



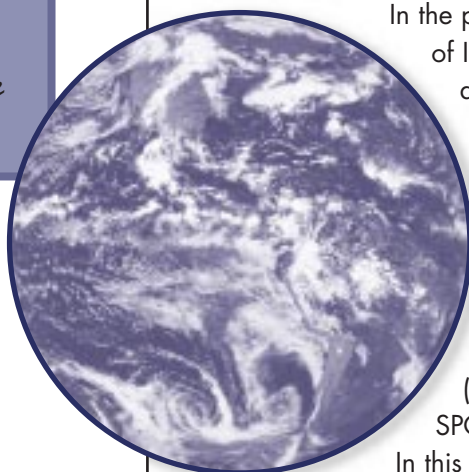
imagiNEWS

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How to convert geographic data from SPCS27 to SPCS83

BY BROOKS E. KELLEY, 3DI, LLC.

In the previous two issues of ImagiNews, topics associated with the ongoing conversion of geographic data from the 1927 State Plane Coordinate System (commonly referred to as SPCS27) to the 1983 version (commonly referred to as SPCS83) were addressed.

In this issue the discussion continues by focusing on techniques that can be used to perform this conversion using a variety of Geographic Information Systems (GIS), including ArcInfo, ArcView, AutoCAD Map, C-Map, and MapInfo.

All GIS capable of converting geographic data from SPCS27 to SPCS83 make use of a series of parameters that define the source and target data's datum, projection, and coordinate system. Thus the trick of converting data from SPCS27 to SPCS83 is knowing the parameters associated with these two coordinate systems. These parameters include at the minimum: coordinate system, zone, datum, and horizontal measurement unit but may also include: X and Y shifts or offsets, spheroid, and vertical measurement unit among others.

ArcInfo: ArcInfo 8.0 provides two methods of converting coverage data from SPCS27 to SPCS83. The older command line method uses the "project" command and a series of subcommands to define the input and output coordinate systems. This method is available for both PC and workstation versions of ArcInfo (including pre-8.0 versions). ArcInfo 8.0 Desktop provides a "Project Wizard" that essentially provides a series of dialog boxes into which a user can enter the older "project" subcommands. An example of using the "project" command to convert a property coverage named PROP27 to one named PROP83 is shown below.

```
Arc: PROJECT COVER PROP27 PROP83
Project: INPUT
Project: PROJECTION STATEPLANE
Project: FIPZONE 2112
Project: DATUM NAD27 NADCON
Project: UNITS FEET
Project: PARAMETERS
Project: OUTPUT
Project: PROJECTION STATEPLANE
Project: FIPZONE 2112
Project: DATUM NAD83 NADCON
Project: UNITS 3.280839895
Project: PARAMETERS
Project: END
```

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Hello! I am Frank Sobie, the Board Liaison for the Information Resources Committee which coordinates the creation of the *imagiNews*. I am the GIS Manager for Wade-Trim a consulting engineering firm with offices in Michigan, Florida and Ohio.

You may have noticed that the format of the newsletter has changed from a 24 page, bi-monthly magazine to a more concise 8 page document. The feeling was that the shorter format would be more easily read from cover to cover. The goal is to publish the newsletter on a monthly basis sometime later in this year.

The current format consists of a feature article, "State & Federal News," "IMAGIN organizational news," a committee message and the "Who is Doing What in GIS" section. IMAGIN is our members' publication and we welcome your comments on the new format.

Since the newsletter is meant to be representative of our members, we would be very pleased to publish feature articles regarding topics or projects that you believe would be of interest to our membership.

Organizations that are working on projects can submit some of the highlights of their project for the section "Who is Doing What in GIS."

I would like to thank the members of our information resource committee for their effort to make the new newsletter a success. If there are others who would like to play a role in the creation of the *imagiNews*, please contact me fsobie@wadetrim.com. Once again I would like to thank our members and look forward to hearing your comments about the newsletter.

Correction — In the last issue of the *imagiNews* we need to note a correction to the Jim Kovas article "Common Stumbling Blocks in the Use of State Plane Coordinates." In the table of conversion of centimeters to feet a double quote symbol next to the numeric value denoting inches was used instead of a single quote denoting feet. Unfortunately this error occurred in the transferring and importing of the electronic digital file. Our apologies for any confusion this may have caused.

MAIN STORY *continued from page 1*

While the "PROJECTION" subcommand is straightforward enough, a couple of comments concerning the others are warranted. First, the "INPUT/OUTPUT" and "PARAMETERS" subcommands are required before and after specification of input and output coordinate system parameters. Second, the "NADCON" statement at the end of the "DATUM" subcommand lines tells ArcInfo to use the National Geodetic Survey's NADCON method when shifting from NAD27 to NAD83. Other methods such as Michigan HARN are also available (see ArcDoc topic "Transforming between NAD27 and NAD83" for more details). Third, "FIPSZONE 2112" corresponds to both the "New" SPCS27 and SPCS83 Central Zone. A complete list of Michigan-specific zones is shown below:

Coordinate System	Zone	FIPS Zone
"Old" SPCS27	East	2101
	Central	2102
	West	2103
"New" SPCS27	North	2111
	Central	2112
	South	2113
SPCS83	North	2111
	Central	2112
	South	2113

Forth, note the subcommand "UNITS 3.280839895". This is ArcInfo's way of handling the so-called international foot (recall from the previous article that Michigan's SPCS83 is geared toward the meter (m) and thus the meter-based international foot). Because ArcInfo only supports linear measurements in meters and US survey feet, conversion constants expressed in units per meter must be specified when using other measurements. For example, one can use the constant 0.001 to represent kilometers (km) since 1 m = 0.001 km.

