THE STUDY ON MAPPING POLICY AND TOPOGRAPHIC MAPPING FOR THE INTEGRATED NATIONAL DEVELOPMENT PLAN OF THE PHILIPPINES



EDITION 1

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1. Introduction

The purpose of the Softcopy Exploitation Tool (SOCET SET®) software is to support imagebased softcopy applications such as map-making, mission rehearsal, and photo-interpretation.

SOCET SET generates databases and products such as Digital Terrain Models (DTM), reports, vector databases, orthophotos, image maps, and image mosaics. SOCET SET supports a wide variety of applications, including:

- Populating a GIS database (vector or raster)
- Producing image maps
- Civil engineering
- Mission planning
- Targeting
- Mission rehearsal
- Sensor research and development

The SOCET SET software consists of over sixty application functions that can be chained together to form a processing flow that inputs imagery, performs the requisite analysis, and produces the final hardcopy or softcopy products. This User's Manual describes the application functions in detail, including the following:

- Data import capabilities for imagery, feature, and terrain data
- Automatic extraction of Digital Terrain Model (DTM) elevation data
- Interactive graphical editing of DTM data
- Interactive two and three-dimensional feature data extraction
- Orthophoto generation
- Perspective scene generation
- Point positioning, three-dimensional mensuration, and targeting
- Image mosaicking
- Image enhancement
- Data export functions for softcopy databases (imagery, feature, and terrain data), and hardcopy products (image maps)

2. Typical Product System Flow

Imagery is input to SOCET SET from either a digital softcopy source, such as SPOT or Landsat, or by scanning film-based imagery. The workstation products are in either softcopy format (such as DTMs, vector databases, orthophotos, etc.) or hardcopy format (such as image maps or photorealistic perspective scenes).



3. Using Satellite Imagery

Overview of SPOT, JERS, and IRS

SPOT, JERS, and IRS Imports read imagery and geo-referencing information from CD-ROM, magnetic tape, and disk media into SOCET SET. SPOT imagery is available from SPOT Image Corporation and other distributors. JERS imagery is distributed by NASDA. IRS imagery is available from various distributors.



When to Use SPOT Image Import

You use SPOT Import when you have SPOT data and you want to exploit the image in the data set. You run SPOT Import after creating a project to hold the imagery. After importing a SPOT image, you can the proceed with Triangulation and then data extraction. SPOT Import works in projects with the Geographic, UTM, or Grid coordinate systems, but not the LSR coordinate system.

Formats Supported

SPOT imagery is supplied in a variety of formats and processing levels. The various formats are described below.

Categorized by spectral type, SPOT comes in several types:

- Multispectral without short-wave infrared (SWIR) (known as MLA or Xs) (3 bands)
- Multispectral with SWIR (known as Xi or I) (4 bands)
- Panchromatic (known as PLA, PAN, P, or M)

SOCET SET imports all the above types of SPOT imagery.

SPOT multispectral imagery comes in two formats: Band Interleaved (BIL) or Band Sequential

(BSQ). SPOT panchromatic imagery always comes in BSQ format. SOCET SET imports both

BIL and BSQ formats.

Your SPOT imagery may have been preprocessed by your supplier to assist with control or geopositioning.

There are four processing levels available from SPOT:

- 1A Raw. This is unrectified data and the pixels may have non-uniform GSD.
- 1B Rectified. The imagery has been resampled and geo-coded to a uniform GSD.
- 2 Controlled. Controlled support data is provided that is based on GCPs.

• S – Stereo. A relative orientation has been performed on this SPOT stereo pair. SOCET SET accepts processing levels 1A and 1B only. Processing level 1B is the most common type of SPOT imagery.

SPOT Image has introduced the DIMAP format. They are distributing all SPOT 5 data in this format and will be transitioning data from previous satellites to DIMAP. If you have a DIMAP data set, you must import it with SPOT DIMAP Import. SOCET SET supports the same SPOT DIMAP products as with previous formats, that is, SPOT full-scene 1A and 1B in both panchromatic and multispectral.

Finally, the SPOT tape format varies between SPOT distributors. SOCET SET accepts imagery in the standard format of the SPOT Image Corporation and in the standard format of the Canada Centre for Remote Sensing (CCRS) and Australian Centre for Remote Sensing (ACRES). The image formats processed by SOCET SET are taken from The SPOT Scene Standard Digital Product Format (S4-ST-73-01-SI), SPOT Image Corporation, 1995, and *Standard SPOT MLA/ PLA CCT Format* (DMD-TM85-428A), Canada Centre for Remote Sensing, 1985. SOCET SET supports the "CAP" data format.

Some CCRS SPOT data sets have a defect which causes the image to be shifted to the east or west. You can set a special environment variable when starting SOCET SET to fix the problem. There are two ways to set the variable. One is to add -setenv_no_arg CCRS_ROLL_INVERT to the file <install_path>/.socet_xxx, where "xxx" is the name of the machine you are working on. This method will always perform the correction for all CCRS SPOT imports until you edit the .socet_xxx file and take the instruction out. The other way is to start the SPOT Import task manually by typing:

% <install_path>/bin/start_socet -setenv_no_arg CCRS_ROLL_INVERT -single spot 1 xxx.prj

where "xxx" is the name of your project. This method only performs the correction for that

particular import session.

Some SPOT images in the CCRS (Canadian) format contain an error in the sensor attitude data on the tape header, which make it impossible to control the image with SOCET SET. If you find this to be true, ask your tape supplier for a replacement tape. This is not a problem with SPOT tapes produced by the SPOT Image Corporation.

Using SPOT images

When creating a project which will include SPOT images, the geodetic datum must be based on an earth-centered ellipsoid such as WGS 84. The reason for this is that the SPOT satellite ephemeris and attitude data are based on an earth-centered system. Before importing your data, make sure your project has an origin near the center of your SPOT or JERS data set. It should be in the same hemisphere for Geographic projects, or the same UTM zone for UTM projects.

Interior Orientation is not required with SPOT images, since the sensor is a digital camera, resulting in a known, fixed relationship between each image pixel and the sensor lens.

SOCET SET can accommodate images from different sensors simultaneously. From the user's point of view, there is little difference between triangulating a block of frame images, SPOT images, or a mixture of both. When triangulating SPOT images, there are thirteen parameters which can be adjusted: the focal length, the 6 parameters of position and attitude, and the 6 first degree components of position and attitude with respect to time. A priority estimates for these are obtained from the SPOT header data.

The recommended number of ground control points is 4–6 per model (or per multiple image strip if all images are from a single orbital pass.) Pointing accuracies range from 6–20 meters. If there are no ground control points available, the expected absolute distance error is approximately 500 meters. A single control point can correct for model offsets due primarily to timekeeping errors.

Two control points can correct for offset and azimuth errors.

Outputs

Outputs consist of an ASCII support file and a binary image file which is tiled with a header in a tiled format. The support file is created in the data directory used by the current project file. The display of support data is provided by the window popped-up from the main SPOT menu.

Importing From CD-ROM

SPOT Import recognizes the data format for SPOT Scene and CCRS CD-ROM products. On Unix, the CD-ROM must be mounted on the directory "/cdrom." If this is not the case, ask your system administrator to mount it there. The root directory of the CD ROM must have subdirectories called "scene01," "scene02," etc. for each scene on the disk. If you have difficulty importing, you can also try identifying the files with the Importing From Disk interface.

Importing From Disk

SOCET SET can use disk files for the SPOT data. There can be one single large file containing the Volume Directory File, Leader File, Imagery File, Trailer File, and Null Volume Directory File or these files can be kept separate. If the files have the SPOT Scene naming convention, e.g. vold_01.dat, lead_01.dat, imag_01.dat, trai_01.dat, null_01.dat, then you can click on just one of them and the rest will be filled in automatically. The disk file selection box also allows you to select more than one file. You can use this feature if you are having difficulty in importing a set of files and would like to try a different file ordering. The files are read in the order that you click on them. You can specify multiple files by clicking on them while holding the Control Key.

Transferring Data From Tape to Disk

You might want to transfer your data from a tape to disk so that it can be subsequently imported from disk on a different workstation. The steps to do this are as follows:

- 1. Mount the 9-track *CCT* on a tape drive. In this example the device name of the tape drive will be /dev/rmt/7n.
- 2. Use the <install_path>/bin/tape_struct executable to determine the files and record size.

% <install_path>/bin/tape_struct /dev/rmt/7n

As a result of this command the messages should reflect the file number and block size of the records in each file.

3. Edit the <install_path>/bin/copy_spot_to_disk script to reflect the input record block size. This script file should reflect the following commands which must be correct in order to copy records verbatim to disk files

dd ibs=360 if=/dev/rmt/7n of=vold_01.dat

dd ibs=3960 if=/dev/rmt/7n of=lead_01.dat

dd ibs=8640 if=/dev/rmt/7n of=imag_01.dat

dd ibs=1080 if=/dev/rmt/7n of=trai_01.dat

dd ibs=360 if=/dev/rmt/7n of=null_01.dat

mt -f /dev/rmt/7n rewind

Some older SPOT images were on two tapes at 1600 bpi for a single image. If there is a second tape involved, then repeat these first three steps for the second tape as well using _02.dat in place of _01.dat for the output files.

Strip off the first 8640 bytes from part 2 of the image which is imag_02.dat using the following command:

dd if=imag_02.dat of=strip_02.dat bs=8640 skip=1 Second, you then concatenate the following input files into one output file:

> cat vold_01.dat lead_01.dat imag_01.dat strip_02.da trai_01.dat null_01.dat > scene1

4. Now proceed to import the disk image file, as described under importing from disk.

Tips for Triangulating Particular Sensors

SPOT Images

Several sensor types are known generically as "pushbroom," because of the method of collection, have unique characteristics that the user should be aware of. This includes the SPOT sensor and several of the National Technical Means (NTM) sensors. See "SPOT, JERS and IRS Import," Chapter 11. These sensors continuously collect imagery as the sensor passes over the ground. Rather than store the entire image in one huge digital file, the data is broken into pseudo "frames" with overlap regions created to allow later triangulation into a consistent block. The problem develops because the overlap areas are, in fact, the same image with the same exposure station parameters. To determine the elevation of a point (Z) the software projects a ray through an image point in one image and intersects the ray with the same point in the overlapping image. In this case the two rays are parallel and never intersect causing the z value calculation for the point measurement to fail. The x,y values of the sample are still valid for connecting the images together but the z is worthless. When the solution function attempts to adjust the ground positions it fails as well. The problem can be avoided by changing the tie points between these pseudo images to "Vertical" type control points. This treats the point as a Z control point and does not try to adjust the Z image parameters. The x,y adjustments are done as usual to tie the pseudo frames together. An additional tie point between strips is still needed (if there are multiple strips in the block) to connect adjacent images, since these are independent and do not share the same exposure location values. If you have SPOT 5 images without control, try the second degree attitude (q0 0, q1 0, q2 0, q0_1, q1_1, q2_1, q0_2, q1_2, q2_2) to a small sigma value, e.g. 0.00001. Disable all other parameter adjustments.

3.1 Triangulation

3.1.1 Preparation

```
3.1.1.1 Create new Datum (e.g. PRS92) and Grids (e.g. PTM and UTM)
```

To add a new datum or grid, the ASCII files in this directory (C:\SOCET_SET_5.3.0\Internal_dbs\ GEODETIC) must be edited before running Create Project.

SUMMARY OF FILES OF GEODETIC.DAT AND GRID_PARAMETERS _____ - Contains numerical definitions of all geodetic.dat datums, including names. ***** N O T E : **** Do not change any of the datum names contained in this file !!! grid_parameters - Defines grid coordinate systems (state plane, etc.) qeoid84.dat - Defines mean sea level geoid; Binary (non-ASCII) file ellipsoid.dat - Defines reference ellipsoids geodetic.doc - For reference only; not used by SOCET SET software

DATUMS

To create a new datum, you must add the appropriate information to file geodetic.dat

The values for each datum in the geodetic.dat file are arranged in pairs of lines. The values for each column are as follows.

Line 1: Num D_name

Line 2: E_code A F dA dF*10⁴ dX eX dY eY dZ eZ G_code s rX rY rZ use_approx

----- - -- -- -- -- -- -- -- -- -- --The last 5 values (s, rX, rY, rZ, use_approx) are optional. Num = serial number of the entry within the file. D name = name of the datum (sometimes abbreviated, should be 80 characters or less). E code = 2 character code for the reference ellipsoid corresponding to this datum A = equatorial radius (semi-major axis) in meters. F =flattening (defined below). dA = difference between this datum's radius and WGS84 radius (reference only) $dF*10^4$ = difference between this datum's flattening and WGS84_flattening multiplied by 10,000 (reference only). dX, dY, dZ = offset of this datum's ellipsoid with respect to the centroid of the earth (WGS84), expressed in meters. eX, eY, eZ = error estimates for the datum offsets (+ or -, expressed in meters). G_code = EPSG Geographic CS Type Codes, Based on EPSG Datum. Numbers 4200-4999: valid codes Number 0: undefined For details, see the website: http://www.remotesensing.org/geotiff/spec/geotiff6.html#6.3 .2.1 **s** = scale for 7 parameter transform. rX, rY, rZ = Rotations for 7 parameter transform. use_approx = if 0 use rigorous 7 parameter transform if 1 use approximate 7 parameter transform NOTE: Use meters to specify earth radius and XYZ offsets. DO NOT USE FEET. If you are working in a feet-based project, the conversions will be performed automatically for you by SOCET SET. Use radians to specify rotation. The file 'geodetic.doc' is provided for reference and is not used by the workstation. However, you should add an entry to the geodetic.doc file, for reference purposes. GRIDS

GKIDS

The file "grid_parameters" defines the various grids the operator may choose from when running the Project Creation function in SOCET SET. This file is used by the Project Creation process to create

a menu for the operator to select a grid. A grid must be added

to this file BEFORE running the project creation process if you want to use the grid. The format of the file is defined in comments in the file itself.

A grid is a localized coordinate system based on a map projection that is well suited to the local region. Every state has one or more grids defined, called 'State Plane' coordinate systems.

```
All distances in these files are measured in METERS. Distance values include:
```

- the earth radius
- XYZ offset of the datum
- XYZ offset error estimates of the datum
- false easting and northing

Do not use FEET units in these files!! If the coordinate system you are using is feet-based (as are many State Plane systems) don't worry: enter the data (false easting and northing) in these files in METERS, then select "Units = FEET" during the project creation process. Thereafter, all your input and output will be in FEET units. For more information, see the Project Management chapter of the DPW SOCET SET User's Manual.

Sample file of geodetic.dat

VERSION 1.0

######## # # DO NOT CHANGE THE FIRST LINE (the 'VERSION' line) # # This file contains the parameters for specifying datums. # Parameters for the standard datums are taken from # NIMA document "Department of Defense World Geodetic System 1984. # Its Definition and Relationships with Local Geodetic Systems". # TR8350.2, Third Edition, Amendment 1 (3 January 2000), # Appendices A.1, B.1-B.10 and C.1-C.2. # # NOTE: This file replaces old versions of both datum.dat # and geodetic.dat. # # You can add lines to this file, to specify other datums, if you # wish. If you do, be sure to follow the existing format. The # values for each datum in this file are arranged in pairs of lines. # See internal dbs/GEODETIC/README for the format. # ######## 1 WGS 72 2.000 0.00031000 0.0 1.0 WD 6378135.00000 0.0033527795 0.0 1.0 0.0 1.0 4322 2 WGS 84 WE 6378137.00000 0.00335281066475 0.000 0.0000000 0.0 1.0 0.0 1.0 0.0 1.0 4326 3 [ADI-M]_ADINDAN(Mean_Solution) CD 6378249.14500 0.0034075614 -112.145 -0.54750714 -166.0 5.0 -15.0 5.0 204.0 3.0 4201 4. PHILIPPINE (PPCS) CC 6378206.40000 0.00339007530393 -69.400 -0.37264639 -127.6220 0.0 -67.2448 0.0 F dA dF*10^4 E code Α dY dX eX eΥ -47.0431 0.0 0 0.99999893998 0.000014872241633 -0.000023769979580 eZ G_code dZ S rX rY 0.000007649875327 1 rΖ use approx

Sample file of ellipsoid.dat

VERSION 1.0 # # # # DO NOT CHANGE THE FIRST LINE (the 'VERSION' line) # # # # This file contains reference ellipsoid names and their # associated constants. Refer to NIMA document TR8350.2, # Third Edition, Amendment 1, 3 January 2000, # "Department of Defense World Geodetic System 1984", # Appendix A.1 # # You can add entries to this file if you desire. # When doing so, please use the following guidelines. # # 1. Use underscores (_) instead of spaces in all ellipsoid names. # # 2. Make sure that you specify a unique 2-character ID code for the new ellipsoid. This will be # # the same code that you will use in file geodetic.dat for any datums that will use the # new ellipsoid. # # 3. If you want to specify subclasses of ellipsoids (similar to the Bessel 1841 and Everest # # ellipsoids), the first character of the # subclass line must be a space. # 4. Equatorial radius, flattening and eccentricity # squared values are included in this file for # reference, but are not used by the software. It is not critical that these values be # # accurate in this file. # # # # Ellipsoid Name ID Code Equat. Rad(a) Flattening(f) Ecc squared # -----_____ _____ -----# Airy_1830 AA 6377563.396 0.003340850641 0.006670539999 Australian_National AN 6378160.0 0.0033528918692 0.0066945418545 Bessel 1841 Ethiopia, Indonesia, Japan and Korea BR 6377397.155 0.003342773182 0.006674372231

Namibia
0.006674372231
Clarke_1866
0.00676865799729
WGS_1972
0.0066943179
WGS_1984
0.00669437999014

- BN 6377483.865 0.003342773182
- CC 6378206.4 0.00339007530393
- WD 6378135.0 0.0033527795
- WE 6378137.0 0.00335281066475

Sample file of grid_parameters

DO NOT CHANGE THE FIRST LINE (the 'VERSION' line) # # # This file is the grid file. This file defines the various grid coordinate # systems that the operator may select when creating a SOCET SET project. # This file is used by several SOCET SET applications: # # a) Project Create (selecting a Grid coordinate system) # b) Coordinate Measurement - CoordinateTransformation subwindow # c) Annotation - Gridlines / Ticks # d) Control Point Measurement - data entry coordinate system # e) Triangulation - Interactive Point Measurement # **# ADDING GRID DEFINITIONS TO THIS FILE** # ------# If you want to create a grid coordinate system and use it in SOCET SET, follow # these steps: # # 1) Edit this file. Add your new grid definition into this file. # It is usually easiest to copy an existing grid definition and change it # rather than typing-it in from scratch. # You may add your grid anywhere in this file after the first "VERSION" line. # Most users find it most convenient to place their grid as the first coord system. # # 2) You can delete other grid definitions out of this file if you want to. # # 3) Save this file back into /usr/geoset/internal dbs/GEODETIC/grid parameters # # 4) Start SOCET SET. When you run Project Create, you will see your Grid in the # the list of grids when you select the Grid option under Coordinate Systems. # # # # **# FORMAT OF GRID DESCRIPTOR** # ------# Each grid is described in three sections: # # (1) The first line describes the grid name and datum info. # The grid name follows the keyword GRID_TYPE and may be any string you like: it sole purpose is to distinguish between the various grids in this file. # The values for DATUM NAME, DATUM, OFFSET and ERROR are those # contained in file geodetic.dat for the datum in question.



