,50,END=99) INPUT
            READ (30,50,END=99) INPUT
            YHOLD = INPUT
            WRITE (81,64) XHOLD, YHOLD
64      FORMAT(A10, ', ', A10)
            GOTO 400
        ELSE
            30TG 400
        ENDIF
500     CONTINUE
C
C     THIS WRITES THE X AND Y COORDINATES FOR A LINE
C     THE 'X COORD' ALWAYS FOLLOWS A '10'
C     THE 'Y COORD' ALWAYS FOLLOWS A '20'
C     THE SECOND 'X COORD' ALWAYS FOLLOWS A '11'
C     THE SECOND 'Y COORD' ALWAYS FOLLOWS A '21'
C
C     THERE ARE ONLY 2 PAIRS OF COORDINATES FOR A LINE
C
        READ (30,50,END=99) INPUT
        IF (INPUT .EQ. '10') THEN
            READ (30,50,END=99) INPUT
            XHOLD = INPUT
            READ (30,50,END=99) INPUT
            READ (30,50,END=99) INPUT
            YHOLD = INPUT
            WRITE (81,64) XHOLD, YHOLD
            READ (30,50,END=99) INPUT
            READ (30,50,END=99) INPUT
            XHOLD = INPUT
            READ (30,50,END=99) INPUT
            READ (30,50,END=99) INPUT
            YHOLD = INPUT
            WRITE (81,64) XHOLD, YHOLD
            WRITE (81,69)
            GOTO 1
        ELSE
            GOTO 500
        ENDIF
        GO TO 1

```

```
99      CONTINUE
        WRITE (81,57)
C       WRITE (81,69)
69      FORMAT ( 'END' )
        WRITE (81, 70)
70      FORMAT ( 'QUIT' )
        WRITE (81,72)
72      FORMAT ( '&END' )
        WRITE (81,73)
73      FORMAT ( '&RETURN' )
        WRITE (1,100) CPLFILE
100     FORMAT (  A19, 'ALL DONE' )
        END
```

GETQUAD.CPL

```
/*
/*
/*   THIS PROGRAM GETS THE BOUNDARY OF THE DESIRED TOPO HAP
/*   (FOR   EXAMPLE:   233A)
/*
/*   10 RUN IT:   R GETGUAD 233 A   (FOR EXAMPLE)
/*
/*   OUTPUT:   A COVERAGE NAMED   QUAD233A   (FOR EXAMPLE)
/*
&ARGS QUADNUMBER; QUADLETTER
&S TEXT := [QUOTE %QUADLETTER%]
COMO GETBND.COMO
&DATA ARC
RESELECT SWS>SINCLAIR>TOOLS. DIR>QUAD7.5 QUAD%QUADNUMBER%%QUADLETTER% POLY
RES QUAD-15 = %QUADNUMBER% AND QUADRANT-CAPS = %TEXT%
N
N
/*
Q
&TTY
&END
COMO -E
```

CLIPBOX.CPL

```
/*
/*
/* THIS PROGRAM IS RUN AFTER GEIQUAD.CPL. IS RUN AND AFTER
/* THE LINES AND POLYIDS FOR THE CLIPBOXES HAVE BEEN ADDED
/* TO QUADXXXX (WHICH WAS PRODUCED BY GEIQUAD.CPL)
/*
/* THIS PROGRAM IS RUN FOR EACH DESIRED CLIPBOX
/*
/* TO RUN IT: R CLIPBOX QUADXXXX OUTCOVER POLYID
/* 'OUTCOVER' NAME SHOULD BE THE SAME AS DXF FILE
/*
/* OUTPUT: COVERAGE OUTCOVERBND (END IS ADDED TO ALL OF THEM)
