Manual for Technology Transfer

DIGITIZATION OF EXISTING MAPS
WORK SPECIFICATIONS

(Draft)

DEPARTMENT OF LANDS AND SURVEYS,
DEPARTMENT OF STATE FOR
LOCAL GOVERNMENT AND LANDS,
THE REPUBLIC OF THE GAMBIA

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Section 1 Summary

(Summary)

Article 1. The digitization of existing maps shall be defined as a work of digitizing existing maps such as topographic maps (hereinafter referred to as the "existing maps") in order to create the corresponding digital topographic maps.

(Definition of terms)

Article 2. The terms used in this Chapter shall be defined as follows:

(1) The vector data shall be defined as graphic data represented in a series of points with individual coordinate values.

(2) The raster data shall be defined as image data composed of an array of pixels arranged in lines and rows.

(Scales of existing maps to be used)

Article 3. The standard scales of the existing maps to be digitized shall be 1/1,000 to 1/25,000.

Article 3. Standard of Operation

The existing maps to be used shall be approved by the Department of Lands and Surveys (hereinafter referred to as "DL&S").

(Forms of Products)

Article 4. The standard forms of the products in the existing map digitization shall be vector data, provided, however, that the raster data be used if a planning agency specifies it.

(Unit of Data File as Product)

Article 5. The standard unit of DM data files as products shall be one file per map sheet.

(Types of Data Files)

Article 6. The data files for vector data as products shall comply with the Rules for Data Format specified by DL&S.

Article 6. Standards of Operation

1. comply with those specified by DL&S.

2. The standard specifications of the data files for raster data as products shall be those specified by DL&S, unless otherwise specified or approved by a planning agency.

(Units of coordinate values)

Article 7. The coordinate values of vector data (ground coordinates) shall be expressed in mm or cm depending on the map information level.

2. The pixel size for raster data shall be 0.1 mm/pixel at maximum.

(Works and order by process)

Article 8. The works and order by process shall be as described below, provided that they may be changed if a planning agency specifies or approve such changes.

(1) Work plan
(2) Preparation of base map for measurement
(3) Measurement
(4) Compilation
(5) Creation of DM data files
(6) Arrangement of products and other materials

Section 2 Work Plan

(Work Plan)

Article 9. A work plan shall be prepared through process before starting a work, taking into account the work method, main equipment, personnel, work schedule, scales of existing maps, quality of base maps, accuracy, items of digitization, etc. to be used for the work.

Section 3 Preparation of Base Maps for Measurement

(Summary)

Article 10. The preparation of base map for measurement shall be defined as the preparation of the base map provided for measurement by using the existing maps or positive films for reproduction as originals.

Article 10. Standards of Operation

1. The original maps or original positive films specified by DL&S shall be used.
2. The original maps and films shall be checked on their neatlines and diagonal lines. The error tolerances in the predetermined lengths shall be as follows:
   1) Neatline: Within 0.5 mm
   2) Diagonal line: Within 0.7 mm

(Preparation of base maps for measurement)

Article 11. The base maps for measurement shall be prepared by copying the original manuscripts of existing map or original positive films through a photographic process or any other process.

2. In preparing such base maps for measurement, the collection of materials, field surveys, etc. shall be made to complement the contents of the originals, if necessary.

Article 11. Standards of Operation

1. A base map for measurement shall be prepared for each item such as road, building or contour line to be digitized in principle. However, a base map may be prepared in combined blocks for all items unless the measurement is affected.
2. The material for a base map for measurement shall be a polyester film or other less elastic material.
3. The base maps for measurement shall be checked on quality of image lines, represented features, etc. by comparing with the respective original manuscripts, and corrected if necessary.

Section 4 Measurement

(Summary)

Article 12. The measurement shall be defined as a work of digitizing a base map for measurement by using measuring instruments and acquiring the digital data.

(Measuring instruments)

Article 13. In principle, the measuring instruments shall be those specified in the table below, to be equivalent or superior.

Classification	Performance	Reading range
Digitizer	Resolution: Within 0.1 mm Reading accuracy: Within 0.3 mm	The data shall be readable within the neatlines of a base map for measurement.
Scanner	Resolution: Within 0.1 mm Reading accuracy: Within 0.25 % (between 2 arbitrary points)	The data shall be readable within the neatlines of a base map for measurement.

Article 13. Standard of operation

The measuring instruments to be used shall be selected, taking into consideration the purpose of use, accuracy, etc. of the DM data files.

(Measurement by digitizer)

Article 14. The measurement by a digitizer shall be carried out for each base map for measurement. The measured data shall be acquired per map sheet.

2. The measurement shall be carried out with a prescribed accuracy.
3. The classification code, etc. shall be added to the base map for measurement.

Article 14. Standards of operation

1. The four (4) corners of the map border shall be measured twice, independently for each measuring item at the start and end of measurement. If the difference between 2 values of each measuring item for each corner exceeds 0.3 mm, the corner shall be measured again. However, the points with coordinates that can be confirmed around the four corners of the map border may be used according to the conditions of the base map for measurement.
2. The measuring accuracy for planimetric or other features shall be within 0.3 mm (standard deviation) on a map.
3. The standard conversion from the instrument coordinate values into the plane rectangular coordinate values shall be the Affin's or Helmert's conversion.
4. The conversion factor shall be determined by the method of least squares from the instrument coordinate values and coordinate values at the four corners of a map border.
5. The residual errors at the four corners shall not exceed 0.2 mm on the map.

(Measurement by scanner)

Article 15. The measurement by a scanner shall be performed for each digitization item in a rectangular area to be completely enclosed by the map border in accordance with

the same standards and with the same accuracy, in order to create the measured data per map sheet.

2. The measured data may be converted into raster or vector data, if necessary.

Article 15. Standards of operation

1. The standard reading accuracy (interval) in measurement shall be 1/2 the minimum width of line of a feature to be read.
2. For the measurement, the numbers of pixels on each map sheet shall be corrected as prescribed in the longitudinal and horizontal directions.
3. The nearest neighbor interpolation, bi-linear interpolation or cubic convolution interpolation shall be used for re-arraying.
4. The map sheet names and others shall be entered in the measured data.
5. The element coordinates at or around the four corners of a map border shall be displayed and measured, if they can be confirmed.
6. The conversion from the instrument coordinate values into the plane rectangular coordinate values shall comply with the provisions of Paragraph 3, Article 14 <Standards of operation>.
7. The conversion factor shall be determined in compliance with the provisions of Paragraph 4, Article 14 <Standards of operation>.
8. The residual errors at the four corners of a map border shall not exceed 2 pixels in digital data coordinates.

Section 5 Compilation

(Summary)

Article 16. The compilation shall be defined as a modification or correction of the measured data by using a compiling system and creating the compiled data.

Article 16. Standards of operation

1. The standard configuration and functions of the compiling system shall be as follows:
   1) The compiling system shall consist of an electronic computer, a graphic display, a tablet or digitizer, etc.

(Compilation)

Article 17 The compilation shall perform the correction of the measured data, the addition of their attributes, or any other necessary processing by using the interactive operations on the graphic display of the compiling system.

Article 17. Standards of operation

1. The measured data shall be corrected, in case of data omission, error or defective line.
2. If the map data between adjacent map sheets are not coincident, the coordinates of such data shall be made coincident by using the adjoining process.

(Checking)

Article 18. Checking shall be made on the output maps for checking or the graphic display by using the compiled data.

2. If the results of checking show any measuring omission or error, the compiled data shall be corrected.

Article 18. Standards of operation

1. Preparation of output maps for checking
    1) The output maps for checking shall be prepared using a plotter or any other means.
    2) The map sheet number, name, neatlines, features, attributes, etc. shall be shown in an output map for checking, and clearly identifiable.
    3) An output map for checking shall be prepared in combined blocks for checking items, if there is no trouble in checking. However, an output map for checking may be prepared for each digitized item, if necessary.
2. Checking by output map for checking
    1) Checking shall be made for any omission of digitized items and on the positioning accuracy by comparing the output map for checking with the base map for measurement.
    2) The tie between the adjacent map sheets shall be visually checked on an output map for checking.
3. Checking on display
    1) Any omission of digitized items, positioning accuracy, continuity of lines, etc. shall be visually checked.
    2) Any omission of digitized items shall be checked on the raster data in the

background.

3) The adjacent maps shall be displayed and visually checked on the tie between them.

Section 6 Creation of DM Data File

(Summary)

Article 19. The creation of a DM data file shall be defined as the recording of the compiled data in an electronic memory medium.

(Creation of DM data file)

Article 20. Checking the contents of compiled data and recording it in a prescribed format and structure in an electronic memory medium shall create the DM data file.

(Preparation of the instruction manual)

Article 21. The instruction manual for the DM data files shall be prepared to describe the matters needed for the management and use of the files.

(Preparation of output map)

Article 22. An output map shall be prepared using a plotter or any other means, based on the digitized data outputs.

Article 22. Standards of operation

1. An output map shall be created as a sheet containing digitized items. If the digitized items are complicated and overlap with each other, they may be divided into groups and contained in several output maps.
2. The method for preparing an output map shall be as follows:
   1) An output map for checking shall be prepared using a plotter or any other means.
   2) The map sheet number, name, neatlines, features, attributes, etc. shall be shown in the output map for checking, and clearly identifiable.
   3) An output map for checking shall be prepared in combined blocks containing checking items, if there is no trouble in checking. However, an output map for checking may be prepared for each digitalized item, if necessary.

Section 7 Arrangement of Products and Others

(Products and others)

Article 23. The products and others shall include the following:

(1) DM data files

(2) DM data file instruction manual

(3) Output maps

(4) Accuracy control table

(5) Other materials

REVISION OF DIGITAL TOPOGRAPHIC MAPS
WORK SPECIFICATIONS
(DRAFT)

DEPARTMENT OF LANDS AND SURVEYS,
DEPARTMENT OF STATE FOR
LOCAL GOVERNMENT AND LANDS,
THE REPUBLIC OF THE GAMBIA

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Section 1 Summary

(Summary)

Article 1. The revision of digital topographic maps shall be defined as revision of the secular changes and other changes in the existing digital topographic maps and the updating of the existing DM data files (hereinafter referred to as the "old DM data files", while the existing DM data shall be referred to as the "old DM data").

(Accuracy)

Article 2. The reviseing accuracy of the digital topographic maps as well as the map originals for reviseing topographic maps shall be as follows:

Item			Scale		Remarks
			Min. 1/500	Max. 1/1,000	
Standard deviation	Horizontal position		Within 0.7 mm	Within 1.0 mm	Distance on map
	Elevation	Elevation point	Within ⊿h/3	Within ⊿h/2	⊿ h is an interval between intermediate contour lines.
		Contour	Within ⊿h/2		Ditto

(Methods)

Article 3. The digital topographic maps shall be revised according to any of the following methods:

(1) Revision by photogrammetric survey

(2) Revision by using existing maps

(3) Revision by using other existing data

2. Each of these methods can be used partially and jointly with any other method to revise a digital topographic map.

3. The revised data shall be also acquired in the area around the revised planimetric features to confirm the matching with the surrounding features.

Article 3. Standards of operation

1. The data used for revision shall have the map information level equal or superior to that of old DM data.

2. As a rule, the revised data shall be acquired per map feature.

(Works and order by process)

Article 4. The works and order by process shall be as specified below in principle, provided that they may be changed or omitted if a planning organization specifies or approves such change.

(1) Revision by photogrammetric survey
- a. Work plan
- b. Photography
- c. Preliminary examination
- d. Digital plotting of revised maps
- e. Field survey
- f. Digital compilation of revised maps
- g. Updating of DM data files
- h. Preparation of revised topographic maps originals
- i. Arrangement of products and other materials

(2) Revision by using existing maps
- a. Work plan
- b. Preliminary examination
  - 1) Collection of existing maps
  - 2) Extraction of features to be revised
- c. Field survey
- d. Digital plotting of revised maps
  - 1) Editing of the results of field survey
  - 2) Acquisition of revised data by digitizer or any other means
- e. Digital compilation of revised maps
- f. Updating of DM data files
- g. Preparation of revised topographic map originals
- h. Arrangement of products and other materials

(3) Revision by using other existing data
- a. Work plan
- b. Preliminary examination
- c. Digital plotting of revised maps
  - 1) Collection of other existing data
  - 2) Preparation of output maps containing other existing data

3) Extraction of revised features

d. Field survey

e. Digital compilation of revised maps

f. Updating of DM data files

g. Preparation of revised topographic map originals

h. Arrangement of products and other materials

Section 2 Work Plan

(Summary)

Article 5. The work plan shall be made up by process before starting the work, taking into account the work method, main equipment to be used, personnel, work schedule, range of revision, quantity of revision, etc.

Section 3 Preliminary Examination

(Summary)

Article 6. The preliminary examination shall be defined as the checking of the output maps that include the old DM data files (hereinafter referred to as the "revised manuscript maps"), extracting the features to be revised, and selecting the work method.

Article 6. Standards of operation

1. In principle, the collection of materials shall include the following items:
   1) Checking of neatlines on revised manuscript maps
   2) Survey of ground control points newly installed, or relocated or re-buried
   3) Judgment on the availability of various materials and maps
   4) Comparisons between revised manuscript maps, and materials such as aerial photographs
   5) Investigation and collection of changed geographic names and boundaries
   6) Selection of working procedure and work method
2. The old DM data shall be checked on the file structure, format, data quality and other simple logical discrepancies.
3. If no revision by photogrammetric survey or the acquisition of the data to be

revised on output map sheets is performed, the output maps shall be prepared by using a plotter or any other means.

4. The revised features shall be extracted by using materials such as enlarged aerial photographs and collected maps.
5. The changes in annotations, symbols, attributes, etc. shall be shown clearly on the revised manuscript maps.

Section 4 Digital Plotting of Revised Maps

Sub-section 1 Revision by photogrammetric survey

(Summary)

Article 7. The revision by photogrammetric survey shall be defined as the acquisition of the map data on revised features such as secular changes (hereinafter referred to as the "revised data") by using the DM technique.

(Method)

Article 8. The acquisition of revised data shall be based on the results of the preliminary examination and shall comply with the provisions in Work Plan (Article 10), Section 2, Chapter 3.

2. The relative orientation shall be made around 6 points in accordance with the tie point selection standard, while the ground orientation shall be made by using the coordinate values of planimetric features that are clear in revised manuscript maps or the coordinate values in DM data files.

Article 7. Standards of operation

1. The scale of aerial photographs to be used may be reduced to the limit of 80% of the standard scale.
2. The methods of relative orientation and ground orientation shall comply with the Standards of operation.

Sub-section 2 Revision by using existing maps

(Summary)

Article 9. The revision by using existing maps shall be defined as the determination of the coordinates of the changed features by using existing maps and acquiring the revised data.

2. In principle, the information items of the data acquired by using existing maps shall be plotted data.

(Requirements for existing maps to be used)

Article 10. The requirements for existing maps to be used for revision shall be as follows:

(1) The existing maps shall be prepared in a scale that is at least equivalent to the map information level of the old DM data.

(2) The existing maps shall have the accuracy of the results of basic survey or public survey or the accuracy equivalent to or higher than these results.

(3) The accuracy of existing maps shall be such that the revised data acquired by using these existing maps may maintain the accuracy as specified in Article 2.

(4) In principle, the coordinate system shall be the UTM coordinate system.

(Method)

Article 11. The results of field survey shall be edited and arranged on the output maps from the old DM data files, and combined with the changed features extracted in the preliminary examination process in order to acquire the revised data by using a digitizer or any other means.

2. The measuring accuracy shall be such that the DM revision accuracy may be maintained if the scale of revised maps is converted (through the linear equation) into that of the revised manuscript maps.

Article 11. Standard of operation

The method for acquiring data shall comply with the provisions in “Digitization of existing maps”.

Sub-section 3 Revision by using other existing data

(Summary)

Article 12. Revision by using other existing data shall be defined as the acquisition of revised data using the digital map information created by other survey works.

(Requirements for other existing data)

Article 13. The provisions in Article 10 shall be applied to the requirements for other existing data to be used for revision.

(Method)

Article 14. The revised data shall be acquired from the existing digital map information based on the results of preliminary examination on the said map and the necessary conversions shall be performed for the classification codes and other items of the revised data.

Section 5 Field Survey

(Summary)

Article 15. The field survey shall be defined as a completion survey to be made in the field as necessary, in order to study and verify the representation items and names necessary for creating the revised data.

2. Such field survey shall be made using the output map originals of old DM data and revised data.

Article 15. Standard of Operation

The results of a field survey shall be edited and arranged on old DM data file output maps together with the changed features as extracted in preliminary examination.

Section 6 Digital Compilation of Revised Maps

(Summary)

Article 16. The digital compilation of revised maps shall be defined as the creation of revised DM data in which changed features are revised through digital compilation using a digital compilation system in order to obtain the integrity between the newly acquired revised data and the old DM data.

2. The compiling system to be used shall have the prescribed functions.

Article 16. Standards of Operation

The provisions of Article 13, “Digitization of exiting maps”, shall be applied to the functions of the compiling system to be used.

(Method)

Article 17. The revised DM data shall be created by adding, deleting and/or correcting the acquired changed data to the old DM data.

Article 17. Standards of Operation

The digital compilation of revised maps shall be performed in accordance with standards of operation and also as follows:

1) The revised data shall be matched with the old DM data in obtaining the coincidence of the coordinate values of each tie point between both data.

(Checking)

Article 18. The revised DM data shall be checked through the use of output maps prepared by a graphic display or plotter.

Article 18. Standards of Operation

Any erroneous or unclear points shall be checked and corrected in each process in which such unclear points are generated.

Section 7 Updating of DM Data Files

(Summary)

Article 19. The updating of DM data files shall be defined as the recording of the revised DM data that have been created in the preceding section on an electronic memory medium.

(Method)

Article 20. The DM data files shall be recorded on an electronic memory medium in accordance with the given specifications of revised DM data.

(Checking)

Article 21. The contents of DM data files shall be checked using a checking program or a graphic display.

(Preparation of Manual)

Article 22. A DM data file instruction manual shall be prepared to explain the matters required for the file management and applications.

Section 8 Arrangement of Products and Others

(Products and others)

Article 23. The products and other materials to be created shall be as follows:

(1) DM data files
(2) DM data file instruction manual
(3) Accuracy control table
(4) Other materials

Manual for Creation of 1:50,000-scale Maps Using TNTmips

August 2002

Department of Lands and Surveys

JICA Study Team

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1. Purpose

This Manual describes the outline of the procedures for creating 1:50,000-scale topographic map data using TNTmips with the aim to define the file configuration as final product and to facilitate the understanding of the method for arranging the map data. The procedures for processing are also outlined. For the details of each step of processing, refer to the supplemental material "Basis of TNTmips" and the manual issued by the manufacturer. This Manual is prepared on the assumption that the 1:50,000-scale maps will be newly created by importing the map data from other systems and various data sets into TNTmips. For the direct entry of 1:50,000-scale topographic map data using TNTmips, refer to the "TNTmips-based 1:50,000-scale Data Correction Manual".

For the use of this Manual, prepare the data file model [template.rvc] that will be supplied together with the 1:50,000 topographic map data. For the system parameter setting, refer to the supplemental material "Basis of TNTmips".

2. Configuration of the File as Product

2.1 template.rvc

The product file shall be stored in the TNTmips RVC format. The RVC format is a data file consisting of the objects containing geographic information such as [Vector], [Cad] and [Raster], the display styles of these objects and the sub-objects including Geo-reference information. The [template.rvc] file will be provided as a sample of all processes. The [template.rvc] file contains map data and other information such as parameters for creating legends, grid lines and output files. The output result from the [template.rvc] file is very approximate to a printed map and can be used normally as a simple printed map. The data file as the final product of the map creation work must follow the models in [template.rvc] on all items including object naming and order of indication. The layout view window of the template file is shown below. The objects contained in the file will also be outlined below.

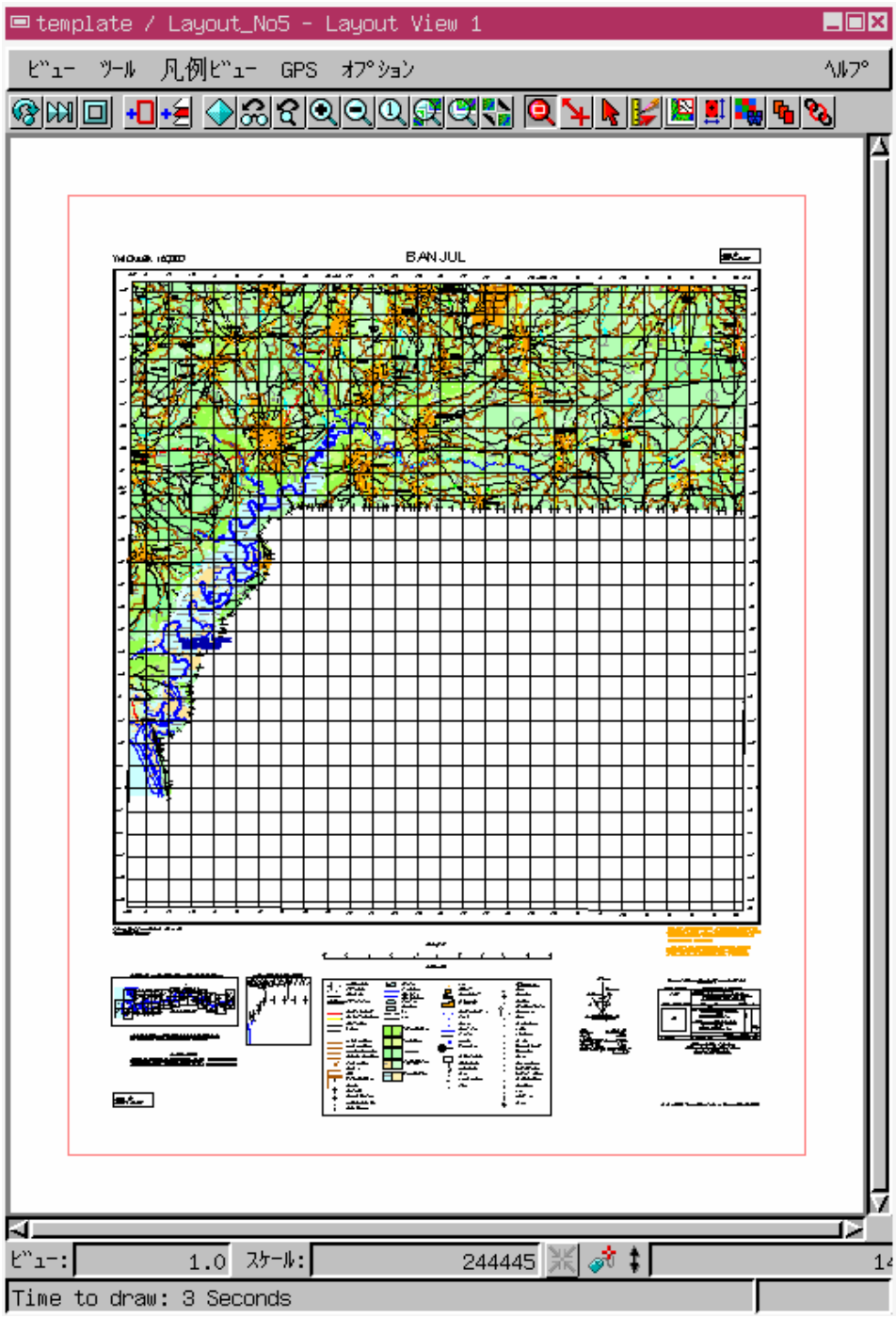


Figure 2.1 [template.rvc] on Layout View window

1. External neatline
2. Series name (The GAMBIA 1:50,000)
3. Map name

4-1. Map number (upper left)

4-2. Map number (lower right)

5. Publisher
6. Explanation of topographic mapping project
7. Scale bar

8-1. Index map

8-2. Title of index map

8-3. Explanation of index map

9-1. Map sheet history

9-2. Map sheet history title

10-1. Administrative boundary map

10-2. Title of administrative boundary map

11. Legend
12. Magnetic variation
13. Explanation of survey standard system
14. Seller

Figure 2.2 [template.rvc] on Control window

Reference <Control Window>

When handling objects by using TNTmips, the Control and View windows will appear in a pair. The outline of how to read the Control window will be given below.

The types of objects on the Control window are indicated by icons. The main objects used in [template.rvc] are explained in the figure below.