GRID_TYPE al_e_27 DATUM_NAME [NAS-C]_NAD_27(CONUS) DATUM 6378206.4 0.00676865799729 OFFSET -8 160 176 ERROR 5 5 6

The numbers on this line can be in scientific notation (e.g. 6.69E-03) or in normal # floating point notation (e...g 0.00669). # # The XYZ offset is measured from the center of the WGS_84 ellipsoid (Z axis up thru # North pole; X axis thru Greenwich meridian; Y axis thru +90 degrees longitude). # # # (2) The middle lines describe the projection. The possible projections are: # # TRANSVERSE_MERCATOR_PROJECTION # CASSINI SOLDNER PROJECTION HOM_PROJECTION (Hotine) # # LAMBERT_CONFORMAL_PROJECTION # MERCATOR PROJECTION # POLAR STEREOGRAPHIC PROJECTION POLYCONIC PROJECTION # # STEREOGRAPHIC PROJECTION # TRANSVERSE_MERCATOR_PROJECTION # UTM PROJECTION NEW ZEALAND # # SINUSOIDAL PROJECTION # # Each projection has a 2 to 4 lines of definition. # The content varies depending on the projection. The syntax # for each projection is described below in the "sample" grids. # For example, for UTM: # # keyword # defining the # projection # # ν # PROJECTION TYPE UTM PROJECTION # ZONE 1 # # # (3) The last line holds false easting and false northing (in meters).

These are positive offsets added to the projection coordinates to force # most values to be positive. Generally, the Positive and Negative # false eastings are identical. IMPORTANT: If your grid does not # work properly, make the first and second numbers the same and # the third and fourth numbers the same, e.g. # # F_NORTH_POS 10000000 F_NORTH_NEG 10000000 F_EAST_POS 500000 F EAST NEG 500000 # # **# FEET VS. METERS** # ------# All distances in this file are measured in METERS. Distance values include: # # - the earth radius of the datum # - XYZ offset of the datum # - XYZ offset error estimates of the datum # - false easting and northing # # Do not use FEET units in this file!! If the grid coordinate system you # are using is feet-based (as are many State Plane systems) don't worry: # enter the data (false easting and northing) in this file in METERS, then # select "Units = FEET" during the project creation process. Thereafter, # all your input and output will be in FEET units. For more information, # see the Project Management chapter of the SOCET SET User's Manual. # # **# FALSE EASTINGS AND NORTHINGS** # ------# XY Coordinate values in a grid coordinate system are often negative (e.g. # X values are negative to the West of the origin point). However, many grids # are defined to force the XY values to be always positive. This is achieved NOT # by moving the origin point, but rather by adding artifical offsets to the # mathematically correct XY values. These offets are called "false northing" and # "false easting". These are usually large positive numbers. # # There are two false values for X: false easting positive and false easting # negative. The former is used when the X value is positive, and the latter # when the X value is negative. The same for Y: false northing positive and # false northing negative. # # The false easting positive and false easting negative should be identical # (we are not aware of any coordinate system in which they differ). # # The false northing positive and false northing negative are usually identical, # but will be different in some rare cases. For example, the UTM grids # (transverse mercator, with origin at the equator) use different values # for false northing positive and false northing negative. # # The false eastings and false northings are always defined in this file in # meters, even if you are defining a feet-based grid. If you are using a # feet-based grid, you may find the following conversion

table useful (note: these values are based on the # International Foot definition; if you are using the U.S. Survey Foot, these # values are not valid): # FEET # METERS (use in the grid definition below) # _____ # 100,000 30,480 # 500,000 152,400 # 1,000,000 304,800 2,000,000 609,600 # # # # LATITUDE / LONGITUDE # ------# All latitude and longitude locations are specified in radians, not degrees. # Degrees WEST of Greenwich are expressed as NEGATIVE radians. For example, # 118 degrees west is represented as -2.059488517353309 radians. # If you have a location in degrees, and you need to convert it to radians, use # the degree-to-radian conversion program (activated under the Tools menu on the # main SOCET SET menu). # # **# SCALE REDUCTION FACTOR:** # ------# The central scale factor is another way of expressing a scale reduction: # e.g. a scale reduction of 1:10,000 corresponds to a scale factor of 0.9999 # This is used in transverse mercator, hotine oblique mercator, and # stereographic projections. # # **# STATE PLANE DATUMS** # ------# The entire Unites States is covered by 122 grids called the State Plane grids. # There are two versions of the State Plane grids: an older set based on the NAD 27 # datum and a newer set based on the NAD 83 datum. This file contains both # the old and the new state plane systems. For example, California Zone 6 is # ca_6 (old, NAD-26) and ca_6_83 (new, NAD-83). For reference, the two datums # used for State Plane grids are: # # XYZ Accuracies Datum Equa.Radius ecc_squared XYZ offsets # ----- -----NAD 27 6378206.4 0.00676865799729 -8.0 160.0 176.0 5 5 6 # NAD 83 6378137.0 0.00669438002290 0.0 0.0 0.0 2 2 2 # # # **# COMMENT LINES** # ------# All lines in this file beginning with '#' are treated as comments and ignored. # # **# ECCENTRICITY AND FLATNESS** # ------

```
# The oblateness of the earth may be expressed three different ways:
#
# flattening
                   = (a-b)/a;
   eccentricity
                   = sqrt ( (a**2 - b**2) / a**2 );
#
   eccentricity_squared = (a^{**2} - b^{**2}) / a^{**2};
#
#
# Where a = equatorial radius, and
      b = polar radius.
#
#
# To compute ecc_squared from flattening, use this formula:
#
     ecc_squared = f * (2 - f);
#
#
#
# GEOTIFF
# -----
# Each grid definition may be followed by an optional GeoTiff ID number line.
# The format is:
#
     GEOTIFF <id number>
# This line is optional, and if it does appear, it must be the final line
# of the grid definition. The ID numbers are obtained from the GeoTiff
```

(a) Coordinate System

Coordinate system for all control points carried out under the Philippine Plane Coordinate System (PPCS) in 1992. The characteristics of the PPCS are:

actoris	ppelan	12 = 0.10 3 1 co 1 6.3	
(i)	Spheroid Projection	10	
350	Clarke's Spheroid of 1866	·	
	Semi-Major Axis	:6,378,206 9) T	0
	Semi-Minor Axis	6,356,583,8	
	Flattering	: 1/294,98	
	X Shift to WGS84	: -127.6220m	
	Y Shift to WGS84	: - 67.2448m	
	Z Shift to WGS84	: - 47.0431m	
	X Rotation to WGS84	: 3.06762 arc seconds	
	Y Rotation to WGS84	:-4.90291 arc seconds	
	Z Rotation to WGS84	:-1.57790 arc seconds	
	Scale Correction to WGS8	4 🕼.06002ppm	
	W-74-74	0.11999 833 972	

Projection Transverse Mercator, in zones of two (2) degrees net width

Point of Origin Intersection of the Equator and the Central Meridian of each zone, with Northing of 0 meter and Easting of 500,000 meters.

	Zone No	Central Meridian	Exte	ent of	Zone	
	1	117°	116° 00′	to	118° 30	'
	I	119°	117° 30'	to	120° 30	1
0	ш	121°	119° 30′	to	122° 30	2:
	IV	123°	121° 30′	to	124° 30	· ·
	v	125°	123° 30'	to	127° 00	,

(iv) Scale factor at the Central Meridian : 0.99995

Zone III was occupied for the project. Two (2) existing GPS stations, namely NVY-1 and ISB-2, which were established by National Mapping and Resources Information Authority (NAMRIA) in 1992, were chosen and applied as the Northing and Easting geographical coordinates datum for the project.

-1-

3.1.1.2 Establishing the path/directory where the images are to be located.

Before you can import or display imagery with the software, you must create a project. You can think of a project as a container holding the data for a set of images you are going to utilize. The data you extract from a set of imagery will be stored in the project directory that contains that set of imagery. When you create a project, you specify the coordinate system and datum to use for the project. You also will specify the disk directories of where the project and imagery data will be stored. Most importantly, you give your project a name. The name of the project file is the name you assigned to the project with the extension.prj when it was created. The software stores the definition of a project in a special project file.

SOCET SET uses the computer file system to store its project data. The following figure depicts the directory tree the software uses to store its data.



Most software applications require that you first load a project. Once you have loaded a project, you can then operate on the imagery and other data contained therein. You can import images into the project, triangulate the images, perform feature and terrain extraction, and create image products to export. The locations of the image files are defined by entities called Image Locations.

1. Create the path/directory location of the image file.

C\SOCET_SET_5.3.0\images\sat_stereo			
C Eak How Fayones Coas Pop	33×9 m.		
Address C:\SOCET_SET_5.3.0\images\sat_stereo			🔹 🌅 Go
Folders ×	Name	Size	Type 4
	5203319:06112102205124.hf Index_Map_2007may_spot_stereo.j2k Index_Map_2007may_spot_stereo.j2k Index_Map_2007may_spot_stereo.j2k_128 Index_Map_2007may_spot_stereo.j2k_256 Index_Map_2007may_spot_stereo.j2k_256 Index_Map_2007may_spot_stereo.j2k_256 IZ7221V Angat 5m.j2k_128 IZ7221V Angat 5m.j2k_256 IZ712714065sj2k_64	305,463 KB 1,181 KB 4 KB 2 KB 2 KB 13 KB 4 KB 2 KB 29,659 KB 13 KB	Microsoft Offic J2K File J2K_64 File J2K_128 File J2K_256 File J2K_128 File J2K_256 File J2K_56 File J2K_56 File J2K_64 File
Application Data Cookies Cookies Cookies Favorites TratalAnywhere Mozaments My Documents My Documents My Recthood Finthood Start Menu H M Programs	T172:1 Maloks, J2k, 128 T172:1 Maloks, J2k, 256 T172:1 Maloks, J2k, 512 T172:1 Maloks, J2k, 512 T172:1 Maniks, J2k, 64 T172:1 Maniks, J2k, 54 T172:1 Maniks, J2k, 512 T172:1 Maniks, J2k, 512 T173:1 San Miguel, J2k, 128 T173:1 San Miguel, J2k, 128 T173:1 San Miguel, J2k, 128 T173:1 San Miguel, J2k, 256 T173:1 San Miguel, J2k, 256 T173:1 San Miguel, J2k, 128 T173:1 San Miguel, J2k, 128 T173:1 San Miguel, J2k, 128 T173:1 San Miguel, J2k, 128	4 KB 2 KB 2 KB 47,022 KB 11 KB 2 KB 2 KB 27,203 KB 13 KB 4 KB 2 KB 2 KB	12K_128 File 12K_256 File 12K_512 File 12K_64 File 12K_56 File 12K_526 File 12K_52 File 12K_54 File 12K_64 File 12K_56 File 12K_56 File 12K_56 File 12K_512 File

2. Open "SOCET SET 5.3.0". Click "Project", select "Create/Edit Project"



3. A "Create/ Edit Project dialog box will appear. Click the browse — button in the "Location "box.

Project:	escon2trames.pn
Project Path:	C:\SDCET_SET_5.3.0\data\escon2frames
Datum:	WGS_84
Coordinate Syste	m: Grid / State Plane
Lat/Lon Format	BB(MM/BS Units: Meters -
Minimum Ground	Elevation (estimated) 200.00
Maximum Group	The second s
Maximum Ground Location esco	m

4. A "File Location" dialog box will appear. Click "Edit Locations" Edit Locations button



5. A "location.list-WordPad" dialog box will appear. Type the directory (e.g. C:\SOCET_SET_5.3.0\images\spot). Then click "Save"

halmil	alal al whaten I mil
AULT	C:\SOCET SET 5.3.0\images
st	C:\SOCET SET 5.3.0
ial	C:\SOCET SET 5.3.0\images\trial
con	C:\SOCET SET 5.3.0\images\escon
ot	C:\SOCET SET 5.3.0\images\spot

3.1.1.3 Creating Project.

You use Create/Edit Project to create your project. Since most SOCET SET applications require a project to be loaded, you must create a project before you can proceed with importing and extracting data.

1. Click "File", select "New".

Create / Eoit I	roject	
File Options Help		
New	gntitled	
Load Asoject	CASOCET SET 531	steb/f
Save		
Save As	WGS_84	.2
Fxit	Select Coordinate Sy:	stem 🧷 🦉
at/Lon Format:	DD-MM-SS	(Inits: Westernet +
Minimum Ground Ek	evation (estimated)	
Maximum Ground E	levation Testimated)	
DEFAU	, <u>,</u>	
Welcome to Lireate currently in use by Current project esc Enter attributes for	e/Edit Project. Moditying other stations is not adv con2frames.prj loaded su new project	projects ised. ccessfully
	27 Million 19	

2. Click the down arrow **I** in the "Coordinate System" box and select "Grid / State Plane".

💽 Greate / Edit P	roject	
File Options Help		
Project:	unided	
Project Path	C:\SOCET_SET_5.3.0\data	
Datum:	WGS_84	
Coordinate System:	Select Coordinate System	1
Lat/Lon Format:	Select Coordinate System Geographic	
Vertical Reference:	LSR with Curvature	
	Grid / State Plane	No.
Minimum Ground Ele Maximum Ground El	evation (estimated)	1
Location. DEFAU	LT	
Welcome to Create currently in use by Current project test Enter attributes for	e/Edit Project, Modifying projects other stations is not advised _new.prj loaded successfully new project	
		11

3. A "Select a Coordinate System" dialog box will appear. Scroll down the arrow and select the desired coordinate system (e.g. Philippine_UTM_51N). Then click "OK".

PTM_zone_1(117) PTM_zone_2(119) PTM_zone_3(121) PTM_zone_4(123) PTM_zone_5(125) Philippine_UTM_51N	Gauss_Boaga_Italia	_Fuso_Ove	st	-
PTM_zone_2(119) PTM_zone_3(121) PTM_zone_4(123) PTM_zone_5(125) Philippine_UTM_51N	PTM_zone_1(117)	Q.		
PTM_zone_3(121) PTM_zone_4(123) PTM_zone_5(125) Philippine_UTM_51N	PTM_zone_2(119)			
PTM_zone_4(123) PTM_zone_5(125) Philippine_UTM_51N	PTM zone 3(121)			
PTM_zone_5(125) Philippine_UTM_51N	PTM_zone_4(123)			
Philippine_UTM_51N	PTM_zone_5(125)			-
	Philippine_UTM_51	N,		-
	ilippine_UTM_51	N		1

4. Click the browse button in the location box. A "File Location" dialog box will appear. Select the image file location [e.g. spot (211451.2mb)] Then click "OK"

DEFAULT (211451	.2MB)	
test (211451.2MB)		
escon (211451.2MI	B)	
spot (211451.2MB)		
		5
		\mathbf{k}
		A

5. Type 0 in the "Minimum Ground Elevation (estimated) box and 1800 in the Maximum Ground Elevation (estimated) depending on the highest elevation of the project area. Click "File", then click "Save".

File Options Help		
New	carto_stereo.pri	1
Load Project	C:\SOCET_SET_5.3.0\data\carto_stereo	
Save		1
Save As		-
Exit	Grid / State Plane	-
	· MSL EGM36	
Minimum Ground El	evation (estimated) 0.00	
Minimum Ground Eli Maximum Ground El Location Carto_s	evation (estimated) 0.00 levation (estimated) 2000.00 tereo	
Minimum Ground El Maximum Ground El Location carto_s Welcome to Create currently in use by Current project car	evation (estimated) 0.00 levation (estimated) 2000.00 tereo e/Edit Project. Modifying projects other stations is not advised to_stereo.prj loaded successfully	

A "Project Name Selection" dialog box will appear. Type the desired project name (e.g. monospot) in the "Enter Project Name" box. Then click "OK"

Project Name Selection		? ×
Enter Project Name		
carto_stereo		
	ок	Cancel

7. Check the bottom box of the "Create / Edit Project" dialog box, if the project "carto_stereo" was created.

🤨 Create / Edit P	roject _ 🗌 🗙
File Options Help	
Project:	carto_stereo.pti
Project Path:	C:\SOCET_SET_5.3.0\data\carto_stereo
Datum:	PHILIPPINE_(PPCS)
Coordinate System:	Grid / State Plane
Lat/Lon Format:	DIMMISS 🛃 Units: Meters
Minimum Ground Ele Maximum Ground El	evation (estimated) 0.00 evation (estimated) 2000.00
Location. carto_st	ereo
Welcome to Create currently in use by Current project carl	Pedit Project. Modifying projects other stations is not advised. o_stereo.prj loaded successfully

3.1.1.4 Importing the Image (SPOT DIMAP)

If you are importing SPOT data with three bands, you will see a "All Bands (color)" the three bands will be merged into a single color (3band) image file. The name of the support file will be what you entered in the name box. If you select "All Bands (grays)" the three bands will be put out as three separate monochrome images. The name of the support file(s) will be what you entered in the name box concatenated with "_band_n.sup," where "n" is "1" "2" or "3" for the three bands. If you select "Band n only," it will behave the same as "All Bands (grays)," except only the single band you select will be imported. For SPOT4, four bands are available.

- File Project Preparation Extra Coad Project Load Images Auto Loader Save Image Load Point Exit
- 1. Click "File", select "Load Project".

