ICHIPB SUPPORT DATA EXTENSION (SDE)

1.0 Introduction

As mensuration and geopositional tools proliferate within the NATO ISR Interoperability Architecture (NIIA) environment and the use of NSIF image chips continues to expand, potential problems have been identified by the NSIF Custodial Support Team (CST). One such problem arises when a mensuration tool, such as Ruler, is applied to an NSIF image chip to determine the length or geoposition of an object within that chip. Ruler requires, as input, data that references the original full image as well as the image chip. This information is not provided within the NSIF header/subheader fields, or within the current NSIF Support Data Extension (SDE) fields. This has resulted in the implementation of various, non-standard solutions for transferring this much-needed "chipping" data along with an NSIF chip. The ICHIPB Support Data Extension is the standard means whereby any recipient of a chipped image containing SDEs from the original full image, regardless of system or application, will be able to access the necessary data and apply a mensuration tool to the image chip in a uniform and consistent manner.

2.0 ICHIPB Overview

As mensuration and geopositioning tools proliferate, several issues have been identified concerning the application of these tools to NSIF-formatted image chips. Specifically, there is no mechanism, in the current NSIF format, to pass a standardized set of data with an image chip such that a user can easily apply Ruler to that image. Ruler provides mensuration functions for client software applications by utilizing the original image line and sample values for the endpoints of the measured dimension in a geometry model for the image's collection sensor. The geometry model for a sensor consists in part of a transformation from the sensor coordinate system to the original line and sample coordinate system. Incorrect mensuration results will be computed if Ruler is not provided the original line and sample for each measured point. In order to apply Ruler to a chipped NSIF image, the using application must provide the Ruler application with the grid point coordinates of interest in the chipped image as if those points came from the original full image. Unless this information is precisely included with the image chip, a user must use alternate methods to generate this data. As a result, several system-specific solutions have been proposed and implemented within the community. Each of these solutions addresses the problem in a different manner, and in many instances, do not generate the same exact points or offsets. In addition, the accuracies of these line and sample points vary. These factors could lead to a scenario where three imagery exploitation systems receive identical images, apply their unique algorithm, derive the points and chip offsets from the full image, input the data to Ruler, and receive mensuration results that are not identical.

Addition of an NSIF Tagged Record Extension (TRE) to the approved set of SDEs as a Controlled Extension (CE) can easily alleviate this situation. By standardizing the data elements (which includes the line and sample corner points, offset data, etc.) in a consistent manner within this TRE, and including it with all image chips, exploiters will be more likely to arrive at the same answer from the mensuration process.

2.1 Background

The ICHIPA extension was developed via a series of technical interchange meetings as well as through comment and inputs from the user community. The ICHIPA extension was based on the simplification of and generalization of the currently registered I2MAPD extension. System specific I2MAPD data fields were either removed or generalized such that there would be no system-specific dependencies within ICHIPA.

This specification for ICHIPB resulted from attempting to apply ICHIPA to chipped imagery collected by airborne sensors containing attribute data within the Airborne SDE. The Airborne SDE and ICHIPA do not provide a consistent means to identify the width and height of the original full image to which the coverage of the SDE applies. With ICHIPA, a more general-purpose mechanism was needed to accurately process and display coordinate information for chipped images. The changes to ICHIPA resulting in ICHIPB provide a means to identify the number of pixel rows and number of pixel columns in the original full image for which the coverage of the SDEs is applicable.

Version 1.0 of ICHIPB represents a major simplification of I2MAPD pertaining to dewarped (non-linear) capabilities. For example, the previously existing grid overlay has been deleted. As such, ICHIPB deals only with linear situations where only the four line and sample “original” product coordinates are considered. Thus, there is no need for nth order polynomials and the tag length is fixed at 224 bytes. On the other hand, several existing features have been retained such as the non-linear transformation flag, which indicates whether the associated image is dewarped or not, and the anamorphic correction indicator. The scan block number is added to reflect comments received from the user community.

3.0 Implementation of ICHIPB

ICHIPB is a system-independent NSIF TRE that, when included with the SDEs in all NSIF image chips, will support all users within the NIIA environment for the mensuration of SDE-based image chips (non-dewarped imagery only). It holds the support data that analysts need when using Ruler to mensurate or determine detailed geospatial parameters on pixel-based features within image chips. ICHIPB also holds other limited, processing-related information, such as various correction indicators and scale factor, that are useful to receiving systems.