Likewise, one can use the constant 3.280839895 to represent international feet since 1 m = 3.280839895 international feet.

ArcView: ArcView 3.2's new Projection Utility (launched from the Windows Start menu or loaded as an extension and launched from ArcView's File menu) can be used to convert projected shapefiles from SPCS27 to SPCS83. This utility uses a Wizard to guide the user through five steps. These are:

1. Selection of the input shapefile e.g. wshed27.shp
2. Specification the input shapefile's coordinate system parameters (see figure 1)
3. Specification output shapefile's coordinate system parameters (see figure 2)
4. Choosing a name and location for the output shapefile e.g. wshed83.shp
5. Reviewing the conversion parameters

With the exception of MapInfo's "Save Copy As" functionality, it really doesn't get any easier than this. However, there are some areas that may cause confusion. First, to see a list of Michigan-specific coordinate systems during steps 2 and 3, one must first select the "Projected" radio button (see figures 1 and 2). Second, when specifying the input shapefile's parameters you must specify a geographic transformation. To do this check the "Show Advanced Options" checkbox then click on the "Datum" tab (see figure 1) and select "NAD_1927_To_NAD_1983_NADCON" from the Geographic Transformation" dropdown list. Third, if the input shapefile's coordinate system has not been formally defined, the Projection Utility will prompt the user to save its definition along with the shapefile in a *.PRJ file. A *.PRJ is merely a text file

similar to an ArcInfo coverage's PRJ.ADF file containing coordinate system-specific information. Creating one simply adds another file to the shapefile's suite and in no way affects the data itself. It does however, add value to the shapefile from a metadata perspective so go ahead and create it. Forth, please note that the Projection Utility uses the terms "Feet [9002]" for international feet, "Feet_US [9003]" for US survey feet, and "Meters [9001]" for SI meters.

AutoCAD Map: Perhaps the simplest way to convert AutoCAD drawings from SPCS27 to SPCS83 within AutoCAD Map 2000 (AKA release 4) is via a query. However, prior to building and executing the query, coordinate system information for both the source and target drawings must be defined. To do this, invoke the "Assign Global Coordinate System" dialog box (located at Map | Tools | Assign Global Coordinate System) shown in figure 3. First, select the target datum, coordinate system, zone, unit combination e.g. "NAD 83, Michigan State Planes, Central, Meter" (meters are after all the linear measurement we should be using by now). Next, select the source drawing(s). Finally, select the source datum, coordinate system, zone, unit combination e.g. "NAD 27, Michigan State Planes, Central, US Feet". Please note that coordinate systems are nicely categorized within AutoCAD Map; the category containing Michigan-specific coordinate systems is called "USA Michigan" (see figure 4). Close the "Assign Global Coordinate System" dialog box by clicking the "OK" button.

With the source and target coordinate system now defined, the next step is to build the query. To do this, invoke the "Define Query" dialog box (located at Map | Query | Define Query) shown in figure 5. Now, select the source drawing by clicking on the "Drawings" button

then clicking on the "Attach" and "Add" buttons on successive child dialog boxes to respectively select the file and add it to the query. After selecting the drawing to attach, close the "Select Drawings to Attach" dialog then click on the "Select All" button. Then close the first child dialog by clicking on the "OK" button. Next, click on the "Location" button and make certain that the "Boundary Type" is set to "All" (this is the default). Lastly, set the "Query Mode" to "Draw" and execute the query. At this point the drawing is converted to the new coordinate system and displayed; all that remains to be done is saving it as a new drawing.

C-Map: The present version of C-Map does not support the SPCS27 to SPCS83 conversion. However, the forthcoming 3.06 release of C-Map (freely downloadable from the web for users who've purchased 3.0 or higher) will.

MapInfo: Of the GIS software mentioned herein, MapInfo provides one of the easier ways to convert data from SPCS27 to SPCS83. Essentially, all you do is save a copy of the current map table using SPCS83-specific parameters. Assuming the current map table is an "earth map" stored in Michigan state plane, central zone, NAD27, US survey feet (described as "feet" in reference to SPCS27), simply follow the steps below:

1. From the "File" menu, select "Save Copy As" to invoke the "Save Copy of Table As" dialog box
2. Enter the destination map table's filename
3. Click on the "Projection" button to invoke the "Choose Projection" dialog box (see Figure 6)
4. Select "US State Plane Coordinate Systems (1983, feet)" from the "Category" dropdown list (again, see Figure 6)

5. Select the Michigan-specific zone from the "Category Members" list e.g. "Michigan 2112, Central Zone (1983, feet)" keeping in mind that here feet means international feet (again, see figure 6)
6. Click on the "OK" button to close the "Choose Projection" dialog box
7. On the "Save Copy of Table As" dialog box, click "Save"

ACKNOWLEDGEMENTS

Special thanks to Garfield Charter Township and Grand Traverse County for data as well as Scott Muller of ESRI, Brian J. Buckley of MSU's Center for Remote Sensing & GIS, and Viet Doan of the Northwest Michigan Council of Governments for their respective insights into the ArcView Projection Utility, C-Map and MapInfo.