2. A "Select Project File" dialog box will appear. Select the project name (e.g. carto_stereo.prj) that was created. Then click "OK"

🔅 Select Proje	ect File	? X
Files		
Dingo_test_apn	n_level.prj 1.1	
bingo_test_jul2	I-I.prj	
carto_sat.prj		
carto_sat2.prj		
carto_sat2_juni	21.prj	
carto_sat3-1.pr	i	
carto_sat3.prj		
carto_sat4.prj		
carto_sat4_ged	o.prj	
carto_sat5.prj		
carto_sat6_rigo	prous.prj	
carto_sat_back	(up.prj	
carto sat bak	jun20.prj	
carto_stereo.pr	 i	-
Selection		
Ciccular		
carto_stereo.pi	rj	
J		
	01/	
	UK	Cancel

- 😉 SOCET SET® 5.3.0Export_20070308 Copyright © BAE SYSTEMS National Security Solution File Project Preparation Extraction Products Output Preferences Tools Help Import Image Þ Project: mono: Import/Reformat Minification X/Lon: 49624 Terrain . TIFF-RPC Image Dodge and Balance Features , Ortho 10.0 Interior Orientation Þ **ASCII Ground Points** Computer GeoTIFF Control Point Editor **ASCII Image Points** DOQ Multi-Sensor Triangulation 179 Full 💌 🏥 🕫 🗧 NITE Registration ĸ World File Network Resample Þ Frame laces **Build Fast Sensor Model** BINGO Frame Camera Calibration Panoramic QuickBird Basic ycle Bin QuickBird Standard WorldView Basic WorldView Standard ADS40 OrbView3 **IKONOS** LandSat SPOT DIMAP SPOT JERS IRS RADARSAT ERS
- 3. Click "Preparation", select "Import", select "Image" and then click "SPOT DIMAP".

4. A SPOT DIMAP IMPORT<monospot.prj> dialog box will appear. Put mouse arrow inside the "DIMAP files box and click right mouse button. Click the "Add" button.

SPOT DIMAP Impo	rt <monospot.pri></monospot.pri>	
DIMAP Files		
	Add	
Dutput Images		
Location: spot	TIFF Tiled	
Edit Names		
	1	Start

Select one or more files to add		2 3
Look in: C:/JICA/Spot5_orginal/CD8/SCENE01/	<u>_</u>	🍫 🗈 🕁 🖽 🎹
	_	
	T	
File name: ["METADATA.DIM"	T _a	Open

6. The selected image file will be reflected in the "DIMAP Files" box. Set Format to TIFF TILED. Then click "Start"

ISPUT DIMAP Imp	ort <mon< th=""><th>ospol pri V</th><th></th></mon<>	ospol pri V	
DIMAP Files			
C:\JICA\Spot5_orig	inal\CD8\Si	CENE01\M	ETADATA.DIM
			1.
Output Images			
Copy images to			
Location: spot		_	
Format:	F	TIFF Tiled	
Edit Names			
7. See information at the bottom box and check if import is complete.

SPOT DIMAP Import <monospet.pr ></monospet.pr >	-IOI ×
DIMAP Files	
C:\JICA\Spot5_original\CD8\SCENE01\META	DATA.DIM
	1.1
Output Images	- 17
🔽 Copy images to	
Location spot	-
Format:	E
Edit Names	
Please wait Created 53033190602280235561A.sup Reformatting image Minifying 53033190602280235561A.sup Concatenating TIFF files Import complete	
	Start

8. After importing the image, click "File", select "Load Images".



9. An "Image Loader" dialog box will appear. Click "Create" Create to create a view window. Select the first image file (e.g. 53033190611210220512AL) in the left file box and select the second image file (e.g. 53043200604260240041AR) in the right file box. Then click "Load".

33033190611210220512AL 53043200604260240041A 53043200604260240041AR BRAPHICS_ONLY Index_Map_2007may_spot_stereo Retresh Image: Destroy Load	Left Filter			Right Filter
53033190611210220512AL 53043200604260240041A 53043200604260240041AR GRAPHICS_ONLY Index_Map_2007may_spot_stereo Refresh Load View Control Panel View: 3 Current Point Create Destroy		-	×	- Z
View Control Panel View: 3 _ Current Point _ Create Destroy	53033190611210220512AL 53043200604260240041A 53043200604260240041AR GRAPHICS_ONLY Index_Map_2007may_spot_stereo	Refresh	5303319061121022(5304320060426024(5304320060426024(GRAPHICS_ONLY Index_Map_2007ma;	D512AL D041A J041AR y_spol_stereo
/iew: 3 💽 Current Point 💌 Create Destroy	View Control Panel	_		
	View: 3 🗾 Current Point		Create	Destroy

10. A view window will appear displaying the imported image (e.g. SPOT).



- 3.1.1.5 Importing the Image (Index Map_Control Point)
 - 1. Click "Preparation", select "Import", select image, and click "World File".



2. An "Image Import" dialog box will appear. Put mouse arrow inside the "Input Image Files" box and click right mouse button. Click the "Add" button.

Input Image File(s)	
	Add
Identity Only	Georeferencin
Output Image(s) —	
C Support File On	ly .
Image and Sup	port File
Location: spot_s	ata
Image Format TI	FF Tiled JPEG
Prefix:	Suffix:
Output Name: Kir	nage>
elect input image(s	i].

3. A "Select one or more files to add" dialog box will appear. Use the down arrow in the "Look in" box, browse and locate the image file (e.g. Index_Map_2007may_spot_stereo.tif) to add. Then click "Open" Open.

Select one or more files to add		<u> </u>
ook in: G:/JICA/table/sat_stereo/	<u> </u>	
east_side_gcp.xls GCP読み取り.xls Index_Map_2007may_spot_stereo.tfw Index_Map_2007may_spot_stereo.tfw Index_Map_2007may_spot_stereo.tf Mamria_0501_14_03_01.con sat_stereo.csv sat_stereo.xls	R	
ile name: ["Index_Map_2007may_spot_stereo.tif"		Open

4. 4The selected image file will be reflected in the "Input Image Files" box. Click "Georeferencing".

🛞 Image Import/Reformat <	carto 💶 🗙
File Options Help	
Input Image File(s)	
Index Map_2007may_spot_ste	reo.tif
🔲 Identity Only	Georeferencing
Output Image(s)	
Support File Only	
Image and Support File	
Location: carto_stereo	
Image Format: JPEG 2000	•
Prefix: Suffix:	
Output Name: <image/>	
Select input image(s).	
	Start

5. A "Georeference Data" dialog box will appear. Select "Other" under "Source" column. Click "Select World File". Click right mouse button.

Geo	reference Data										<u>? </u> ×
	Image	ULX	ULY	URX	URY	LRX	LRY	ШХ	LLY	Source	
1	Index_Map_2007may_	263930.299	1718019.194	321207.832	1718019.194	321207.832	1628593.994	263930.299	1628593.994	World	Select World File
											×
Lorda	an file										
Come	unnie	hei anlu)									
102.00	1977) 1977 - Contra Contra 1977 - Contra	111111111	 At pixel ce 	ntel			C At pixel ou	er edge			
											1
									0	<u>K</u>	Cancel

6. A "World File Selector" dialog box will appear. Select the required world file (e.g. Index_Map_2007may_spot_stereo.tfw). Then click "Open".

World File Select	or				? >
Look in:	🔁 sat_stereo		•	- 0 d I	H -
	Index_Map_	2007may_spot_stereo.tfw	1.1		
My Recent	1.1				
Documents					
Lieskton .					
Freeswep					
My Documents					
- Mai					
Му Сотрыес					
My Network	File name:	Index_Map_2007may_sp	ot_stereo.tfw		Open
Places	Files of type:	World files (*.*w * *W)		•	Cancel

7. The world file parameters will be reflected in the "Georeference Data" dialog box. Then click "OK".

Index_Map_2007may_ 263930.299 1718019.194 321207.832 1718019.194 321207.832 1628593.994 263930.299 1628593.994 Work		Image	ULX	ULY	URX	URY	LRX	LRY	ШХ	ЩY	Source
		Index_Map_2007may_	263930.299	1718019.194	321207.832	1718019.194	321207.832	1628593.994	263930.299	1628593.994	World
from Re	ħ	rom file)									
I from file	i fn	rom file)	net anlu)								
oad hom Re	ad fr	rom file)									

8. Set Image Format to JPEG 2000. Then click "Start".

File Options Help	carto 💶 🗙
_Input Image File(s)	
Index_Map_2007may_spot_ster	eo.tif
📕 Identity Only	Georeferencing
Output Image(s)	
C Support File Only	
Image and Support File	
Location: carto_stereo	
Image Format: JPEG 2000	-
Prefix: Suffix:	
Output Name: <image/>	,
Select input image(s).	
	Start

9. After importing the image (e.g.Index_Map_2007may_spot_stereo.tif) is done, click "File", select "Load Images".



10. A "Image Loader" dialog box will appear. Click "Create" Create to create a view window. Select the image file name (e.g. Index_Map_2007may_spot_stereo) and click "Load".

inage coader		_	طليقي
Left Filter		-	Right Filter
53033190611210220512AL - 530432006042602400416		53033190611210	1220512AL
53043200604260240041AR GRAPHICS_ONLY		53043200604260	1240041AR Y
Index_Map_2007may_spot_stereo	<u> </u>	Index_Map_2007	'may_spot_stereo
		1	
		1	
View Control Panel			-
	<u>«</u>	Lieate	Destroy
		Stereo Model Mana	ager Close

11. A view window will appear displaying the imported image (e.g. Index_Map_2007may_spot_stereo.tif).



3.1.2 Import Ground Controls

Ground Point Import reads ground point data in an ASCII format into the internal Ground Point File Format. The input ASCII file is restricted to one ground point per line. Each ground point contains a point ID along with an (X,Y,Z) coordinate. This information can be in any order, but it must all be on one line.Obtaining this window is as simple as clicking *Preparation* > *Import* >*ASCII Ground Point* Import on the main workstation.

ASCII Ground Point Ima	art Selar III DX
He Optime Help	
Moul File Format:	181
frence ASCII Ground Point Elec-	1 10
Dapat Grand Point File	
Liaiz	Pigert Narve
Chanse project life Select input life	
	1911
	14

Ground point control types of horizontal, 3-dimensional, and vertical are used within SOCET SET. Ground points which have a value of 0.0 exactly will cause the control point type setting to change. If your data has a control point of 0.0 0.0 3.2, the point type will be set to vertical (Z only). If your data has a value of 2456.8 23778.9 0.0, the point type will be set to horizontal (X and Y only).

You use ASCII Ground Point Import to translate and import ground point data from an external source into the native SOCET SET ground point file format. The units of the data can be either decimal for UTM, grid, LSR, or Geographic projects (see below), or degrees minutes seconds for any project. Degrees minutes seconds must be entered as "+-DD:MM:SS.SSS". The presence of two colons is mandatory. When you create a Geographic project, you specify a preference for coordinate display. If you import a file with decimal numbers into a Geographic project whose display preference is "dd.dddd" the numbers will be interpreted as decimal degrees. For all other Geographic projects, decimal numbers will be interpreted as radians.

Edit Input Format Option

This window provides you with a way to specify the order of the information in the input file. Click *Options > Edit Input Format* on the ASCII Ground Point Import window. You can save this ordering in an input format file for later use with other ground point files.

The Fields column on the right of the ASCII Ground Point Import window (above), indicates the current order. To change a field setting, select the desired format from Format Selection on the left. Then click on the appropriate field on the right.

There are seven format settings from which to select: ID, X, Y, Z, Code, Ignore, and Illegal.

- "Code" has no meaning for ASCII Ground Points.
- "Ignore" is used to ignore any information that may be specified in a field.
- "Illegal" indicates that a field should not contain any information. The entire point is discarded should any information be found in a field marked as "Illegal." The following are some examples of legal settings for the input fields.



EXAMPLE 1	EXAMPLE 2	EXAMPLE 3
1: ID	1: Y	1: Ignore

EXAMPLE 1	EXAMPLE 2	EXAMPLE 3
2: X	2: X	2: X
3: Y	3: Z	3: Y
4: Z	4: Illegal	4: Z
5: Ignore	5: Illegal	5: Code
6: Ignore	6: Illegal	6: Ignore

3.1.2.1 Edit Ground Control Points file.

The GPS Ground Control Points file has several Field columns that need to be edited based on the seven Field column Format settings (ID, X, Y, Z, Code, Ignore, and Illegal) being used in SOCETSET.

1. Open GPS Ground Control Points (text file) in Excel.

Elle Edit View Inse	rt Format <u>T</u> ools <u>D</u> ata	Window Help	Type a	avestien for	iselo 📀	- 5
Arial • 10	• B I U ==	三国 \$ %・*		里• 🔊	· 4 ·]	
H63 + /	÷				-	
A	B	C I	D	E	E	1 2
RM-112	280498.3611	1681111.478	13.35	-	_	
. RM-113	280404.8499	1681730.245	13.84			
RM-114	280235.7847	1682861.066	15.02	_		1
RM-115	280104.2226	1683767.52	15.02	_	_	_
RM-116	279324.2696	1684455,11	11.92			
RM-117	278513.7908	1685292.39	13,84	-	_	_
RM-118	277618.309	1686293.545	12.74		_	_
RM-119	276696.0963	1687761,304	13.69			
RM-120	275987 1559	1688946.544	13.26			
D RM-128	271866.0584	1689828.985	14.14			_
1 RM-A	275951.6498	1637872.66	3.072			
2 RM-B	276763.5497	1638340.173	3.167			
3 RM-1	277675.2729	1638884.291	11.209			
4 RM-2	278362.2933	1639044.223	5.124			
5 RM-3	279024.4756	1639342.594	6.691			
5 RM-4	279641.7973	1639825.988	8.849			
7 RM-7	281358,4815	1640945.261	10.875	_		
3 RM-9	282137.3567	1641290.109	32.212			
9 RM-8A	282561.4235	1642146,067	33.285			
RM-10	283501.8717	1643639,405	36.208			
1 RM-11	284140,5201	1644438.708	46,343			
2 RM-12	284903.3686	1645035.903	50.384			_
3 RM-13	285759.2129	1645837.805	68.99			
1 RM-14	286291.0279	1646570.386	75.381	_		
5 RM-15	287438,3213	1647882.203	71.757	_		
5 RM-16	288332.5662	1648183.005	64.762			
7 RM-17	288882.5566	1648908,949	60.774			
3 RM-18	288465.0843	1649143.753	59.051			
3 RM-20	287780.1449	1650526:764	40.447			
0 RM-21	287874.483	1651354.678	36.88			
1 RM-22	287164.6899	1652689.626	32.559			
2 RM-23	287606.3598	1653061.586	34.767			
3 RM-24	288497.9165	1653082.423	36.343			
1 DIN-25	199050 1771	1652673.463.	73 737			1

2. Delete unnecessary Field Columns. Then save file to *.csv format.

×	Microsoft Excel - gcp_list.csv				
:21	Elle E	<u>E</u> dit ⊻iew	Inse	ert F <u>o</u> rmat <u>T</u> oo	ols <u>D</u> ata
		100%	1	Arial	
1	23			105 XXI 🖉 🗟	
	D2	1		fx-	
	A		В	C	D
1	501	274572	.52	1698191.53	33.00
2	502	284407	_35	1689629.16	34.00
3	503	285036	.27	1686969.12	42.00
4	504	278627	.80	1706457.48	37.00
5	505	282713	8.07	1714043.42	46.00
6	506	291496	.24	1717591.18	55.00
7	507	293956	.31	1719087.12	77.00
8	508	299401	.51	1724409.00	74.00
9	509	300977	.67	1729218.00	83.00
10	510	310398	8.82	1731545.73	202.00
11	511	304110	.74	1730564.91	100.00
12	512	300660	0.70	1730234.01	72.00
13	513	300486	.72	1731078.03	76.00
14	514	297375	6.89	1737378.17	88.00
15	515	296363	88.	1737489.20	90.00
16	516	280582	.30	1722327.55	52.00
17	517	278239	.21	1720170.60	54.00

3.1.2.2 Import edited Ground Control Points File.

1. Click "Preparation", select "Import, and click "ASCII Ground Point".



2. An ASCIII Ground Control Point Import dialog box will appear. Click the browse button in the "Input File Format" box.

ASCII Ground Point Imp	oort <carto_set< th=""><th>_ [] ×</th></carto_set<>	_ [] ×
File Options Help	_	
Input File Format:	[
Input ASCII Ground Point File:		
Output Ground Point File.		
Units:	Project Native	*
Select input file		
		Stat)
		4

3. Another ASCIII Ground Control Point Import dialog box will appear. Select "Default.gcp". Then click "Save".

ASCII Ground Po	oint Import				? X
Save in	MISC			- 🗈 💣 💷 -	
My Receni Documents Desktop	Default.gcp				
My Documents					
My Computer					
My Network	File name:	Default.gcp			Save
Places	Save as type:	ASCII Ground Point Files	*.gcp)		Cancel

4. Click the browse button in the "Input ASCII Ground Control Point File" box.

Input File Format:	Default.gcp	
Input ASCII Ground Point File:	[
Output Ground Point File:	1	
Units:	Project Native	
Select input file Write in the output file name.		

5. An "ASCIII Ground Control Point Import" dialog box will appear. Click the down arrow, browse and locate the directory where the gcp text file is located. Select the file (e.g. "gcp_list.txt"). Then click "Open".