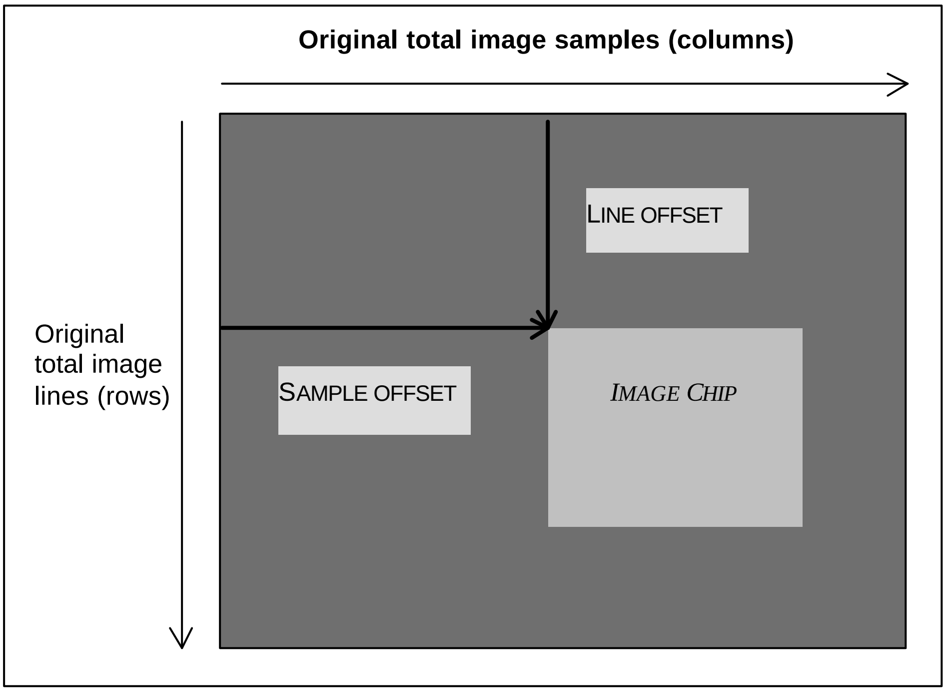


FIGURE 1 OUTPUT CHIPPED PRODUCT

3.1 Generation and Use of ICHIPB (Non-dewarp Scenarios)

The ICHIPB TRE shall be generated by all NSIF applications that produce NSIF formatted image chips of simple linear (non-dewarped) images that include the Ruler complement of SDEs. NSIF receiving systems capable of interpreting and using airborne data extensions shall properly recognize, read and interpret the information within ICHIPB when present in an image chip.

Ruler mensuration uses the line and sample indexing scheme of the original image to determine various geospatial measurements and position within an image, be it the original image or a chip of the original image. ICHIPB captures image chip corner point coordinate information that is mapped to the original image coordinate system. The mapping function is the result of a linear interpretation between image corner points and as such, can be assumed for only the simple linear (non-dewarped) processed imagery.

The reason for this is twofold. First, few systems today process dewarped imagery and even fewer can mensurate and calculate geopositions from dewarped imagery. Second, due to the complexity of the algorithms that derive line and sample corner points and offset data, as well as the required processing power required, standardization of the algorithms for the community would be difficult. Therefore, standardizing the linear transformation, a straightforward process, is an appropriate baseline for ICHIPB. For a more detailed explanation of this mapping function, and specific examples of chipping non-dewarped imagery, refer to the Annexes of this document.

3.2 Dewarp Scenarios

In addition, a new TRE or a revision to ICHIPB is recommended for more complex mensuration requirements. This is because the current TRE is not sufficient for addressing dewarp scenarios.

To maintain interoperability within the NIIA, ICHIPB shall be included with all non-dewarped NSIF chips, specifically when the chip is disseminated. It shall also be included with NSIF chips of dewarped images that include the original SDE to serve as a flag that the coverage of the SDE is different from the coverage of the pixels in the chip.

4.0 Format of ICHIPB

The ICHIPB TRE provides the data needed to mensurate and calculate geopositions of features on chips. This TRE provides the output product row and column data for the image, as well as those data points referenced back to values for the original full image. For this TRE, the original line and sample grid point values will be provided at the four corners of the intelligent image data in the chip (for those cases where the chip includes pad pixels).

4.1 ICHIPB Field Specification

The Tagged Record Extension fields for ICHIPB are specified in tables 1, 2, and 3.