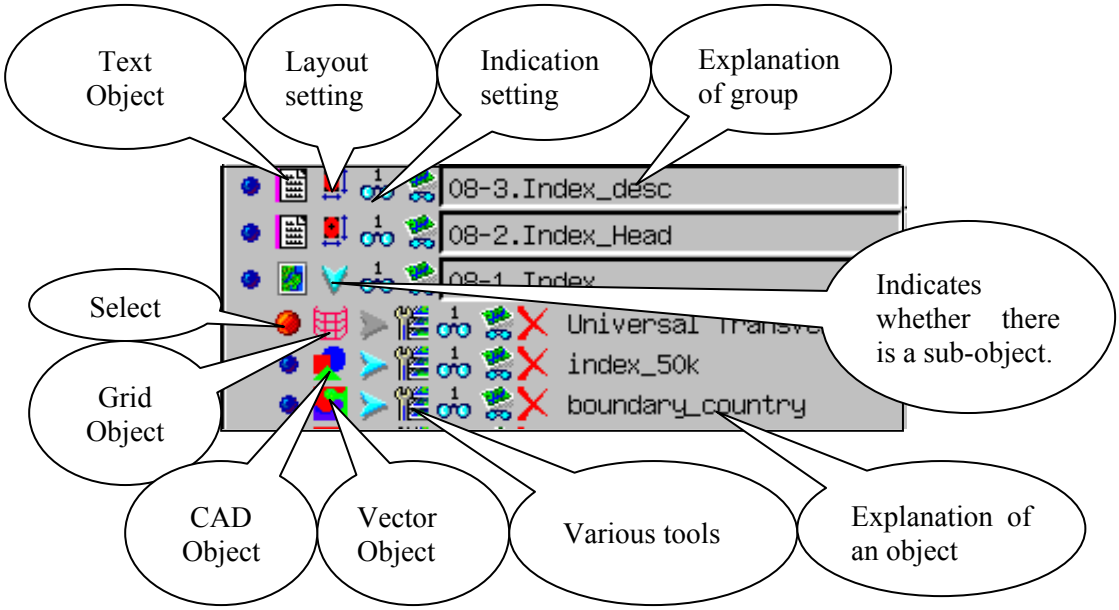


Figure 2.3 Icons of objects

Reference <Order of Indication>

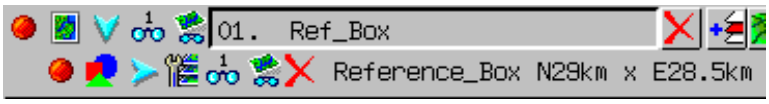
The order of object indication and output is the down-to-up order from the bottom of the Control window in TNTmips. In [template.rvc], the order of indication and output starts from 1 and ends at 15. If items are overlapped at the same position, the item with a larger figure will be indicated.

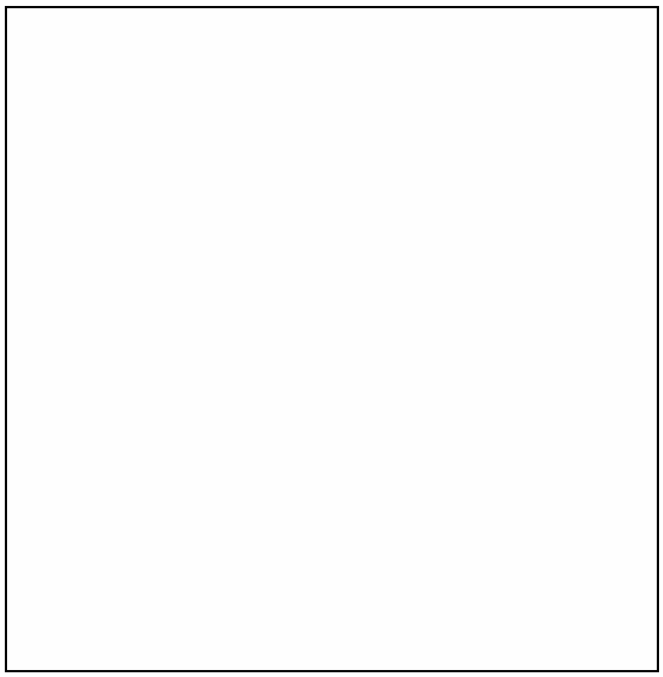
2.2 Explanation of Groups

The explanation and indication example of each group in [template.rvc] will be given below.

2.2.1 External neatlines

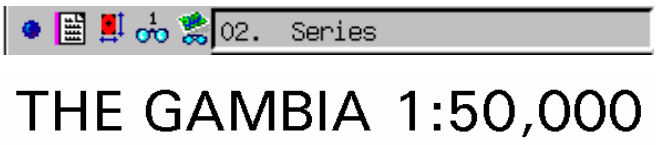
Each neatlines of 29-km long x 28.5-km wide shall be the same object. Other objects laid out in a map shall be arranged in the positions relative to this object.





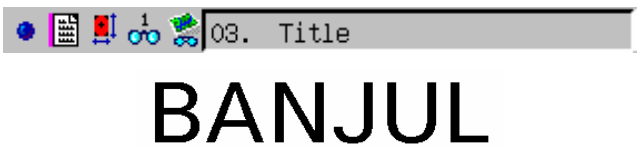
2.2.2 Series name (The GAMBIA 1:50,000)

The same object shall be used for each neatline.



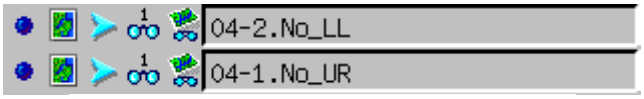
2.2.3 Map name

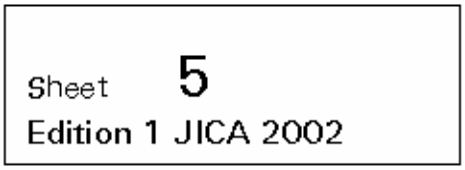
A map name is the name of a neatline determined for each neatline.



2.2.4 Map number (upper left) (lower right)

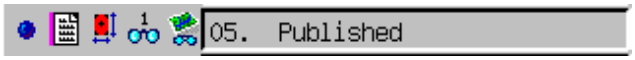
A map number represents the neatline number determined for each neatline and the series name such as revision number. The map number shall be indicated in two positions, namely upper left and lower right.

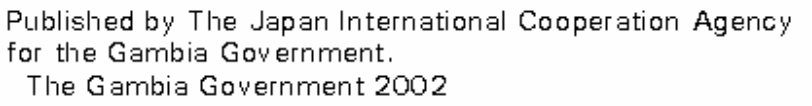




2.2.5 Publisher

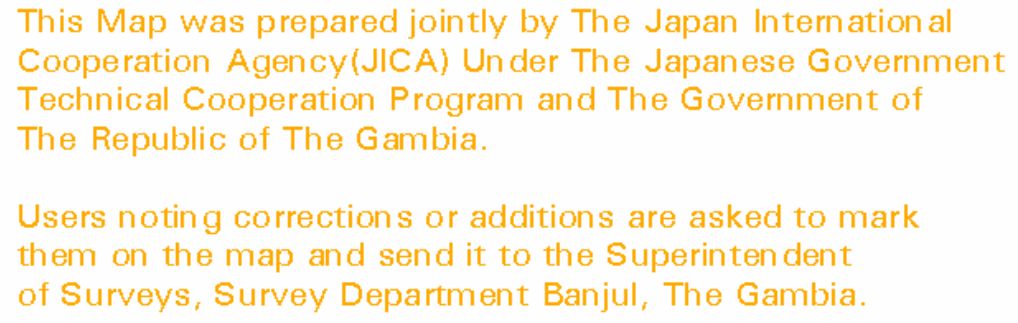
A publisher shall be the same object within each neatline.





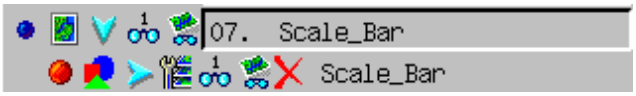
2.2.6 Explanation of topographic mapping project

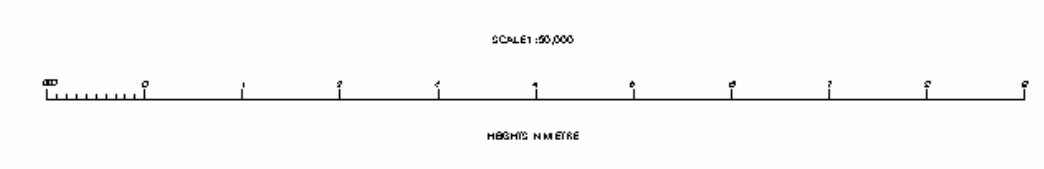
The explanation of a project shall be the same object within each neatline.



2.2.7 Scale bar

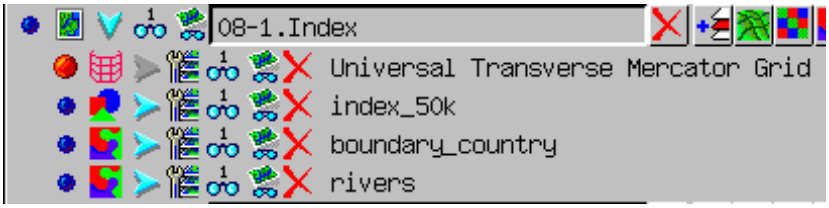
A scale bar shall be the same object within each neatline.

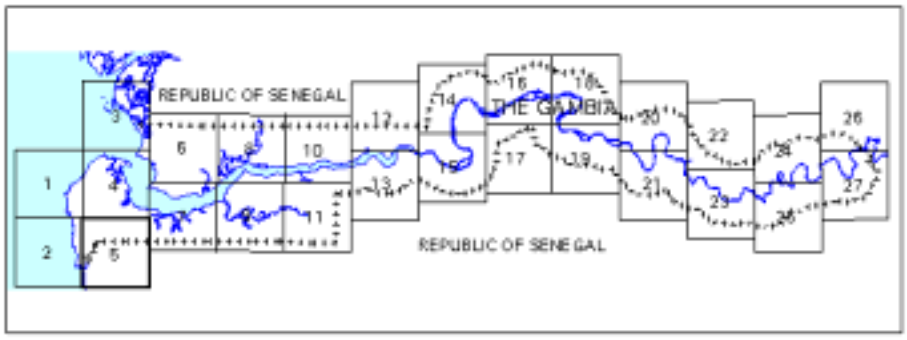




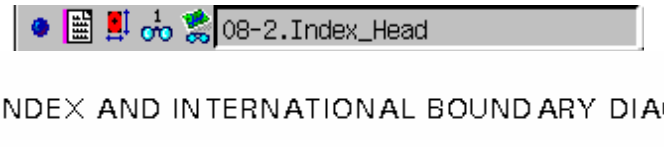
2.2.8 Index map

An index map is a group for reference to several objects such as rivers, neatlines and national borders. The relevant neatline shall be corrected to be indicated by bold neatlines.

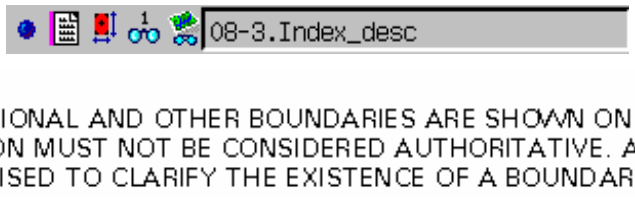




Index map title



Explanation of index map

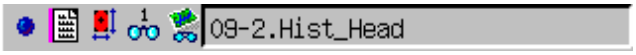


2.2.9 Map sheet history

The history of map sheet corrections shall be added by series name such as revision number.

Field survey data by Survey Department and JICA Study Team, December 2001.
Air photography by D.T.M CO. LTD., November 2001.
Field completion by Survey Department and JICA Study Team, December 2001.

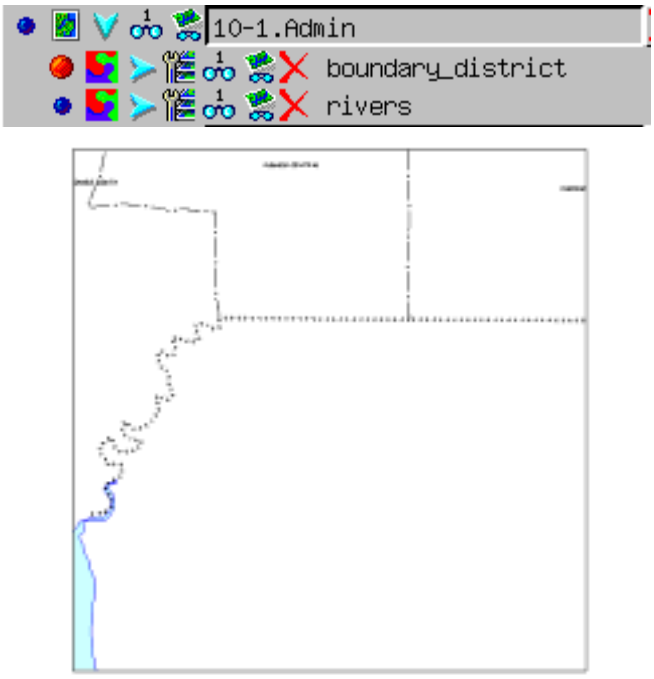
Map sheet history title



SHEET HISTORY

2.2.10 Administrative boundary map

An administrative boundary map is a group for reference to several objects such as administrative boundaries and rivers. The objects referenced in 8-1 index map are indicated in a different scale. The indicated range shall be corrected to indicate only the relevant neatline range.

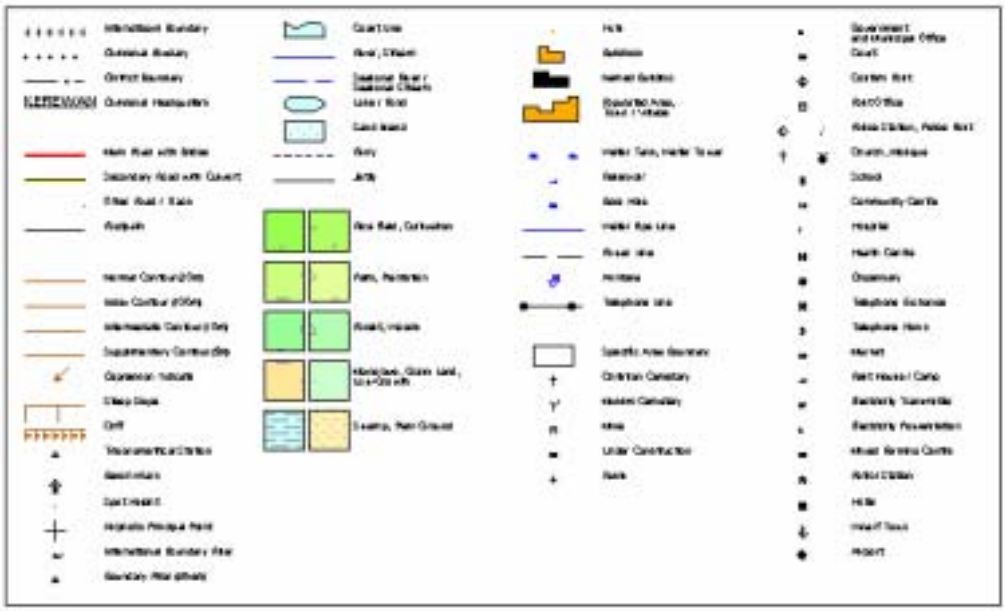


Title of administrative boundary

ADMINISTRATIVE BOUNDARIES

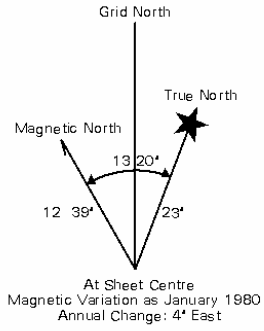
2.2.11 Legend

The same object shall be indicated within each neatline.



2.2.12 Magnetic variation

A magnetic variation value shall be corrected within each neatline.



Grid:-	U.T.M. Zone 28
Projection:-	Transverse Mercator
Spheroid:-	WGS984
Unit of Measurement:-	Metre
Meridian of Origin:-	15 00' West of Greenwich
Latitude of Origin:-	Equator
Scale Factor at Origin:-	0.9996
False Co-ords of Origin:-	500,000m Easting
	Nil m Northing

2.2.13 Explanation of the survey standard system

A checked value shall be corrected in reference to the ground control points indicated within each neatline.

The numbered lines indicate the 1,000 Metre Universal Transverse Mercator Grid, Zone 28
WGS 1984 Spheroid

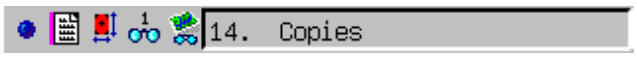
GRID ZONE DESIGNATION	TO GIVE A GRID REFERENCE ON THIS SHEET		
28P	LETTERS See 100,000m SQ. IDENTIFICATION FIGURES Pay no attention to the smaller co-odonate figures in the margins. They are for finding full co-odinates: viz 300 000m PAY ATTENTION TO LANRGER MARGINAL FIGURES:		
100,000 M. SQ. IDENTIFICATION	POINT ⚠ *KM 5*	LETTERS	CK
CK	EAST Take west edge of square in which point lies and read the figures printed opposite this line (on north or south margin). Estimate tenths eastwards to point.	24 7	
	NORTH Take south edge of square in which point lies and read the figures printed oppsite this line (on east or west margin). Estimate tenths northwards to point.		58 5
	REFERENCE	CK 247	585
Unit.....Metre	Square.....1,000 m	Reference to nearest.....100 m	

Height Datum: Heights are based on a datum about
0.6069 m below Mean Sea Level (Banjul PWD BM4 = 2.661 m)

Supplementary Height information may be
obtained from the Survey Department, Banjul.

2.2.14 Seller

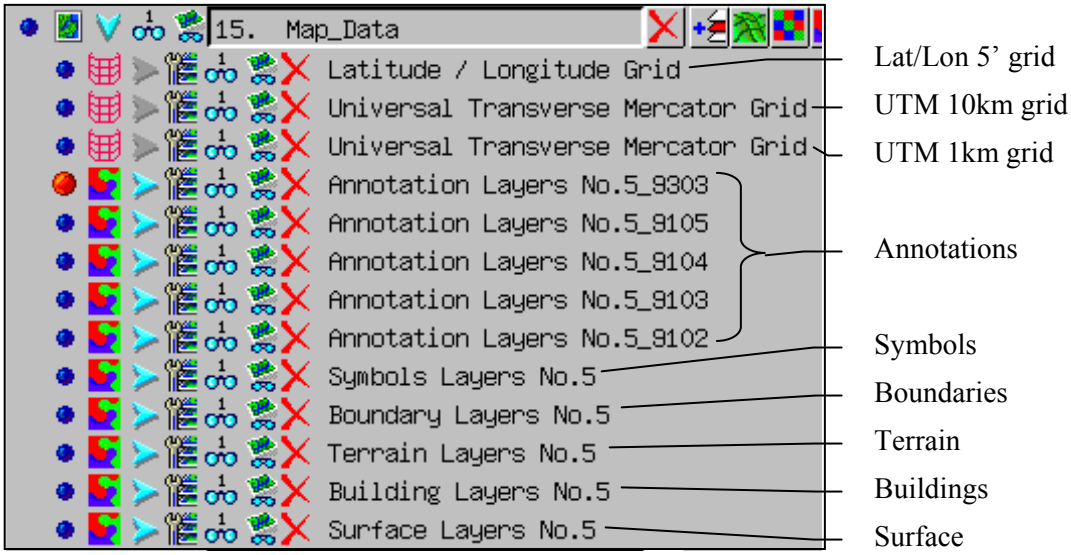
The same object shall be indicated within each neatline.

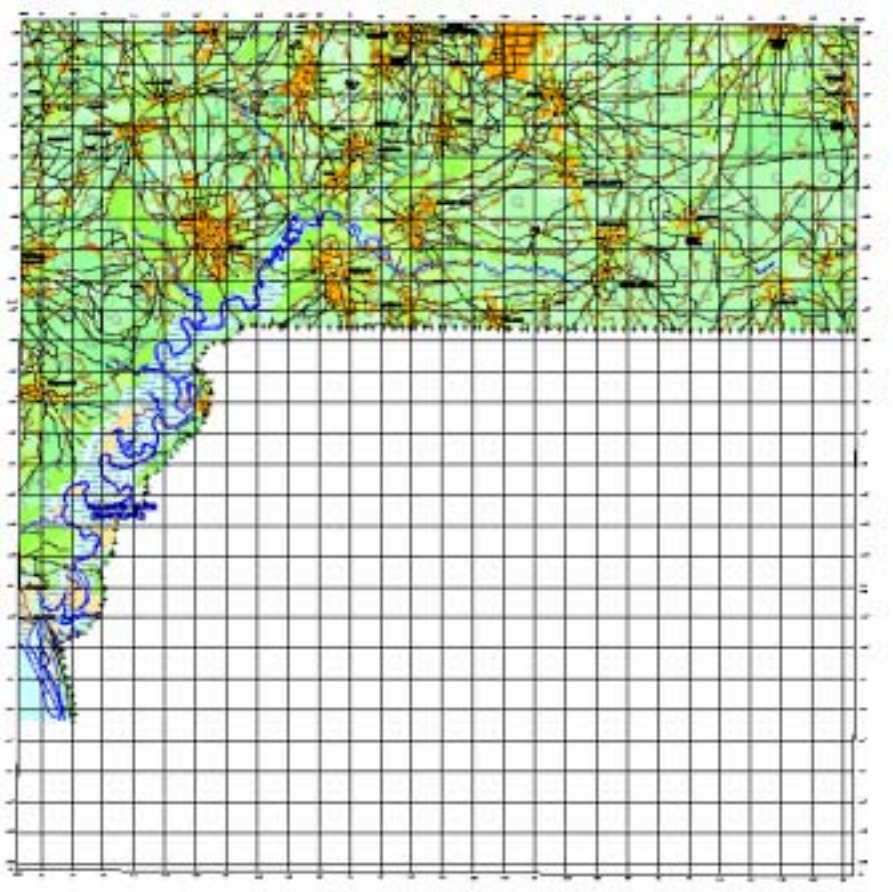


Copies of This Map can be obtained from Surbey Department, Banjul, The Gambia.

2.2.15 Map data (within internal neatline)

The map data constitute a group containing several objects such as all map data and grid lines. Each object configuration and name shall follow the example as shown below. Especially, an annotation layer shall be configured for each map symbol code.





3. Workflow

This section describes the workflow from the data import from different sources and creation of RVC file to the creation of the EPS (encapsulated Post Script) file to output printed maps and simple output maps. The flowchart is as shown below.

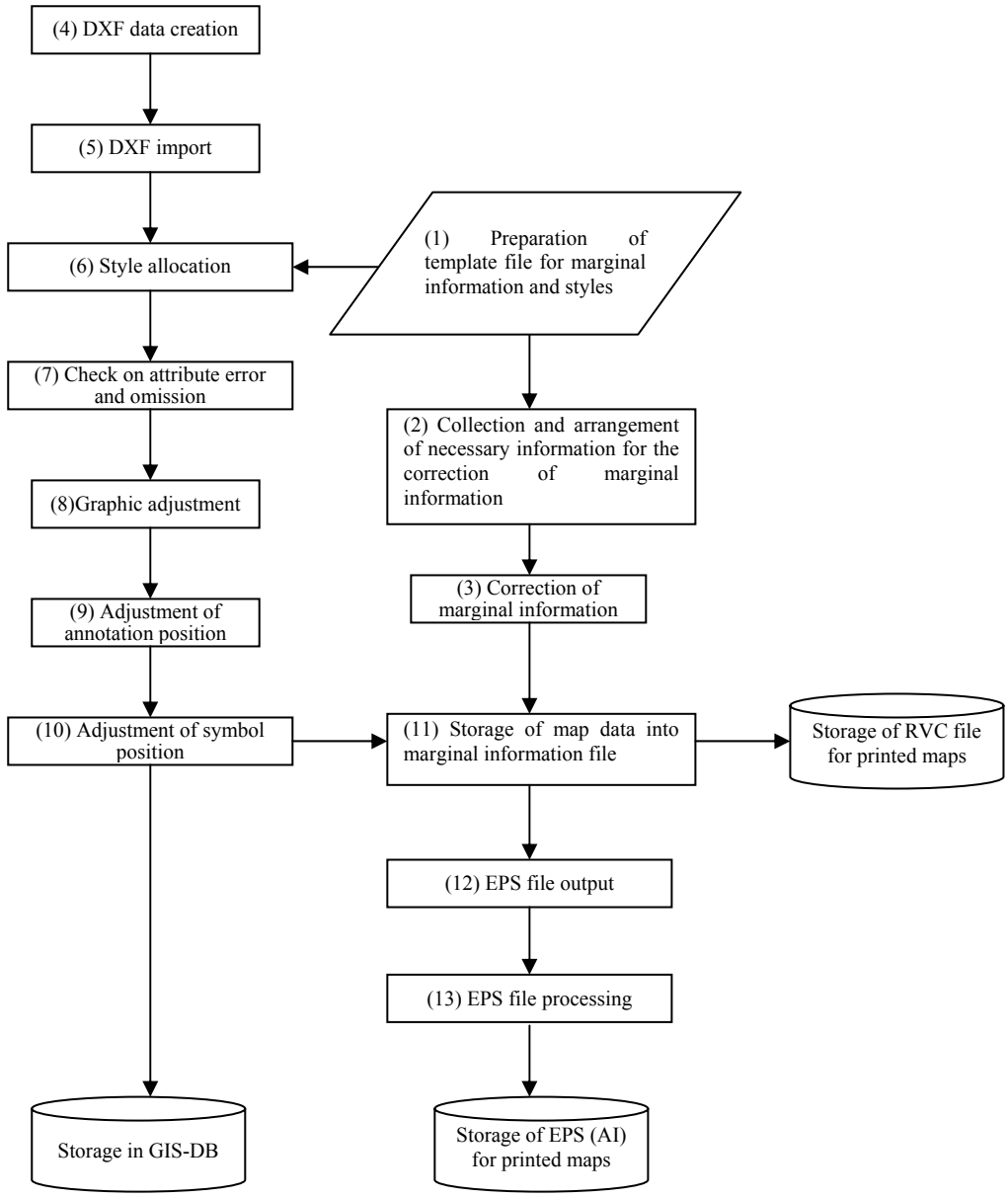


Figure 3.1 Work Flowchart

3.1 (1) Preparation of template file for marginal information and styles

A file [template.rvc] shall be prepared. This file will be available in the form of CD-R.