II Ground Po	int Import				1
Look in	sat_stereo	Z	🌩 🖻 C	f 💷 •	
	east_side_gcp.xls		-	-	_
MuBerént	GCP.xls 国内の時み取り vis				
Documents	Index_Map_2007may_spot_stereo.tfw				
G	Index_Map_2007may_spot_stereo.tif				
Desklop	sat_stereo.csv				
-	sat_stereo.xls				
ly Depuments					
1.1					
My Eamputer					
My Campi (ter					
My Eompiliter				-11	
Ay Eamouter My Network	File name: sat_stereo.csv		3		Open

6. Click "Options", select "Edit Input Format".

ASCII Ground Point Import <carto_< th=""><th>ste 💶 🗙</th></carto_<>	ste 💶 🗙
File Options Help	
Input Edit Input Format	
InputSet Accuracy	v
Output Ground Point File:	
Units: Project Nativ	e 💌
Select input file Write in the output file name. Select output file	
	Start
Edit Input Format	

 An "Edit Input Format" dialog box will appear. Select the settings in the "Format Selection" box the fields (e.g. ID, X, Y, Z) that were used in your gcp text file. Then click "OK".

ormat Selection	Fields
X Y Z Code Ignote	1: ID 2: X 3: Y 4: Z 5: Ignore 6: Ignore
DK	Cancel

8. Type output ground point file name (e.g. gcp_spot) in the "Output Ground Point File" box.

🔅 ASCII Ground Point Imp	port <carto_ste th="" 💶="" 🗙<="" 🗵=""></carto_ste>
File Options Help	
Input File Format:	D ault.gcp
Input ASCII Ground Point File:	sat_stereo.csv
Output Ground Point File:	rto_stereo\sat_stereo_gcp.gpf
Units:	Project Native
Select input file Write in the output file name. Select output file	
	Start

9. Click "Options", select "Set Accuracy".



10. A "Set Accuracy" dialog box will appear. Type "7" in "X Accuracy" box, type "7" in "Y" Accuracy" box, and type "10" in "Z Accuracy" box. The values are the handheld GPS accuracy level in XYZ. Then click "OK".

Set Accuracy	<u>? ×</u>
X Accuracy: 1.000000	
Y Accuracy: 1.000000	
Z Accuracy: 1.000000	
ОК	Cancel

11. Click "Start". Check the bottom box if conversion was successful.

🔅 ASCII Ground Point Im	port <carto_ste th="" 💶="" 🗙<=""></carto_ste>
File Options Help	
Input File Format:	Default.gcp
Input ASCII Ground Point File:	sat_stereo.csv
Output Ground Point File:	rto_stereo\sat_stereo_gcp.gpf
Units:	Project Native
White in the output file Select output file Conversion has begun Conversion completed succe	ssfully
	Start
	//

•

3.1.2.3 Using Control Point Editor

Control Point Editor creates a file of control points, which are used by Triangulation. Use the Control Point Editor to create, view, edit, or change a file of control points.

One of the important features of the Control Point Editor is that it lets you input the control point data in one coordinate system, and save the file in a different coordinate system. Selecting an alternative datum changes the display and input values. These are converted to/from the underlying project datum for storage in the .gpf file. This could be used, for example, when you have a pair of well-controlled images in a UTM project, but you want to collect control points for a State Plane project. The major capabilities of the Control Point Editor are as follows:

- Creates a new ground point file or modifies an existing ground point file.
- Saves the ground control points to the current project or a different project.
- Converts the list of points to any project's coordinate system and datum.
- Measures (in three-dimensional space) ground points from controlled imagery.
- Drives the extraction cursor to a three-dimensional ground point location for any point in the list.
- Displays and accepts control point data in the current project's coordinate system or an arbitrary coordinate system and datum.

There are four ways to build a file of control points:

- The Control Point Editor,
- The Interactive Point Measurement window of Triangulation,
- Ground Point Import, and
- Coordinate Measurement Log.

If you decide to use Control Point Editor for inputting your control points, you should run it after you create a project, but before running Triangulation. If you are going to use well-controlled imagery (e.g. PPDB) to fabricate control points, you must import the well-controlled images before running Control Point Editor. 1. Click "Preparation", select "Control Point Editor".



2. A "Control Point Editor" dialog box will appear. Click the browse button in the "Ground File" box.

und File: carto	o_sat.gpf	6		
tem *cur	rent_project	. Datum: PHILIPPI	NE_(PP	Elev (MSL)
Point List: 0 poir Find Point:	nts	Exact Match		រាត
Point ID	_	Ιτυ	pe It	Jse
		141		
Í	X/Long	Y/Lat	Z	
Coordinates				
Coordinates Accuracy				
Accuracy				
Accuracy			niste N	
Loordinates Accuracy	Mov	veTo	oints 🞝	
Loordinates Accuracy	Move the first sector of t	veTo	oints 💦	
Loordinates Accuracy	trol Point Editor.	veTo	oints	

3. A "Select Ground Point File" dialog box will appear. Click the down arrow button in the "Look in" box and locate the folder of the imported ground control point. Then click "Save".

Select Ground Point File			13
.ook in: C:/SOCET_SET_5.3.0/data/carto_stereo/	* E	-	<u> : :</u> 111
carto_stereo.gpf			
ile name: sat_stereo_gcp.gpf		Sav	ve

4. The GCP point ID will be reflected in the Point ID box. Select one point ID (e.g. RM 112), the coordinates XY and elevation Z will be shown in the Coordinates box. Click down arrow and select "Z Cntrl". Change all "XYZ Cntrl" type of leveling point id to "Z Cntrl". Edit the Accuracy values with respect to X/Long, Y/Lat, and Z.. Select another point ID and edit the accuracy. Repeat the procedures until all the needed point ID have been edited.

ystem: *curr - Point List: 38 po Find Point:	ent_project Da ints	tum: PHIL	IPPINE_(PP	Elev (M	isl) •
Point ID			Туре	Use	-
203			XYZ Until		-
319			XYZ Cntrl 🔄		
322			XYZ Cntrl 💽	~	
rm14		6	Z Cntl 👱		
rm15			Z Cntl 🔄		-1
-	1000 11	1.035	Tie		
Coordinates Accuracy	287437.319 0.300	164	XY Cntrl XYZ Cntrl Z Check XY Check XYZ Check	71.757	
Welcome to Cont	rol Point Editor.	I T Dra	w Points		

5. Click "File", select "Save GPF".

Save As Exit more one. If Exact Match Point ID Type BM-112 Z Cntl RM-113 Z Cntl RM-114 Z Cntl RM-115 Z Cntl RM-116 7 read X/Long Y/Lat Z 280496.314 1681142.123 13.350 Accuracy 0.000 MoveTo Draw Points	Save As Exit morrows. Point ID Type Use RM-112 Z Entt RM-113 Z Entt RM-114 Z Entt RM-115 Z Entt RM-116 X/Long Y/Lat Z Ocordinates 280496.314 1681142.123 X/Long Y/Lat Z MoveTo MoveTo Torw Points	Save GPF	eo.gpf		NE_(PP	Elev	(MSL)
Exit Image: Sect Match Image: Sect Match Point ID Type Use RM-112 Z Cntl Image: Sect Match RM-113 Z Cntl Image: Sect Match RM-113 Z Cntl Image: Sect Match RM-114 Z Cntl Image: Sect Match RM-115 Z Cntl Image: Sect Match RM-116 Image: Sect Match Image: Sect Match X/Long Y/Lat Z Coordinates 280496.314 1681142.123 13.350 Accuracy 0.000 0.000 1.000	Exit Image: Exact Match Image: Exact Match Point ID Type Use RM-112 Z Cntl Image: Exact Match RM-113 Z Cntl Image: Exact Match RM-114 Z Cntl Image: Exact Match RM-115 Z Cntl Image: Exact Match RM-116 Image: Exact Match Image: Exact Match Image: Exact Match Image: Exact Match Image: Exact Match Image: Exact Match Image: Exact Match Image: Exact Match RM-112 Z Cntl Image: Exact Match Image: Exact Match RM-114 Z Cntl Image: Exact Match Image: Exact Match RM-114 Z Cntl Image: Exact Match Image: Exact Match Image: Exact Match Image: Exact Match Image: Exact Match Image: Exact Match RM-114 Z Cntl Image: Exact Match Image: Exact Match Image: Exact Match Image: Exact Match Image: Exact Match Image: Exact Match Image: Exact Match Image: Exact Match Image: Exact Match Image: Exact Match Image: Exact Match Image: Exact Match Image: Exact Match	Save As			in a state of the		har a san ta
Point ID Type Use RM-112 Z Cntl V RM-113 Z Cntl V RM-114 Z Cntl V RM-115 Z Cntl V RM-116 V/Lat Z X/Long Y/Lat Z Accuracy 0.000 0.000 MoveTo Draw Points	Point ID Type Use RM-112 Z Cntl V RM-113 Z Cntl V RM-114 Z Cntl V RM-115 Z Cntl V RM-116 Z Cntl V X/Long Y/Lat Z Coordinates 280496.314 1681142.123 13.350 Accuracy 0.000 0.000 1.000	Exit		xact Match		Į	<u>y</u> (
RM-112 Z Cntl V RM-113 Z Cntl V RM-114 Z Cntl V RM-115 Z Cntl V RM-116 Z Cntl V X/Long Y/Lat Z Coordinates 280496.314 1681142.123 13.350 Accuracy 0.000 0.000 1.000	RM-112 Z Cntl V RM-113 Z Cntl V RM-114 Z Cntl V RM-115 Z Cntl V RM-116 Z Cntl V X/Long Y/Lat Z Coordinates 280496.314 1681142.123 13.350 Accuracy 0.000 0.000 1.000 MoveTo Draw Points elcome to Control Point Editor.	Point ID		Ty	pe	Use	J
RM-113 Z Cntl V RM-114 Z Cntl V RM-115 Z Cntl V RM-116 Z Cntl V X/Long Y/Lat Z Coordinates 280496.314 1681142.123 13.350 Accuracy 0.000 0.000 1.000	BM-113 Z Cntl V RM-114 Z Cntl V BM-115 Z Cntl V RM-116 Z Cntl V MoveTo Y/Lat Z MoveTo Draw Points elcome to Control Point Editor.	RM-112		Z	Cntl		-
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RM-115 Z Cntl RM-116 Z Cntl X/Long Y/Lat Zoordinates 280496.314 Accuracy 0.000 0.000 0.000	BM-115 Z Cntl V RM-116 Z Cntl V X/Long Y/Lat Z Coordinates 280496.314 1681142.123 13.350 Accuracy 0.000 0.000 1.000 MoveTo Toraw Points elcome to Control Point Editor.	RM-114		Zű	Cntl	V	
RM-116 IZ Cont IZ X/Long Y/Lat Z Coordinates 280496.314 1681142.123 13.350 Accuracy 0.000 0.000 1.000	K/Long Y/Lat Z Coordinates 280496.314 1681142.123 13.350 Accuracy 0.000 0.000 1.000	BM-115		Z	Cntl	v v	
X/Long Y/Lat Z Coordinates 280496.314 1681142.123 13.350 Accuracy 0.000 0.000 1.000	X/Long Y/Lat Z Coordinates 280496.314 1681142.123 13.350 Accuracy 0.000 0.000 1.000	RM-116		77	"ntl		2
Coordinates 280496.314 1681142.123 13.350 Accuracy 0.000 0.000 1.000	Coordinates 280496.314 1681142.123 13.350 Accuracy 0.000 0.000 1.000 MoveTo Draw Points elcome to Control Point Editor.		X/Long	Y/Lat	Z		
Accuracy 0.000 0.000 1.000 MoveTo To Draw Points	Accuracy 0.000 0.000 1.000 MoveTo Draw Points elcome to Control Point Editor.	Coordinates	280496.314	168114	2.123	13.350	
MoveTo Draw Points	MoveTo Draw Points elcome to Control Point Editor.	Accuracy	0.000		0.000	1.000	
	elcome to Control Point Editor.		MoveTo	Draw F	Points		

3.1.3 Measurement of Image Coordinates (Points)

There are four ways to measure ground points in imagery:

- Automatic Point Measurement (APM) (in Triangulation)
- Interactive Point Measurement for APM
- Interactive Point Measurement (IPM) for Blunder Detection
- Interactive Point Measurement for Simultaneous Solve

The decision of whether to run IPM before of after APM depends on the kind of ground points you have. The following table gives some guidance:

WHAT TO RUN SITUATION

APM before IPM	You have a few control points; and you want to Solve
	(after APM) before running IPM so that it is easier to
	find the control points in IPM.
IPM before APM	You measure some control points and some tie points in
	IPM (in one image only), then you run APM to transfer
	these points to other images and to measure
	additional tie points.
IPM only	You have just one image. Or, you have lots of control
	points and you don't need tie points.
APM only	You have no control points. To interactively review the
	tie points measured by APM, you use IPM. Neither APM
	or IPM You have measured the image points on an
	analytical plotter, and imported them with ASCII Image
	Point Import, and are using Triangulation only for the
	Solve process.

Control Points are points with known ground coordinates (XYZ, or XY, or Z). You must enter the location into the IPM window. Triangulation stores this data in the project Ground Point File. You must also use the extraction cursor to identify the control point in all the images in which the point is located. The image space positions are stored in the Image Point Files (IPF).

Tie Points are points on the ground that you can identify in two or more overlapping images, but you don't know the ground coordinate. You use the extraction cursor to identify the point in all the overlapping images. The image locations are stored in the Image Point Files (IPF). An entry is created in the Ground Point File (GPF) for each tie point. APM will create tie points automatically.

Check Points are points with known ground location (XYZ) that are not used in the solution, but are provided to help the operator perform a quality control check after the solution is complete. Check points are also called diagnostic points.

Ground Point is an umbrella term that includes Control Points, Tie Points, and Check Points.

Image points are the image space locations (in lines and sample coordinates) of Ground Points. A single image point is stored for every instance of a ground point in an image. For example, if a tie point is located in 4

overlapping images, and you measure it in 3 of the images, then 3 image points are stored. Image points are stored in the IPF files. An image point must be associated with some ground point. If you somehow have points in IPF files which are not reflected in the GPF file, transfer them using the *Reset* > *Transfer* Image Points menu selection.

Ground Point Selection

Ground Point consists of two tables containing ground point information. The upper table lists all ground points in the current Ground Point File. Clicking the LMB on any point in the table moves the extraction cursor to that point and loads the measured and unmeasured images.

Image Point Section

This area contains the image status list which displays all images containing the selected ground point. The point status is either locked or unlocked, measured or unmeasured. An X in the appropriate field indicates locked or measured. The Master field indicates which images are loaded left or right. The left master image is always used as the master when Auto Two or Auto All is selected.

3.1.3.1 Opening an Automated Triangulation file.

1. Click "Preparation", select "Multi-Sensor Triangulation".



2. An "Automated Triangulation" dialog box will appear. Click "Setup".

	Setup	_f a
4 utoma	atic Point Measuremer	1
nteraci	ive Point Measureme	ent
B	lunder Detection	Ľ.
	Solve	
	Soiva BINGO	

3. A "Setup" dialog box will appear. Click "Advanced". Click "Rigorous Simultaneous" in "Solution Type".

Solution Type/Setup Files	? ×
Solution Type	
Rigorous Simultaneous	
 Direct Linear Transformation (DLT) 	
SD Polynomial	
Setup Files	
Solve Strategy: default.solve	
APM Strategy File: apm.apm_strat	
-Auxiliary Data (optional)	
🔽 Input Covariance:]
Airborne GPS: null]
Constraints:]
Cutput USMSD:	<u> </u>
OK Car	icel

4. A "Setup" dialog box will appear. Click "Add" Add...

Setup <carto< th=""><th>sat.atf></th><th></th><th></th><th>?</th></carto<>	sat.atf>			?
Advanced	Ground Point F	ile [carto_sa	it.gpf	
Auto Populate	Setup Block	Exterior	rit	
Strips				
Strip ID		Use Kapp	a	
Rever Images Support F	se Order	Add.	Elemo ar ફ	ve
Fieverse Order	Add	Rem	OVE	Image Data
Help		1	ок.	Cancel

5. A "Strip ID Sequence" box will appear. Type a number (e.g. 1). Then click "OK"

Strip ID Sequence		? ×
sss.sss:sss(no_spaces)		
0		
	OK	Cancel

6. A "Select Support File(s)" dialog box will appear. Select the images (e.g. 53033190611210220512AL.sup and 5304320060426240041AR.sup) in the "Available" box. Click the arrow ➡ to copy the selected image to the "Selected" box. Then click "OK" OK.

Available		Selected
53043200604260240041A.sup GRAPHICS_ONLY.sup Index_Map_2007may_spot_stereo.sup	Ŷ	53033190611210220512AL 53043200604260240041AR
	Ŷ	
Filter	r—	

7. The created strip 1 will be reflected in the "Strips" box and the selected images (e.g. 53033190611210220512AL.sup and 5304320060426240041AR.sup) will be reflected in the "Images" box. Click "OK".

Se	etup <carto_ster< th=""><th>eo.atf></th><th></th><th>? ×</th></carto_ster<>	eo.atf>		? ×
Ad	vanced Grour	nd Point File;	carto_stereo.gpf	
Auto	Populate Setu	p Block	Exterior Init	
Strin			enternet filme	
5114	po ID	166	Lux.	
-	Strip ID	Use	Карра	
÷.		185		
		12		
lma	Reverse Orde	er Add.	Remo	ove
Ima	Reverse Orde ges	er Add.	Remo	ove
-Ima	Reverse Orde ges Support File 53033190611210	er Add	Sensor SP0T5	
-Ima 1 2	Reverse Orde ges Support File 53033190611210 53043200604260	er Add Use 220512 🔽 240041/ 🟹	Sensor SPOT5 SPOT5	ove
-Ima 1 2 Re	Reverse Orde	er Add	Sensor SPOT5 SPOT5 Remove	Image Data
Ima 1 2 Re	Reverse Orde	er Add	Sensor SPOT5 SPOT5 SPOT5	Image Data

- 🔹 Automated Triangulation 🔤 🔲 🗙 File Settings Reset Help Graphical Display Triar Enable Multi-Image Display Setup Automatic Point Measurement Interactive Point Measurement **Blunder** Detection Solve bolive BINGU * Starting Setup ... Triangulation file saved. Starting Interactive Point Measurement....
- 8. Click "Settings" and select "Enable Multi-Image Display.