TABLE 1. ICHIPB TRE SUBHEADER FIELDS

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	Unique extension type identifier	6	ICHIPB	R
CEL	Length of CEDATA field	5	00224	R
CEDATA	User-defined data	224	See table 2	R

TABLE 2. ICHIPB TRE USER DEFINED FIELD FORMAT

FIELD	NAME	SIZE	VALUE RANGE	TYPE
XFRM_ FLAG	Non-linear Transformation Flag	2	Numeric 00 (non-dewarped, data provided), 01 (no data provided)	R
SCALE_ FACTOR	Scale Factor Relative to R0 (original full image resolution)	10	Numeric (typically reciprocal of display magnification) xxxx.xxxxx	R
ANAMRPH_CORR	Anamorphic Correction Indicator	2	Numeric 00 (no anamorphic correction) 01 (anamorphic correction applied)	R
SCANBLK_NUM	Scan Block Number (scan block index)	2	00-99 00 if not applicable	R

FIELD	NAME	SIZE	VALUE RANGE	TYPE
OP_ ROW_11	Output product row number component of grid point index (1,1) for intelligent data	12	Numeric xxxxxxxx.yyy (typically 00000000.500)	R
OP_ COL_11	Output product column number component of grid point index (1,1) for intelligent data	12	Numeric xxxxxxxx.yyy (typically 00000000.500)	R
OP_ ROW_12	Output product row number component of grid point index (1,2) for intelligent data	12	Numeric xxxxxxxx.yyy	R
OP_ COL_12	Output product column number component of grid point index (1,2) for intelligent data	12	Numeric xxxxxxxx.yyy	R
OP_ ROW_21	Output product row number component of grid point index (2,1) for intelligent data	12	Numeric xxxxxxxx.yyy	R
OP_COL_21	Output product column number component of grid point index (2,1) for intelligent data	12	Numeric xxxxxxxx.yyy	R
OP_ROW_22	Output product row number component of grid point index (2,2) for intelligent data	12	Numeric xxxxxxxx.yyy	R
OP_COL_22	Output product column number component of grid point index (2,2) for intelligent data	12	Numeric xxxxxxxx.yyy	R
FI_ROW_11	Grid point (1,1), row number in full image coordinate system	12	Numeric xxxxxxxx.yyy	R
FI_COL_11	Grid point (1,1), column number in full image coordinate system	12	Numeric xxxxxxxx.yyy	R
FI_ROW_12	Grid point (1,2), row number in full image coordinate system	12	Numeric xxxxxxxx.yyy	R
FI_COL_12	Grid point (1,2), column number in full image coordinate system	12	Numeric xxxxxxxx.yyy	R
FI_ROW_21	Grid point (2,1), row number in full image coordinate system	12	Numeric xxxxxxxx.yyy	R
FI_COL_21	Grid point (2,1), column number in full image coordinate system	12	Numeric xxxxxxxx.yyy	R
FI_ROW_22	Grid point (2,2), row number in full image coordinate system	12	Numeric xxxxxxxx.yyy	R
FI_COL_22	Grid point (2,2), column number in full image coordinate system	12	Numeric xxxxxxxx.yyy	R
FI_ROW	Full Image Number of Rows	8	Numeric 00000000 and 00000002 to 99999999	R
FI_COL	Full Image Number of Columns	8	Numeric 00000000 and 00000002 to 99999999	R

Note: - Row and column indexing, NSIF nomenclature, corresponds to line and sample indexing in original product nomenclature.
- If XFRM_FLAG is 01, then remaining values will be zero fill.