/*
&ARGS INCOVER; OUTCOVER; POLYID
COMO CLIP%OUTCOVER%.COMO
&DATA ARC
RESELECT %INCOVER% %OUTCOVER%BND POLY RES %INCOVER%-ID = %POLYID%
N
N
/*
Q
&TTY
&END
COMO -E
```

DOCUMENTATION FOR SWS>SINCLAIR>TOOLS.DIR>SCANNING.DIR

THIS UFD CONTAINS THE PROGRAMS AND COVERAGE USED FOR CONVERTING A .DXF FILE INTO A COVERAGE, TRANSFORMING IT TO LAMBERT CONFORMAL AND APPENDING THE COVERAGES IF THE DOCUMENT WAS SCANNED IN SECTIONS (THE .DXF FILE ORIGINATED AS A SCANNED DOCUMENT)

TO USE THESE PROGRAMS, COPY OVER THE ENTIRE UFD AND LOAD YOUR DXF FILES DIRECTLY INTO THE NEW UFD

PROGRAMS AND COVERAGE LOCATED HERE - WHAT THEY DO

- DOALL.CPL - CONVERTS EACH XXX.DXF FILE TO AN ARC/INFO COVERAGE IN DIGITIZER INCHES
- DOALL2.CPL - USED ON DOCUMENTS THAT WERE SCANNED IN ONE PIECE IS USED AFTER TICS ARE ADDED TO XXX.CL AND TICMAP TRANSFORMS COVERAGE TO LAMBERT CONFORMAL FINAL PRODUCT IS CALLED FINAL.COV
- DOALL3.CPL - USED ON DOCUMENTS SCANNED IN UP TO 4 PIECES USED AFTER TICS ARE ADDED TO XXX.CL AND TICMAP TRANSFORMS ALL COVERAGES TO LAMBERT CONFORMAL APPENDS ALL COVERAGES INTO FINAL.COV
- INFILENAME - USED TO HOLD A FILENAME SO THAT DOALL.CPL CAN BE RUN IN BATCH
- DXFARC.F77 - CONVERTS THE XXX.DXF FILE TO XXX.GEN.CPL XXX.GEN.CPL CONTAINS BOTH DATA AND THE ARC GENERATE COMMANDS  
THIS PROGRAM IS RUN BY DOALL.CPL
- GETQUAD.CPL - GETS THE QUAD BOUNDARY, USED WHEN CREATING THE CLIPBOXES
- CLIPBOX.CPL - CREATES CLIP BOXES FROM THE COVERAGE CREATED BY GETQUAD.CPL
- LAMBERT - A COVERAGE WHICH CONTAINS THE STATE WIDE TICS BUT HAS HAD TICS 1, 2, 3, 4 RENUMBERED SO THAT TRANSFORM WILL WORK CORRECTLY

STEPS IN THE ENTIRE PROCEDURE (SCANNING TO APPENDED COVERAGE)

- A. DATACOPY SCANNER PRODUCES A XXX.IMG FILE LOCATED AT >IMAGES ON THE IBM-AT
- B. CAD/CAMERA VECTORIZES THE XXX.IMG FILE AND PRODUCES THE FILE XXX.DXB. LOCATED AT >CC ON THE IBM-AT
- C. AUTOCAD CREATES THE LIST OF READABLE COORDINATES BY CHANGING THE XXX.DXB FILE (BINARY) TO A XXX.DXF FILE (ASCII). THIS XXX.DXF FILE IS THEN USED WITH THE PROGRAMS FOUND HERE

D. MOVE THE XXX.DXF FILES TO THE PRIME COMPUTER.

IT IS SUGGESTED THAT A SEPARATE UFD BE USED FOR EACH DOCUMENT THAT WAS SCANNED IN ONE PIECE OR FOR. EACH DOCUMENT THAT WAS SCANNED IN SECTIONS AND THAT THE FINAL PRODUCT - FINAL.COV - THEN BE COPIED 001. THE UFD CAN'T BE REUSED BECAUSE COVERAGES ARE CREATED WITH NON-DISTINCT NAMES.