3.2 (2) Collection and arrangement of necessary information for the correction of marginal information

The information on items among the marginal information that are required to be corrected within each neatline shall be collected and arranged. The information to be collected is listed below.

- 3. Neatline name
- 4. Neatline number or series number
- 8-1. Neatline corner coordinate values (Lat/Long)
- 9-1. Field surveyor, date of field survey, photographer, data of photography, field completion surveyor, and date of field completion
- 12. Magnetic variation value, observation year
- 13. Results of verification of coordinate values relative to ground control points within a neatline

3.3 (3) Correction of marginal information

The marginal information collected in step (2) shall be corrected. The [template.rvc] shall be copied and its copy shall be used for processing. Each object shall be corrected. During the correction process, it will be necessary not to change parameters such as indication styles, positions and scales.

3.4 (4) DXF data creation

This step will be explained assuming that the map correction data will be obtained from external sources, but this step shall not apply to the direct correction using TNTmips. The conditions necessary for DXF data are described below.

- Layer name

  The data to be stored in the DXF data file shall be 4-digit symbol codes (e.g. 1101). For example, in the case of converting the Microstation DGN format into DXF, it is necessary to set a table to allocate symbol codes uniquely to each level for export.
- Coordinate system

  The UTM zone 28 (World Geographic Coordinate System) shall be applied.
- Logic integrity

  The data shall have high logic integrity in which the node matching is executed.
- Adjoining of neatlines

The coordinate values and attributes shall be complete.

- 3-dimension

  Contour lines and ground control points shall have 3-dimensional coordinate values.

- File configuration

  The file shall be configured as specified for symbols.

  Example: Boundaries/Surface/Buildings/Road/Symbols/Utilities/Water Facilities/GCP/ Terrain/Annotation

3.5 (5) DXF import

Import: Choose Process and Import of the menu and then Import Tool. The procedure shall be taken as follows:

- Select a data format (Vector or Cad) defined as GIS attribute in symbols for an object type.
- Select dxf as format.
- Select a relevant DXF file on the Select Files widow.
- Set the import options as shown in the figures below. The setting of annotation layer is lightly different from the setting of any other layer.

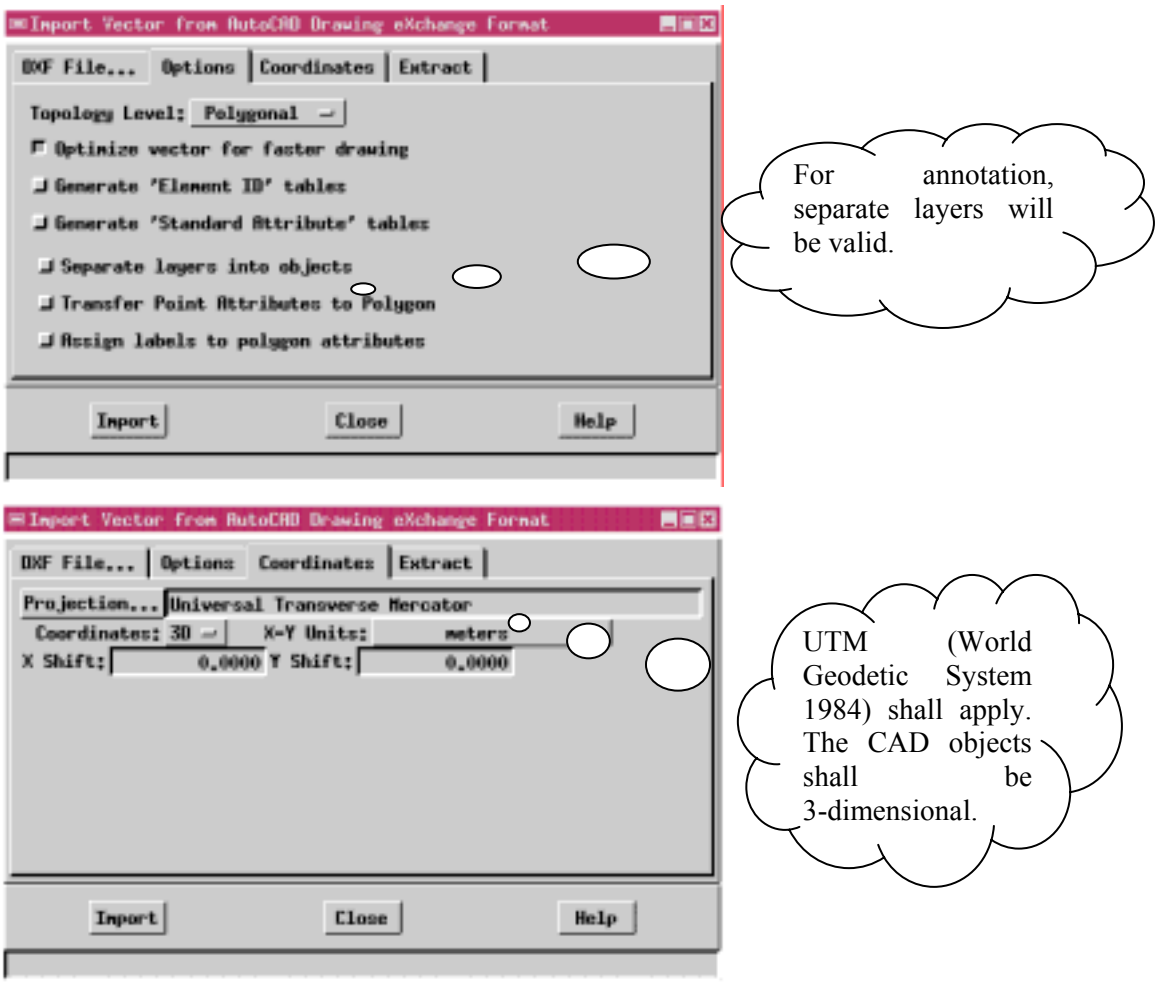


Figure 3.2 Setting of DXF import

The imported DXF data shall be provided with a defined symbol layer. If the layer is checked as shown in the figure below, the import will be deemed successful. This confirmation shall be made by choosing Edit of the menu, Spatial Data and Spatial Data Editor, and then selecting any element.

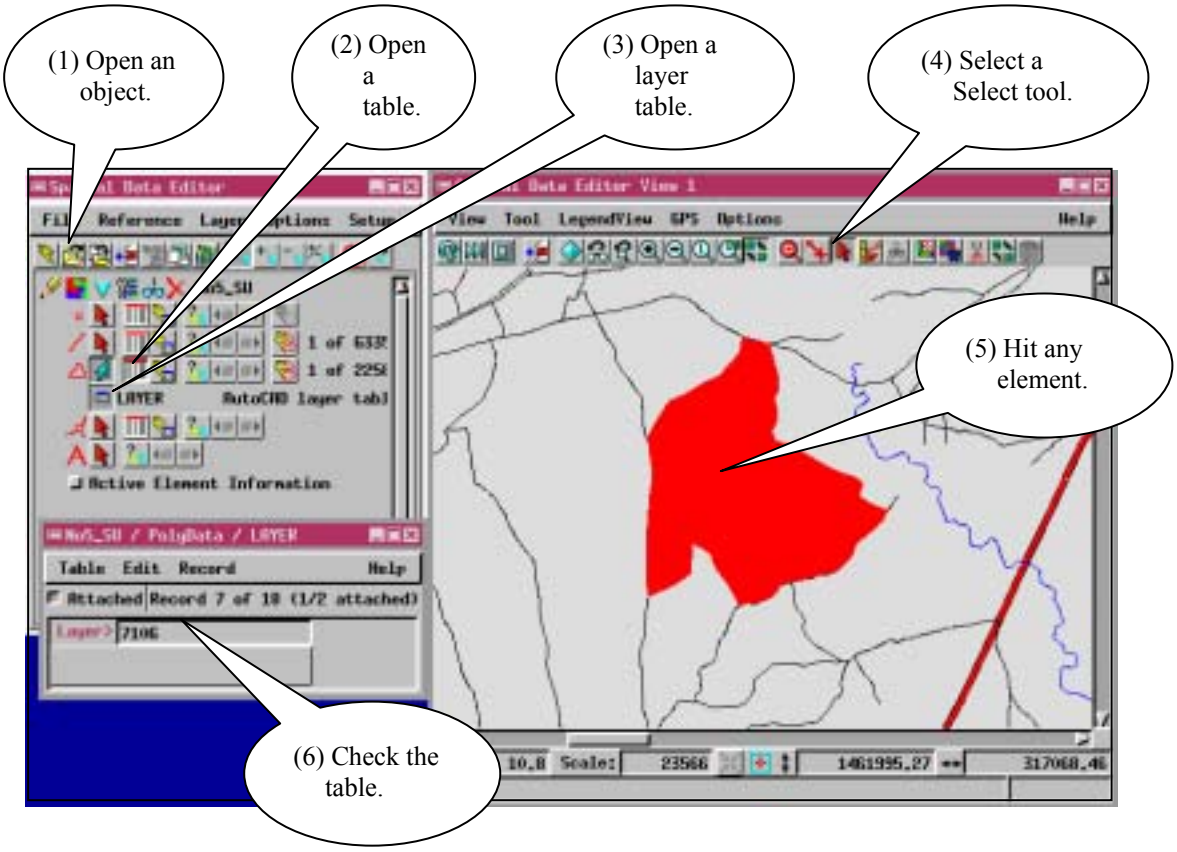


Figure 3.3 Check on layer

3.6 (6) Style allocation

The primary key shall be set to make available the layer table as the attribute for display. Choose Table of the Layer Table menu, Edit Definition to access to the database design tool and the following procedure shall be taken:

- Set Layer to “Primary Key” in the Field Info tab.

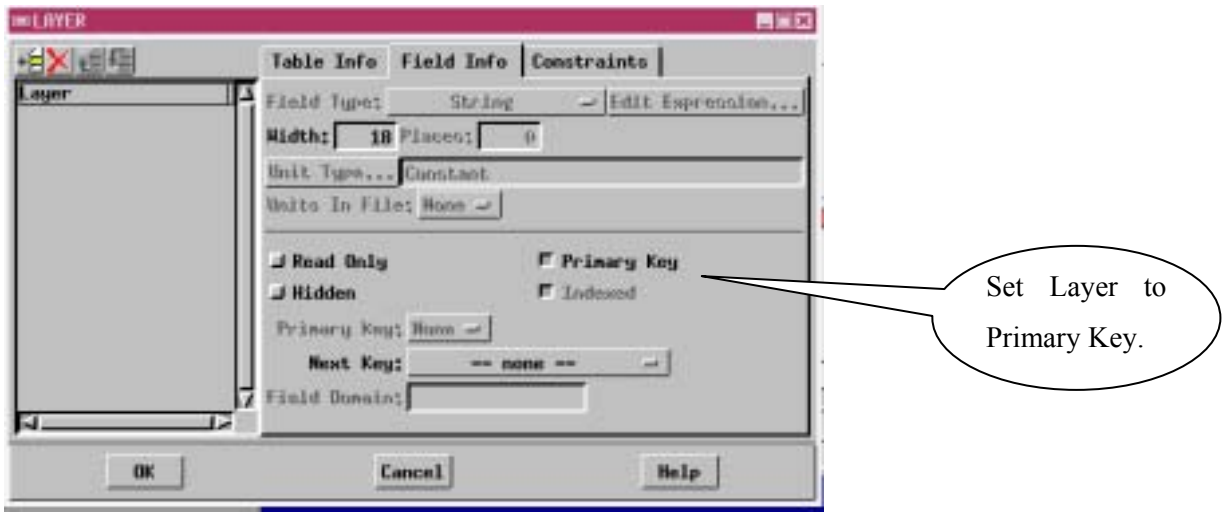


Figure 3.4 Definition of layer

- Choose Layer of the Spatial Data Editor menu and Controls to access to the Control menu.

  The setting for each data type tab shall be as follows:

  √ Select: All

  √ Style: by Attribute

- Click the button [Specify] and start the definition of indication. Set as follows:

  √ Key Field: Layer

  √ Style Table: Layer Style

  √ Style Object: [template.rvc] “Style_Gambia”

- The same name for Layer and Style will automatically be associated with each other.

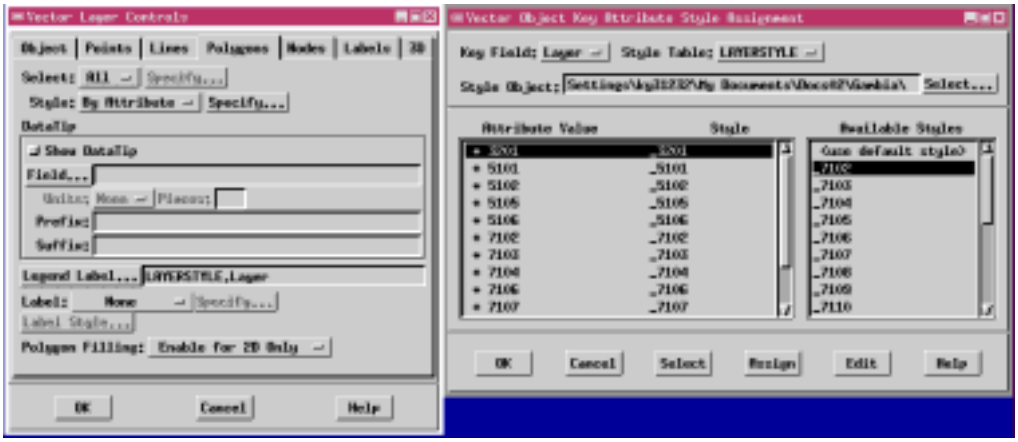


Figure 3.5 Style allocation

- After completing the style allocation, check that the imported table and allocated style are configured as shown in the figure below. This check shall be made by choosing Edit, Attribute Database and Database Editor. The Database is stored as a table for each data type of each object.

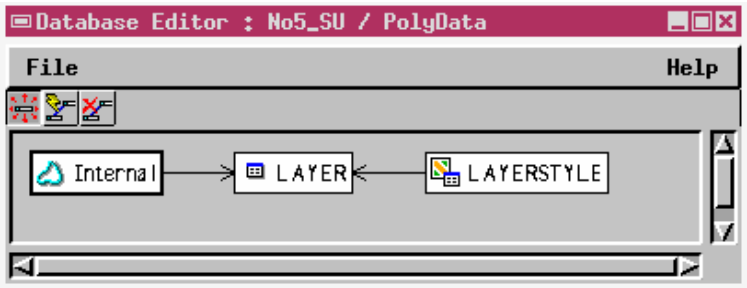


Figure 3.6 Data association

3.7 (7) Check on attribute error and omission

The object to which the style is allocated will be indicated to check on the window that there is no element to which the style is not allocated. If no style is allocated to any element, there may be two types of error, namely:

- An undefined code is used in Layer.
- There is an element to which any layer is not allocated.

If any of the error types is found, select one of the two countermeasures:

In the case of a small quantity of errors, allocate the attribute to each element on Spatial Data Editor.

In the case of a large quantity of errors, a problem may have occurred when creating DXF data, and DXF data should be created again, or the errors should be corrected on the software used for creating the DXF data.

After checking that the styles are allocated to all the elements, proceed with the next process.

3.8 (8) Graphic adjustment

The geometric forms of graphic figures shall be corrected. There are 4 main items as follows:

- Adjoining of neatlines
- Processing of overshoots and undershoots
- Addition and/or deletion of data points to obtain the appropriate data density
- Cutting of the data at national boundaries after all graphic figures are corrected.

Each item mentioned previously shall be executed using the tools on Spatial Data Editor.

3.9 (9) Adjustment of annotation position

If there is a part where an annotation is overlapped by any other graphic figure through symbol representation, and it is difficult to distinguish, the annotation position shall be moved to any other most adequate position. The annotation position shall be adjusted by means of a tool on Spatial Data Editor. The annotation layout shall conform to the symbol specifications.

3.10 (10) Adjustment of symbol position

If a symbol is overlapped by any annotation or another graphic figure, and it is difficult to distinguish through the symbol representation, the symbol position shall be moved to any other most adequate position, as described in (9) adjustment of annotation position. However, the symbol should be handled carefully, because it indicates the true position of a planimetric feature. The symbol layout shall conform to the symbol specifications.

3.11 (11) Storage of map data in a marginal information file

The created or corrected map data objects shall be stored in the "Map Data" group in the copied [template.rvc] file. The storage shall be made by choosing Support of the menu, Maintenance and Project File to access to the maintenance tool.

Backup copies of those files are required since the files may be broken during copying or moving.

3.12 (12) EPS file output

All the objects including the map data stored in the marginal information file shall be outputted in the printing layout. For file and paper outputs, choose Display of the menu, Spatial Data, Open and Open Layout, and then the following procedure shall be taken:

- Open the object for setting a printing layout [layout_No.*]. If all parameters are accurately set, the similar image of a printed map shown on the Layout View window in Section 2 of this Manual could be monitored.
- Choose Layout of the menu of the Control window and Print to print.
- Set the print format to EPS.
- Set the print size and other parameters in size tab as shown in the figure below.
- When executing Print, the file with the extension ".eps", namely [ex.test.eps] will be created. The data will be created in the file size of 5 to 30MB per neatline in which the processing is properly executed.

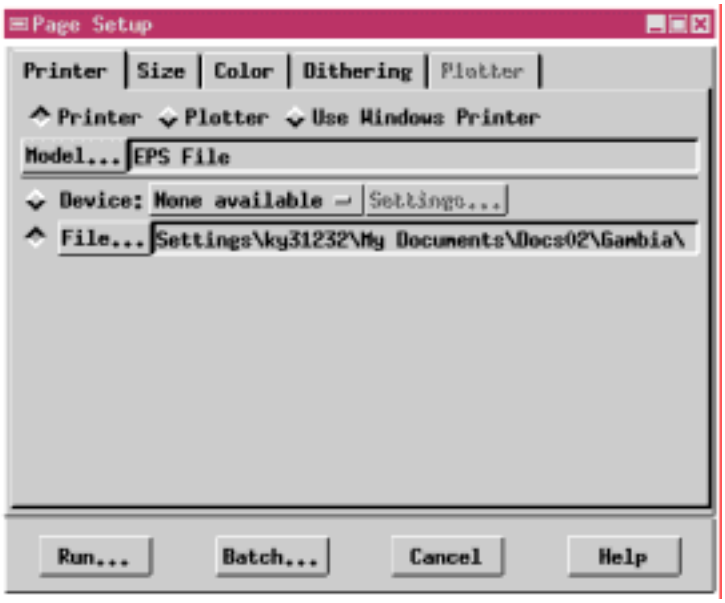


Figure 3.7 EPS output

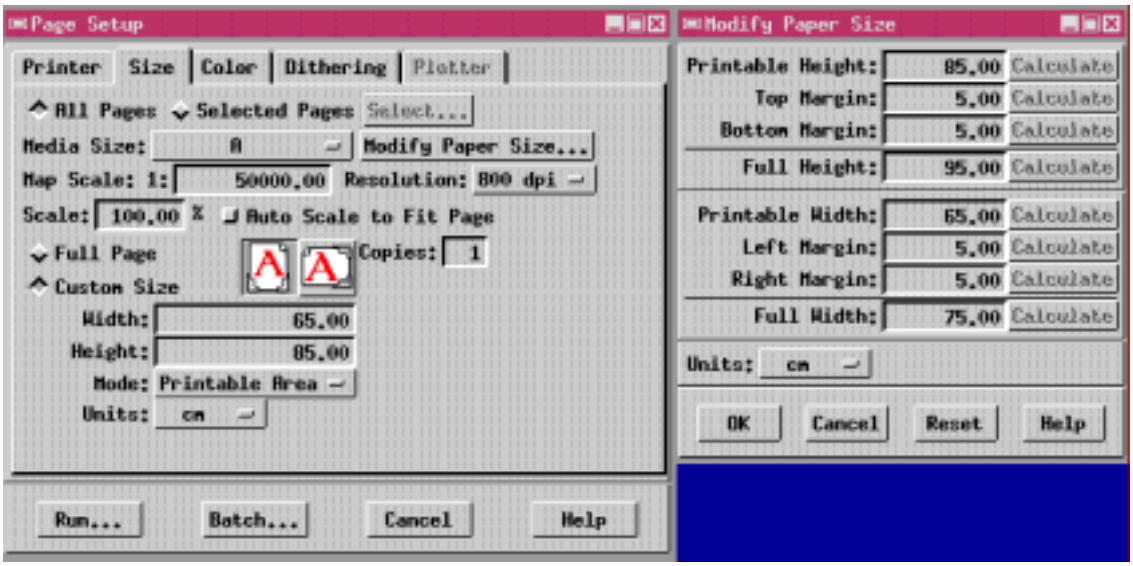


Figure 3.8 EPS setting

3.13 (13) EPS file processing

The EPS file so created is approximate to the printing data, but it will be more effective if the file processing is made to obtain a good view. The processing shall be made using Illustrator. For the details of the operation, refer to the "Basis of Illustrator" and the manual provided by the manufacturer.

3.13.1 Optimization of indication order

The file read using Illustrator will hold the layer architecture in TNTmips. The order of layer indication shall be rearranged according to the standard of map representation for obtaining a good view. The layers will be depicted from the lowest level in the table below and if some layers are overlapped, the upper layer will be indicated.

Table 3.1 Optimization of indication order

Group	Layer	Feature	Remarks
15 Map Data	Lat/Lon Grid 5 '	—	—
	UTM Grid 5km	—	—
	UTN Gird 1km	—	—
	Annotation	All of Annotation	9101-9601
	GCP	Control Point/Pillars	8301-8403
	Symbols	Building/Symbols/Small Object	3301-4109
	Road	Road(Real Width) /Road Facilities	2201～2202

Group	Layer	Feature	Remarks
	Buildings	Prominent House	3101～3103
	Water Facilities	Structures related to water	5201-5202
	Boundaries	Boundaries	1101～1103
	Terrain	Contour/Distorted Areas	8101～8202
	Surface	Primary Road	2101 (black rim line)
			2101 (red center line)
		Secondary Road	2102 (black rim line)
			2102 (yellow center line)
		OtherRoad/Track	2103
		Footpath	2104
		Populated Area	3201
		Specific Areas	6101～6106
		Water Areas	5101～5106
		Vegetation	7102～7111
14 Seller	—	—	No overlap with others
13 Explanation of survey standard system	—	—	No overlap with others
12 Magnetic variation	—	—	No overlap with others
11 Legend	—	—	No overlap with others
10-2 Administrative boundary map title	—	—	No overlap with others
10-1 Administrative boundary map	Boundary_District	—	—
	Rivers	—	—
9-2 Map history title	—	—	No overlap with others
9-1 Map history	—	—	No overlap with others
8-3 Explanation of index map	—	—	No overlap with others
8-2 Index map title	—	—	No overlap with others
8-1 Index map	Correspond Map	—	—
	Index_50k	—	—
	Boundary_Country	—	—
	Rivers	—	—
7 Scale bar	—	—	No overlap with others
6 Explanation of topographic mapping project	—	—	No overlap with others
5 Publisher	—	—	No overlap with others
4-2 Map number	—	—	No overlap with others

Group	Layer	Feature	Remarks
(lower right)			
4-1 Map number (upper left)	—	—	No overlap with others
3 Map name	—	—	No overlap with others
2 Series name	—	—	No overlap with others
1 External neatline	—	—	No overlap with others

Figure 3.9 Example of change of indication order (road)

3.13.2 Paint allocation

The paint patterns of vegetation figures shall be set to the colors and sizes according to the symbol specifications. The template file in Illustrator shall be read in the system as a swatch library and the paint pattern of each figure shall be executed through batch selection and batch replacement. In this work, the symbols of cultivated fields shall be laid out to form a regular grid pattern and those of uncultivated lands shall be randomly laid out.

Table 3.2 Symbol layout of vegetation

Planimetric Features	Layout
7102 Rice Field	Grid pattern
7103 Cultivated Field	Grid pattern
7104 Palms	Grid pattern
7105 Plantation	Grid pattern
7106 Forest	Random pattern
7107 Woods	Random pattern
7108 Mangrove	Random pattern
7109 Grassland/Low Growth	Random pattern
7110 Swamp	Grid pattern
7111 Plain Ground	Grid pattern

3.13.3 Import of annotation layer font

If EPS is used to import the data from TNTmips into Illustrator, the characters are represented as outlines, but they cannot be handled as fonts. This problem cannot change fonts and results in a poor view. To solve this problem, dxf shall be used to import the fonts in the annotation layer from TNTmips to Illustrator. In this case, the reference data such as internal neatlines shall be outputted simultaneously to check whether the annotations within neatlines are laid out relatively at their right positions.