TABLE 3 ICHIPBTRE USER DEFINED FIELD DEFINITIONS

FIELD	VALUE DEFINITIONS AND CONSTRAINTS
XFRM_FLAG	Non-linear Transformation Flag. If image is non-dewarped, field is 00. For all others, flag is 01 with zero fill in the remaining fields.
SCALE_FACTOR	Scale factor relative to the full image resolution R0. This provides a mechanism to reference back to the full image if product is not at R0. To determine product RRDS value: if 0001.00000 then R0; 0002.00000 then R1; 0004.00000 then R2; 0008.00000 then R3; 0016.00000 then R4; 0032.00000 then R5; 0064.00000 then R6; 0128.00000 then R7
ANAMRPH_CORR	If no anamorphic correction, 00; otherwise 01
SCANBLK_NUM	Scan block number from which the product was chipped if applicable; otherwise 00. When chipping from imagery that has multiple scan blocks, the scan block from which the chip was extracted shall be identified. The value in this field permits identification and selection of the scan block specific SDEs from the entire complement of SDEs in the original image file.
OP_ROW_11	Output product row number component of grid point index (1,1) for intelligent data. Typically 00000000.500
OP_COL_11	Output product column number component of grid point index (1,1) for intelligent data. Typically 00000000.500
OP_ROW_12	Output product row number component of grid point index (1,2) for intelligent data.
OP_COL_12	Output product column number component of grid point index (1,2) for intelligent data.
OP_ROW_21	Output product row number component of grid point index (2,1) for intelligent data.
OP_COL_21	Output product column number component of grid point index (2,1) for intelligent data.
OP_ROW_22	Output product row number component of grid point index (2,2) for intelligent data.
OP_COL_22	Output product column number component of grid point index (2,2) for intelligent data.
FI_ROW_11	Grid point (1,1), row number in full image coordinate system. Note: For images with multiple scan blocks, the "full image" value refers to the extent of the single scan block from which the chip was extracted.
FI_COL_11	Grid point (1,1), column number in full image coordinate system. Note: For images with multiple scan blocks, the "full image" value refers to the extent of the single scan block from which the chip was extracted.
FI_ROW_12	Grid point (1,2), row number in full image coordinate system. Note: For images with multiple scan blocks, the "full image" value refers to the extent of the single scan block from which the chip was extracted.
FI_COL_12	Grid point (1,2), column number in full image coordinate system. Note: For images with multiple scan blocks, the "full image" value refers to the extent of the single scan block from which the chip was extracted.
FI_ROW_21	Grid point (2,1), row number in full image coordinate system. Note: For images with multiple scan blocks, the "full image" value refers to the extent of the single scan block from which the chip was extracted.

FIELD	VALUE DEFINITIONS AND CONSTRAINTS
FI_COL_21	Grid point (2,1), column number in full image coordinate system. Note: For images with multiple scan blocks, the "full image" value refers to the extent of the single scan block from which the chip was extracted.
FI_ROW_22	Grid point (2,2), row number in full image coordinate system. Note: For images with multiple scan blocks, the "full image" value refers to the extent of the single scan block from which the chip was extracted.
FI_COL_22	Grid point (2,2), column number in full image coordinate system. Note: For images with multiple scan blocks, the "full image" value refers to the extent of the single scan block from which the chip was extracted.
FI_ROW	The number of pixel rows in the original full image for which the coverage of the SDEs is applicable. When known by the chipping application, this field is to be populated with the maximum row value for the coverage to which the support data (SDE) applies. The default value of 00000000 shall be interpreted to mean the total coverage area of the SDE applies, but the maximum number of rows is unknown. Note: For images with multiple scan blocks, the "full image" value refers to the extent of the single scan block from which the chip was extracted.
FI_COL	The number of pixel columns in the original full image for which the coverage of the SDEs is applicable. This field is to be populated with the maximum column value for the coverage to which the support data (SDE) applies. The default value of 00000000 shall be interpreted to mean the total coverage area of the SDE applies, but the maximum number of columns is unknown. Note: For images with multiple scan blocks, the "full image" value refers to the extent of the single scan block from which the chip was extracted.

5.0 Summary

The ICHIPB NSIF TRE is an SDE mechanism by which exploiters of non-dewarped imagery chips can generate the required data for Ruler mensuration. By requiring that all systems generating non-dewarped imagery implement this TRE, interoperability will be maintained. This standard will enforce a uniform solution to the application of Ruler to NSIF images.

6.0 Glossary

Chip	A portion of another image, be it from the original image as captured by a sensor, or from a sub-image cropped from an original image.
Coverage	The entirety of pixel rows and columns of an original image that directly correlate to the attributes in the Support Data Extensions resulting from the original image capture.
Geopositioning	The process of determining the precise location of an object relative to the Earth’s surface.
Grid Points	The line and sample index values (coordinates) of the chipped image in the applicable reference grid coordinate system.

Line and Sample The row and column of the image, respectively.

Mensuration The process of measuring positions, distances, and object dimensions (such as length, height, diameter) on an image or map.

Original Full Image The entire image pixel data for which the attribute information in the Support Data Extensions applies. For images with multiple scan blocks, "Original Full Image" refers to the single scan block from which the image chip was sourced.

Output Product The image product resulting from the chipping operation.

SDEs Support Data Extensions. The term applied to both Data Extension Segments (DESs) and Tagged Record Extensions (TREs). The SDEs contain attribute information providing the details of the original full image capture sensor and the original capture event. ICHIPB is a tagged record extension.

Intelligent Pixels As defined for chipping within this context, are those pixels that possess visual utility or convey exploitable or potentially exploitable information to the user or an application.