E. PUN DOALL.CPL

TO RUN THIS PROGRAM:

TYPE: R DOALL XXX (XXX IS DXF FILE WITHOUT .DXF)

DOALL.CPL THEN RUNS THE FOLLOWING PROGRAMS;

DXFARC.F77 WHICH REFORMATS THE .DXF FILE INTO A FORM WHICH ARC GENERATE CAN USE. IT ALSO CONTAINS THE COMMANDS FOR RUNNING GENERATE. THIS OUTPUT IS CALLED XXX.SEN.CPL

XXX.GEN.CPL IS WRITTEN BY DXFARC..F7? AND IS USED TO GENERATE THE COVERAGE

THE COVERAGE IS CLEANED AND BUILT

THE COVERAGE LAMBERT IS COPIED INTO TICMAP. TICS THAT WERE ADDED TO THE SCANNED DOCUMENT WILL BE ADDED TO THIS COVERAGE.

FILES AND COVERAGES THAT WILL BE PRESENT AFTER DOALL.CPL IS RUN

XXX.DXF THE ORIGINAL DATA

XXX.GEN.CPL COORDINATES REFORMATTED SO THAT GENERATE CAN USE THEM, IT ALSO CONTAINS THE COMMANDS FOR GENERATE.

XXX COVERAGE CREATED BY GENERATE

XXXCL CREATED BY CLEAN FROM XXX

TICMAP EHPTY COVERAGE COPIED FROM LAMBERT, THE TICS ADDED TO THE SCANNED DOCUMENT WILL BE ADDED TO THIS COVERAGE - ESPECIALLY USEFUL WHEN A DOCUMENT IS SCANNED IN SECTIONS

F. MANUALLY ADD TICS TO BOTH COVERAGES -

1. - THE SCANNED COVERAGE IN DIGITIZER INCHES

USE ARCDIT TO ADD TICS TO XXXCL

2 - THE TICMAP COVERAGE WHICH THE SCANNED DOCUMENT WILL BE TRANSFORMED INTO

USE THE DIGITIZER TO ADD TICS TO TICMAP FROM THE SCANNED DOCUMENT (IF NECESSARY)

G. CREATE THE CLIPBOXES -

USE GETQUAD.CPL TO GET THE BOUNDARY OF THE TOPO MAP

R GETQUAD QUAD# QUADLETTER

USE ARCDIT TO SPLIT IT UP AND TO LABEL IT

CLEAN THE COVERAGE

USE CLIPBOX.CPL TO CREATE THE CLIPBOXES

R CLIPBOX INCOVER OUTCOVER ID#

INCOVER IS THE COVERAGE CREATED BY GETQUAD.CPL

NAME THE OUTCOVERS TO MATCH THE DXF FILES

THE PROGRAM WILL ADD 'BND' TO EACH COVERNAME

ID# IS THE LABEL ASSIGNED IN ARCDIT

THE CLIPBOXES MUST BE NAMED XXXBND (NO .) SO THAT THEY CAN BE USED IN THE PROGRAM DOALL3.CPL

(IF MUCH SCANNING IS TO BE DONE, IT WOULD BE ADVANTAGEOUS TO CREATE ALL THE CLIPBOXES AT THE SAME TIME.)

- H. RUN DOALL2.CPL OR DOALL3.CPL  
DOALL2.CPL - USED IF DOCUMENT SCANNED IN ONE PIECE  
DOALL3.CPL - USED IF DOCUMENT SCANNED IN UP TO 4 PIECES  
TO RUN DOALL2.CPL, TYPE:  
R DOALL2 XXX XXXX IS COVERAGE WITHOUT THE EXIENSION)
- TO RUN DOALL3.CPL TYPE:  
R DOALL3 XXX YYY ZZZ AAA (COVERAGE NAMES WITHOUT THE EXTENSION)
- BOTH PROGRAMS TRANSFORM THE COVERAGE(S) TO LAMBERT CONFORMAL  
THE FINAL PRODUCT IS ALWAYS CALLED FINAL.COV
- IN ADDITION, DOALL3.CPL CLIPS THE COVERAGES WITH THE CLIPBOXES  
AND APPENDS THE PIECES TOGETHER
- I. COPY THE COVERAGE FINAL.COV TO THE DESIRED UFD AND RENAME IT  
J. DO THE FINAL EDITING ON THE COVERAGE TO CORRECT ANY PROBLEMS