9. Click "Settings", select "Graphic Display".



10. A "Graphic Display" dialog box will appear. Check "Tie" box, "Control" box, "Icon" box, and "IDs" box. Click "Apply" Apply . Then click "Close" Close

Graphical Display	? ×
Attribute File	
🔽 Display	F Rotate to First Stop
Point Graphics	<u></u>
🔽 Tie	
🔽 Control	
F Check	
Filter by Number of Ra	ays:
Color by Number of R	ays
Select Graphics to Drav ✓ Icons ✓ IDs ✓ Ray Count ✓ Image Residuals 1,000000 Ground Residuals 1,000000 1,000000 	cm/pixels residuals signa threshold
F Block Connections	
Image Graphics	
Apply	Close View

11. Click "Interactive Point Measurement".

angulation file [carto_sat.atf
Settip
Automatic Point Measurement
Interactive Point Measurement
Valunder Detection
Solye
Solve BINGE
ting Setup ngulation file saved ting Interactive Point asurement

12. An "Interactive Point Measurement" dialog box will appear.

Find Point:	I⊽ E	xact Mate	h		T	
Point ID			Туре		Use	
RM-112			Z Cntl			
RM-113			Z Cntl	*	V	
RM-114			Z Cntl		V	
RM-115			Z Cntl	-	V	
RM-116			Z Cntl		V	
RM-117			Z Cntl	-	V	_
ſ	X/Long	Y/Lat	Ť	z	-	
Coordinates	280496.314	16	81142.123		13.350	
Accuracy	0.000		0.000		1.000	
nage Points Image IC	10 10	1	Master Loc	ж Т	Measure	4
nage Points Image ID		Ň	Master Loc	*	Measure	±]
nage Points Image ID	n T (viz)) N Sample	Aaster Loo	k Aut	Measurer o All	.

elect a Point ID (e.g. RM-112). Put arrow inside Image Points box, click right mouse button and select "Add".

13.

PointID		Tune	Use	
RM-112		Z Cott	214	
RM-113		Z Cntl		
RM-114		Z Cntl	-	
RM-115		Z Cntl		
RM-116		Z Cntl	V	
BM-117		Z Cntl	V .	-
r	123.0	55 9940 13	12	
-	X/Long	Y/Lat	Z	
Loordinates	280496.314	1681142.12	3 13.35	
Accuracy	0.000	0.00	1.000	9
age Points		Master I	Lock Measur	ed

14. A "Select Image to Add" dialog box will appear. Select the needed images (e.g. 53033190611210220512AL.sup and 5304320060426240041AR.sup). Then click "OK".

🙁 Select Im	age to Add	? ×
53033190611 53043200604	1210220512A 4260240041A	L.sup R.sup
OK		Cancel

15. The position of selected point ID (e.g. RM-112) will be shown on the image. Using the Description of Bench Mark as reference, move the cursor if necessary to adjust the location of the control point.





16. Once you have moved the cursor to the exact location, check the "Lock" box of the first Image ID (e.g. 53033190611210220512AL). Click "Auto Two" button if the image point Id is within two or more images. Click "Save".

Point ID			ype	Use	<u>+</u>
RM-112			Chtl		-
RM-113			Cntl .	<u>v</u>	
RM-114		Z	Cntl	v	
RM-115		Z	Cntl	<u>v</u>	
RM-116		Z	Cntl	- V	
RM-117			Cntl	- I-	
	X/Long	Y/Lat	z		_
Coordinates	280496.314	16811	42.123	13.350	
Accuracy	curacy 0.000		0.000 1.00		
age Points	S		. It ask	10	n:
5303319	Image ID 5303319061121022051261		CELOCK	Measured	
53043200604260240041AB		B	5	U	-

te: If control point is only within 1 image, just click "Sample" and then click "Save"

17. Repeat steps 13 and 16 until all the required gcp's have been measured.
3.1.4 Calculation/Inspection

3.1.4.1 Simultaneous Solve.

Simultaneous Solve performs a rigorous triangulation adjustment of a block of images to refine the estimates of their Triangulation parameters. Simultaneous Solve uses the weighted least squares method of adjustment in an iterative manner. It is capable of simultaneous adjustment of blocks of images taken by different sensors such as frame, panoramic, etc. It is also capable of recovering the interior geometry of the sensors via added parameters.

Simultaneous Solve requires the following input: image coordinates of control and tie points and their accuracies (image point files), ground coordinates of control points and their accuracies (ground point file), estimates of Triangulation parameters and their accuracies (support files and Triangulation file), and the interior geometry of the sensors (support files). All these data are automatically accessed by Simultaneous Solve without your intervention.

Simultaneous Solve uses a method known as "bundle adjustment" to determine the set of individual image parameter coefficients that minimizes the relative line/sample differences between points measured in overlapping images. The goal is to adjust the image parameters so that the position of a point in one image corresponds to the same point position in the other. If ground control is included, the parameters are adjusted so that the same image point corresponds to the same absolute position on all the overlapping images.

The method constructs a matrix of the linear equations and iteratively adjusts each of the independent image parameters until the solution converges below a pre-defined acceptance threshold. There are generally two problems that can happen with Simultaneous Solve: failure to converge, and excessive RMS residual error.

When you accept the solution, Simultaneous Solve will:

- Update the residual fields in the Ground Point File.
- Update the residual fields in each of the Image Point Files.
- Update the sensor model parameters in each of the Image Support Files.
- Write a Solution Accuracy Quality Report file (with extension .rep) in the project directory summarizing the image points, residuals, and solution quality.
- Write a second, more detailed Accuracy Summary Data report <atffilename>.atf.utri_rep. This contains information on QA statistics not available under the regular solve bundle adjustment method.
 - 1. After measuring all the needed gcp, click "Solve" in the "Automated Triangulation" dialog box.



2. A "Simultaneous Solve" dialog box will appear. Click "Start" Start.

Simultaneou	s Solve				
Math Model:	Rigorous				
Iteration:	1 of 8				
# Ground Pts.:					
Redundancy	0				
ROOT MEAL	N SQUARE (RMS)				
Image (pixels):	0.00				
X or Long	0.00				
YorLat:	0.00				
Z or Elev:	0.00				
	Display				
Presiduais	Report				
Parameters	1				
Start	Start At				
Save	Close				

3. Check if adjustment of measured gcp is finished shown at the bottom window.



3.1.4.2 Multi-Sensor Triangulation Residual

This window displays the residuals of image coordinates of all points and the residuals of ground coordinates of all control points. The residuals are displayed in a largest to smallest order based on image residuals.

The display residuals window provides a flexible interface to perform the following procedures:

- View lists of residuals
- Change the ground point type
- Toggle ground points ON and OFF
- Toggle individual image measurements ON and OFF
- Re-measure points

1. Click "Residuals" Residuals... in the "Simultaneous Solve" dialog box.

Math Model:	Rigorous
Iteration:	3 of 3
# Ground Pts.:	82
Redundancy	181
ROOT MEAN	SQUARE (RMS)
Image (pixels):	1.295
X or Long:	8.056
YorLat:	9.810
Z or Elev:	4.286
D	isplay
Residuals.	Report
Parameters	1
Start	Start At.
Save	Close

2. A "Multi-Sensor Triangulation Residual" dialog box will appear. An RMS (Root Mean Square) **below 1** is acceptable. If your RMS is above 1 you probably made a mistake in measurement. Review the residual values of each gcp and check the point ID which you think needs to be re-measured.

Find poin						Search				
	Point ID	State	Type	Lon/X	Lat/Y	Ht/Z	Image ID	Measured	Line	Sample _
ŧ.							5304320060426(X	0.08	-C
ĵ.	RM-28	×	Z Cntrl			-0.15	5304320060426(X	-0.70	-(
5							5303319061121(X	0.70	C
7	RM-112	X	Z Cntrl			-0.16	5303319061121(X	-0.65	Ç
3							53043200604260	X	0.65	
3	RM-23	X	Z Cntrl			+0.08	5304320060426(X	0.61	Ç
0							5303319061121(X	-0.61	۰.
ă	RM-24	X	Z Cntrl			+0.31	5303319061121(X	-0.52	-0
2							53043200604260	X	0.52	Ç
					Ren	neasure Poi	nt(s)			

3.1.4.3 Reviewing and correcting GCP measurement with residual errors.

Excessive RMS residual error

The RMS of all the image residuals for the block is reported once convergence has been achieved. The acceptability of the RMS residual error depends on the sensor type and GSD but should be less than 1.0 pixel in most cases. Values greater than this indicate that one or more points is mismeasured and is skewing the solution excessively.

The Display Residuals menu can be selected to view the current image and ground residuals for all the measured points sorted by magnitude. Unfortunately, the largest residual points may or may not be the culprit in skewing the solution.

The first strategy should be to turn off all control points and attempt a relative solution first, unless the bad tie point is obvious.

If you examine a point with a high residual and it looks like it was well measured, you can skip it and try other points until you find one that is mismeasured. Examine points with even numbers of image overlaps over 2 (4, 6) and check the points between the first, third, fifth, etc. images to make sure that the point is measured at the same location.

Also, move and remeasure points which are on rooftops or in trees. Trees tend to move somewhat in windy conditions, or are difficult to measure accurately and distort the solution when used for tie point locations.

It is recommended that solutions with excessive RMS error should be discarded and not Saved. It is likely that the resulting math models are degenerate, or at least worse than the existing approximate math model. If the relative solution (control points OFF) shows good RMS error results, the math model can be Saved and the control points can be later remeasured. Usually the problem is not the measurement but the absolute ground position specified for the point. You

should confirm from the original hardcopy control database, or other sources, that you have the right coordinates for the right image point, and that the elevation data is consistent with the project units (feet vs. meters, MSL vs. Ellipsoid) as specified.

1. After all the measured points have been calculated, using the "Multi-Sensor Triangulation Residual" dialog box, identify and select point ID's (e.g. E006) which has a large Lon/X and Lat/Y value. Click right mouse button and select "OFF".

Find point:								Search			
	Point ID	State	Туре	Lon/X	Lat/Y	Ht/Z	Image ID	Measured	Line	Sample	
95	PC-05	X	XYZ Cntrl	-3.71	-0.61	+0.13	5303319061121(X	0.75	-1.11	
96							53043200604260	X	0.16	-1.30	
97	PC-22	X	XYZ Cntrl	+1.30	-0.66	-0.51	5303319061121(X	0.19	0.95	
98							53043200604260	X	0.03	0.0	
99	E001	X	XYZ Cntrl	-1.09	-12.97	+0.76	53043200604260	X	0.90	0.16	
100	PC-19	×	XYZ Cntrl	-1,79	-0.70	+0.14	5303319061121(X	0.52	-0.6(
101							53043200604260	X	0.16	-0.5(
102	E006	×r	hi mantil	+4.06	+10.28	+0.33	53043200604260	X	-0.76	0.1	
103	ſ		UFT				5303319061121(Ĭ			
104	PC-10	×	ON Intil	-0,30	-0.84	+0.06	5303319061121(X	0.56	-0.08	
105	PC-17	X	XYZ Cntrl	+0.56	+0.47	+0.12	53043200604260	X	-0.37	0.29	
106	E002	×	XYZ Cntrl	+5.48	-2.43	+1.87	53043200604260	X	0.07	0.45	
(5-	F.;	46 - 6					11		11	
					Rein	neasure Pr	pint(s)				
_									Close	Help	

2. In the "Automated Triangulation/Full Block" dialog box, click "Interactive Point Measurement".



3. An "Interactive Point Measurement" will appear. Click the down arrow. Locate and select control points (e.g. E006) that were turned off.

1

1 OB K 1D		Type	2	Use	
PC-37		XYZ	Cntrl		
E001		XYZ (Cntrl	N -	
2003		XYZ	Cntrl		
E006		XYZ	Cintri 🛛	• – –	
2002		XYZ	Cintril	- 17	
RM-8A		Z Cnt		- T	-
	1134V4 11	Real Providence	1.02		
	X/Long	Y/Lat	Z	1.0.0	
Coordinates	296242.761	1673626.3	398	192.779	
Accuracy	3.000	3.0	000	3.000	
age Points					
- Image ID	Ř	Master	Lock	Measured	
5304320	0604260240041AR	1.1.40101	F	F	
	0611210220512AL	B	m	-	
5303319	AND IN THE REPORT OF A DESCRIPTION OF A DESCRIPTION	P. A			•
5303319					
2 5303319					
2 5303319					

4. The position of the select point ID (e.g. 538) will be identified on the image in view 1 and also in the gcp index in view 2. Set active view 1 and move cursor to a new position.



5. Check "Lock" in the "Image Points" box, select "Sample" and click "Save".

Poi	ot ID.				Tupe			1100	~
533					Iwz.	Cett	20		-
534					XXZ Cottl				
535					XYE	otri	~		
536					XZ	Cotrl	-		
537					XZ	Cotrl	~	121	
538				XYZ	Critit	~	2	~	
		152.01		-					
E.	ordinates	253	3427 090	TZLat	689772	100		24.000	
Ar	curacy	2.00	7 000		7	000		10.000	
age	e Points								
	Image ID	r 0000000000	10 A A		Master	Lock	1	Aeasured	
•	5303319	0602280235	DETA		L.	~		1	

Note: Repeat steps 3 - 5 until all the control points that were turned off were selected, viewed and remeasured if necessary.

6. Click "Solve" in the "Automated Triangulation" dialog box.

1.6	iangulation file: Carto_stereo.atf	14
	Setup	<u>I</u>
	Automatic Point Measurement	
	Interactive Point Measurement	~
	Blunder Detection	
	Solve	~
	Solve BINGO	- ÎTÎ
Co	mouting Iteration #2	
Co Co Sa St Cli Be Lo Ini	inipuling Iteration #2 mmputing Iteration #3 justment finished. aved 2 files to backup arting Solve ck Start to begin. ginning Solution adding solution data array adding triangulation (SUP/IPF/GPF) data sluding strip 1 image 1 sluding strip 1 image 2	à

7. A

"Simultaneous Solve" dialog box will appear. Click "Start". Then check the RMS if value result is less than 1. Then Multi-Sensor Triangulation is ok.

ę	🧿 Simulta	aneous	Sol	ve		? ×		
	Math Mod	el:		Rigor	ous			
	Iteration:	Γ	1	of		8		
	# Ground	Pts.:		65	;			
	Redundar	ncy:	66					
	ROO	T MEAN	MEAN SQUARE (RMS)					
	Image (pix	mage (pixels):			0.496			
	× or Long		2.649					
	Y or Lat:		5.115					
	Z or Elev:	Γ		0.323	3			
[D	isplag	y ——				
	Residu	ials		Re	port			
	Parame	eters						
		Start		9	Start	At		
		Save			Clo	se		

3.1.5 Product

Spot image with all the measured control points



3.2 Creating DTM (SOCETSET)

You create a DTM within the ATE or ITE applications. Depending on which application you are running, do the following to interactively create a new flat DTM:

Click Extraction > Terrain > Automatic Extraction or Click Extraction > Terrain > Interactive Edit Click File > Create DTM... on the ATE or ITE windows.

To create a DTM, you must select an ATE Method (either Adaptive ATE or Non-Adaptive ATE) and the images to be used when generating the DTM data (for explanations regarding Adaptive ATE and Non-Adaptive ATE, see Choosing an ATE Method section below). See "Adaptive vs. Non-Adaptive ATE" on page 35-1 for greater detail. If you select more than two images, the images must not be rectified. You must also define the boundary of the DTM. The DTM boundary can be:

- A polygon
- A minimum bounding rectangle around a polygon
- A rectangle defined by its Lower-Left and Upper-Right corner coordinates

If you are going to run ATE next, the DTM boundary should cover the overlapping area shared by at least two images, as shown in the figure below (for the case of only two images: left and right).



The DTM you create will always be rectangular. When using a polygon to define the DTM boundary and the polygon is not rectangular, the posts outside of the polygon will be marked with a Figure Of Merit (FOM) value of OUTSIDE_BOUNDARY and will not be considered as valid posts by any SOCET SET application. For TIN DTM formats, there will be no mass points and breaklines outside of the polygon. See the figure above for an illustration.

There are four ways to define DTM boundary:

Use Polygon	Use Minimum Bounding Rectangle around Polygon
Use ATE Images	Specify Lower-Left and Upper-Right Corner Coordinates

You must also specify the new DTM's post spacing, and a strategy or a number of DTM Filter parameters. You can then start Automatic Terrain Extraction to collect DTM data.

After you create a DTM, your next step is to run one of the following applications:

- ATE—For all rural imagery and for small-scale imagery of urban areas. After ATE, you will run Interactive Terrain Editing or DTM/Feature Merge.
- ITE—For large-scale imagery of urban areas. You can use ITE to build the DTM manually.
- DTM/Feature Merge—If you have a vector database containing features such as drains, breaklines, and ridges.

3.2.1 Extract DTM Points

1. Click "File" and select "Load Images".



2. An "Image Loader" dialog box will appear. Create a view and select the required images to be used.

Image Loader			
Left Filter		ł	Right Filter
53033190611210220512AL 53043200604260240041A 53043200604260240041AR GRAPHICS_ONLY Index_Map_2007may_spot_stereo	Refresh	53033190611210220 53043200604260240 53043200604260240 GRAPHICS_ONLY Index_Map_2007may	1512AL 1041A 1041AR y_spot_stereo
View Control Panel	•	Create	Destroy
		Stereo Model Manager	Close

3. The selected image (e.g. 53033190611210220512AL.sup and 5304320060426240041AR.sup) will be displayed in the view box created.



ick "Extraction", click "Terrain", and select "Automatic Extraction".

<mark>0</mark> 5	ocet se	T® 5.3.0 - C	opyright @) BAE SYS	TEMS N	ational Secu	rity Solutions
File	Project	Preparation	Extraction	Products	Output	Preferences	Tools Help
Proje	ct: carto	stereo.prj	Terrair	Terrain 🕨		Automa	tic Extraction
X/Lo	n: 29434	1.592	Featur	е	•	Interact	ive Edit K
			ClearF	lite			

5. An "Automatic Terrain Extraction" dialog box will appear. Click "File" and select "Create DTM".

Create DTM Open DTM.	t: rec_90m 	1 of 1	5	
Post Spacing X/Long: 90.0 Y/Lat: 90.0	00	Percent Comple Percent Measu Posts Per Seco Number of Post	ste: red: nd: s: 172883	
3	K/Long	Y/Lat	Z/Elev	
Lower Left	271980.000	1651050.000	54.794	
Upper Right	301320.000	1698570.000	54.794	
e contra	apt.strat			

6. A "Create DTM" dialog box will appear. Select the SPOT images in the available box, click the arrow Click the browser button on the left side of the DTM box.



7. A "Select a DTM" dialog box will appear. Type the DTM name (e.g. carto_stereo_50m). Then click "OK".

Select a DTM(s)	? ×
DTMs	
carto_stereo_20m carto_stereo_90m	
carto_stereo_50m	=
OK Cance	;I

8. Select the SPOT images and click the arrow to transfer the images into the "Selected" box. Then click the "DTM Properties" tab.