3.13.4 Creation of special symbols

The symbols that are difficult to depict by TNTmips shall be rearranged at the same positions as in TNTmips. The following features shall be considered.

- Ferry: A ship symbol shall be added to the center of a route.
- Steep Slope: The symbol shall be replaced by the line type newly depicted.

Addition of direction label

A direction label shall be positioned between an internal and an external neatline. The direction label in an existing map shall apply to this position accordingly.

3.13.5 Storage in AI file format

The contents of the work shall be stored in the AI format that is the internal format of Illustrator. Through this process, all the information of the work can be stored in an AI file.

4. Naming Rules for Various Data Files

Various file objects shall be named following the examples in [template.rvc].

Table 4.1 Data file naming rules

File type	Rule	Example	Remarks
RVC	(Neatline No.)_(Edition).rvc	no04_ed1.rvc	
Eps (AI)	(Neatline No.)_(Edition).eps	no11_ed1.eps	
Shp	(Neatline No.)_(Edition)_**.eps	no01_ed1_int_bnd.shp	To GIS Specification

5. Check Items in Steps

It is important to carry out the inspection of each step of the work for keeping the quality of the products. A Quality Check Sheet shall be prepared by neatline and shall be signed by a responsible person after each step of work is completed. For the Quality Check Sheet, the

sample form as attached hereto shall be copied and used.

6. Representation Styles

The view styles in TNTmips and the representation styles used in printed maps are covered completely by the style sample [style_Gambia] stored in the file [template.rvc]. However, some special symbols are omitted because it is difficult to handle them in the TNTmips system. To produce the printed maps on a full scale, the right symbols shall be applied to printing maps.

7. Coordinate System

The survey standard system for use in topographic maps shall be selected properly. If any faulty standard system is applied, the absolute position coordinates may show large errors. All map data shall be stored as UTM/xyh coordinate values or latitude/longitude values. The survey standard system to be used is described in the tables below.

Table 7.1 Survey standard system to be applied

Survey standard system	Value	Remarks
System	Lat/Lon	-
Datum level	GAMBNET	Compatible with World Geodetic System 1984
Ellipsoid	WGS1984	-

Survey standard system	Value	Remarks
System	UTM	Zone28
Projection	Transverse Mercator	-
Datum level	GAMBNET	Compatible with World Geodetic System 1984
Ellipsoid	WGS1984	-

8. Requirements for Full-scale Printing

The Illustrator software to be used for the production of printed maps has all necessary functions for creating the data for printing the maps. However, a good technical knowledge is needed to create the map data necessary for printing. For example, the knowledge on color separation form plates and on the layout and fonts of curved line annotations for linear features is required. To this end, refer to the detailed descriptions in technical books.

Manual for Revision of 1:50,000-Scale Maps Using TNTmips

August 2002

Department of Lands and Surveys

JICA Study Team

Table of Contents

1. Purpose

This Manual describes the method for revising the data of 1:50,000-scale topographic maps using TNTmips to attain a better understanding of the method for inputting and revising the 1:50,000-scale map data according to the TNTmips software. For example, it is expected to add detained terrains in 1:50,000-scale topographic maps based on some existing maps of a large scale such as 1:2,500, or to update 1:50,000-scale topographic maps based on newly photographed aerial photos. For the basic operation of each process, refer to the supplemental material "Basis of TNTmips" and the manual provided by the manufacturer. For re-creating the 1:50,000-scale maps by importing the map data from other systems and various data sets into TNTmips, refer to the "Manual for Creation of 1:50,000-scale Maps Using TNTmips".

The data file model [template.rvc] to be supplied together with the 1:50,000-scale topographic mapping data shall be prepared for the use of this Manual. For the system parameter setting, refer to the supplemental material "Basis of TNTmips".

2. Preparatory Works

Before starting the work, some preparatory works must be carried out.

2.1 Work Plan

The following work items shall be planned:

- Determination of scope of work

  The scope of work shall be determined and filled in the map plans such as 1:50,000-scale topographic maps.
- Determination of working methods

  The basic materials in which data will be entered shall be determined. These materials shall be selected from newly photographed aerial photos and existing large-scale topographic maps.

2.2 Collection of Required Materials

The aerial photos, topographic maps and ground control point materials in which data will be entered shall be collected.

2.3 Preparation of a Quality Check Sheet

A Quality Check Sheet shall be prepared to keep the quality of the products obtained from the work, and results of the work shall be recorded in this sheet. The sample form as attached hereto shall be used as the Quality Check Sheet by adding some necessary items.

3. Work Flowchart

The data file to be created shall follow the examples in the file [template.rev], which is described in the "Manual for Creation of 1:50,000-scale Maps Using TNTmips".

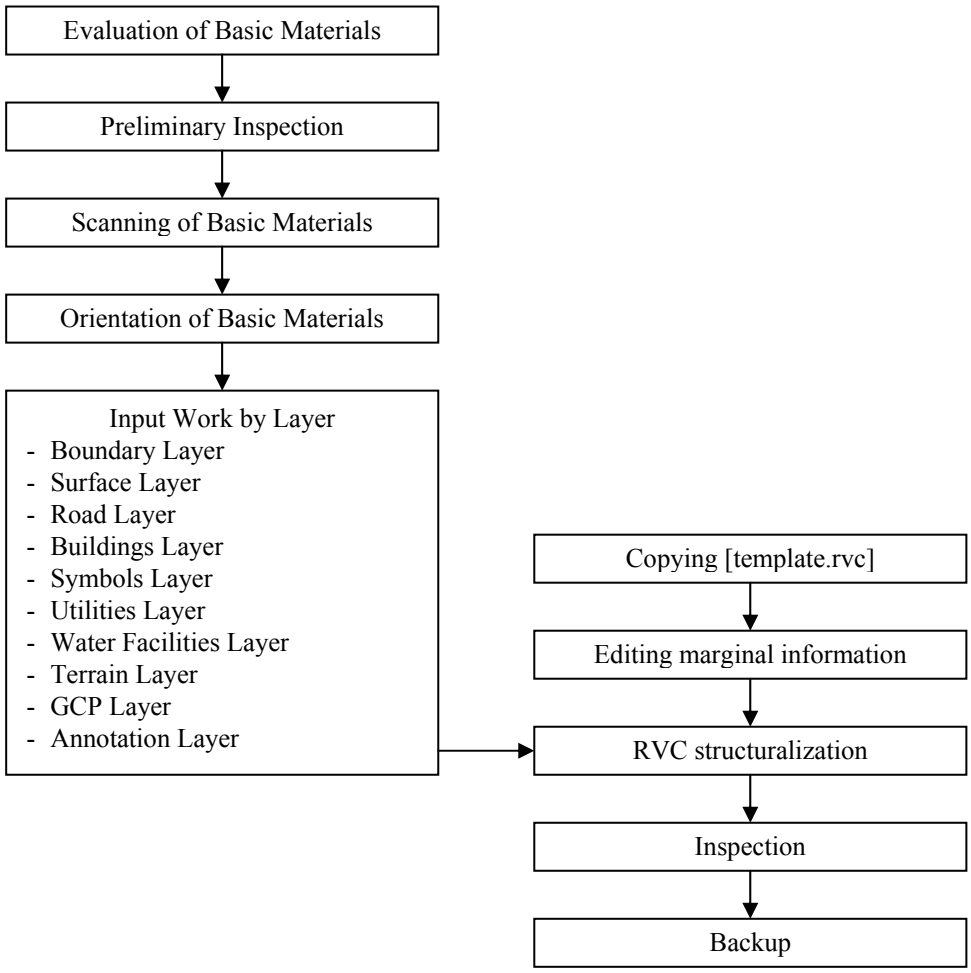


Figure 3.1 Work Flowchart

4. Work Processes

The work processes are described in detail as follows.

4.1 Evaluation of Basic Materials

An evaluation shall be made whether the existing topographic maps and aerial photos collected in the preparatory work are appropriated for this revision work. In particular, the maps shall be checked on the below-mentioned items, and if any of the collected materials is inappropriate for the revision work, alternative materials shall be collected again.

- Folds of map sheets

  Printed maps shall show no strong folds and creases that would make it difficult to scan and digitize the maps. The normal hold lines of printed maps will cause no problem if the maps are handled carefully.

- Irregular expansion or scaling

  The correction of expanded or scaled maps shall be possible using the Helmart or Affine transformation. If any maps with irregular expanded or scaled parts should be used, it is necessary to divide each map into several parts and orientate them carefully using technical ideas and careful quality control.

- Line blurs

  The maps shall show no blurs that would make it difficult to scan and digitize them on a CRT screen. The maps that are entirely printed but can be adjusted in scanning quality are effective.

- Lack of representation items

  The representation items in the maps shall cover all the items to be digitized.

- Insufficient coordinate information

  The data shall include the UTM coordinate values, Lat/Ton coordinate values or known ground control points whose arbitrary coordinate values can be incorporated into the survey standard system and integrated with the existing data.

4.2 Preliminary Inspection

The output maps to be revised shall be compared with the basic materials to determine the amount of revisions by marking the points to be revised. The cost and time period of the revision work shall be estimated based on the results, in order to plan the detailed work schedule.

4.3 Scanning of Basic Materials

If the result of evaluation is good, the basic materials may be scanned to obtain the raster data of the maps. For the operation of the scanner, refer to the "Map Scanner Manual" and the manual provided by the manufacturer. The scanning specifications are described hereinafter. The scanning work shall be carried out according to the following specifications:

Table 4.1 Scanning specifications

Item	Value (unit)	Remarks
Resolution	200 to 300 (dpi)	Applicable to maps
	500 to 1000 (dpi)	Applicable to aerial photos
File format	TIFF	Uncompressed format
Color depth	8 (bits)	Grayscale
	24 (bits)	Full color

4.4 Orientation of Basic Materials

The preparatory work for use of the image data scanned from the basic materials shall be carried out.

4.4.1 Import of scanning data

The scanned image data shall be imported into TNTmips by choosing Process of the menu and Import. It is recommended to take care of some setting parameters when importing.

- Select the Pyramid format

  This format shall be selected to realize high-speed image display.

- Select Compress

  This setting shall be selected to compress a large quantity of image data.

- Set the coordinate system

  The following items shall be set:

  √ UTMzone28 World Geodetic System 1984

  √ Lat/Long World Geodetic System 1984

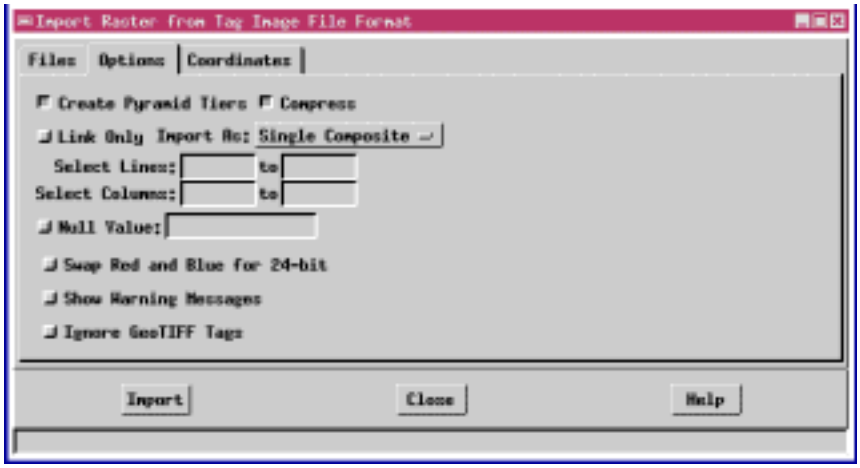


Figure 4.1 Setting of image import

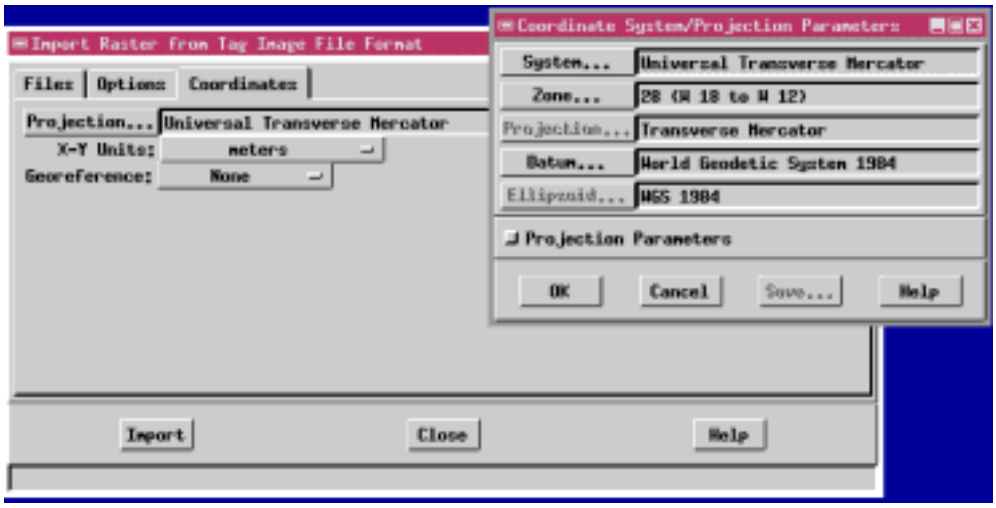


Figure 4.2 Setting of coordinate system when importing images

4.4.2 Orientation

Choose Edit and Georeference to access to the orientation tool. The procedure shall be taken as follows:

- Open the image for orientation by choosing File on the Georeference window and Open.
- Open the map data to be revised for reference by choosing Option on the Georeference window and Show Reference View.
- Set a coordinate system by choosing Setup on the Georeference window and Projections. The setting parameters are the same as for importing the image.
- Select both cross-hair tools on Input Object View and Reference Object View and assign the corresponding points between both views.
- Click the Apply button on the Georeference window to register the corresponding points.
- Register the corresponding points repeatedly as necessary times. It is adequate to register at least 5 points to 10 points.
- Check Residuals on the Georeference window, and if Residuals do not meet the required value, change Add mode into Edit mode. Re-measure or delete the points with large residuals. The residuals of the corresponding points in a 1:50,000-scale map shall be less than 25 m.
- After the completion of measurement of corresponding points, save the object "UTM" recording the orientated scanning image by choosing File on the Georeference window and Save. The storage location of "UTM" is determined automatically as the image data sub-object.

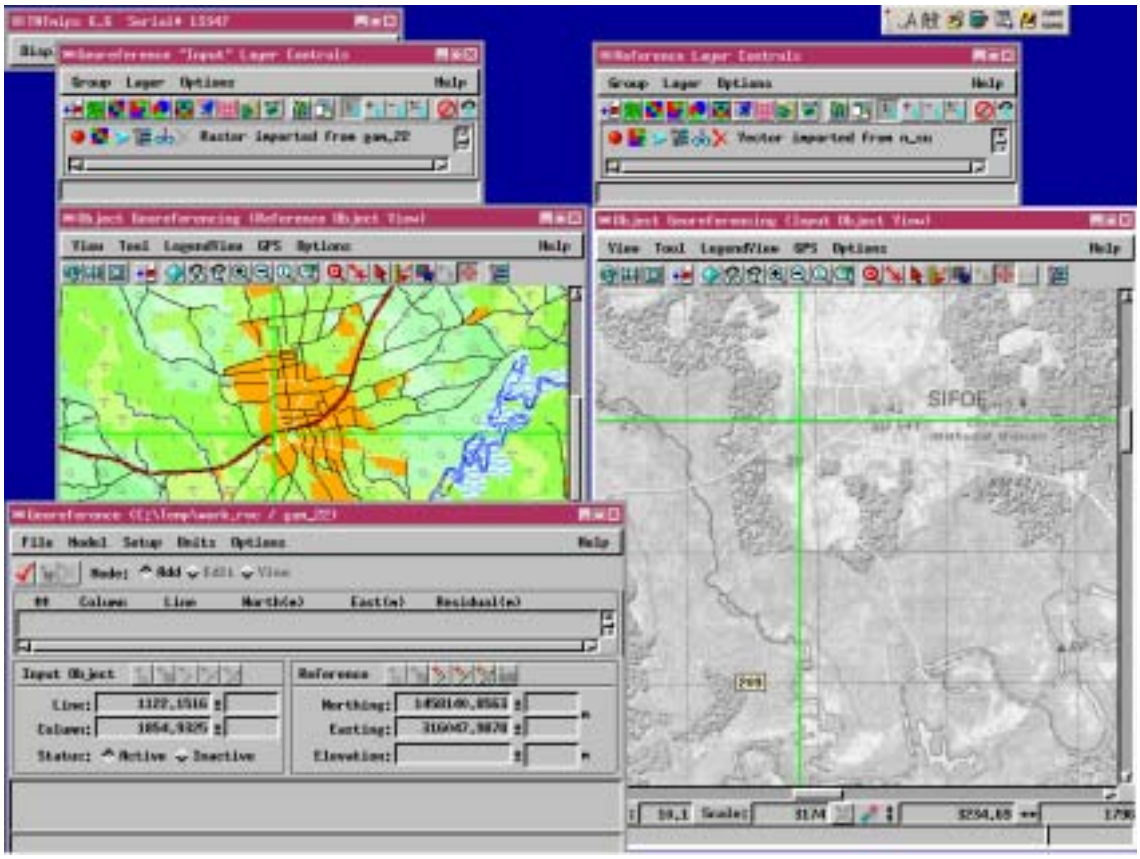


Figure 4.3 Orientation of scanning image data

- After the completion of the orientation of the image data, the coordinate system and layout positions are imported automatically when it is displayed. As shown in the figure below, the image data can be displayed in overlay with the map data.
- In this example, the orientation of an existing map is shown. It can be made by the same operation as in the orientation of aerial photos. However, take note that aerial photos may have poor position accuracy depending upon the conditions such as terrain undulations and camera focus distance due to the geometric features of the central projection images. Therefore, the following conditions shall be satisfied for the use of aerial photos:
  √ A flat terrain shall be photographed.
  √ The central area of each photo shall be used.

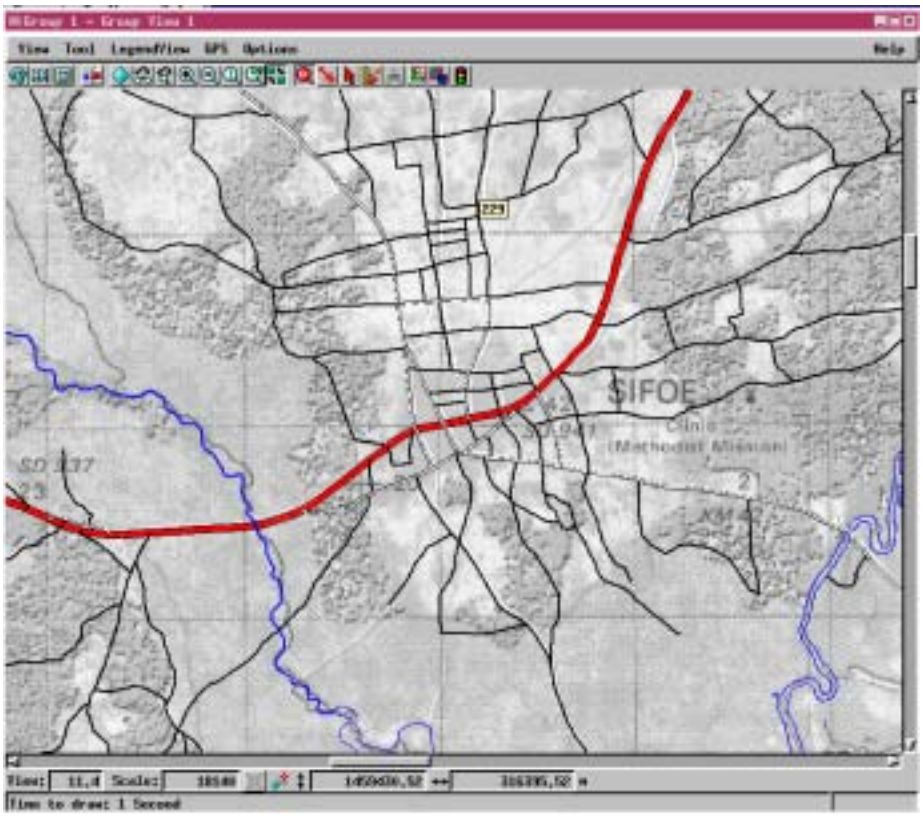


Figure 4.4 Overlay display of map data and scanning image

4.5 Input Work by Layer

After orientating the basic materials, proceed with the input/edit process. The input process shall be carried out for each layer configuration as specified in 1:50,000-scale map specifications. The points to be considered in the input process by layer will be described below.

4.5.1 Boundary layer

This layer includes the features indicating the administrative boundaries, but no revision is needed.

4.5.2 Surface layer

The surface layer includes vegetation fields and shorelines as boundaries to categorize the land cover (land use) on the ground surface and the linear planimetric features such as roads serving also as boundaries. The lines and polygons configuring these features show a phase structure. The data revision shall be made as follows:

- Delete the unnecessary lines from the basic materials regardless of the line types.
- After completing all the deleting jobs, delete the unnecessary nodes, which represent the ends of line elements. A node is required at a point where three or more lines gather, but a

point where two lines gather is not required. The deletion shall be made by choosing Tools and Remove Excess Nodes for each object.

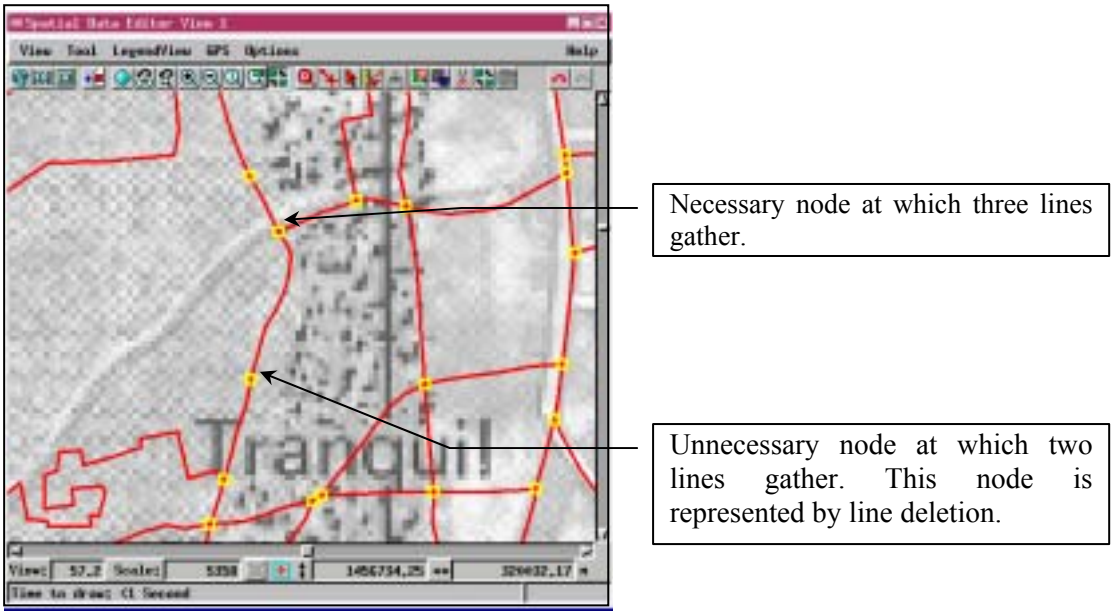


Figure 4.5 Unnecessary node

- Draw a new line which shall be added by extending an existing line because a line may serve to form the boundary of a polygon in many cases. When drawing a line, it is not necessary to know to which feature the line belongs.