Significant Pixels All pixels included within the number of rows (NROWS) and number of columns (NCOLS) counts in an image subheader. They may or may not include intelligent and/or pad pixels.

Pad Pixels Those pixels with sample values that have offer no real meaning or intelligence to the image. Pad pixels (sometimes referred to as “fill” or “gray”) may be used to complete or “fill out” portions of an image to maintain consonance between row/column counts and block sizes and/or to distinguish a starting location of intelligent pixels.

Warping Non-dewarped imagery is projected in the same plane as originally collected by the sensor and possesses linear characteristics inherent to the original collection process. Dewarped imagery is imagery that has been changed from its original collection plane to one that is more suitable for display. Dewarped imagery possesses non-linear characteristics as a result of the transformation process.

Annex A, Pixel vs. Grid Overview

A1.0 Introduction

This Annex provides detailed explanations and illustrations of the relationships between image pixels and the NSIF grid space over which the images are laid. Three examples are presented: 1) simple chip; 2) chipping after image rotation of original image; and 3) chipping beyond the edge of the original image. It should be noted that in all examples, “image” and “grid” illustrations are highly exaggerated to provide greater detail and visualization. The image sizes are unrealistic and should never be encountered in a real world situation. Lastly, throughout the illustrations and explanations in this and subsequent Annexes, different uses of the term “pixel” are used. They are presented here to prepare the reader in understanding the chipping processes. Intelligent pixels, as defined for chipping within this context, are those that possess visual utility or convey exploitable or potentially exploitable information to the user or an application. Significant pixels are all pixels included within the number of rows (NROWS) and number of columns (NCOLS) counts in the image subheader. They may or may not possess intelligence. Pad pixels are those with sample values that offer no real meaning or intelligence to the image. Pad pixels (sometimes referred to as “fill” or “gray”) may be used to complete or “fill out” portions of an image to maintain consonance between row/column counts and block sizes and/or to distinguish a starting location of intelligent pixels. In all cases, pad pixels are used to maintain the uniform raster row/column structure of the intended matrix of pixel values.

A2.0 Pixel vs. Grid Orientation.

The chipping process involves the replication of some portion of a source image plus a copy of the Support Data Extensions (SDEs) that address the coverage for the original image operation. The resulting image chip is also known as the Output Product (OP). The original image operation to which the SDE coverage applies is defined as the Full Image (FI). Since the chip is a subset of the full image, it must be capable of inheriting all of the information necessary to perform mensuration and other exploitation functions. For this to occur, the SDEs presume a grid associated with the original imagery operation. To use the SDEs, the chip pixels must be related back to the original grid, regardless of what manipulations (e.g., rotation, reduced resolution, chip of a chip, etc.) have occurred.

In the following illustration, an image chip of NSIF size NROWS = 3 and NCOLS = 4 is being created from a full image of NSIF size NROWS = 9 and NCOLS = 7. In both the chip and full image cases, the (row,column) indices are such that the upper left corner contains pixel (0,0), the upper right corner contains pixel (0,NCOLS-1), the lower left corner contains pixel (NROWS-1,0), and the lower right corner contains pixel NROWS-1, NCOLS-1). (Note: Row and column values are zero-based indices which correspond with NSIF display of images in accordance with STANAG 4545, Annex C, paragraph 17).