Create DTM			
DTM: carto_stereo_50m			
ATE Images DTM Properties	ATE	Properties	Seed DTM
-Edit ATE Images Available		Selected	
53043200604260240041A.sup Index_Map_2007may_spot_ste		530331906 530432006	11210220512 04260240041
	4		
	Ŷ		
		×	
Sav	e	Save As	Close

9. Click the "Use ATE Images" button. Type "50" in the "X Spacing" box and "50" in the "Y Spacing" box. Then click "Save".

	DIM Properties	TE Properties	Seed DTM
DTM Boundary	-		2010
	X/Long	Y/Lat	Z/Elev
Lower Left	2/1950.000	1651050.000	54.794
Upper Hight	301350.000	1698600.000	54.794
32-20			1.10
Posts:	560728		
	undanu		
Dofine DTM Re	unualy		
Define DTM Bo	Use Polygon	und Polygon	

DTM File: carto_stered_50m ATE Method: Adaptive Strategy File: adaptistral 1 of 1 Post Spacing Percent Complete: Percent Measured: X/Long: 50.000 Posts Per Second: Posts Per Second: Y/Lat: 50.000 1651050.000 560726 X/Long: Y/Lat: 50000 1651050.000 54.794 Upper Right 301350.000 1698600.000 54.794 One polygon has been generated from 1 polygons. Initializing DTM, please wait Finished initializing DTM Strategy File: adapt.strat Strategy File: adapt.strat	ile Options	Help			
ATE Method: Adaptive Strategy File: adaptistral 1 of 1 Post Spacing Percent Complete: Percent Measured: Y/Lat: 50.000 Y/Lat: 50.000 Y/Lat: 50.000 X/Long Y/Lat Z/Elev Lower Left 271950.000 1651050.000 54.794 Upper Right 301350.000 1698600.000 54.794 Upper Right 301350.000 1698600.000 54.794 Upper Right 301350.000 1698600.000 54.794 Strategy File: adapt.strat	TM File:	carto_stered_50m	- 21		
trategy File: adapt.stral 1 of 1 Post Spacing X/Long: 50.000 Percent Measured: Percent Measured: Posts Per Second: Number of Posts: 560726 X/Long Y/Lat Z/Elev Lower Left 271950.000 1651050.000 54.794 Upper Right 301350.000 1698600.000 54.794 Comparison of the second	TE Method:	Adaptive			
Post Spacing Percent Complete: X/Long: 50.000 Y/Lat: 50.000 Posts Per Second: Posts Per Second: Number of Posts: 560726 X/Long Y/Lat Z/Long Y/Lat Z/Elev Posts Per Second: Number of Posts: 560726 X/Long Y/Lat Z/Elev Posts Per Second: Doer Posts: 560726 Dre polygon has been generated from 1 folygons. Initializing DTM, please wait Finished initializing DTM Strategy File: adapt.strat	trategy File:	adapt.stral	1 of 1		
X/Long Y/Lat Z/Elev Lower Left 271950.000 1651050.000 54.794 Upper Right 301350.000 1698600.000 54.794 Journ polygon values to the second sec	Post Spacir X/Long: 🗗 Y/Lat: 📑	ng 170.000 170.000	Percent Comple Percent Measu Posts Per Seco Number of Post	ete: red: nd: s: 560726	
Lower Left 271950.000 1651050.000 54.794 Upper Right 301350.000 1698600.000 54.794 Due polygon has been generated from 1 polygons. nitializing DTM, please wait Finished initializing DTM Strategy File: adapt.strat		X/Long	Y/Lat	Z/Elev	
Jpper Right 301350.000 1698600.000 54.794 One polygon has been generated from 1 polygons. initializing DTM, please wait initializing DTM Strategy File: adapt.strat initializing DTM, please wait initializing DTM	Lower Left	271950.000	1651050.000	54.794	
nan polygon anon Ine polygon has been generated from 1 polygons. nitializing DTM, please wait inished initializing DTM trategy File: adapt.strat	Jpper Right	301350.000	1698600.000	54.794	
elect Start to begin DTM extraction	Ine polygon nitializing DT inished initia Strategy File: Select Start	has been generated fi M, please wait Ilizing DTM adapt.strat to begin DTM extracti	rom 1 polygons. ion		

10. Click "Start". Wait until the system process the data.

11. Click "Extraction", click "Terrain", and select "Interactive Edit".

50CET SET® 5.3.0 - 0	opyright @	BAE SYS	TEMS N	ational Secu	urity Solutions
File Project Preparation	Extraction	Products	Output	Preferences	Tools Help
Project: carto_sat2.prj	Terrair	n i	ł	Automa	tic Extraction
X/Lon: 233281.442	Featur	е		Interact	ive Edit
X =	ClearE	lite		1	J.V.

12. An "Interactive Terrain Edit" dialog box will appear. Click the "Open DTM" icon.

🖲 elmer_dtm - Interactive Terrain Edit	- = ×
Pile Options Help	
Creating backup Terrain file loaded	
Open DTM for editing	

13. A "Select a DTM" dialog box will appear. Select the dtm file (e.g. carto_stereo_50m_dtm). Then Click the "OK'.

Select a DTM	(s) ? X
carto_stereo_2	Om
carto_stereo_5	Om
carto_stereo_9	Om
carto_stereo_50m	
ОК	Cancel

14. Click "Setup DTM Graphis" icon in the "carto_stereo_50m" – Interactive Terrain Edit" dialog box.

carto_stereo_50m - Interactive Terrain Edit	
File Options Help	
□ ∅ 🖪 🖌 ⋬ 💪 丛 🖊 🛼 🖥	2
※ G ※ Q	DTM Graphics
Terrain file loaded Creating backup Terrain file loaded	
i Setup DTM graphics	1

15. A "Preferences" dialog box will appear. Select "Elevation" in the "Color Source" box. Set "20" for "Contour Interval", "5" for index Interval". Set "10" for "X-Steps and "10" for "Y-Steps". Then click "OK".

Preferences			? ×
TIN Edit	-Setup DTM		
Setup DTM Setup Overlay	Mode:	Dots	
TSR SK-AFF	Line Style:	Solid	×
SK-Circle SK-Parallel	Graphic Width:	Thin	
SK-Rotate/Scale SK-Thinning	Contour Interval	20	
SK-Display SK-Square	Index Interval	5	
SK-Stream SK-Sample	X-Steps 10	Y-Steps 10	1
SK-Snap	C Auto XY Ste	os and Contour Interval	
	Color Source:	Monochrome	×
	Monochrome Co	lor.	
		- 0.	
	OK	Cancel	Apply



lick the "Draw Terrain Graphics" icon.

💼 elmer_dtm - Interactive Terrain Edit	
File Options Help	
Terrain file loaded Creating backup Terrain file loaded	
Draw terrain graphics	-

17. The mode (dots) selected in the "Preferences" dialog box will be displayed on the image.



3.2.2 Generate Contours

1. Click "Setup DTM Graphics" icon in the "carto_stereo_50m" – Interactive Terrain Edit" dialog box.



2. A "Preferences" dialog box will appear. Select "Continuous" in the "Color Source" box. Set "20" for "Contour Interval", "5" for index Interval". Set "10" for "X-Steps and "10" for "Y-Steps". Then click "OK".

Preferences		?
TIN Edit	Setup DTM	
TIN Edit Setup DTM Setup Overlay TSR SK-AFE SK-Circle SK-Parallel SK-Parallel SK-Rotate/Scale SK-Thinning SK-Display SK-Scapay SK-Stream SK-Stream SK-Sample SK-Snap	- Setup DTM Mode: Line Style: Graphic Width: Contour Interval: Index Interval: X-Steps: 10 Color Source: Monochrome Colo	Continuous Contours Dots Icons X-Profile Y-Profile Mesh Editable Contours Continuous Contours Editable Contours & Dots Y-Steps: 10 s and Contour Interval Monochrome
<u>.</u>	ОК	Cancel Ápply

3. Click the "Draw Terrain Graphics" icon.



4. The mode (Editable Contour) selected in the "Preferences" dialog box will be displayed on the image.



THE STUDY ON MAPPING POLICY AND TOPOGRAPHIC MAPPING FOR THE INTEGRATED NATIONAL DEVELOPMENT PLAN OF THE PHILIPPINES



EDITION 1

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1. Introduction

VrOne is a powerful photogrammetric vector collection and editing package with image display capability. Photogrammetry today requires the mapping professional to deliver vector, image and digital terrain model (DTM) data as digital products. VrOne addresses many of the problems encountered in handling the collection, editing and plotting of vector, image and DTM data. Map update and revision may also be done with VrOne.

VrOne Mapping Software The NEW standard in photogrammetric mapping • Over 130 interactive mapping applications • Over 40 batch mapping applications • Digital Terrain Modeling (DTM) with draping • Function Key, Macro and Python user programming • Image backdrop display • Stereo 3D and 3D vector viewing windows • Data translators including DXF, SHAPE, ASCII, CAICE, KDMS and CADMAP • Optional Microstation data translator • Drivers for various analytical/analog stereo plotters and xy digitizing tablets • Drivers for BAE Systems SOCET SET Softcopy • Image scratch and blob removal and edit • Hard copy plotting • Available for Windows 2000/XP VrTwo Softcopy Adds the power of stereo to VrOne • Real-time, seamless integration with VrOne • Interactive single model orientation program • Model import support in orientation program • Supports VrOne interactive vector data collection and edit • Static image display • Roaming image display • Cursor vector masking and image magnification • Single or dual screen solution • Z support from mouse thumbwheel or 3D mouse • StereoGraphics active or passive stereo viewing support • NuVision stereo viewing support • VrTwo includes VrOne (VrOne is embedded in VrTwo and a stand alone license of VrOne is included) VrOne. VrTwo Viewing • VrMapping Data viewing in stereo and mono • VrOne/VrTwo data-base compatible • View VrOne graphics files • View stereo models from VrTwo • Create highlight layers for later processing in VrOne/VrTwo • Stand-alone program Orthophoto Production made easy • Batch Processes large jobs • User definable orthophoto areas • Interactive single photo resection • Ability to import exterior orientations • Transparent DTM data import from VrOne • Support for TIFF (tiled/raster/jpeg) • Stand-alone program Aerial Triangulation Collection Innovative, familiar • Layout mode allows viewing of all photos and data • Interactive point measurement with auto-correlation and stereo modes • Blunder detection during point measurement • Flexible project management • Export to various Air Triangulation formats • Stand-alone program Aerial Triangulation Adjustment Adds adjustment to VrAirTrig • Seamless integration of collection and adjustment • One button strip and block adjustment • Full strip and block error reporting • Requires VrAirTrig Image Stitching and Balancing • Better Control of the Mosaic Process • Real-time image preview during seam line placement and editing • Interactive or batch sheet output • Image balancing between images and entire job (version 2) • User defined variable feather width per line or per segment • Ability to down/up sample resolution of final images • Ability to compress final images • Support for 8/24 bit TIFF raster or tiled images • Support for JPEG compression within TIFF • Flexible project and orthophoto management • Ability to output seams in standard DXF format • Stand-alone program Image Balancing and Tone Matching Make multiple images balance as one • Available inside VrMosaic or as stand-alone program • Fast balancing computation • Uses advanced methods to balance image color and intensity across all images in the project • Real-time display of global balance results before final images • User control over adjustment parameters • Batch adjustment of all images in a project Computations between Surfaces Volume computations using DTMs • Runs inside VrOne/VrTwo • Computes volumes between two DTM surfaces • Seamless integration • Flat surface DTM surface available • Requires VrOne VrOne/Microstation In/Out Translators Time tested translator designed by users • User friendly interface • Runs inside VrOne • Cross references mapping properties during translation • Uses native VrOne/Microstation

data-base libraries • Supports line-styles, line-patterns • Able to use client cell libraries • Requires VrOne

2. General VrOne Configuration

a) VrOne Configuration

The VrOne Configuration can be accessed by either double-clicking on the Vr SOCET Configuration icon, or by using Windows Explorer to navigate to the $vr\bin\$ directory and double-clicking on vrcfig_ss.exe.



In the VR Configuration window:

```
      Project > Project Parameters

      Use default directories?
      No

      Configuration > XYZ Digitizer

      XYZ Digitizer
      BAE SYSTEMS SOCET SET

      Configuration > Keyport

      Keyport Type
      Keyport 252 USB or Serial (if using a Keyport) None (if not using a Keyport)
```

If the user wishes to always start with either the Mouse or XYZ Input:

- Vr SOCET Config: General > Start input device. Select Mouse or XYZ Stereoplotter and press OK.

But from within VrOne, either input mode can be selected by entering digmou or digxyz in the VrOne key-in window.

If the user wants to use customized data files:

Vr SOCET Config > Configuration > General > Function Key File
Enter or browse to the custom file and press OK.
Vr SOCET Config > Configuration > General > Keypad Command File
Enter or browse to the custom file and press OK.
Vr SOCET Config > Configuration > General > Macro File
Enter or browse to the custom file and press OK.
Vr SOCET Config > Configuration > Vector Graphics > Symbol File Name
Enter or browse to the custom file and press OK.
Vr SOCET Config > Configuration > Vector Graphics > Symbol File Name
Enter or browse to the custom file and press OK.
Vr SOCET Config > Configuration > Vector Graphics > Pen Table File Name
Enter or browse to the custom file and press OK.

The colors used with VrOne (VrSOCET Config > Configuration > Vector Graphics > Use pen table?) can be defined in one of two ways:

If this is set to Yes, then VrOne will use the specified pen table (which is one line above the "Use pen table?" line) and will map out the colors by VrOne layers. If the default VrOne pen table (\vr\data\default.pen) is opened with a text editor, the Layer / Entity Type / Pen Number (color) is shown. Each VrOne layer (1–10001)

can have a separate pen number for line entities, splines, symbols and text. This means that the colors will always be fixed based on the entity type for a specific layer. (For example, all lines found in layer 35 would 5 have the same color.) The default is to have one pen number (color) for all of the entities within a layer, but this isn't a requirement. If desired, one VrOne layer could have different colors for each of the four entity types.

If "Use pen table?" is set to Yes, it's possible to cycle through the available colors with the following:

- 1. Insert a line into a VrOne file.
- 2. Pick the line with Pen > Change Pen.
- 3. Press Button 2 to increment or Button 3 to decrement the pen number (color). The Change to pen number and color are shown in the main VrOne menu window.

If "Use pen table?" is set to No, then the user will define colors to be used and won't be forced to use the same color for all of the elements within a particular Layer-Entity type. This would then allow for the placement of utility valve, water valves, gas valves, ... into the same VrOne layer, but each could have a different color.

Lastly, VrOne doesn't display all color combinations to the screen, but only goes up to pen number 70. The screen display colors are determined by \vr\data\defaultscreen.ct, and this file also provides a cross-reference of pen number to color name.

Please refer to Appendix A – Pen Table Colors for a listing of the default screen display colors.

b) SOCET SET Configuration

Once SOCET SET is running, VrOne can be loaded by selecting the VrOne SOCET icon from the desktop or by selecting VrOne > VrOne SOCET from the SOCET SET Extraction pull down menu.

The current SOCET SET versions should include VrOne SOCET and VrOne Config in the SOCET SET Extraction pull down menu. If VrOne is not present, it is possible to manually add those items to the menu as follows:

- 1. Open \usr\geoset\internal_dbs\CONFIG\standard_NT.cnf with a text editor.
- 2. Add the last three highlighted VrOne lines, below, to the Extraction section. Please note that tabs must be used to indent the lines, spaces will not be recognized.

Extraction |0|0|0

Terrain|0|0|0

Automatic Extraction|0|2|0|\$(EXEDIR)/ate PREF Interactive Edit|2|1|0|\$(EXEDIR)/ite PREF

Feature|0|0|0

Feature Specification Editor|0|0|0|\$(EXEDIR)/spec_ed Feature Extraction|2|1|0|\$(EXEDIR)/fei PREF RT Feature Database Merge|2|1|0|\$(EXEDIR)/fdbm PREF ClearFlite|2|1|0|\$(EXEDIR)/clearflite Merge|0|2|0|\$(EXEDIR)/dtm_ftr PREF RT Annotation & Counting|2|1|0|\$(EXEDIR)/annot PREF

VrOne|0|0|0 VrOne SOCET|0|1|0|\$(VRHOME)/bin/vrone_ss VrOne Config|0|0|0|\$(VRHOME)/bin/vrcfig_ss

c) VrOne-SOCET Button Definitions

As with other SOCET SET applications, it is possible to cross-reference the 12 VrOne buttons to the SOCET SET 3D input device with the following:

- 1. Copy \vr\bin\vrone.acc to the SOCET SET events directory (e.g., \usr\geoset\internal_dbs\EVENTS or \SOCET_SET_5.3.0\internal_dbs\EVENTS).
- Rename...\internal_dbs\EVENTS\vrone.acc to...\internal_dbs\EVENTS\VRONE.
 Please note that VRONE must be upper-case.
- 3. Save a copy of the current SOCET key definitions: copy \$HOME\.socet keys.localhost \$HOME\original keys
- 4. Start up SOCET SET and activate the Keyboard/Trackball Accelerator Mapping window (SOCET: Preference > Keyboard/Trackball Accelerator Mapping).
- 5. From within the Keyboard/Trackball Accelerator Mapping window, press the Restore All Defaults button to remove the current button definitions. Before doing this, please ensure that a copy of those button definitions has been made as suggested above.
- 6. Select VrOne from the Application option menu. The events for the twelve VrOne buttons will appear in the list box.
- 7. Select the VrOne button whose hot key you want to change in the box. Use the Change Mapping, Add New Mapping, or Remove Mapping buttons as desired. When you select Change Mapping or Add New Mapping, a dialog box will appear instructing you to press the key you wish to assign to the event.
- 8. Repeat the above step for each VrOne button that you wish to cross-reference.
- 9. Click OK to save the mappings or Cancel to exit without saving.
- 10. It is also possible to define unused device buttons to events in the Main Image Display. For example, it might be useful to assign the Zoom In and Zoom Out events to two unused buttons.
- 11. After defining the VrOne-SOCET button events, exit SOCET SET and save a copy of the current VrOne-SOCET key definitions: copy \$HOME\.socet_keys.localhost \$HOME\vr_keys
- 12. Then, if required, two batch files can be created with a text editor (and sent to the Desktop as short-cuts) to easily set the button definitions for the current SOCET SET session:
 - Create \$HOME\vrkeys.bat (to re-initialize the VrOne SOCET button definitions)
 - Copy \$HOME\vr_keys \$HOME\.socet_keys.localhost
 - Create \$HOME\socet_keys.bat (to re-initialize the original SOCET button definitions)
 - Copy \$HOME\original_keys \$HOME\.socet_keys.localhost

3. Starting VrOne

With SOCET SET running (and an absolute oriented model displayed), VrOne can be started by either:

- Selecting the VrOne SOCET icon from the desktop, or by
- Selecting VrOne SOCET from the main SOCET SET menu (SOCET: Extraction > VrOne > VrOne SOCET).