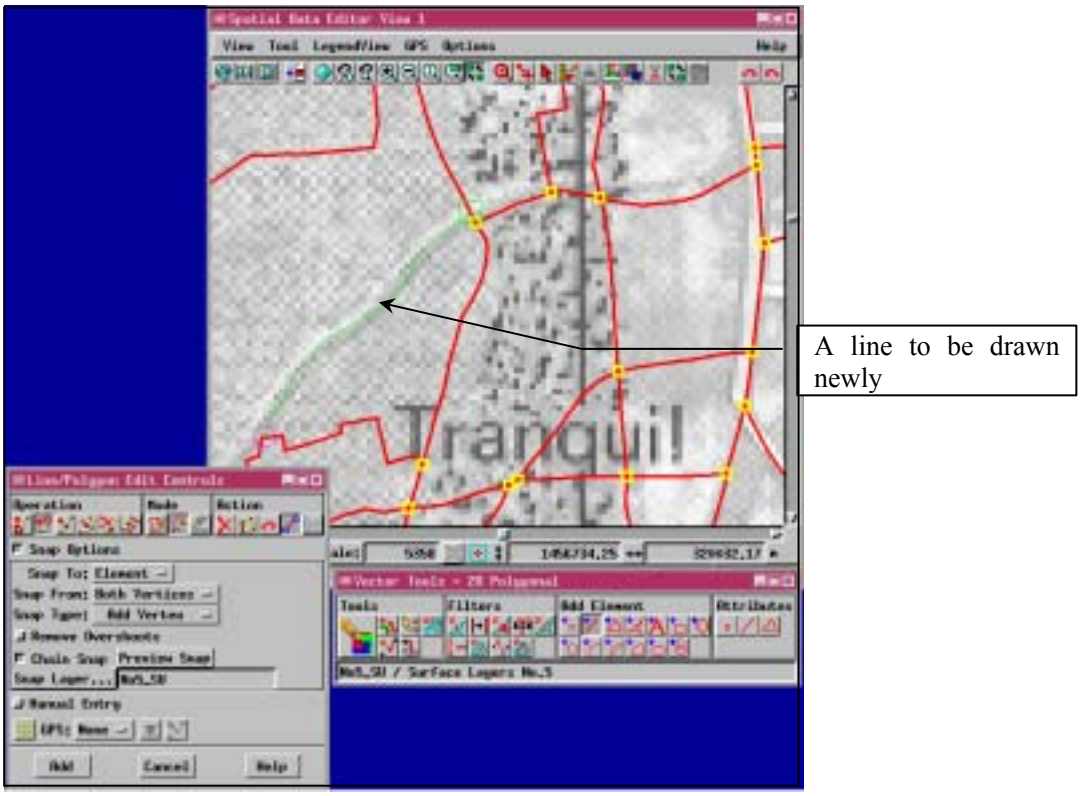


Figure 4.6 Addition of a line

- After the completion of the input of lines to be added, enter the feature to which these lines and a polygon area created by these lines belong, into the Layers table by data type.

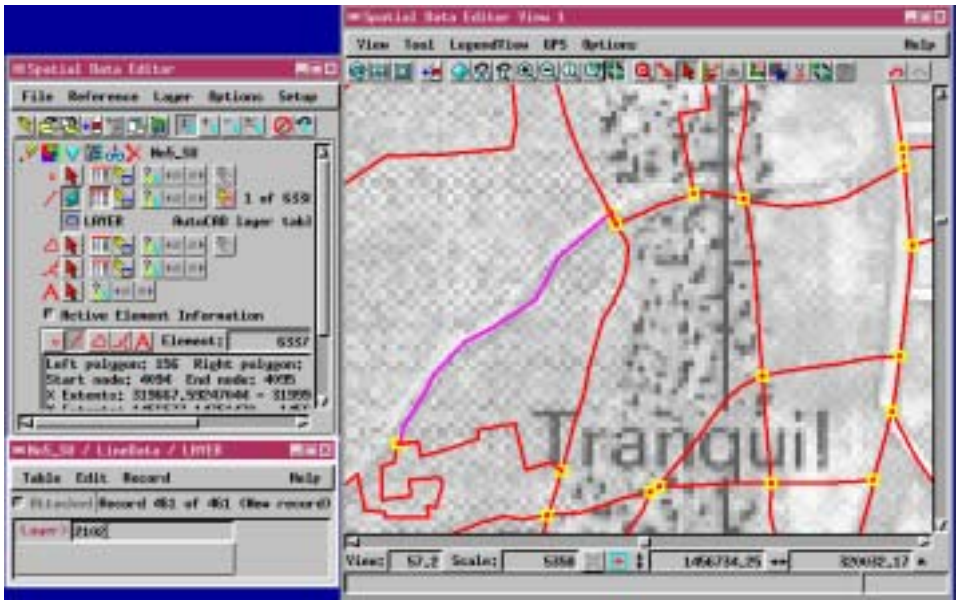


Figure 4.7 Input into Layers table

- After the input process, check that the Layers are allocated to all the newly inputted liens and generated polygons in the style representation. If no style is indicated for any image part on the window, the style shall be inputted.

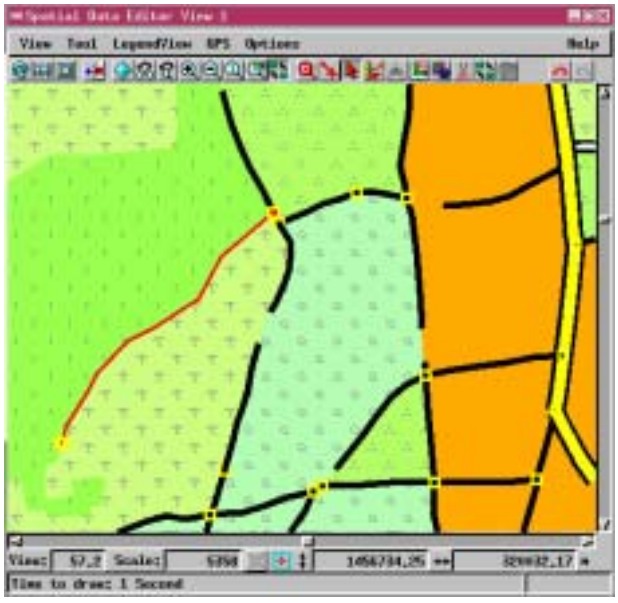


Figure 4.8 Image display in style representation

4.5.3 Road layer

- This layer includes the sections with a median strip (central reserve) of a road that should have a realistic representation, and the features representing structures such as bridges. This layer has no phase structure.
- The outlines of the features shall be inputted from the basic materials.
- A bridge or culvert with its symbol shall be drawn according to the map symbol specifications.

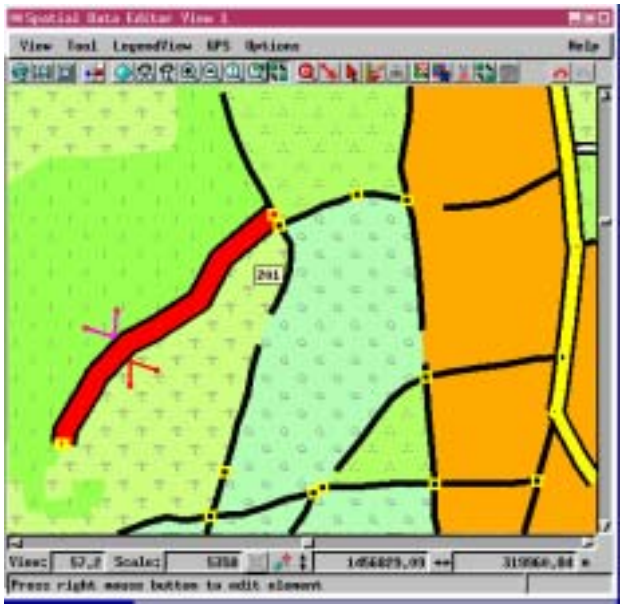


Figure 4.9 Example of drawing of culvert

4.5.4 Buildings layer

This layer includes independent houses and buildings to be represented independently, but has no phase structure.

- The center or outline of a house shall be inputted from the feature.
- When inputting the data from an aerial photo, the houses along the roadsides shall be inputted with consideration for the road width according to the symbol specifications and taking care that the houses are not overlapped.
- When inputting the data from an aerial photo, there may be cases in which individual independent houses are not inputted, but simply represented as a community or a housing area.

4.5.5 Symbols layer

This layer includes the symbol features representing the buildings such as a mosque and school.

- A symbol shall be inputted at the center of a building feature as a rule.

- The feature shall be drawn in style representation. If the symbol is overlapped with any other feature, it shall be shifted by a minimum distance. This shift is needed in the case that two symbols or a symbol and an annotation are represented overlapped.

4.5.6 Utilities layer

This layer includes the features such as a water tank and power transmission lines, but has no phase structure.

- A symbol shall be put at the center of a feature as well as the building symbols.
- A linear feature such as a power transmission line shall be inputted as a shape.
- A reserved area boundary shall be inputted in the case that the boundary can be interpreted from an aerial photo or that the material regarding the boundary is available.

4.5.7 Water Facilities layer

This layer includes the features such as a ferry route and a pier, but has no phase structure.

- For a ferry, its route shall be inputted on a water channel.
- For a pier, its shape shall be inputted as lines.

4.5.8 Terrain layer

This layer includes the features such as contour lines and deformed lands, but has no phase structure.

- The contour lines shall be inputted as a 3-dimensional feature.
- An intermediate contour shall be drawn additionally depending upon the contour line density.
- Take care that no matching is caused between the contour lines and the values of spot heights and bench marks in GCP layer.

4.5.9 GCP layer

This layer includes the features such as ground control points, but has no phase structure.

- A feature with a 3-dimensional product shall be inputted 3-dimensionally.
- The point names and elevation values shall be represented in the annotation layer.
- The ground control points with X-Y products shall be laid out at their accurate positions unlike other symbols. The position to be represented shall not be shifted.

4.5.10 Annotation layer

The annotation layers are formed as a group. Each annotation layer shall be stored as an independent object by feature, unlike other layers.

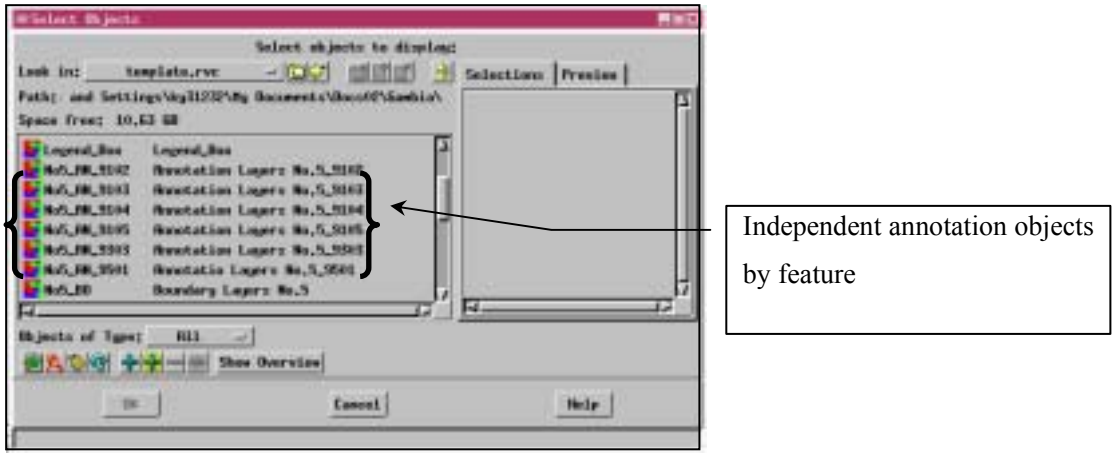


Figure 4.10 Annotation layer object

4.6 Copy of [template.rvc]

The data such as marginal information, except the map data, shall be copied from the file [template.rvc].

4.7 Editing of Marginal Information

The objects of unique information such as edition number in the copy of [template.rvc] shall be revised. For the details, refer to the "Manual for Creation of 1:50,000-scale Maps Using TNTmips".

4.8 Structuralization of RVC data file

The configuration of the object group in the RVC file shall be structuralized following the example in the file [template.rvc].

- The order of Layout (representation) shall be structuralized.
- The Description shall be entered to serve the arrangement and for a better understanding of object names.

4.9 Inspection

The progress and conditions of the work shall be well understood by using the Quality Check Sheet. If there is any unclear or doubtful process, the contents of the process shall be rechecked and revised. If the work covers several map sheets, some sheets shall be sampled to inspect all the process items and evaluate the accuracy of the entire work.

4.10 Backup

After completion of the entire revision work, the RVC data file and the EPS (AI) file for output as well as the scanning image data file and the meta-data file shall be stored in a CD-R as a master backup.

- The file explanation shall be prepared as the meta-data text format. The meta-data file includes the information with the work name, responsible person, work area, date of completion, scale of basic materials and scale of data product.
- A label shall be attached to the CD-R and the work name, backup date and the quantity of CD-Rs serving as the master backup shall be mentioned on the label.
- The master backup shall be kept at a secure place of storage.

Manual for Coordinate Conversion from Existing System to GAMBNET

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Department of Lands and Surveys

JICA Study Team

Table of Contents

1. Purpose

A coordinate value in the same measurement reference system is required to use the existing contour map and geographic information with a 1:50,000-scale map. The conversion of coordinate systems is required to:

- Convert an existing drawing into digital form by standardizing the horizontal position using the coordinate values in the four corners of the drawing
- Overlay existing digital data over a 1:50,000-scale map.

This manual describes specifically how to code a software program or data set used together with a process provided for converting actually a coordinate value.

2. Overview

The operation is to accept XY of UTM Zone28 as the input value and output XY of UTMZone28 in GAMBNET. The conversion is performed in five steps as shown in the figure below. The software programs to be used are "TNTmips Map Calculator" and DOS programs "BLH2XYZ", "XYZ2XYZ", and "XYZ2BLH".

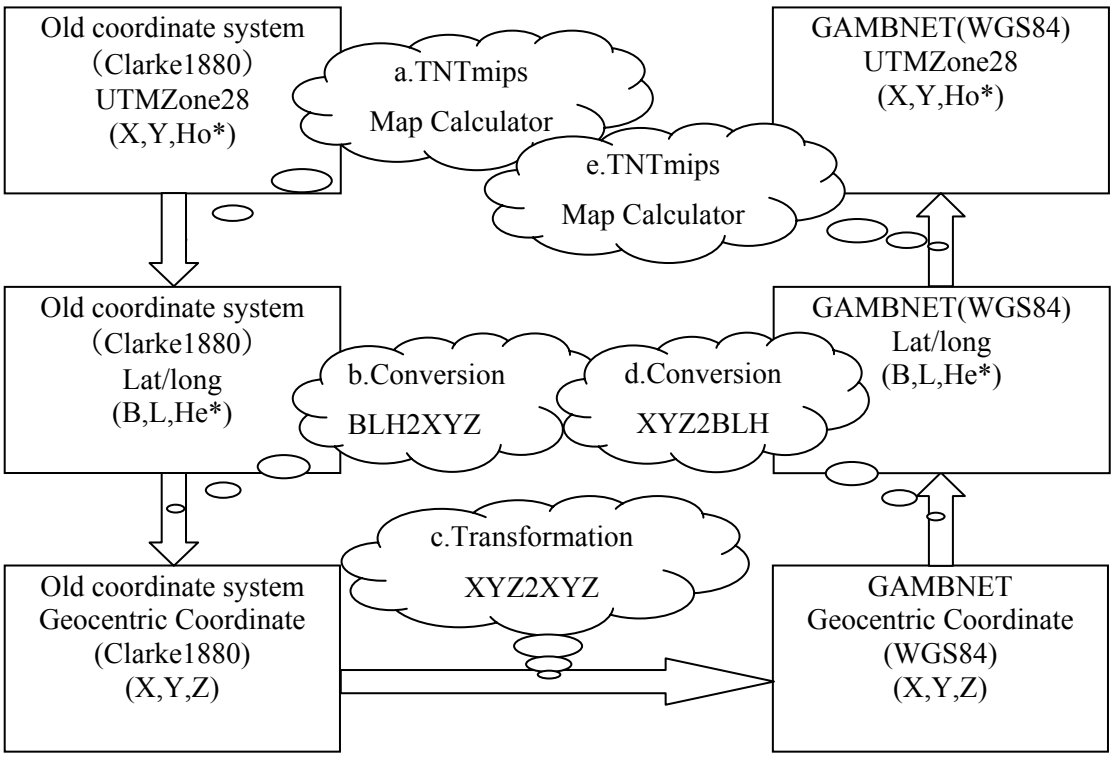


Figure 2.1 Coordinate conversion steps

* The current coordinate system is called the old coordinate system in order to distinguish it from GAMBNET.

* Ho: Orthometric Height

* He: Ellipsoidal Height

3. Precautions

- For more information on various parameters to be used and error in conversion, refer to the "DRAFT TECHNICAL REPORT ON GPS SURVEY THE GAMBIA NATIONAL NETWORK".
- This method is applicable only to geographic information with a medium scale of 1:5,000 or less.
- A coordinate value converted in this method may cause a conversion error of three meters or more in the horizontal position.
- Always perform calculation with the ellipsoidal height of 0 m, considering that the data to be converted may not have a height coordinate or that it may be difficult to give a height from a geoid model. The influence of a height error over the horizontal position is negligible in a medium to small scale of 1:5,000 or less.
- Geographic data cannot be converted in the current data format. Convert the data to the list of coordinate values in the text format, then perform the coordinate transformation to convert it into a required data format.
- Edit data using MS-EXEL, etc.

4. Work Procedure

4.1 (a) Using TNTmips Map Calculator to convert old coordinate system (Clarke1880) UTMZone28 (X, Y) to old coordinate system (Clarke1880) lat/long (B, L, H)

- Have ready input data. The following shows an example of data (e.g., coordutmin.txt). Create data in the text format. Code a UTM coordinate values (X, Y) by delimiting them with a comma.

```
308638.100, 1448554.600
346315.100, 1455964.000
380993.758, 1462581.948
412028.672, 1500336.853
456997.300, 1518657.800
497595.214, 1497500.617
552212.800, 1506162.600
550912.400, 1471993.300
585744.600, 1492630.200
587855.363, 1461463.308
619833.517, 1482248.022
```

Figure 4.1 Example of input data

- Start the Map Calculator.
- Select the input data in the Input File field.
- Set the Input Projection, Format, and Delimited as shown below.

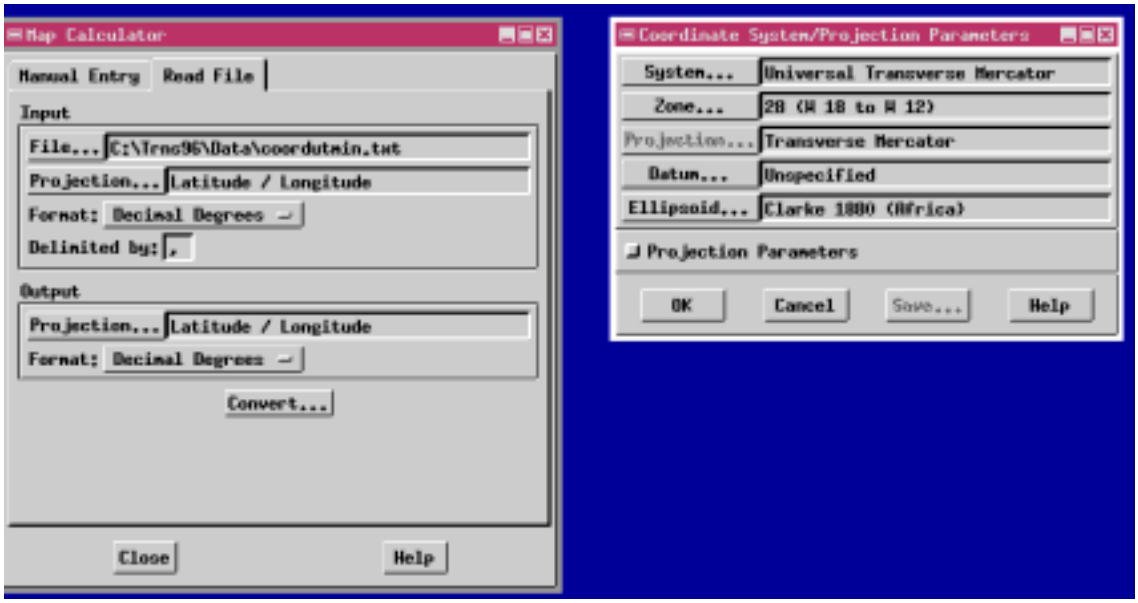


Figure 4.2 Data input settings

- Set the Output Projection and Format as shown below.

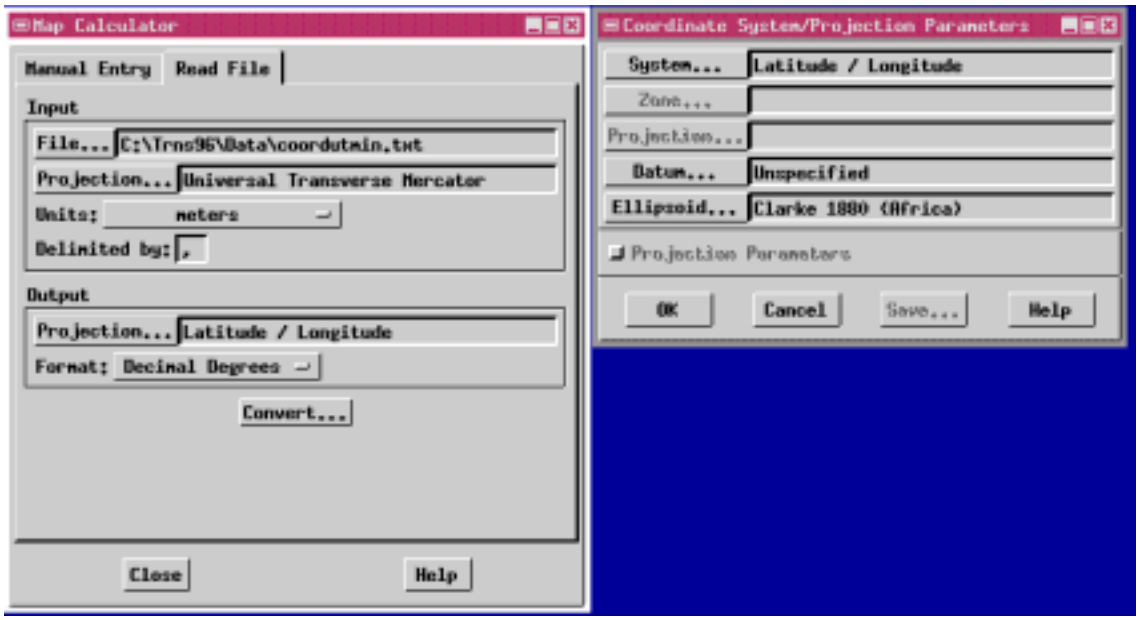


Figure 4.3 Data output settings

- Click Convert.
- Specify an output file name (e.g., coordblhin.txt).

Figure 4.4 Output file specification

- A file is output as soon as the processing ends (refer to the example).

13.098387,-16.765068
13.167517,-16.418014
13.228923,-16.098357
13.571384,-15.813093
13.738064,-15.397750
13.547059,-15.022225
13.624922,-14.517295
13.315958,-14.529920
13.501765,-14.207717
13.219882,-14.189156
13.406702,-13.893201

Figure 4.5 Example of output file

4.2 (b) Using BLH2XYZ to convert old coordinate system (Clarke1880) lat/long (B, L, He) to old coordinate system (Clarke1880) Geocentric Coordinate (X, Y, Z) / (c) Using XYZ2XYZ to convert old coordinate system (Clarke1880) Geocentric Coordinate (X, Y, Z) to GAMBNET (WGS84) Geocentric Coordinate (X, Y, Z) / (d) Using XYZ2BLH to convert GAMBNET (WGS84) Geocentric Coordinate (X, Y, Z) to GAMBNET (WGS84) lat/long (B, L, He)

- Execute continuously three procedures b, c, and d by entering the commands on the command line.
- Have ready the input data. Process an output file in the preprocessing (e.g., coordblhin.txt) as shown in the figure below. Convert the data to the ones delimited with spaces and add the H value. Assume H = 0 m.

```
13.098387 -16.765068 0
13.167517 -16.418014 0
13.228923 -16.098357 0
13.571384 -15.813093 0
13.738064 -15.397750 0
13.547059 -15.022225 0
13.624922 -14.517295 0
13.315958 -14.529920 0
13.501765 -14.207717 0
13.219882 -14.189156 0
13.406702 -13.893201 0
```

Figure 4.6 Example of input data

- Open the DOS Prompt window and enter the following commands:
  - √ Blh2xyz [Input File] | xyz2xyz | xyz2blh > [Output File]
  - √ e.g.) C:¥Trns96>blh2xyz coordblhin.txt | xyz2xyz | xyz2blh > coordblhout.txt

- A file is output as soon as the processing ends (refer to the example).

```
#processed by blh2xyz. Units are degree and meter. Mikio Tobita, GSI
#ellipsoid : 6378249.145000 293.465000 Clarke specified in "blh2xyz.par"
#processed by xyz2xyz. Units are meter. Mikio Tobita, GSI
#Transformation parameters specified in "xyz2xyz.par" :
#  T1     T2     T3     D    R1    R2    R3    Coordinate System
#  cm     cm     cm     1D-8  .001"  .001"  .001"  From     To
# -3684.04  4741.70  17417.33 -894.09 -1182.37 -202.22 3607.62   CENT&EAST    GAMBNET
#processed by xyz2blh. Units are meter and degree. Mikio Tobita, GSI
#ellipsoid : 6378137.000000 298.257224 WGS-84 specified in "xyz2blh.par"
 13.0987801165 -16.7636762573   29.05123
 13.1679011280 -16.4166188539   29.28910
 13.2292990628 -16.0969587433   29.50782
 13.5717249221 -15.8116899984   29.82095
 13.7383860284 -15.3963423635   30.13329
 13.5473970416 -15.0208155626   30.29288
 13.6252491164 -14.5158808423   30.63398
 13.3163152290 -14.5285081016   30.50359
 13.5021019985 -14.2063011602   30.78033
 13.2202463176 -14.1877419767   30.67460
 13.4070461321 -13.8917832562   30.93999
```

Figure 4.7 Example of output file

4.3 (e) Using TNTmips Map Calculator to convert GAMBNET (WGS84) lat/long (B, L, He) to GAMBNET (WGS84) UTMZone28 (X, Y)

- Have ready the input data. Process an output file in the preprocessing (e.g., coordblhout.txt) as shown in the figure below. Delete the lines that are not coordinate values and convert the data to the ones delimited with commas.

```
13.0987801165,  -16.7636762573,    29.05123
13.1679011280,  -16.4166188539,    29.28910
13.2292990628,  -16.0969587433,    29.50782
13.5717249221,  -15.8116899984,    29.82095
13.7383860284,  -15.3963423635,    30.13329
13.5473970416,  -15.0208155626,    30.29288
13.6252491164,  -14.5158808423,    30.63398
13.3163152290,  -14.5285081016,    30.50359
13.5021019985,  -14.2063011602,    30.78033
13.2202463176,  -14.1877419767,    30.67460
13.4070461321,  -13.8917832562,    30.93999
```

Figure 4.8 Example of input data

- Start the Map Calculator.
- Select the input data in the Input File field.
- Set the Input Projection, Format, and Delimited as shown below.