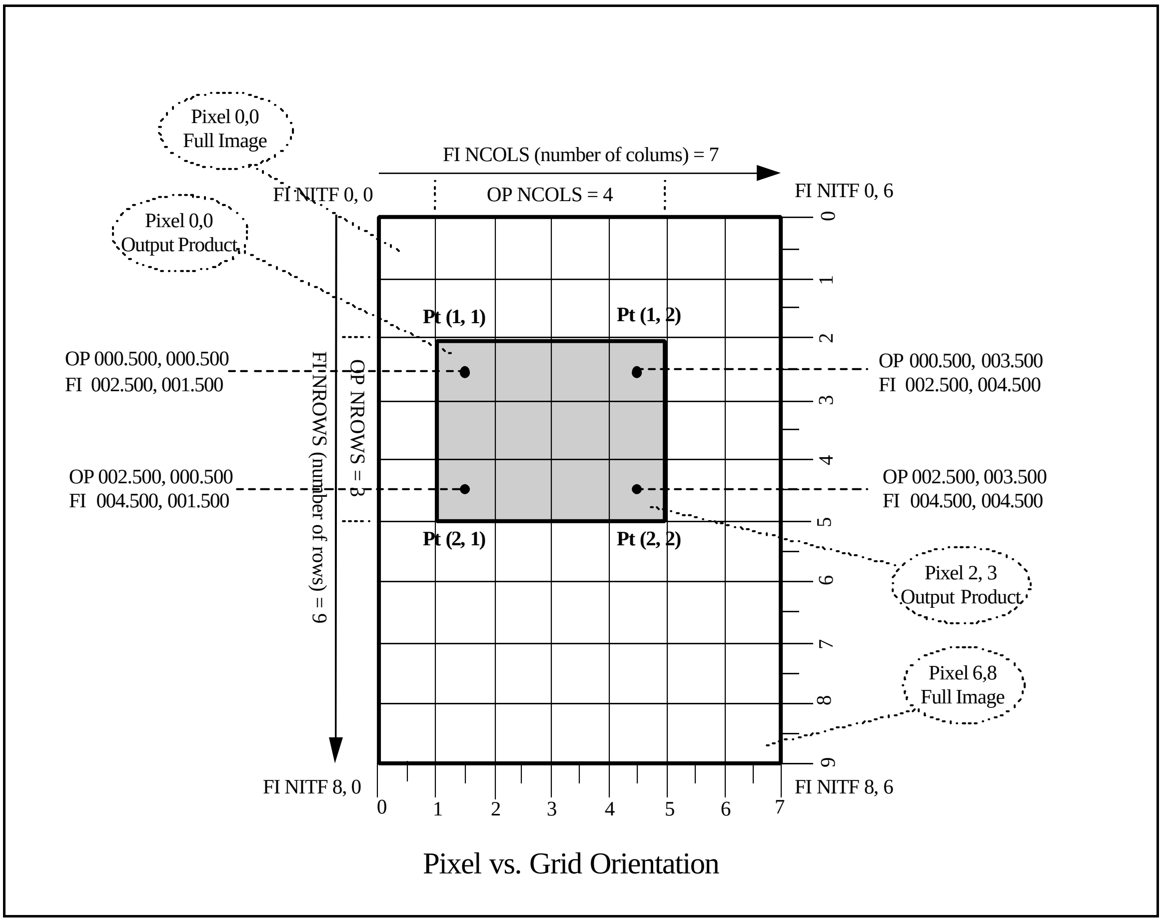


FIGURE A1-1. PIXEL VS. GRID ORIENTATION

To determine where a chip's corner points are in relation to the full image grid coverage from which it is drawn, the location of the center of each of the chip's corner pixels must be determined in relation to the full image's grid space. (Note: Since a pixel is an abstract object whose shape and size are not easily defined, the pixels in this Annex are portrayed in square space, the size of "one unit," to easily determine orientation and measurements). With the center point of a square being located at one half of its height and width, the center of each OP and FI pixel will typically be 0.5, 0.5. In this particular case, the center points of all chip pixels are coincident with the center points of the corresponding pixels in the full image. Also, for this case, all significant pixels in the chip and the full image are considered intelligent pixels.

Given the aforementioned information, the specific index values for completing the ICHIPB corner points for the chip (OP) and their corresponding location full image (FI) are as follows:

Pt (1,1)	OP_ROW_11:	00000000.500	FI_ROW_11:	00000002.500
	OP_COL_11:	00000000.500	FI_COL_11:	00000001.500
Pt (1,2)	OP_ROW_12:	00000000.500	FI_ROW_12:	00000002.500
	OP_COL_12:	00000003.500	FI_COL_12:	00000004.500
Pt (2,1)	OP_ROW_21:	00000002.500	FI_ROW_21:	00000004.500
	OP_COL_21:	00000000.500	FI_COL_21:	00000001.500
Pt (2,2)	OP_ROW_22:	00000002.500	FI_ROW_22:	00000004.500
	OP_COL_22:	00000003.500	FI_COL_22:	00000004.500

Using the corner point values above and other related information, an NSIF interpreter should be able mensurate and ascertain other information from the chip by using the FI support data that accompanies it, just as if the interpreter was mensurating across the full image.

A3.0 Pixel vs. Grid Orientation - Rotation

In the following example, the same chip and full images, as in figure A1-1, are used again; however, in this case, the full image has been rotated approximately 30 degrees. With this new orientation, two new factors need to be addressed and considered: “pad” pixels and non-coincident pixel center points.

In the illustration below, pad pixels are those that appear within the 12 x 11 NSIF image space but are NOT part of the intelligent pixels within the 9 x 7 rotated image. The resulting visual affect is similar to when a NSIF viewer rotates an image for display, such as in a north orientation. Accordingly, the significant pixels of the full image contain both intelligent and pad pixels, but in the chip, all significant pixels are also intelligent pixels.