4. Exiting VrOne

The normal procedure for exiting VrOne can be done with any of the following:

- VrOne: File > Exit
- Enter **exi** <**Return**> in the VrOne Key-In dialog box.
- Clicking the Close button (X) in the upper right-hand corner of the VrOne Main Window.
- Double-clicking on the VrOne icon in the upper left-hand corner of the VrOne Main Window.

5. VrOne Help

VrOne has extensive local Web-based Help pages that can be accessed from the About pull down in the VrOne Main Window.

- VrOne: About > Help Presents the top-level help and general usage selections.
- VrOne: About > Global Help (key-in: **ghelp**) Lists and describes the global key-ins that are available.
- VrOne: About > Local Help (key-in: help) Calls up the help section for the currently active VrOne command. For example, if the Reverse Line command is active, selecting About > Local Help or entering

help in the Key-In dialog box will load the Reverse Line help page in your specified Web browser.

6. Opening an Existing VrOne File

While VrOne is running, one or more VR files can be opened with:

- 1. VrOne: File > Open VR Files.
- 2. Navigate to the directory containing the VR file(s) to be opened.
- 3. Using the mouse to select and the arrow buttons, move the files to the Files to open section in the right portion of the window
- 4. Press OK in the Open VR File window

7. Creating a New VrOne File

While VrOne is running, a new VR file can be created with:

- 1. VrOne: File > Open VR Files
- 2. Navigate to the directory into which the new file will be created.
- 3. Select the New File button in the lower-right portion of the window.
- 4. Enter the New File Name, when prompted
- 5. Press OK in the Open VR File window
- 6. Define the VR file parameters in the Workspace window.

- Target Scale (1:n): whether for feet or meters, enter the ratio. For example, 1:1200 (for 1"=100') or 1:2000 or ...
 - Units: select US Foot or Meter or International Foot
 - Coordinate Format: select State Plane or UTM
 - State plane zone
 - UTM zone
 - Description

8. Closing an Existing VrOne File

VR files can be closed with:

- 1. VrOne: File > Close VR Files.
- 2. Using the mouse to select and the arrow buttons, move the files to the VR Files to close section button in the right portion of the window.
- 3. Press OK in the Close VR File window

9. Starting an Application(Command)

VrOne applications can be started through a number of different methods.

- Pulling down a menu and selecting an item may start commands.

- Commands may also be started from a key-in using the command name. Each command name is the first three letters of the first two words on the pull down. For example, the key-in command name for Insert Line is **InsLin**.

- Selecting the command from a pre-programmed input device, such as a Keyport.

10. Custom Symbol and Line Font Creation

a) Define a New VrOne Symbol File

The default symbol and line font file is \vr\data\default.sym, but it is recommended that a custom file with a different name (e.g., \vr\data*SomeOtherName*.sym or D:\safe\baesystems.sym) be created to prevent the inadvertent overwriting of the file during VrOne upgrading. Since the default VrOne symbol file contains numerous examples of symbols and line fonts, it may be more practical to *copy* the default file to a new name and location and then modify that file.

See Appendix B for a listing of the default VrOne line fonts and symbols.

The Symbol file to be used by VrOne is specified with

VR Configuration > Configuration > Vector Graphics > Symbol file name.

b) Create a New Symbol or Line Font

Custom symbol and line fonts are easily and quickly created with VrOne. A normal procedure would be as follows:

- 1. Start with a new (empty) VrOne file or go to a blank area in an existing file.
- 2. Turn the Grid Display ON (Graphics > Grid On or **grion**). This allows for the symmetrical placement of the font components.
- 3. If necessary, set the Grid Display Resolution (Graphics > Set Grid Resolution or **setgri**) to a reasonable size.

- 4. Draw the components that will be included in the new symbol or line font entity with Insert Line (Insert > Insert Line or **inslin**). A line font will contain the components needed to complete one complete unit of the font. (For example, the creation of a new fence line font only needs to include a single unit length of line with a single X.) The scale is not important, since symbols and line fonts are scaled at plot time.
- 5. Call up the Create Symbol application (Insert > Create Symbol or cresym).
- 6. Place a window box that includes the entities to be used for the new symbol or line font, and Accept or Reject the selection.
- 7. Digitize the origin of the new symbol or line font that corresponds to the center of a symbol or the beginning of the line font.
- 8. Specify whether it is a new symbol or line font.
- 9. Enter the symbol or line font number (1-1000).
- 10. Enter the symbol or line font name.
- 11. Enter the symbol scale factor (usually 1.0) or the repeating line font length (which defines the plotting length for one line font segment when plotting the line font).

c) Using a New Symbol or Line Font

A newly created symbol or line font can be placed into the current VrOne file by selecting Insert Line (**inslin**) or Insert Symbol (**inssym**) and manually entering the number of the new symbol or line font:

grp=83 (or 27 or 473)

Or, as for other feature types, a function key containing the newly created symbol or line font number can be defined and used.

1) Zoom and Window Display Functions Zooming into and out of the VrOne graphics window can be done from the VrOne menu pull-downs (Graphics > Zoom) or from key-in commands:

Zoom Center	zooc	Zoom in	zoø.5	Zoom Right	zoor
Zoom All	zooa	2x Zoom	zool	Zoom Down	zood
Zoom Left	zool	Last Zoom Window	zoow	Zoom Out 2x	zoo2
Zoom Up	zoou	Zoom Previous	zoop		

The Zoom Left/Right/Up/Down commands are also keyed to the four keyboard arrow keys. And the Zoom In/Out commands are keyed to the two keyboard Page Down/Up keys.

The graphics can be replotted to all VrOne windows with

Graphics > Replot rep

The VrOne window rotation can be defined with

Graphics > Set Window Rotation **winrot**

This is useful if the operator wants to have the VrOne cursor move and track in the same direction as the SOCET SET floating mark.

The window rotation can be set to a specific value (such as 0 or 30 or -45 degrees) with:

Environment > Set Parameters Rotation about the Z axis 0 (or 30 or - 45)

The **rotz** key-in command can also be used to define the window rotation angle:

rotz 0 (or rotz 30 or rotz -45)

Please note that the rotation defined by a **rotz** key-in command might also require that one of the above zoom commands be applied before the new rotation value will become apparent.

The VrOne window can be configured to automatically re-center whenever the cursor touches the edge of the graphics window with:

Graphics > Toggle Window Shift **togwin**

Additionally, this parameter can be set globally with:

Vr SOCET Config: Configuration > General Graphics > Window Shift > select Off or On

11. Zoom and Display

a) Displaying Line Fonts

A normal behavior when VrOne entities are displayed to the screen is that lines appear to "lose" their fonts. This is "normal" because as the display scale gets smaller than a certain size, line fonts, symbols, and text will be displayed by VrOne in a simple format as unfonted lines (lines), single dots (symbols), and as lines (text).

The solution is to zoom in and out with the Page Up or Page Down keys, or to use zoom window (**zoow**) to zoom in to a smaller area, or to manually change the display scale (Environment > Set Parameters > Scale (1:n): 2000). As the display scale gets larger, the line fonts will re-appear.

VrOne Config (Global Default): Configuration > Vector Graphics > Minimum Text Size and Minimum Symbol Size

VrOne SOCET (Session Default): Environment > Edit Configuration > Minimum Text Size and Minimum Symbol Size

Also, issuing a Zoom All (**zooa**) command will display unfonted lines. Provided that the display scale is not too small, issuing a Replot (**rep**) command will display the line fonts.

b) Display Data Disappears with ZoomAll

The **zooa** command (Zoom All) displays and fits the entire contents of the VR file to the graphics screen. If there's an outlier at say x=0 and y=0, the screen scale might be extremely small and no data would be visible. If this happens, one of the following might help:
- 1. Do a Pack VR File (File > Pack VR File) and then a Zoom All. This will permanently remove any deleted VR entities and will resize the XY file dimensions.
- 2. If step 1 doesn't work, and a small dot of data is visible on the screen, try to zoom into that area. If this is successful, use Insert Line and draw a box around the outside of the "good" area. Then use Cut Polygon (Edit > Cut Polygon or **cutpol**), set the parameters to Cut from outside and Throw data away, pick the newly drawn box, and accept the action.
- 3. If it is not possible to see even a small dot of data, get the Range XY (File > Range XY or **ranxy**), make note of the Maximum X and Y, and then use Set Graphics Parameters (Environment > Set Parameters or **setpar**) to define the lower left east and north and scale to "sane" values.

12. Data Collection

VrOne has numerous routines for the interactive insertion of line, symbol, and text entities. For example: Insert Line, Insert Fly Line, Insert Parallel Line, Insert Symbol,

Insert Annotated Symbol, Insert Text, Insert Line Text, etc. These applications are typically found under the Insert pull down in the VrOne Main Window.

When an insertion application is started, a Menu Keys dialog window is displayed. At the top of the window is the command name. The next area displays the entity parameters. This information is command dependent and normally shows where the data is to be stored on insert commands or where the data came from on edit commands.

The third area is the menu keys area. These show what functions are assigned to the 12 menu key buttons. These keys are normally mapped onto an input device such as the keypad. They are also mapped onto the 12 function keys on a standard keyboard.

Following are a few examples for inserting various types of data into a VrOne file.

Specific help can be called up for each of the insertion routines with:

VrOne: About > Local Help or key-in help

For these examples:

- Open a new VrOne file.
- Initialize the Target Scale to 1:1200 if using English units, or 1:1500 if using metric units.
- Using the Page Down and Page Up keyboard keys, set the VrOne display scale to approximately 1:1200 or 1:1500.
- Use the system mouse as the input device (Input > Digitizer Mouse or **digmou**).
- a) Insert Line

Ins Line - Main
Lav 1 Mod 1 Line Wid O Grp 18 TREEL1 Ngr O Lnk O Con O Pen 2 Red Fc Pts O
Tigitize.pt
2 Close
3 Backup
4 End
5 Attach
6 Arc
7 Enter
8 Enter Z
9 Attach + run
* Menu board
0 Toggle snap
End

The Insert Line function would be used to collect linear features where each data point is digitized manually, such as roads, sidewalks, fences, railroads, etc.

- 1. Insert > Insert Line (inslin)
- 2. Move the system mouse cursor into the VrOne graphics window. (While in this window, the cursor should change to a cross.)
- 3. While moving the mouse, press and release the left mouse button (or press the F1 key) to digitize points.
- 4. To back-up along the active line, press Button 3 (Backup) or F3.
- 5. To end the line, press Button 4 (End) or F4.
- 6. To end the Insert Line function, press the # Button or F12.
- 7. During the insertion of a line, B2 (F2) will *close*, but not end, the line and B6 (F6) will place an Arc through the last three digitized points.
- 8. The mode can be changed from line mode (mod=1) to spline mode (mod=2).
- 9. The line font (graphic pointer) can also be changed by entering **grp=18** (which is a treeline if using the default VrOne symbol file).
- 10. The active layer can be changed by entering **lay=4**
- b) Insert Fly Line

The Insert Fly Line function would be used to collect linear features where the data points are automatically collected in a streamline mode, such as treelines, water features, contours, etc

- 1. Insert > Insert Fly Line (**insfly**)
- 2. The Fly Line filtering parameters can be defined by pressing B7 (F7), which will load a Parameters window with: Tube Width, Maximum Distance, Dither Distance, and Z Tube Width. As described in the local help for Insert Fly Line, these parameters affect and determine the frequency with which data points are sampled and stored.
- 3. Move the system mouse cursor into the VrOne graphics window. (While in this window, the cursor should change to a cross.)
- 4. While moving the mouse, press and release the left mouse button (or press the F1 key) to automatically digitize points. The points will be sampled, filtered and stored based on the filtering parameters.
- 5. To back-up along the active line, press Button 3 (Backup) or F3.
- 6. To end the line, press Button 1 (End line) or F1.
- During the insertion of a fly line, B2 (F2) will close and end the line. Button 4 (F4) will Force points that won't be removed by the filtering parameters. B5 (F5) allows for a manually digitizing mode, and B6 (F6) lets the operator go back along the active line and splice in a new section.
- 8. The mode can be changed from line mode (mod=1) to spline mode (mod=2).
- 9. The line font (graphic pointer) can also be changed by entering **grp=16** (which is a water line if using the default VrOne symbol file).
- 10. The active layer can be changed by entering **lay=6**
- c) Insert Square

The Insert Square function is used to collect linear features where the internal segments are placed at right angles to each other.

- Insert > Insert Square (inssqu)

- The squaring parameters include options to square to the Longest Side, First Side, Mean of All Sides and Azimuth. A Squaring Tolerance can also be defined that tells Insert Square to not square segments that fall outside the specified angle.
- d) Insert Symbol

Symbols can be placed into the VrOne file with this function.

- Insert > Insert Symbol (**inssym**)
- Symbols can be inserted with a fixed or pre-defined radius and rotation. Or the size and rotation can be interactively defined as part of the digitizing process.

e) Insert Text

Text can be placed into the VrOne file with this function.

- Insert > Insert Text (instex)
- Text can be inserted with a fixed or pre-defined size and rotation. Or the size and rotation can be interactively defined as part of the digitizing process.
- Ten different justifications can be used when placing text as well as numerous graphical attributes.

f) Insert Annotated Symbol

The Insert Annotated Symbol function is used to collect symbols with the inclusion of a text string, such as spot elevations, annotated fire hydrants, annotated manholes, etc.

- Insert > Insert Annotated Symbol (insann)
- The local help for this function lists the various key-ins commands that can be used when defining entity to be inserted. This is particularly useful when accessing this application from a Function Key definition.

See Appendix B for examples of the different types of Annotated Symbols. g) Insert Line Text

The Insert Line Text function is used to insert text onto an existing line. This routine would typically be used to place annotations on index contours.

- Insert > Insert Annotated Symbol (inslte)

13. Changing the Graphical Attributes

Whenever a VrOne insertion command is started, the graphical attributes from the last usage are active. One of the ways in which these attributes can be changed is by manually keying in the new attribute(s). For example:

- To change the current layer (1-10001), enter **lay=4** (or **lay=125** or **lay=2065**, etc.)
- To change the current line mode (1-2), enter **mod=1** (line) or **mod=2** (spline)
- To change the current line width (1-256), enter wid=1 (or wid=2 or wid=7, etc.)
- To change the current graphic pointer (1-1000), enter grp=11 (or grp=24 or grp=38, etc.)
- To change the current pen code (1-256), enter **pen=3** (or **pen=4** or **pen=14**, etc.)

The better solution to the manual changing of VrOne graphical attributes is the use of pre-defined Function Keys, which is addressed later in this document.

14. Entity Search Raduis

The VrOne entity search radius can be defined in two different ways:

- 1. As the default (global) value from within the VR Configuration program VR Config: Configuration > Vector Graphics > Entity search radius (in ground units)
- 2. As a session value from within the VR SOCET program: VrOne: Environment > Edit Configuration > Entity search radius (in ground units)

15. Data Edit

As with the insertion applications, VrOne also has numerous edit functions. For example: Edit Line, Edit Symbol, Edit Text, Reverse Line, Join Lines, Square Existing, Trim Lines, Cut Polygon, Delete Layers, and many more. These applications are typically found under the Edit pull down in the VrOne Main Window.

a) Edit Line

- Edit > Edit Line (edilin)
- Edit Line lets the operator move, delete, or insert new points along the selected line, and the line itself can be moved, copied, rotated, mirrored, or closed. Additionally, the graphical attributes can be modified with this routine.

b) Edit Symbol

- Edit > Edit Symbol (**edisym**)
- Edit Symbol lets the operator move, copy, delete, rotate, expand, or flip the selected symbol. Additionally, the graphical attributes can be modified with this routine.

c) Edit Text

- Edit > Edit Text (editex)
- Edit Text lets the operator move, copy, delete, rotate, expand, change justification, or flip the selected text. Additionally, the graphical attributes can be modified with this routine.

d) Trim Lines

- Edit > Trim Lines (**trilin**)
- Trim Lines will extend and cut-back one line to another. Options included noding, extension distance and polygon clearing.
- e) Break Line
 - Edit > Break Line (**brelin**)
 - Break Line will break a line into two entities at two user-identified points.

f) Reverse Line

- Edit > Reverse Line (**revlin**)
- Reverse Line will reverse the direction of lines. At times the order of the line points must be in a certain direction. This is true when drawing asymmetrically-fonted lines such as tree lines or depression contours. Reverse Line can reverse single lines by identifying individual lines, and it can batch reverse lines of user defined layers and modes.

g) Join Lines

- Edit > Join Lines (**joilin**)
- Join Lines will join or match two lines together. The lines to be joined are identified by the user and may reside the same workspace or any open workspace. Lines that are short of each other or overlap each other may be joined. If lines are joined, the second line is added to the first. The line parameters of the first line are used when joining. Lines that are matched are graphically joined but remain in two entities and maintain their graphic parameters. Lines identified in multiple workspaces will be matched regardless of the Join Mode.

h) Square Existing

- Edit > Square Exist (**squexi**)
- Square Existing squares existing line(s) in the current workspace or all open workspaces. Lines to square may be identified by pointing at them, or they may be squared by specifying layers in a batch mode. Line segments are rotated about their midpoints to the Square to Azimuth at 0, 90, 180 or 270 degrees and are re-

intersected with the previous and next segments to square a polygon. Line segments that are greater than the Square to Tolerance are not squared (rotated)

16. Deleting Objects

a) Fast Delete

- Edit > Fast Delete (**fasdel**)
- With Fast Delete, the operator is able to delete entities by pointing at them.
- The Search for Entity Type can include lines and/or symbols and/or text.
- There are several procedures within VrOne that will delete entities: Edit Line, Edit Symbol, Edit Text, Global Change and Delete Window. But there are times when entities should be picked one by one for deletion. Fast Delete is a quick way to touch an entity and delete it.

b) Delete Window

- Edit > Delete Window (**delwin**)
- This function will delete the contents of a user-defined window. Only those entities that fall completely within the window will be deleted. Entities that are turned off will not be considered.
- c) Cut Polygon
 - Edit > Cut Polygon (**cutpol**)
 - This function will cut data against a user defined polygon. Data can be cut from the inside or outside of the polygon, and the data can be discarded, copied to a file, moved to a file, or have the graphical pointer changed.