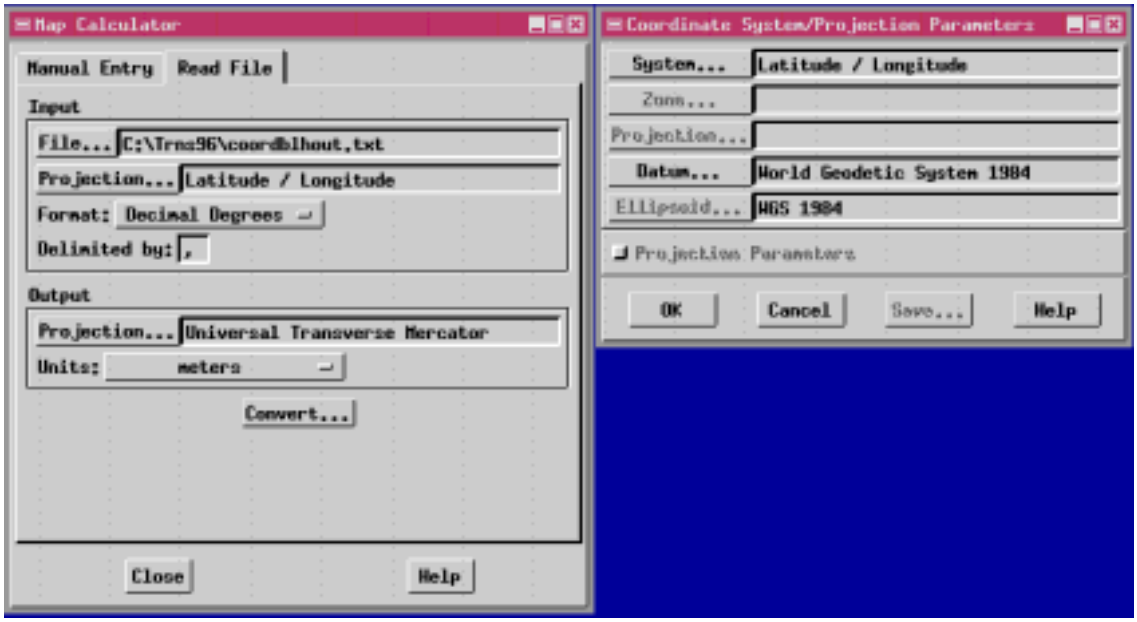


Figure 4.9 Input file settings

- Set the Output Projection and Format as shown below.

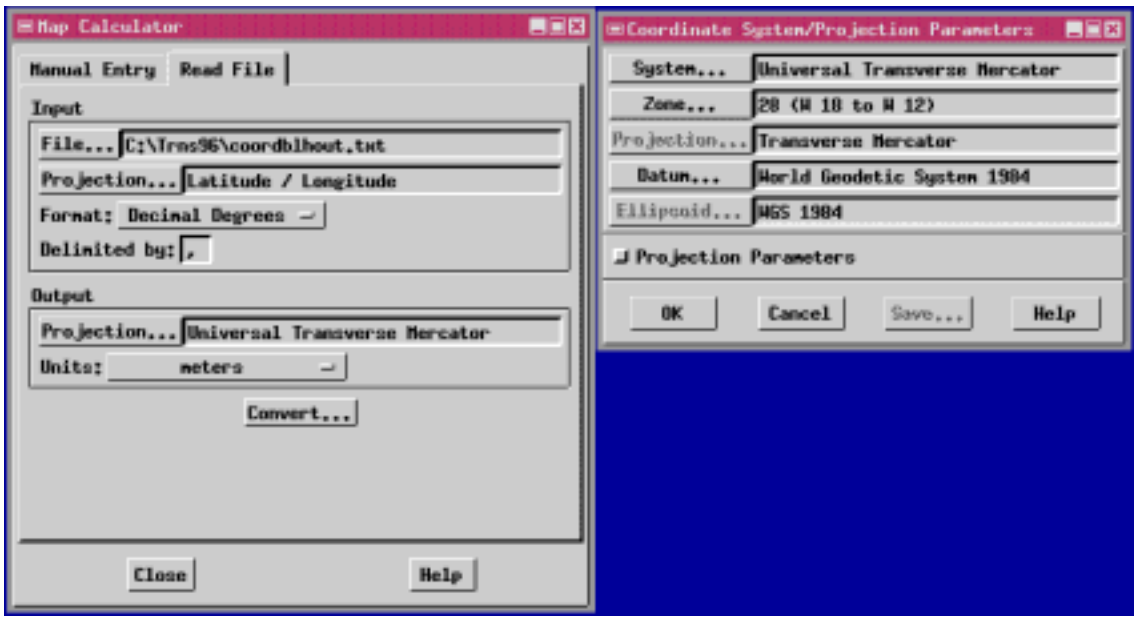


Figure 4.10 Output file settings

- Click Convert.
- Specify an output file name (e.g., coordutmout.txt).

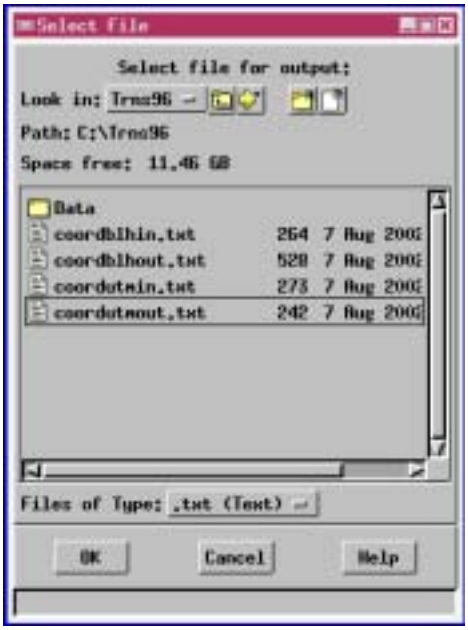


Figure 4.11 Output file specification

- A file is output as soon as the processing ends (refer to the example).
- Check the difference between the input and output files to make sure that there is no error.

The difference vector is about 300 m in the horizontal position.

- Store the output file using the import function of TNTmips. If required, make connections and create polygons.

```
308793.189365,1448726.581706
346469.733606,1456135.833458
381147.911747,1462753.661173
412182.440416,1500508.012888
457150.399061,1518828.607485
497747.781564,1497671.685246
552364.568666,1506333.468585
551064.214475,1472164.654302
585895.935223,1492801.289923
588006.703791,1461634.810942
619984.385268,1482419.208816
```

Figure 4.12 Output file example

5. Conversion Parameter Settings

In GAMBNET, three conversion parameter sets are available according to the regions: "COMMON" intended for the entire country, "KOMBO" intended for the western part, and "CENTRAL and EAST" intended for the central and eastern parts. Applying an appropriate conversion parameter set to the target area can minimize the conversion error. For more information on the target area, refer to the "REPORT ON GPS SURVEY". If "COMMON" is applied to the entire country, the conversion error is about 3 m at the maximum, which will not affect practically in a small scale of 1:25,000 or less.

Set a conversion parameter in program folder "xyz2xyz.par". Remove "#" at the beginning of the line of a parameter to be used to apply the parameter to the calculation. "Central and East" is applied in the following example.

```
# xyz2xyz.par Ver.2.0 2000/8/2
# made by ParCombine Ver.1.1. Mikio Tobita, GSI
# |XS|=|X|+|T1|+|1+D|*|-R3 R2||X|
# |YS|=|Y|+|T2|+|1+D|*|R3 -R1||Y|
# |ZS|=|Z|+|T3|+|-R2 R1 1+D||Z|
# Transformation parameters :
#   T1      T2      T3      D     R1     R2     R3     Coordinate System
#   cm      cm      cm     1D-8  .001"  .001"  .001"   From      To
#  2386.34  3776.69  21530.28 -1976.75 -755.74  546.91 3465.96  COMMON    GAMBNET
# 35902.88 -3331.63  29757.28 -7487.51 7712.97 -1875.57 4655.77  KOMBO     GAMBNET
  -3684.04  4741.70  17417.33 -894.09 -1182.37 -202.22 3607.62 CENT&EAST  GAMBNET
#    0.50    3.60     2.40  -0.31  -0.10   0.00   0.00    ITRF88    ITRF89
#    0.00    1.20     6.20  -0.65  -0.10   0.00   0.00    ITRF88    ITRF90
#    0.20    1.60     7.80  -0.68  -0.10   0.00   0.00    ITRF88    ITRF91
#   -1.00    0.20     8.40  -0.82  -0.10   0.00   0.00    ITRF88    ITRF92
```

Figure 5.1 Example of "xyz2xyz.par"

6. Software

6.1 TNTmips Map Calculator

TNTmips Map Calculator represents a utility software program provided with TNTmips. Choose Support, Map Calculator to execute this program.

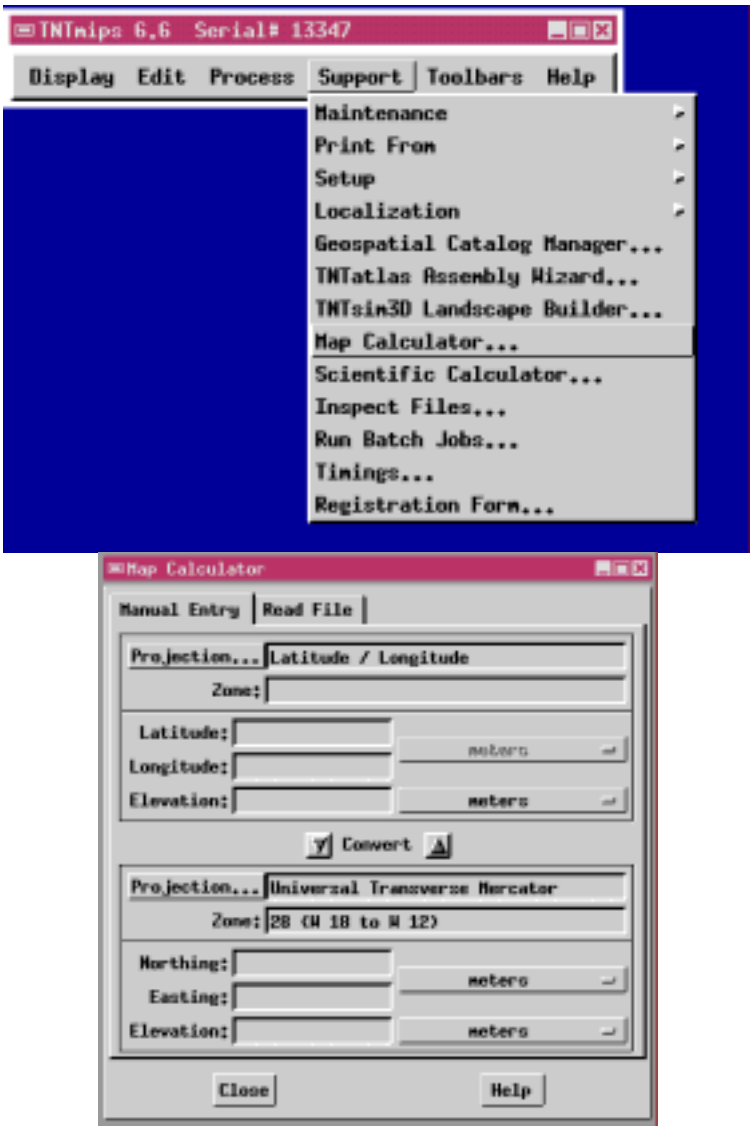
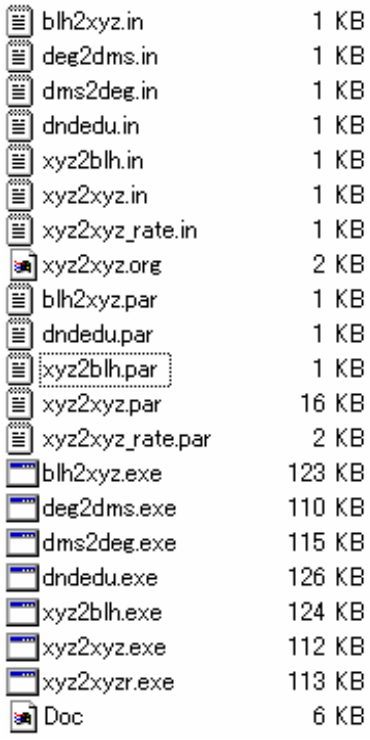


Figure 6.1 Map Calculator

6.2 Trns96

Trns96, developed by the Geographical Survey Institute of Japan, represents a program to be executed at the DOS prompt. Copy the program folder to any drive and key in the command at the DOS prompt to execute the program (This program cannot be executed directly on Windows.) The figure below specifies the files in the program folder.


blh2xyz.in 1 KB
deg2dms.in 1 KB
dms2deg.in 1 KB
dndedu.in 1 KB
xyz2blh.in 1 KB
xyz2xyz.in 1 KB
xyz2xyz_rate.in 1 KB
xyz2xyz.org 2 KB
blh2xyz.par 1 KB
dndedu.par 1 KB
xyz2blh.par 1 KB
xyz2xyz.par 16 KB
xyz2xyz_rate.par 2 KB
blh2xyz.exe 123 KB
deg2dms.exe 110 KB
dms2deg.exe 115 KB
dndedu.exe 126 KB
xyz2blh.exe 124 KB
xyz2xyz.exe 112 KB
xyz2xyzr.exe 113 KB
Doc 6 KB

Map Scanner Manual

August 2002

Department of Lands and Surveys

JICA Study Team

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1. Purpose

This manual explains how to use the scanner to digitize existing maps. In particular it explains the essential points in obtaining map image data to digitize existing maps. For a specific explanation of operation of the equipment, this manual should be used in conjunction with the manufacturer's operating manual. This manual assumes that the scanner used is the Graphtec TS7000 monochrome scanner, and the scanning software used is VIDER Tru Info.

2. Setting up the equipment

2.1 Location of the equipment

A film scanner is easily affected by the temperature or humidity of the surrounding environment. When setting up the scanner, the following points should be taken into consideration.

- Make sure the electricity supply has a stable voltage. Where possible use a regulated power supply.
- Set up the equipment in a location that is out of direct sunlight and not subject to large fluctuations in humidity.

2.2 Checking and maintenance of the equipment

The following daily maintenance should be carried out.

- When the equipment is not in use, it should be covered to protect from dust.
- Clean the paper guide roller. Do not use solvents, as this may damage the surface finish of the roller.
- Replace the fluorescent tube when it shows signs of dimming with secular change. Faithful color quality reproduction may not be possible if a dimmed fluorescent tube is used.

2.3 Software Installation

The software may occasionally malfunction. This problem can be remedied by re-installing the software, following the instructions in the software install manual.

3. Digitization of the map

3.1 Determining the data specifications

Planning involves determination of the type of map image data appropriate to the work content. Below are given the items to be determined, and standard settings for the digitization of a 1:50,000 existing map.

- Resolution

  200dpi (1 pixel = 127 μm); ideally, 300dpi (1 pixel = 84 μm). The resolution is determined according to the material and condition of the original. In the case of a material with little stretch such as polyester film, or an original that is in a well-preserved condition, the resolution is set high. There is no advantage to be gained in setting the resolution high if the original material is printed paper, or if the original is not in a well-preserved condition.

- Medium

  Polyester positive film. The TS7000 scanner can handle both permeable and non-permeable originals. The width of the original may be up to 0.96m. There are no particular restrictions on the length of the original, but with stretching taken into account length should be under 2 meters.

- Data type

  Grey scale (1 pixel = 8 bit). Grey scale is the most appropriate for digitization.

3.2 Preparation and checking of the existing maps

Gather together the existing maps. If necessary, prepare polyester film from the original maps. Check the item before scanning it. Below are listed the points to check and steps to be taken.

- Check map lines

  Check that none of the lines on items to be digitized are scratched or faint. If necessary, replace with an original in better condition.

- Check for stretching

  Check that there is no excessive uneven stretching. Measure the lengths of the diagonals and if the disparity is greater than the permissible range, replace with an original in better condition. Pay particular attention to folds. Stretching that can be corrected with affine transformation is no impediment to accuracy.

- Soiling (Scribble)

  Remove if necessary.

3.3 Scanning

Acquire the image data to be used in digitization. In carrying out this task the following points should be noted.

- In order to adjust the picture quality, select several sheets from the batch of existing maps and carry out a trial scan to determine the size of the data to be acquired and the type of original.
- Take care to insert the original so as to keep any tilt in the image to a minimum. (This is to keep the data size as small as possible.)
- Normally the data file name should use the map number (eg., 1234.tif). To differentiate the files from aerial photo image maps if necessary, it is a good idea to add a prefix before the numbers of the file name (e.g., map1234.tif).
- The file is saved in TIFF format (uncompressed)

3.3.1 Procedure for scanning.

- Turn on the scanner before booting up the workstation.
- Start up VIDER Tru Info.
- From “Options/Select Scanner”, select “SCSI scanners truScan Select 300612”

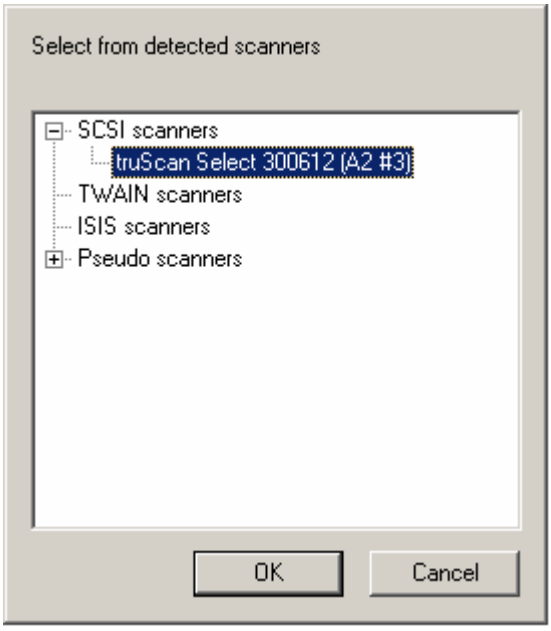

Figure 3.1 Select Scaner

- From “Tools/Scan” start up the scanning tool.
- Determine the size and type of the original, and the file name, then scan.

3.3.2 Image data modification

Open the TIFF image data acquired using the image retouch application Adobe Photoshop, and check the quality of the image. If problems are likely to occur in subsequent work, adjust the brightness and contrast. To remove noise caused by soiling etc., filtering or color reduction is effective.

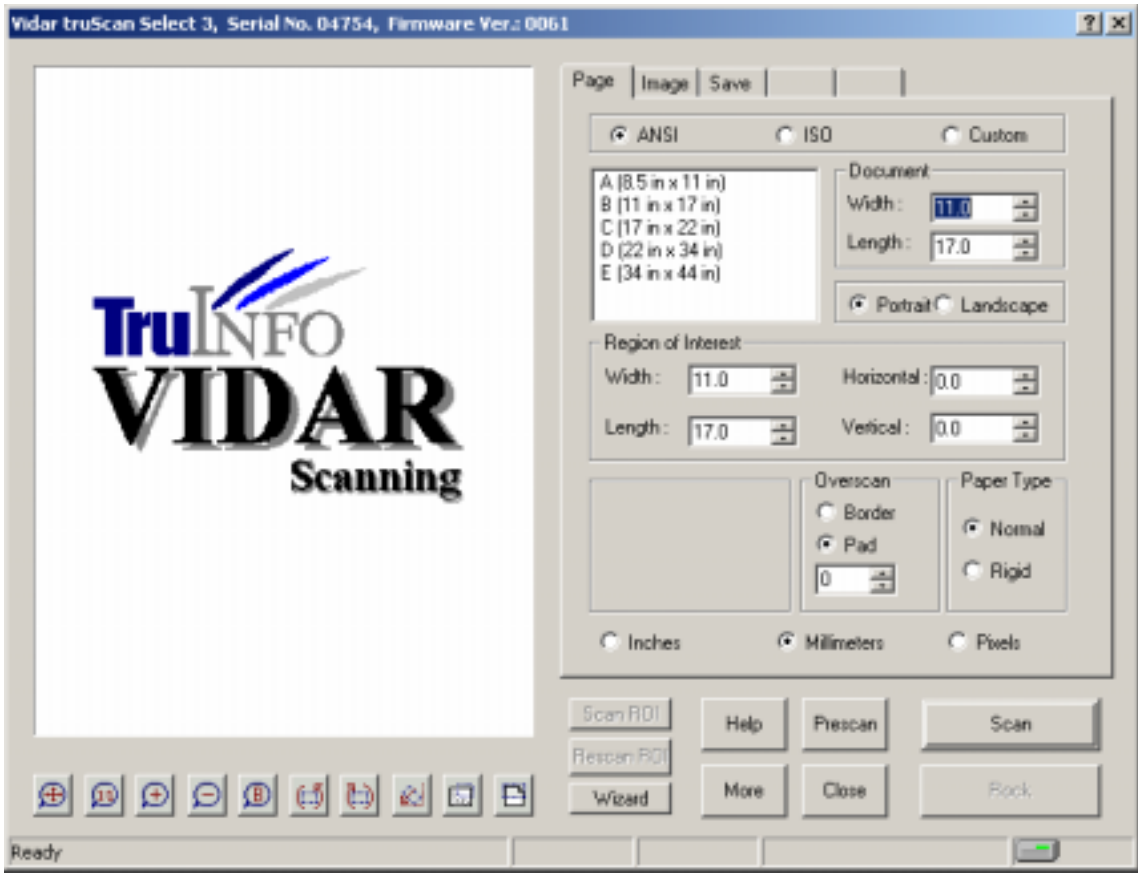

Figure 3.2 Scanning tool

3.3.3 Format Conversion

Import the TIFF image data into the editing system TNTmips. When importing, generate a pyramid structure in order to speed up display. To conserve disk space, the compress format should be selected.

3.3.4 Save the data

The TIFF data file is not used for working on, but is saved as a back-up. When saving the file, save it again in a reversible compressed format (e.g., TIFF5.0LZW) and copy to a DAT or other back-up medium.

Maintenance Manual

August 2002

Department of Lands and Surveys

JICA Study Team

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1. Maintenance of the Equipment

1.1 Role of system administrators

The system administrators must keep track of the state of both the hardware and software used in the system, and take prompt action in the event of any failure. They are responsible for software installation, user registration, client PC registration, and additional hardware installation and setup. System administrators consist of a chief administrator and a sub-administrator.

1.2 Role of general users

General users make use of the hardware and software under the rules defined by the system administrators. Basically, they should not alter the system settings, or install or remove any software.

1.3 Creating a backup

Before altering the system settings, always make a backup of the current state of both the user data and system data. Use an external hard disk or tape backup device to do this.

1.4 About the power supply

As a general rule, all the equipment should be connected to UPS. Some of the equipment is rated for 100 V. Incorrect connection to a 240 V power source may cause serious damage to the equipment. The following equipment only corresponds to a 100 V power source.

- Laser Printer HP5000N
- External Hard Disk
- Switching Hub

2. Windows 2000 Server

This section describes how to re-configure the basic portion of the system after a failure has occurred. For re-configuration of advanced server functions such as network building, refer to the separate manual, "Network Building Manual".

2.1 Re-installing the Windows 2000 Server

Full initialization of the system may be needed if the operating system does not start or user data have been lost due to hard disk failure, etc. In this case, perform the following procedure to initialize the settings using the CD provided. For more details, refer to the documents on the CD. Note that all existing information, including user data, will be lost by initialization.