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Figure 1: ArcView Projection Utility - Step 2



Figure 2: ArcView Projection Utility - Step 3

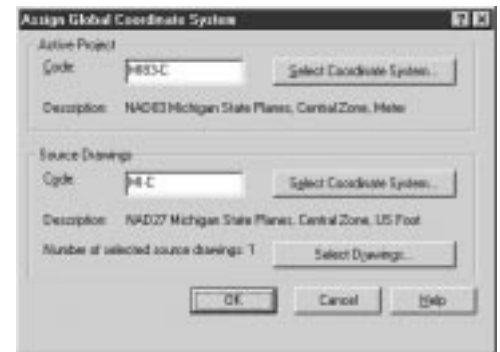


Figure 3: AutoCAD Map 2000's Assign Global Coordinate System dialog box

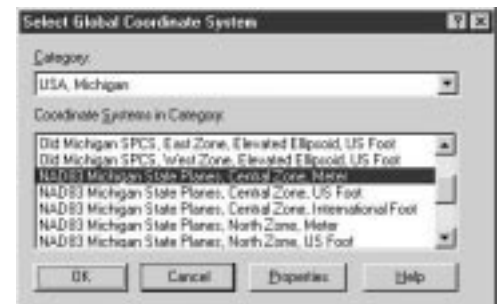


Figure 4: AutoCAD Map 2000's Coordinate System Selection dialog box



Figure 5: AutoCAD Map 2000's Define Query dialog box

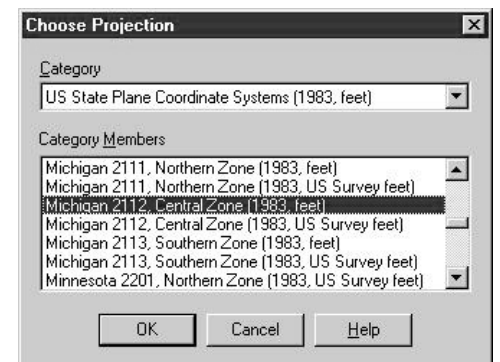


Figure 6: MapInfo's Choose Projection dialog box

IMAGIN Executive Director speaks at Annual Surveyors Conference

IMAGIN's Executive Director, Deborah Schutt was invited to speak at the Annual Surveyors Conference on February 16 in Sault St. Marie at the Kewadin Casino and Hotel. Almost 200 Surveyors attended the session entitled GIS in Michigan. The presentation covered the 101 of GIS, IMAGIN and its history, along with a brief description of the types of applications and programs IMAGIN members are involved developing.

Michigan Society of Professional Surveyors has adopted a position statement that states that GIS should have the involvement and maps should be created under the direction of a professional surveyor. Although not everyone in the GIS community agrees with this position, there is no doubt

that accurate mapping is desirable in creating a robust GIS program.

Executive Director Schutt taking a popular feature from the Forum conducted a drawing of session participants. Prizes included two IMAGIN memberships, two registrations to the 2000 Forum and two golf packages. The winners of the giveaways were:

- Dave Green, City of Traverse City
- Michael Bartolo, Walter E. Frazier and Associates, Inc, Adrian
- Rex Pope, Lakeshore Land Surveying, Ludington
- Don Andrews, Andrews Land Surveying, LLC
- Stan Evens
- Charles Koob



Executive Director Schutt hands out prizes at Surveyor's Conference.

IMAGIN Board at Work

The IMAGIN Board of Directors meets every other month in Clare at the Hotel Doherty. This group of volunteers travel from as close as Lansing to as far as Marquette for the typical 5 hour meeting and buffet lunch. This dedicated group gets no per diem, no free registration at conferences, no paid expense — in fact they pick up the tab for their own lunch at the Board meeting. The payment they do receive is advancing the GIS community through a stronger, more robust IMAGIN organization. Thank you IMAGIN Board!



Left to Right: Jim Bennett, Ken Kaiser, Lori Peltz-Lewis, Steve Aichele and Dave Frey



Left to Right: President, Bill Enslin, Jim Bennett, Ken Kaiser and Lori Peltz-Lewis



Left to Right: Scott Ambs and Scott Oppmann



Left to Right: Sharon Bramble, Jim Bennett, Steve Aichele, Scott Oppmann, Lori Peltz-Lewis, Dave Frey, Bill Enslin and Kurt Schindler



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IMAGIN is a nonprofit 501(c)3 organization comprised of individuals and organizations interested in the use and application of geographic information system (GIS) technology in Michigan. Our members are committed to improving the quality and availability of digital data necessary to make good use of GIS. We believe that cooperation and open communication are necessary to achieve these objectives.

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