17. Selecting the Active Workspace

Up to 256 VR files can be open and displayed within VrOne, but only one file is "active" and it is into this file that data will be stored. The Active Workspace (VR file) can be specified with:

- VrOne: Environment > Set Active Workspace. Enter the number of the active workspace (AWS) and press OK.
- Another way to change the Active Workspace is to turn Snap On (**snaon**) and then select an entity in one of the non-active workspaces. The Snap window appears and, by pressing button #7 (Change to Ws x), the user will be able to select the AWS in which the snapped-to object was found.

18. Batch Editing

VrOne also has numerous batch edit functions. For example: Batch Attach Line, Batch Join Lines, Batch Node Lines, Batch Offset, Batch Trim, Line Cross, Line Close, Global Change, and many more. These applications are typically found under the Batch pull down in the VrOne Main Window.

- a) Batch Join Lines
 - Batch > Batch Join Lines (**batjoi**)

- This batch routine will attempt to join lines within the layers specified. If more that one workspace is open and Workspaces to consider is set to All open then lines between workspaces will be matched. Data layers, line modes, and graphic pointers can also be considered. Care should be taken when setting the Search Distance. Undesirable joins may occur if this parameter is too large. Layers that are turned off will not be considered when searching.

b) Batch Trim

- Batch > Batch Trim (**battri**)
- This batch routine will make up to 60 different trimming passes on the specified VrOne workspaces and will extend and cut-back one set of lines to another, change graphics pointers, and will delete or relayer the trimmed segments.
- c) Batch Node Lines
 - Batch > Batch Node Lines (**batnod**)
 - This batch routine will make up to 60 different noding passes on the specified VrOne workspaces.Options include the ability to node lines only (which places a common point on each line at the intersection) or node and break lines at the intersection points. Under-shoots and over-shoots will be considered.
 - The Z rule for computing the elevation at the intersection of the two lines can be specified. During noding, an elevation for each line is computed at the break point. These elevations are based on the slope of the line segment as determined by the point before and after the break point. The Z Rule determines the action to be taken on these two elevations as follows:
 - Original elevations The elevations of the break points is not modified
 - Mean node elevations The elevations are averaged and stored for both node points.
 - Elevation from line 1 The elevation from the node point on line 1 is used on both lines.
 - Elevation from line 2 The elevation from the node point on line 2 is used on both lines.

d) Batch Filter Lines

- Batch > Batch Filter Lines (**batfil**)
- This batch routine will searches for lines within the specified layers and will reduce the amount of points on those lines with a tube width and maximum distance filter. Layers that are turned off will not be considered when searching.

e) Batch Offset

- Batch > Batch Offset (**batoff**)
- This batch routine will searches for lines found within the specified layers and will place up to 10 additional lines that are parallel to the original. Each new line can have a layer width, graphic point, horizontal offset and vertical offset that are different from the source line.

e) Line Close

- Batch > Line Close (**linclo**)

- This batch routine will close or will check for closure of lines in user defined layers. Lines that are not closed may be closed by one of the following methods:
 - Move the endpoint onto start point
 - Mean the endpoints
 - Add line segment between the endpoint and the start point
 - Intersect the end segments
 - Report unclosed polygons in drive file only (do not modify line)
- A drive file is always created for unclosed lines even if this application closes them.

19. Global Change

- Batch > Global Change (**glob**)
- This extremely powerful batch routine will make up to 60 passes on the specified VrOne workspaces and will globally change line, symbol and text attribute information. Each pass has Search For and Change To criteria.

20. Undo Last

- File > Undo Last (**undo**)

21. Function Keys

The use of Function Keys provides one of the most important aspects of VrOne custom data collection. Taking the time to properly set up function keys before starting a project has the potential to save hundreds of hours of production time.

Function keys reduce the amount of knowledge the mapping professional needs to know about VrOne. They simply choose the feature they want to collect and go. Entering its name or function key number may start a function key. These names or numbers may be keyed in, placed in macros or even placed in other function keys.

For example, if the operator wanted to collect an asphalt road, the Insert Line command would be started, and the various attributes specific to that feature would need to be defined, such as Layer, Mode, Line Width, Line Font, and Pen Code. But VrOne function keys would allow for the predefining of this feature, so that the operator would simply enter a numeric code or a descriptive term for the asphalt road, which would automatically assign all of the desired parameters and behavior to Insert Line and start the command.

A more detailed description of VrOne Function Keys can be found at

```
VrOne: About > Help > Getting Started with VrOne > Function Keys.
```

The default function key file is \vr\data\default.fk, but it is recommended that a custom file with a different name (e.g., \vr\data*SomeOtherName*.fk or D:\safe\socet.fk) be created to prevent the inadvertent overwriting of this file during VrOne upgrading. The Function Key file to be used by VrOne is specified with

VR Configuration: Configuration > General > Function key file

22. Touch Pad and Key-in Input

Just as the use of VrOne Function Keys facilitates the collection of specific project-related features by automatically assigning the desired parameters and behavior to one of the Insert commands, incorporating a touch pad input device with a feature extraction system adds even more efficiency to the collection capabilities.

The Keyport 252 is a touch-sensitive programmable keypad that can be used with VrOne. The 252 programmable keys can have the standard VrOne commands and VrOne Function Keys assigned to individual keys, which allows an operator to press a single key to activate a particular feature to be collected.

The default keypad file is \vr\data\default.kp, but it is recommended that a custom file with a different name (e.g., \vr\data*SomeOtherName*.kp or D:\safe\socet.kp) be created to prevent the inadvertent overwriting of this file during VrOne upgrading. The Keypad file to be used by VrOne is specified with:

VR Configuration: Configuration > General > Keypad command file

The syntax of the keypad file (default.kp or socet.kp) is:

@xxx VrOne_KeyIn_Command

where **xxx** is the Keypad Number defined for a particular key (see "kpvr252_numbers.doc" for the key numbering reference) and **VrOne_KeyIn_Command** is the key-in command, FKey Name or FKey Number that

VrOne recognizes for its various applications.

For example: **inslin** (for Insert Line), **instex** (for Insert Text), **rep** (for Replot), **zooa** (for Zoom All), **zoow** (for Zoom window), **exi** (for Exit), **bldg** (for FKey Building).

23. Macros

Macros give the ability to execute a group of VrOne commands as a single word. Macros can execute VrOne commands, function keys and other macros. One common use of macros is to have it set specific snap parameters for a certain situation. Also, with 10,001 layers that are available with VrOne, a macro can also be created to easily turn groups of layers on and off.

24. Application Overlay

Application Overlaying lets the operator place the current command into a "pause" mode while other commands are executed.

Multiple applications may be overlaid and stacked within VrOne which allows the operator to collect data in the order it presents itself instead of feature type by feature type. This unique VrOne feature allows for the collection of data in a flexible and realistic way.

Appendix A – Pen Table Colors

VrOne Pen Table Colors Filename: \vr\data\defaultscreen.ct

Pen #	RGB	Color Name	Pen z	RGB	Color Name
1	25512551255	White	36	0/250/154	MediumSpringGreen
2	255 010	Red	37	152)251(152	PaleGreen
3	255125510	Vellow	38	46 139 87	SeaGreen
4	0125510	Green	39	0(255)127	SpringGreen
5	0(255)255	Oyan	40	154(205)50	VellowGreen
6	010/255	Blüe	41	47 79 79	DarkSlateGray
7	255 0 255	Magenta	42	47 79 79	DarkSlateGrey
8	192 192 192	Grey	43	105 105 105	DimGray
9	127 255 212	Aquamarine	44	211/211/211	LightGray
10	102/205/170	MediumAguamarine	45	192 192 192	Grey
11	95 158 160	CadetBlue	46	240 230 140	Khaki
12	100 149 237	ComflowerBlue	47	176148196	Maroon
13	72(61)139	DarkSisteBlue	48	255 165 0	Crange
14	173 216 230	LightBlue	49	218 112 214	Orcintl
15	176 196 222	LightStee/Blue	50	153 50 204	DarkOrchid
16	010 205	MediumBlue	51	186 85 211	MediumOrchid
17	123 104 238	MediumSlateBlue	52	255 192 203	Pink
18	25 25]112	MidnightBlue	53	221 160 221	Plum
19	D(0) 128	NavyBlue	54	205192192	IndianRed
20	0 0 128	Navy	55	199 21 133	MediumVioletRed
21	135 206 235	SkyBlue	56	25516910	OrangeRed
22	106 90 205	SlateBlue	57	208:32 144	VioletRed
23	70 130 185	SteelBlue	58	250 128 114	Salmon
24	255/127/80	Coral	59	160 82 45	Sienne
25	178 34 34	Firebrick	60	210/180/140	Tan
26	165(42)42	Brown	61	216 191 216	Thistle
27	255)215 0	Gold	62	255)255)240	lvory
28	2181165132	Goldenrod	63	84 224 208	Turquoise
29	238 221 130	MediumGoldenrod	64	0(206)209	DarkTurquois≥
30	D(100(0	DarkGreen	65	72/209/204	MediumTurquoise
31	85 107 47	DarkOliveGreen	66	238 130 238	Violet
32	34 139 34	ForestGreen	67	138 43 226	BlueViolet
33	50 205 50	LimeGreen	68	245 222 179	Wheat
34	34)139/34	MediumForestGreen	69	255 255 255	White
35	60)179)113	MediumSeaGreen	70	173 255 47	GreenVellow

Appendix B

Default Line Fonts and Symbols (socet.sym)

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Appendix C – Types of Annotated Symbols

Spot with Fixed Position Text

Function Keys	Key hame 200	Lived	Vehactor Ins	et Ásyın	9
Recline_Unpavect 🖄 Retaining Wall	Keyrum 1.1		Description		
Road_Text Road_White_Line	Line Symbol	Text		10	
Buinz Burway	Laje	• হিহা	X Put.	Lot	*
Turwaji_Lights	Ŧok	K SB Simplex Flor	Gust Y	Lover	2
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bol free pot_Hieghr pot1 mitz	Local erg Clocal ang	» NSSYM=1, MCTIVE	=0, DEC=2, OPSX=	-0.10, OF5Y=	0.1
bol_free pot_Hieghr pot1 mntz Key 171 of 172	Local arg Gibbai arg Assoc brid	» Побум=1, мстіче * Г	=0, DEC =2, OPSX=	-0.10, OF5Y=	0.1
pol_free pot_Hiegh/ pot1 nntz Key 171 of 172	Local ang Gilobai ang Assoc brind Assoc brind	; INS5YM=1, IACTIVE ; 1 2	=0, DEC = 2, OPSX=	0.10, OF5Y=	0.1
pol_free pot_Hieghr pot1 nptz Key 171 of 172	Local and Global ang Assoc brind Assoc brind Griend crit	; INS5YM=1, IACTIVE * 1 2 4	=0, DEC = 2, OPSX=	6.10, OFSY=	0.1
pol_fice pol	Local and Global ang Assoc brid Assoc crid Gn end crit On quit an	; INSSYM=1, MCTIVE : 1 2 4	=0, DEC = 2, OPSX=	0,10,0F5Y=	0.1
pol_fice pot_Hieghr pot1 nutz Key 171 of 172	Local arg Global arg Assoc brid Assoc crid On end crit On quit are	, INSSYM-1, MCTIVE 1 2 4 4 6 6 6 1 1 1 1 1 1 1 1 1 1 1 1 1	=0, DEC=2, OPSX=	-0.10,0F5Y=	0.1

Spot Elevation with Manually Placed Text (freely positioned by the operator)

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Retaining_Wall Road_Text Road_White_Line	Une Symbol	Texi	Presentation 1		
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funway Runway Lights	Fort	SR Simplex Rop -	_inst Y	Loner	÷
Linway_Marking	Numerica	10	Herbi	10.100	
otalite_Dish cratch	Thereast	ft	hit au	0.100	_
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ipot_Hicghi pot1 op17 Key 172 of 172	Local arge Global arge Assoc credit Assoc credit	Jinssym=t, iactive [[-1.DEC-2		
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key 172 of 172	Local args Global args Assoc credit Assoc credit On and coul On quit and	INSSYM-1 IACTIVE	-1, DEC-2	skte	

Spot Elevation where the Decimal Point Indicates the Location

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Bedine_Unpaved	Keynum	1	Description	
Road_Text Road_White_Line	Line S	Itest Icomy		
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Sunway_Lights		Fork SR Simplex Flop	📃 dust Y	Lover 📰
Surway_Marking istalite_Dish	Nong	nario 10	Rept	0.100
cratch	Penr	umber 1	Width	10 100
idewalk		Unis ID	Fictation	0.000
Sign Signline	Donst	lucton 011	- Slant	0.000
LAB_PATIO	Featur	e code		
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	Loc	aays		
Key 170 bt 172	l Loc Siob	alag: 		
Key 170 bi 172	J Loc Sido Assoc	alag: slag:		
Key 170 bi 172	J Loc Silob Arson Assoc	alag: alag: .cond1 .cond2		
Key 170 bi 172	J Loc Silob Assoc Assoc On er	alangs alangs Jound1 Jound2 alamad		
Key 170 bi 172	J Loc Silab Assoc Assoc On ef Un gu	a ango a ango Ison di Ison di International International		
Key 170 bi 172	J Loc Silab Assoc Grief Uniqu	a age a age pond1 pond2 id end ul end Add	Ohange D	eete

Manhole with an "MH" String Manhole: Symbol definition

Function Keys	Keyname	in-annotati	ed	Virlunction	Inseit Asym	1
Hedge_Line	Keynum	1		Description	1	
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aton Post		Lajer 675		1		
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Manhole: Text definition

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nstêx amp Poel	Later 575	Just Lat
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1ail_Box 1anhole	Non-graphic 0	Heat 0.080
farsh_Outline	Ben number 1	With 0 180
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dh1	Conduction Dff	· · · · · · · · · · · · · · · · · · ·
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light_Light		
Ibschred_Line	Local args (INSSYM=1	LABSOR=1, ACTIVE=0, OFSX=,12, OFSY=,12
Key 1/3 bt 173	Global args	
	Assoc and 1	
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	On end and	
	Un guil chid	
		and and
	Add	Unange Doicte

Fixed Text String

Function Keys	Key name Pond_Text	Virturction Ins	eit Text	•
Overhead_Pipe 🛃 Overhead_Walk Polm	Kevitum 1	Description		
Parking_Bump Parking_Bump ParkingText Paved_Ditoh Paved_Ditoh Paved_Ditve Paved_Parking Paved_Parking Paved_Boad Paved_Shoulder Pav_Phone Pav_Phone Pav_Phone Pave_Boad Pave_Phone Pave_Boad Pave Pave_Boad Pave Pave_Boad Pave Pave_Boad Pave Pave Pave Pave Pave Pave Pave Pave	Lave 535 For SB Simplex Bour Non-grachic D Pen number 1 Link D Construction Off 2 Feature code Feature code for	illustX JustY Height Width Rickalion Slant	Certer Dartes 0.100 0.100 0.000 0.000	N N N
pole2 Port/Leke Port Key 174 of 174	Locat args Global args Assoc cmd7 Assoc cmd2 On end cmd Un quil cmd Add OL	nange D Cancel	eliste	

Appendix D – Key-In Cross Reference

Insert Line Insert Symbol	inslin	Copy Window Set DTM	copwin	Backup VR File	bacvr
Insert Text	Inssym	Dup DTM	secution	Close VR File	opevr
Insert Square	instex	Drive Crid	runatm	Deplot	CIOVE
Insert Darallel Line	inssqu	Z DTM	arigri	Zeem Left	rep
Insert Line Text	inspar	2 DTM Lobel Reer/Dictoree	zacm	Zoom Center	2001
Insert Line Text	insite	Crid Lines	Tabbea	Zoom Dight	ZOOC
Insert File	Instit	Tick Lines	griin	Zoom Breviews	ZOOF
Edit Line	- 443.4-	Inverse	lclin	Line Fort ON	zoop
Edit Cime	edilin	Inverse Drive Te	inv	Line Font ON	lion
Edit Symbol	edisym	Drive To	dri	Line Font OFF	lioff
Edit lext	editex	Regrive	redri	Spline ON	splon
Inm Line	trilin	Reset Drive	resdri	Spline OFF	sploff
Break Line	brelin	Delete Duplicates	deldup	Line Points ON	lpon
Hack Line	haclin	Batch Filter	batfil	Line Points OFF	lpoff
Point on Line	pol	Batch Trim	battri	Line Elevations ON	leon
Reverse Line	revlin	Batch Offset	batoff	Line Elevations OFF	leoff
Join Lines	joilin	Sheet Grid	shegri	Range XY	ranxy
Insert Flyline	insfly	Plot Control	plocon	Edit VR Header	edivr
		Create Symbol	cresym	UNDO	undo
Interpolate Contours	intcon	Zoom All	zooa	Zoom In 4X	200 .25
Square Existing	squexi	Zoom In 2X	zoo .5	Zoom Down	zood
Hatch Line	hatlin	Zoom Up	zoou	Zoom Out 4X	zoo 4
Label Point	labpoi	Zoom Out 2X	zoo 2	Pop	pop
Symbol Fill	symfil	Zoom Windows	zoow	Pop ALL	popall
Edit Elevation	ediele	Toggle Grid	toggri	Swap Applications	swa
Fast Delete	fasdel	Set Grid Resolution	setgri	Associate Command 1	acl
Line Cross	lincro	Toggle Window Shift	togwin	Associate Command 2	ac2
Change Layer	chalay	Set Display Parameters	setpar	Z Source	zsou
Change Graphic Pointer	chagra	Set Display Parameters	setdis	Plot	plo
Change Pen Code	chapen	Set Layer	setlay	Help	help
Global Change	glob	Reset Layer	layres	Global Help	ghelp
Cut Polygon	cutpol	List Layers	lislay	Edit Macros	edimac
Delete Window	delwin	Edit Config Params	edicon	Edit Function Keys	edifun
Move Window	movwin	Pack VR File	pacvr	EXIT	exi