- Insert the Server Assistant CD (bootable) into the CD drive. The setup program starts up automatically. Install the operating system according to the instructions displayed on the screen. Do not use the Windows 2000 Server CD-ROM.
- After completing OS installation, install the utility software (e.g. Array Manager) using the System Management and Systems Management CDs.
- Configure the hard disks (RAID system). Use the Array Manager to create a Logical Volume from multiple Physical Hard Disks. The RAID disk is composed of Level 5. Level 5 has a redundant physical disk in the logical disk, allowing for data protection if a failure occurs in one of the physical disks. However, if a failure occurs on more than one physical disk, all the data, including the OS, will be lost. In such case, immediate recovery of the logical disk will be needed. RAID configuring is performed in the following two steps:
- Configuring a Virtual Disk from the Physical Disks
- Allocating the Virtual Disk to a drive

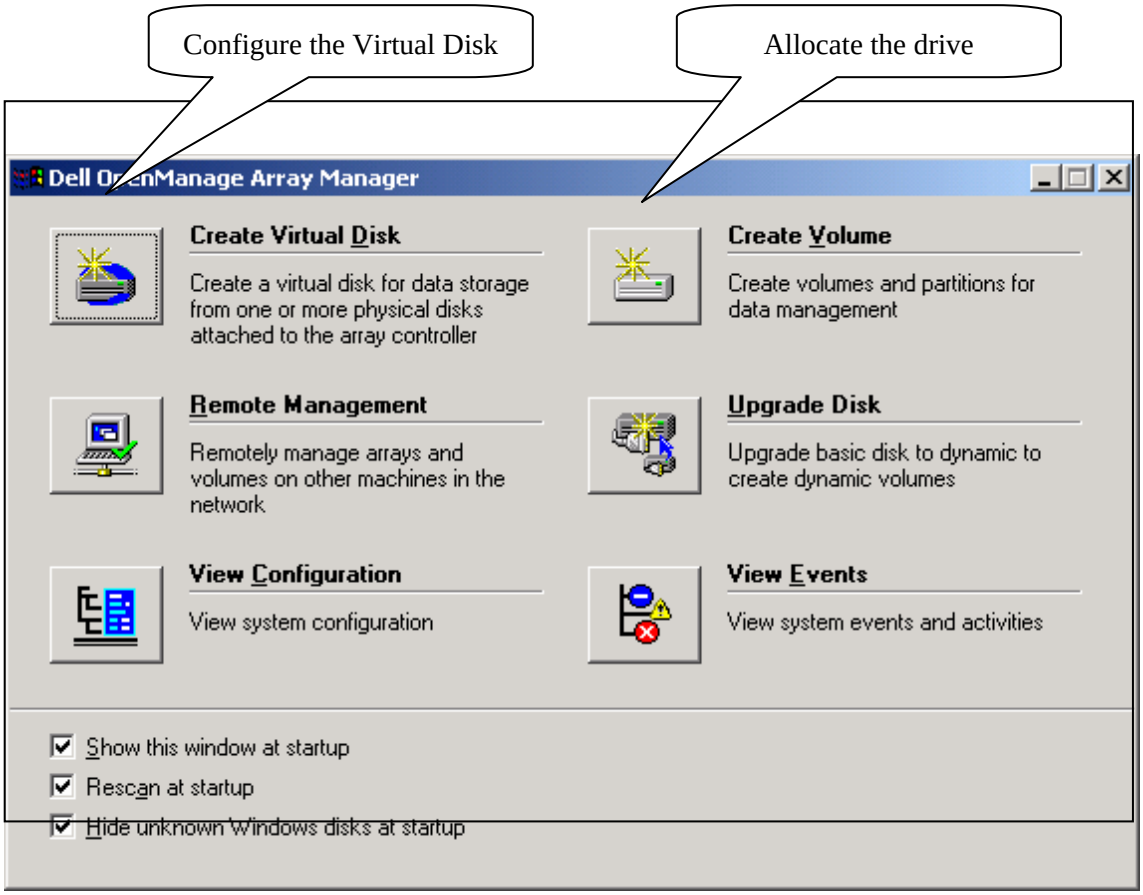

Figure 2.1 Array Manager Quick Access Menu

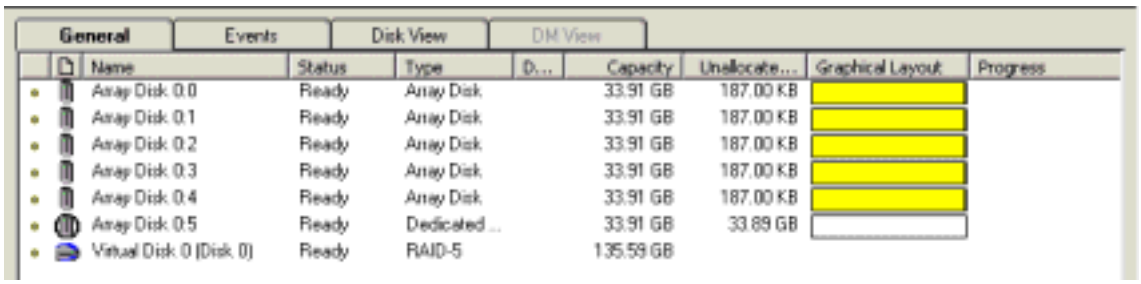

Figure 2.2 Configuration of the Virtual Disk

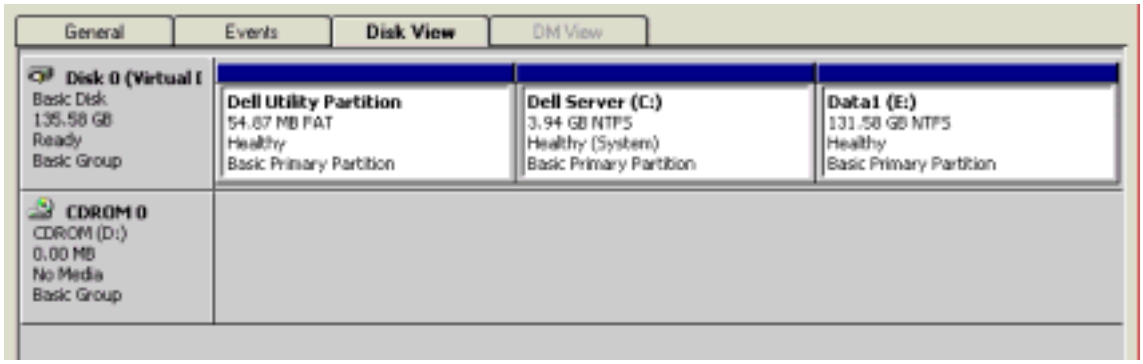

Figure 2.3 Configuration of the Drives

- The server contains six Physical Disks, five of which make up the Virtual Disk. The remaining Physical Disk is maintained in a waiting state as a stand-by disk. When a failure occurs, the system automatically disconnects the failed disk and introduces the stand-by disk.

2.2 RAID Hard Disk failure and action

- The failed disk must be disconnected. After checking the indicator lamp, disconnect the failed disk from the system.
- Start up the RAID Manager and make sure that the Virtual Disk is being re-configured. If it is not, perform re-configuration manually.
- Replace the failed disk with a spare hard disk. The spare hard disk should be attached to the HD bay where the failed disk was set. The system automatically begins recovering the original configuration. Be sure to follow the instructions given by the system. Do not attempt to shut down the system.

3. Work Station PC

This section describes how to re-configure the basic portion after a failure in the Windows 2000 Workstation. Full initialization of the system may be needed if the operating system does not start or user data have been lost due to hard disk failure, etc. In this case, perform the following procedure to initialize the settings using the CD provided. For more details, refer to the documents on the CD. Note that all existing information, including user data, will be lost by initialization.

- Insert the Reinstall CD W2K+SP2 CD into the CD drive. The setup program starts up automatically. Install the OS according to the instructions displayed on the screen. Do not use the Windows 2000 Server CD-ROM.

- Use the Resource CD to set up devices such as the Graphics Card Driver and SCSI Driver.
- Use the Application CD to install application software such as CD-R software.

4. Printer - HP5000N

The printer may be shared over the network. There are two ways for the printer to be connected. One is to connect it to the PC via the parallel port; the other is to connect it to the switching hub via the network interface. In either case, the printer must be installed on the Windows 2000 Server. Follow the procedure outlined below. For more details on setting printer-sharing, refer to the separate manual, "Network Building Manual".

- First, install the driver. HP5000N has a network interface. Use a LAN cable to connect the printer to the switching hub.
- Perform a print test, then check the list of printer settings on the resulting test print description.
- Set the TCP/IP address from the switch panel on the printer. (IP Address: 10.0.0.102, Subnet Mask: 255.255.255.0, Default Gateway: 10.0.0.1)
- Insert the Printing System & Utilities CD into the CD drive, and install the driver and utilities.
- Start the JetAdmin utility just installed, and make sure that the printer has been connected successfully. If a change of IP address is needed, select the printer and enter the appropriate value via "Device/Modify".
- Add the port via “Properties”. "HP JetDirect Port" must be added.
- Make a print of the test page.

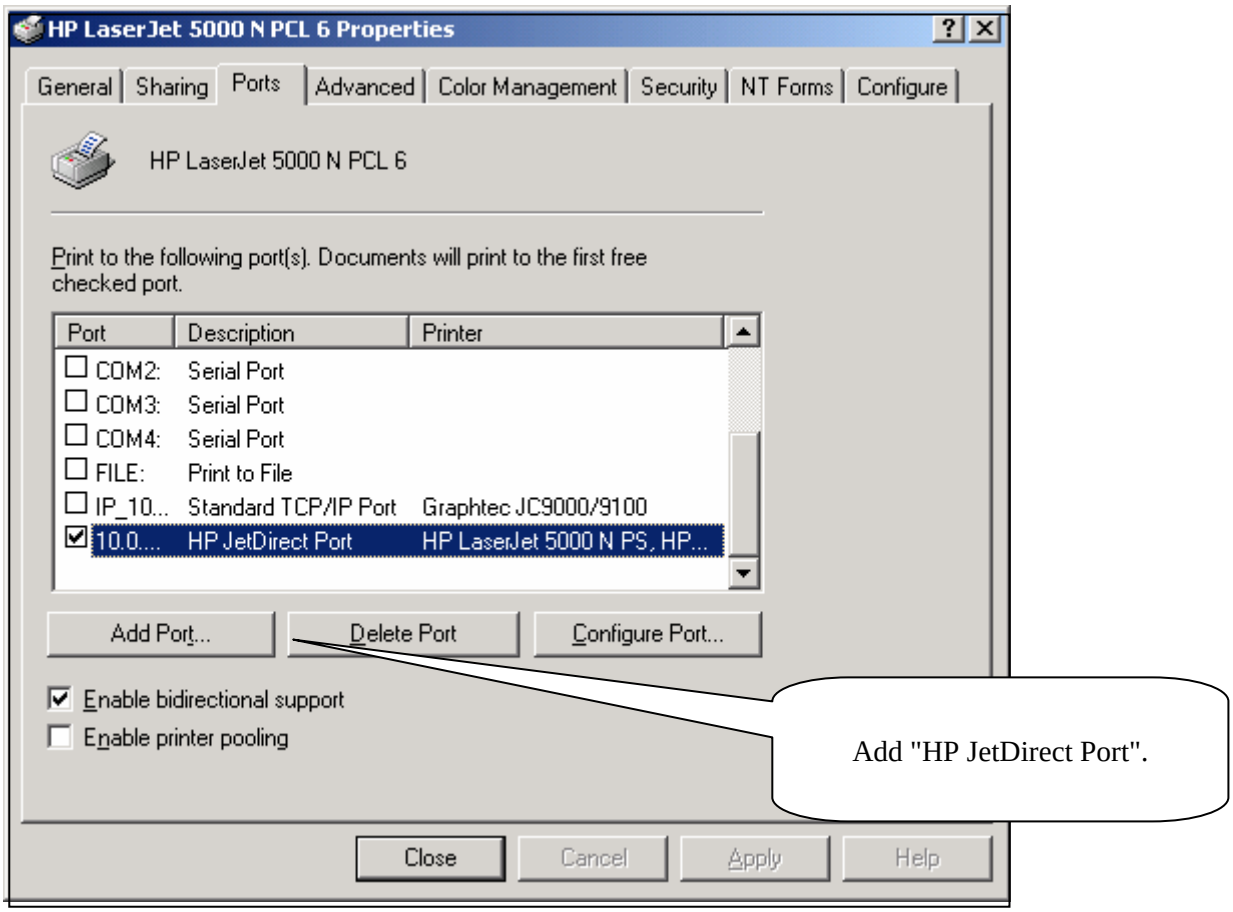

Figure 4.1 Adding the Port

5. Plotter (GRAPHTEC JC9000)

The plotter may be shared over the network. There are two ways for the plotter to be connected. One is to connect it to the PC via the parallel port; the other is to connect it to the switching hub via the network interface. In either case, the plotter must be installed on the Windows 2000 Server. Follow the procedure outlined below. For more details on setting plotter-sharing, refer to the separate manual, "Network Building Manual".

- Install driver JC9000 has a network interface.

  Use a LAN cable to connect the plotter to the switching hub.
- Set the TCP/IP address from the switch panel on the plotter. (IP Address: 10.0.0.101, Subnet Mask: 255.255.255.0, Default Gateway: 10.0.0.1)
- Insert the OPS628-UAL-E floppy disk into the FD drive and install the driver.
- Add the port via “Properties”. "Standard TCP/IP Port" must be added. The settings should be as shown in the figure below.
- Make a print of the test page.

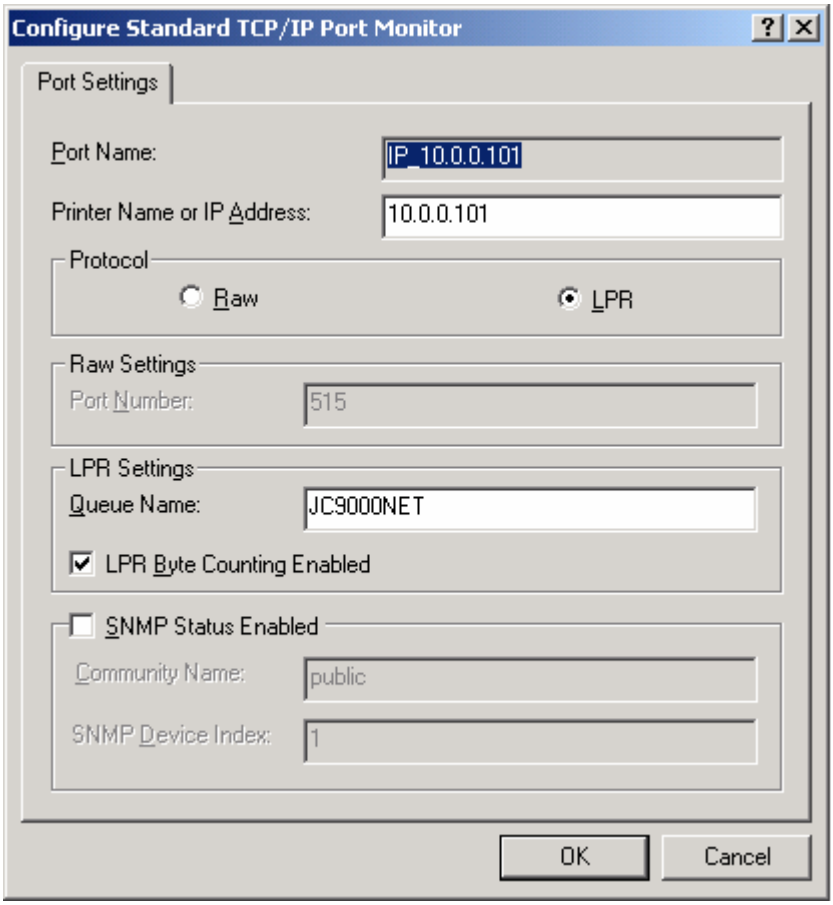

Figure 5.1 Setting the Standard TCP/IP Port

6. Scanner (GRAPHTEC TS7000)

The scanner is may be connected via the SCSI connection. If a failure occurs (e.g. it does not work), follow the steps below to set it up correctly.

- Before starting setup, make sure that the SCSI interface (Adaptec AHA-2930CU PCI SCSI Controller) is activated using the Device Manager. If it is not activated, the driver must be installed from the Resource CD for the workstation. If TruINFO software has been installed, it should be uninstalled.
- Connect the scanner to the workstation and turn on the scanner.
- Re-start the workstation.
- On the device driver, check that SCSI is recognized as an SCSI adapter.
- On the Device Manager, check that VIDAR Truscan Select3 is recognized as “Other devices”.

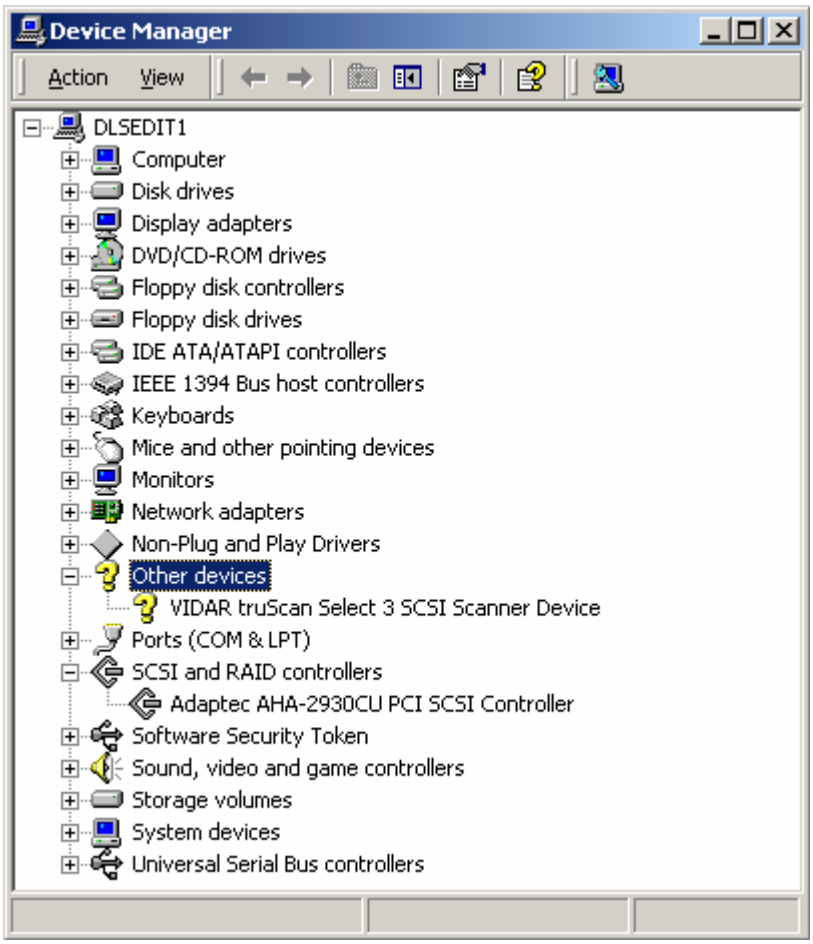

Figure 6.1 Confirming the device

- Install ASPI Layer Ver 4.7.
- Re-start the workstation.
- From the View/Show Hidden menu on the Device Manager, select “Show All Devices”. Make sure that ASPI32 is recognized as “Non-plug & play drivers".
- Start the Aspicheck program and make sure that the display is as follows:

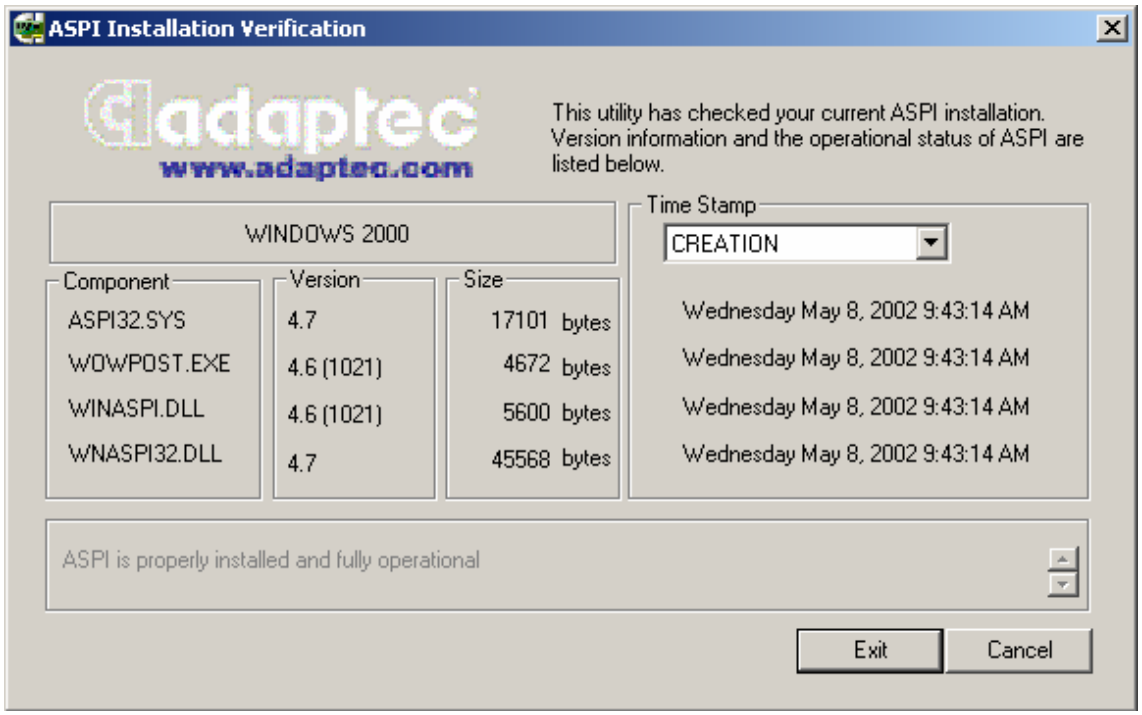

Figure 6.2 ASPICHECK program

- Install TruINFO. (All steps up to the previous step should have been confirmed.)
- Perform the procedure according to the installer instructions. In the window for selecting components, select "Scan to Disk".
- Re-start the workstation.
- Start TruINFO.
- Select the Option/SelectScanner menu, then select “truScan Select 300612” from the SCSI Scanners.
- Select the Tool/Scan menu and perform a scanning test.

7. Network Equipment (Hub)

Network equipment consists of a switching hub and UTP cable. Both are maintenance-free.

8. UPS

The UPS is maintenance-free although the battery will expire in about 4 years. When the battery expires, it can be replaced with an applicable type of automobile battery. Monitoring should be performed using the Power Chute PLUS software.

9. Main Application Software

The main application software is as follows:

- Microimages TNT mips
- Adobe PhotoShop 7.0
- Adobe Illustrator 10
- Roxio Easy CD Creator 5

There are no special requirements to install the above software. Follow the instructions given by the installer.

Network Building Manual

August 2002

Department of Lands and Surveys

JICA Study Team

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1. Preface

This manual describes the basics for building and management of an internal network based on the Windows 2000 Server. The manufacturer's manual does not provide a sufficient description of the numerous functions of the Windows 2000 Server. We recommended strongly reading this manual as well as a commercially available guidebook of the Windows 2000 Server operating system.

2. Building a Physical Network

This section describes the hardware settings required to build a computer network.

2.1 Placing Network Devices

The network is based on the 100BASE-TX specifications. The devices in this network are compatible with 10BASE-T and can be connected with the existing equipment.

2.2 Plan of Expanding the Network

The network features a high potential for expansion. The figure below shows how to expand the network. You can connect the devices to the existing equipment by adding a 100Base-TX or 10Base-T hub and connecting the devices with the switching hub using a cross cable, having opposite properties to an ordinary network cable.

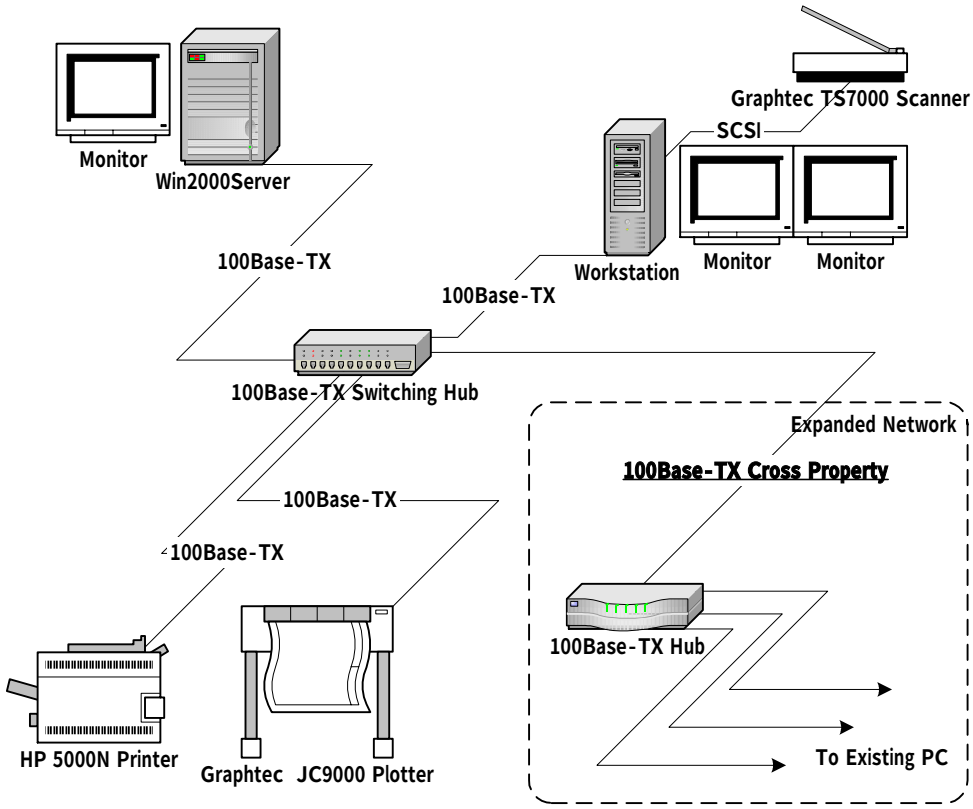

Figure 2.1 Connection and Expansion of Network

3. Building a Windows 2000 Network

3.1 Items to be Determined Beforehand

Before performing the setup, determine the following items. The following lists the current values.