Unlike the first illustration in figure A1-1, the center points of the chip’s corner pixels are no longer coincident with center points of the pixels in the full image grid. In this example, the chip (OP) values used in the ICHIPB corner point index fields remain the same (due to same chip size); however, the full image (FI) index values are not on the “0.5” grid points. The FI values are derived from where the chip’s pixel center points are in relation to the full image grid. Given these relationships, the following values, which are estimates for the purpose of this illustration and discussion, are used to complete the ICHIPB corner point index fields:

Pt (1,1)	OP_ROW_11:	00000000.500	FI_ROW_11:	0000003.400
	OP_COL_11:	00000000.500	FI_COL_11:	00000001.250
Pt (1,2)	OP_ROW_12:	00000000.500	FI_ROW_12:	00000001.850
	OP_COL_12:	00000003.500	FI_COL_12:	00000003.850
Pt (2,1)	OP_ROW_21:	00000002.500	FI_ROW_21:	00000005.100

OP_COL_21: 00000000.500 FI_COL_21: 00000002.200

Pt (2,2) OP_ROW_22: 00000002.500 FI_ROW_22: 00000003.650
OP_COL_22: 00000003.500 FI_COL_22: 00000004.850

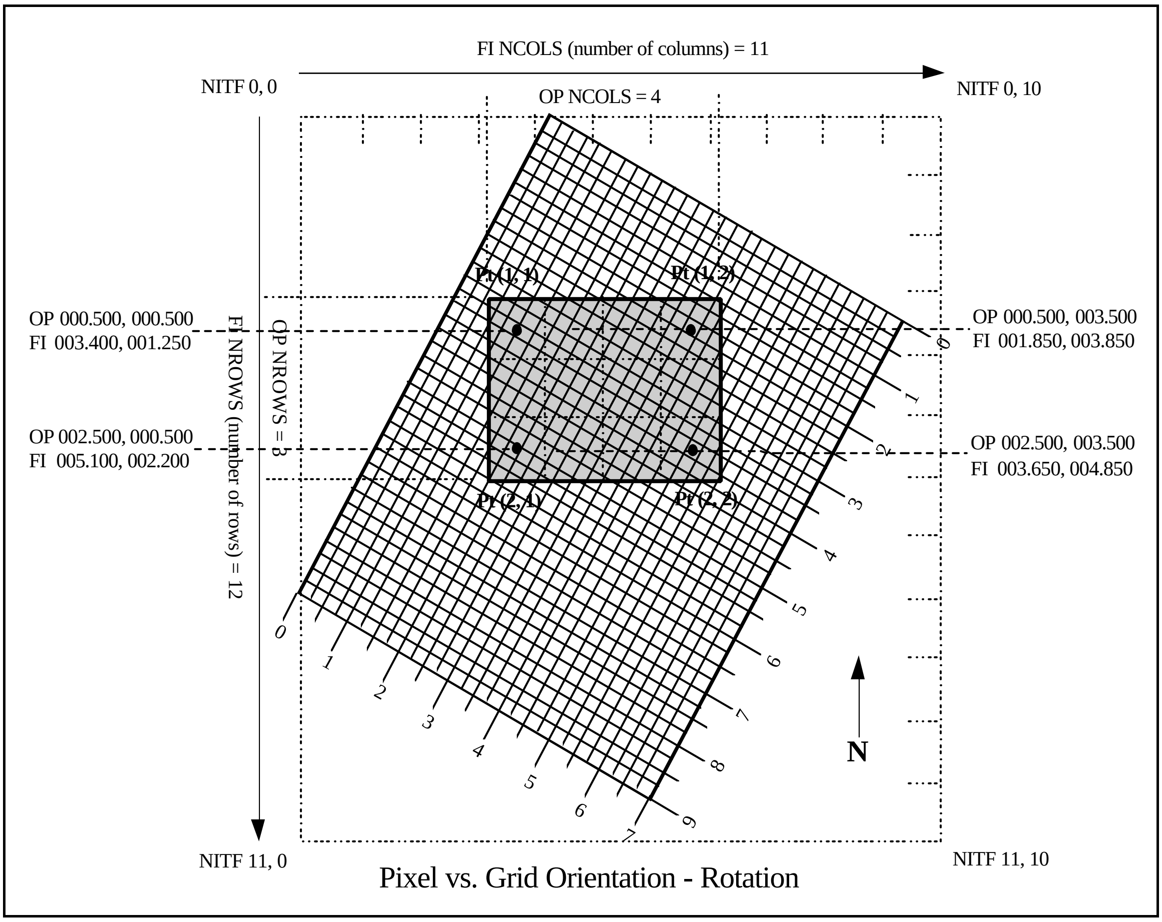