- Domain name: dls.go.gm

  A name used to identify uniquely the network.

- Network ID: 10.0.0

  An ID of the "segment", a unit of the network.

- Subnet mask: 255.255.255.0

  A value that sets a unit of the "segment". When this value is set, the "segment" consists of max. 256 devices.

- IP address for server: 10.0.0.1

  A unique address allocated to a server.

- Name of server: dlsntsv1
  A unique name allocated to a server.
- IP address for clients: 10.0.0.11
  A unique address allocated to a client PC.
- Name of clients: dlsedit1
  A unique name allocated to a client PC.

3.2 Creating a Domain Controller (PDC)

Create a Primary Domain Controller (PDC) on a server. Normally, there is one domain controller per network (a controller for backup may be created). A domain controller is created only once. A PDC, already created on a server, is not described in details in this manual.

3.3 Installing Various Services

Install various services provided by a server. To perform the installation, access to the "Windows 2000 Configure Your Server" program.

3.3.1 Domain Name System (DNS) settings

DNS provides a service that associates a TCP/IP address with a computer name. DNS, once installed, cannot be modified and it is not described in details in this manual.

3.3.2 Active Directory settings

Install the services used to manage the users or computers within a network. In particular, an administrator is required to register the users on a daily basis.

- Registering a user
  Choose Start, Programs, Administrative tools, and then Active Directory User and Computer. Right-click the User icon in the Active Directory User and Computer window and choose New, User to register a user.
- Creating a group
  You can set an access right to a network disk or printer for each user. However, it is not efficient to manage an access right for each user. In that case, create a group for each access right setting and have a user belong to one of the groups.
  Create a group when registering a user.
  After creating a group, open the Property window of the group and, from the Member tab, register a user.
- Adding a computer
  Before a computer is joined to a network, the computer must be registered on the server.

To add a computer, right-click the Computer icon in the Active Directory User and Computer window, choose New, Computer, and register the computer.

3.3.3 DHCP settings

DHCP is a service that performs the dynamic IP address allocation to spare any trouble in management. It is not necessary to use it extensively on a network with a limited number of computers. The details of this service are omitted in this manual.

3.3.4 WINS settings

WINS exist for compatibility with an operating system older than Windows 2000. WINS, like DNS, is used for the name resolution of computers. WINS need not be set up on Windows 2000.

3.4 Sharing a Disk

Set up a server disk to be used by a user. To enable "sharing", create a folder on the server hard disk and open the Property window of the folder. Enable "Share this folder" in the "Sharing" tab.

The default access right of "sharing" is Everyone. Delete Everyone, add a group to which the access right should be given, and give it a necessary access right.

3.5 Publicizing a Printer

In the same way as sharing a disk, you can publicize a printer to users.

- Adding a printer to the server
  Add a printer to the server according to the "Maintenance Manual".
- Making a "Sharing" setting
  Make a Sharing setting in the "Sharing" tab of the Property window of the printer. Set up "Additional Driver" for client computers other than Windows 200 machines. This stores a printer driver for other operating systems on the server to enable automatic distribution.

3.6 Connecting a Client

The connection processing is required when a registered user or computer joins the network for the first time. In the network settings, make a setting required to join the "DLS" domain. An administrator's privilege is required to do so.

Since the method for connecting a client differs lightly depending on the operating system being used, refer to the manual of your operating system for more details.

3.7 Knowledge of TCP/IP

An IP address has a special area within which the private address constitutes an area to be used freely, unless you send out a packet to the Internet.

Table 3.1 Special addresses

IP address	Meaning
10.0.0.0～10.255.255.255	Private addresses 256 x 256 x 256
172.16.0.0～172.31.255.255	Private addresses 32 x 256 x 256
192.168.0.0～192.168.255.255	Private addresses 256 x 256
127.0.0.1	An address that indicates the local system. Also called the local host or loopback address.
224.0.0.0～239.255.255.255	A multicast address. Used to send the same packet to several hosts.
240.0.0.0～254.255.255.255	An address reserved for testing.

3.8 TCP/IP Settings

The table below shows the current network settings. Add a computer using addresses later than 10.0.0.12. Add a peripheral device such as a printer using addresses later than 10.0.0.103.

Table 3.2 IP address settings

IP Address	Subnet Mask	Name	Remarks
10.0.0.1	255.255.0.0	Dlsntsv1	10.0.0.1
10.0.0.11	255.255.0.0	Dlsedit1	10.0.0.1
10.0.0.101	255.255.0.0	JC9000	-
10.0.0.102	255.255.0.0	HP5000N	-

3.9 Useful Commands for Network Management

The following list presents useful commands for monitoring a network. Enter these commands in the Command Prompt window to use them.

- ping

  basic Format ping <target>

  This command checks whether the target device is operating.

  Enter an IP address or host name in the target name.

- nelookup

  basic Format ping <target>

  This command looks up the IP address or host name of the target using DNS.

  If a host name is entered in the parameter, an IP address is displayed. If an IP address is entered in the parameter, a host name is displayed.

- tracert

  basic Format ping <target>

  This command traces the network path to the target.

- ipconfig

  basic Format ping <target>

  This command displays parameters such as an IP address allocated to the machine.

- telnet

  basic Format ping <target>

  This command operates an emulator that remote-controls a computer in a distant location.

- netstat

  basic Format ping <target>

  This command displays the status of a communication session currently active. Use this command to check the health status of the network.

4. Backup

The server is equipped with a "DDS4" tape backup unit. This unit can be used for the backup tool of the operating system. One tape volume has the capacity of 20 GB (or 40 GB when compressed). However, a minor mechanical error may render a "DDS4" tape unusable because data are written to it with a high level of compression. We recommend strongly to back up also on a CD-R such important data as the master backup of map data.

BASIS of TNTmips

August 2002

Department of Lands and Surveys

JICA Study Team

Table of Contents

1. Introduction

This document describes the basic operation procedures necessary for creating and revising 1:50,000 topographic maps. For more detailed information, refer to the on-line software manual and the booklet "Getting Started" which describes the processing procedure for each purpose in detail and in an easy to understand way, giving useful information to operators.

2. System Setup

2.1 Installing Fonts

Two true-type fonts as mentioned below shall be installed at C:¥Winnt¥Fonts that is a storage location to store the system fonts. (The storage area is different by system setup and OS.)

- Universe (unver.ttf)
- Universe Italic (univeri.ttf)

3. References

The booklet "Getting Started" is very useful as a practical guide, of which the practically effective volumes are as follows:

- Map Projections
  The basis and setup of the survey standard system are described.
- Displaying Geospatial Data
  The basic system operations including display of map data are described.
- Importing Geodata
  The method of importing external geodata is described.
- Georeferencing
  The methods of orienting map data and image data.
- Mosaicking Raster Geodata
  The method of mosaicking image data is described.
- Sharing Geodata with Other Popular Products
  The method of sharing geodata with other software including the direct processing of Arc/View data is described.
- Exporting Geodata
  The method of exporting the created map data is described.

- Creating and Using Styles

  The methods of creating and allocating representation styles are described.
- Making Map Layouts

  The methods of making map layouts for printing are described.
- Editing Vector Geodata

  The method of editing vector data is described.
- Editing CAD Geodata

  The method of editing CAD data is described.
- Rectifying Images

  The method of preparing accurate aerial photo images to match with topographic maps is described.
- Managing Geoattributes

  The method of operating database is described.

4. RVC Data File Structure

The RVC data file contains all objects to be created by TNTmips. Each object may include subobjects such as display and database. The system can always hold the relative positional relations of the objects properly so that users do not need to be aware of the storage locations of each object. The main data types to be created by TNTmips are described below.

- Vector:

  These data are of graphic data type with a phase structure. This data type is applied to basic linear features such as roads and rivers of which a GIS base map is composed.
- CAD:

  These data are of graphic type to represent geometric forms such as circles. This data type is applied to the features such as independent houses in the background of a GIS, which do not need to be analyzed with a phase structure.
- Raster:

  This data type consists of a 2-dimensional array that is represented by image data.
- TIN:

  This data type is a surface represented by a series of triangle polygons.
- Layout:

  This data type is an object to record the layout of plural objects for outputting a map.
- Style:

  This is a library object for a representation style.

- Region:

  These data are of graphic type for temporary use in measurement or for other purposes.

Of these data types, Vector, CAD, Raster, Layout and Style are used for creation and revision of 1:50,000-scale map data.

5. Data Reference

Each data type object can be displayed freely in overlay with any other data type object. Some examples of overlay are as follows:

- A road can be added in overlay of a Raster (aerial photo) with a Vector (road).
- A secular change can be monitored in overlay of a Raster (aerial photo) with another Raster (topographic map).
- A three-dimensional bird's eye view can be created in overlay of TIN (ground surface) with a Raster (aerial photo).

6. Editing Data

TNTmips does not store data updates automatically, so the user must operate the storing function. It is a hard and first rule to store data updates diligently considering the case that the system or PC may become sometimes unstable.

7. Survey Standard System in Use

All map data are handled by "GAMBNET". The "GAMBNET" is compatible with "the World Geodetic System 1984". TNTmips performs processes regarding "GAMBNET" as the system to be equivalent to the "World Geodetic System 1984".

8. Styles

As the style objects for representation, "style_Gambia" stored in the file [template.rvc] must be applied to map data objects. The styles applicable to the Vector type and the CAD type are stored in "style_Gambia".

9. Printing

For printing maps using an ink-jet plotter or a printer, the EPS (Encapsulated Post Script) file shall be created by TNTmips. To print map sheets with higher quality, the maps must not be printed directly from TNTmips, but by reading the EPS file into the system using Adobe Illustrator.

Basis of Photoshop

August 2002

Department of Lands and Surveys

JICA Study Team

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1. Introduction

Adobe Photoshop is the image processing software for professional use. This software is used to process image data obtained from scanned based materials. The concepts that are difficult to understand and the functions that are frequently used are described briefly below.

2. Ground Resolution and Display Resolution

It is indispensable to understand the image resolution. The ground resolution represents an absolute value, while the "resolution" used for printing is a value in the scale of an output map sheet, a relative value linking with the scale. Therefore, the term "resolution" shall be defined as follows:

- Ground resolution: **m
  Example: Ground resolution of 1.0m
- Display resolution: **μm (in the scale of 1/***)
  Example: Display resolution of 30μm (in the scale of 1:50,000)

The setting procedure in change of ground or display resolution in the use of Photoshop is shown in the figure below.

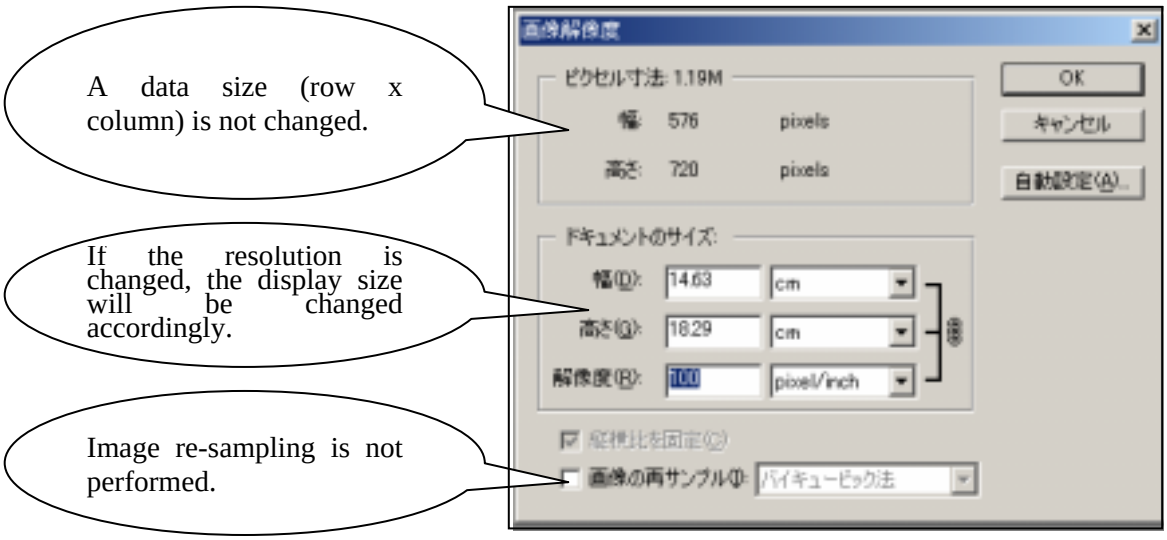

Figure 2.1 Image resolution window for changing an image display size

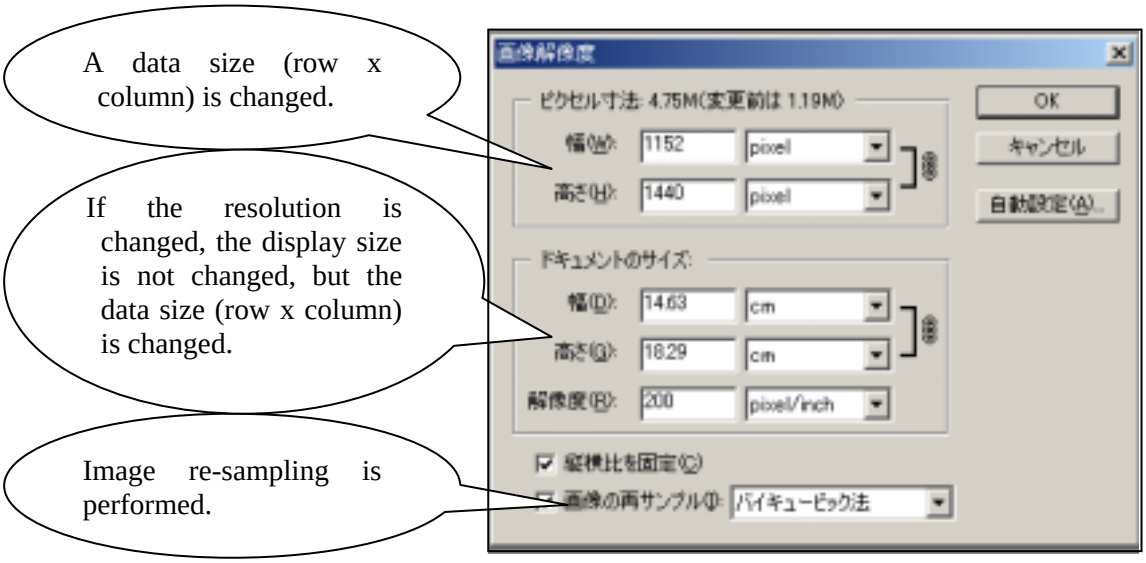

Figure 2.2 Image resolution window for changing an image data size and ground resolution

3. Appropriate Resolution

Then, how is an appropriate resolution determined? The represented value for a topographic map is different from the one for an aerial photo.

Consider the scales of an input map and the created data. It is supposed that the scale of a topographic map is often larger than the scale of map data to be created. For example, take the case of creating 1:50,000-scale data from a 1:1250-scale topographic map. The positional accuracy of the 1:50,000-scale map is just so high that the purpose can be attained if the map is interpretable. If the minimum line represented on the map is 0.1 mm, the resolution of 0.1 mm on the map will be sufficient.

On the other hand, the scale of an aerial photo is almost same as or smaller than that of the created data. In this case, the fine resolution of the photo is required to interpret it. For example, it is supposed that the 1:50,000-scale data would be created using a 1:50,000-scale aerial photo. The positional accuracy on the photo must be nearly equal to that of the created data. If the positional accuracy of the data must be 3 m, the positional accuracy on the photo would be 0.06 mm. (A value of 3 m represents the positional accuracy required for creating the 1:50,000-scale data in photogrammetry.)

As the unit to represent a resolution, “dpi” (dot per inch) is generally used. The resolution of 0.1 mm is equivalent to 254 dpi and 0.06 mm to 423 dpi. This calculation means that how many divisions 1 inch (25.4mm) can be divided into.

Table 3.1 Specifications of Scanning Resolution

Item	Minimum Resolution (dpi)	Ideal Resolution (dpi)	Remarks
Topographic map	200	300	
Aerial photo	500	1000	Applied to contact print

4. Determination of Image Format

An image format shall be selected depending upon the purpose of use. The purposes of use and the image formats to be selected for those purposes are shown in the table below. The layer structure in PSD format can be stored in the format specified for Photoshop, which is very convenient when compounding two or more images into one image display.

Table 4.1 Selection of Image Format

Purpose of Use	Image Format	Remarks
Scanning data	TIFF (uncompressed)	Applicable to topographic maps and aerial photos
Backup of aerial photo	JPEG	The compression rate shall be adjusted to 10% of the data size before compression.
Mosaic image	PSD (Photoshop format)	Applicable to topographic maps and aerial photos

Basis of Illustrator

August 2002

Department of Lands and Surveys

JICA Study Team

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1. Introduction

Adobe Illustrator is publishing software for professional use. This software is used to receive the map data created by TNTmips in the form of EPS data, which is processed to print beautiful map sheets using a printer or an ink-jet plotter. The functions that are often used are described briefly below.

2. Element Selection

The optimum display order is described in Section 3.13.1 of the "Manual for Creation of 1:50,000-scale Maps Using TNTmips". The element selection function allows changing the display order by using Illustrator. A feature shall be selected under the condition of lines in a same color, polygons in same paint or lines of a same size and the display order shall be changed by changing the order of layers.

Figure 2.1 Method of selecting various elements

For selecting elements having the same condition, one of the elements that can be selected shall be selected first from "Direct Selection Tools" and the selection under the same condition shall be executed.

3. Swatch

The swatch function allows allocating a specific swatch to paint a polygon, which is selected from the swatch library prepared as a collection of color and pattern samples. When allocating a swatch, polygons in the same color shall be selected in a batch using the element selection

function as described in the preceding section, and a swatch created in accordance with the symbol specifications shall be applied to all the selected polygons.

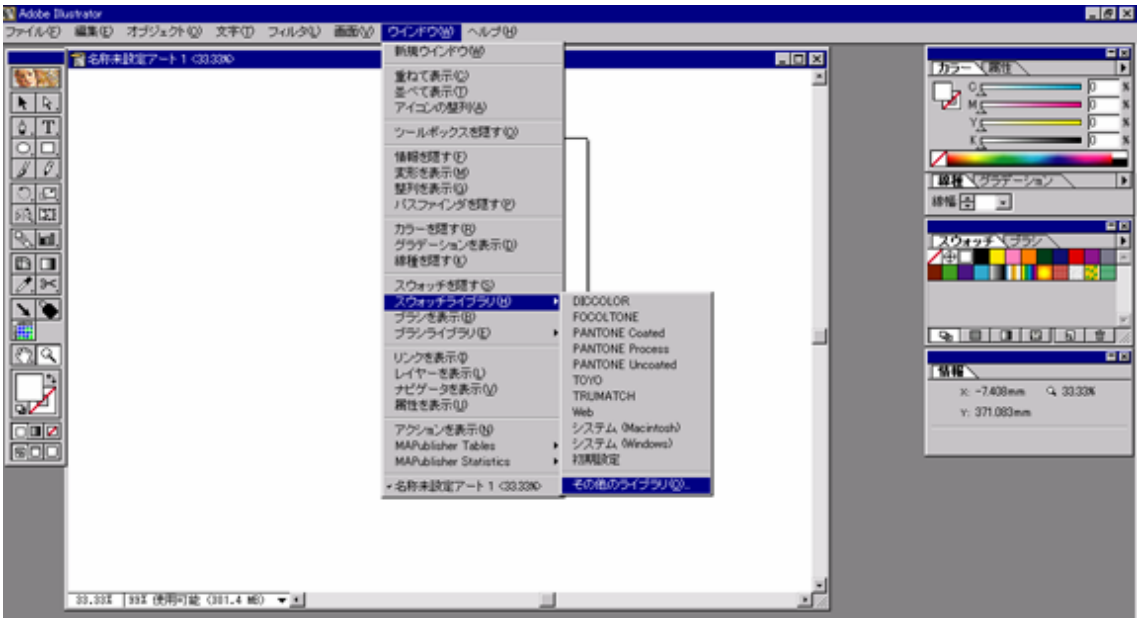

Figure 3.1 Reference to Swatch Library

4. Paint and Line

The map data consist of lines composing a graphic figure and the paint composed of lines. The representation attributes can be assigned to each of the lines and paint. A line type, size and color shall be assigned to the lines and a color to the paint.

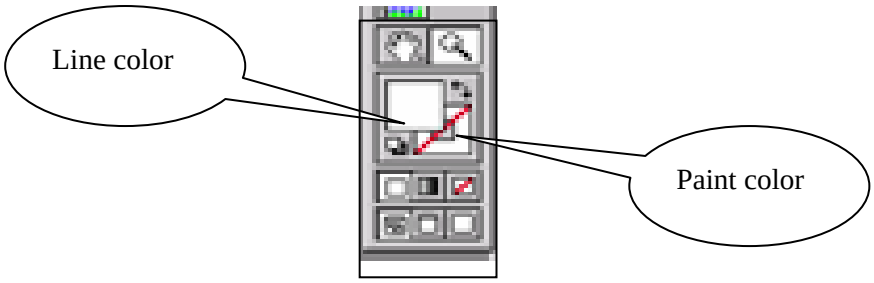

Figure 4.1 Line and Paint

The colors for line and paint can be set at the bottom of the main tool bar.

GAMBIA 50,000 Quality Check Sheet

Sheet No.	

Before Starting the Work

Item	Sub-item	Description	Remarks	Signature
Edition	Check on Edition	Check on whether the data file used for executing the work is the latest one, the edition and the date .	—	

After Editing

Item	Sub-item	Description	Remarks	Signature
Editing	Overshoot	Check on unnecessary overshoots (short vectors).	—	
	Node	Check on unnecessary nodes.	—	
	Symbol	Examine the symbol positions.	Check on whether the symbol's shift is appropriate.	
	Annotation	Examine the spellings and positions of annotations.	Check on whether the position of an annotation is appropriate.	
	Attribute	Check on whether there are any elements with no attribute.	Check on whether there is any element to which no style is assigned.	
	Triangle Point	Check on the names and elevation values of triangle points.	Refer to the overview map of new ground control points.	
	Bench Mark	Check on the positions, names and elevation values of bench marks.	Refer to the overview map of bench marks.	
Adjoining	Figure tie	Adjoining of a figure relative to the adjacent neatline.	—	
	Attribute matching	Matching of the attribute of a figure tied between neatlines.	—	

After Revision of Marginal Information

Item	Sub-item	Description	Remarks	Signature
Marginal Informa-tion	8 index map	Re-arrange the frame line of the relevant neatline.	Configured by a quadrilateral, different from the map data.	
	10 Administrative boundary map	Revise the range of a boundary.	Same as the range of the internal neatline.	
	12 Magnetic variation	Correct the magnetic variation.	Refer to the table of magnetic north variations.	
	13 Survey standard system	Correct the measured values in tests on the survey standard system.	Refer to the table of the measured values in tests on the survey standard system.	
	Grid coordinate values UTM	Correct the range.	—	
	Grid coordinate values BL	Correct the range	—	
	Object name	Check on the object name	Follow the example in [template.rvc].	
	Display order		Follow the example in [template.rvc].	

After Editing EPS File

Item	Sub-item	Description	Remarks	Signature
Style	Apply Style	Check on the style object.	—	
Special Figure	Bridge	Create the figure directly.	—	
	Median strip	Create the figure directly.	—	
	Ferry	Create the figure directly.	—	
	Steep	Display it as shown by the symbol.	—	
	Paint (cultivated)	Apply the proper swatch.	Symbol as a regular grid	
	Paint (uncultivated)	Apply the proper swatch.	Distributed as random patterns	
	Direction	Direction of displaying a steep or cliff.	—	
	Administrative boundaries	• Add a division name. • Lay out “SENEGAL”. • Revise the layout of names. • Revise the style of a boundary line.	—	
Display order	Display order of layers	Display of priority order	—	

Inspector	
Date	