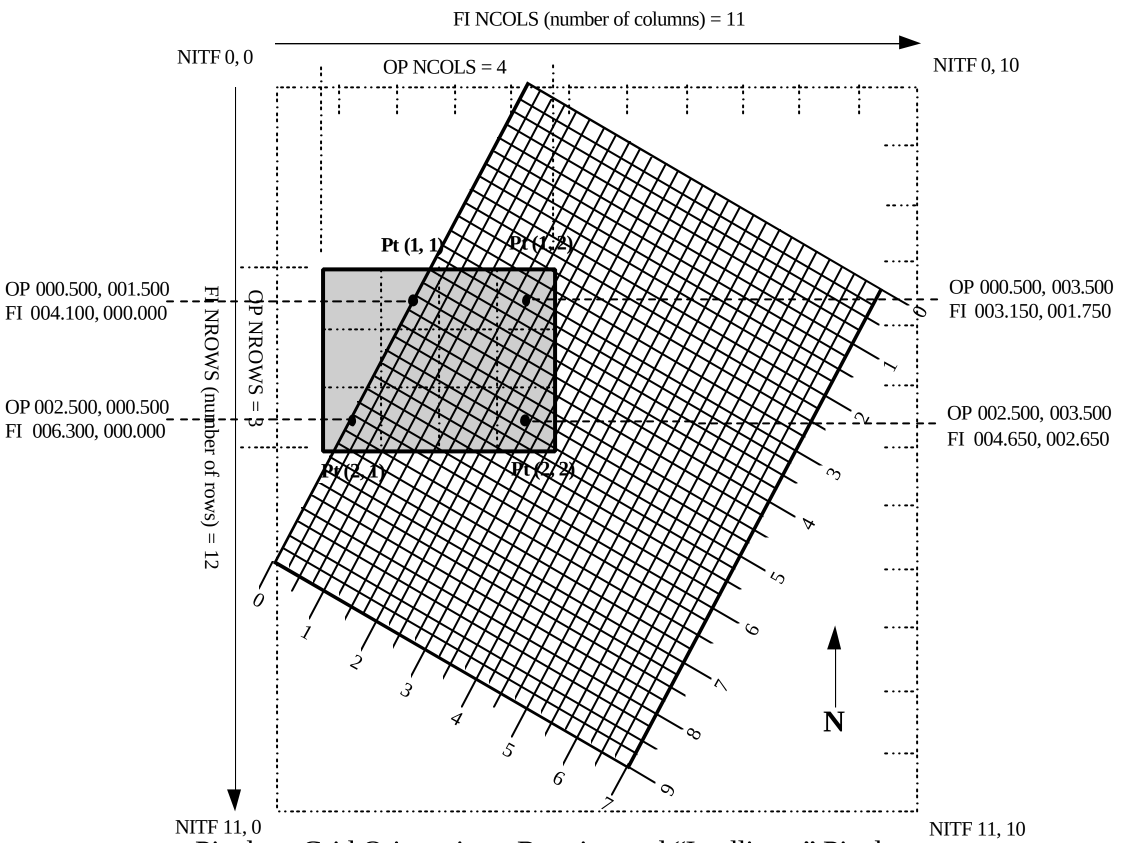


FIGURE A1-2. PIXEL VS. GRID ORIENTATION – ROTATION

Again, using the corner point values above and other related information, an NSIF interpreter should be able mensurate and ascertain other information from the chip by using the FI support data that accompanies it, just as if the interpreter was mensurating across this portion of the full image.

A4.0 Pixel vs. Grid Orientation - Rotation and "Intelligent" Pixels

Figure A1-3 offers another possibility in image chipping whereby not all of the pixels comprising the image chip possess intelligence. In this case, the chip will continue to possess a NSIF size of NROWS = 3 and NCOLS = 4; however, pad pixels (at 0, 0 and 1, 0) will be included in the chip to account for the absence of any pixel contributions from the full image at those locations. Unlike the previous two examples, this case offers intelligent and pad pixels within the significant pixels of both the chip and the full image.



Pixel vs. Grid Orientation - Rotation and “Intelligent” Pixels

FIGURE A1-3 PIXEL VS. GRID ORIENTATION - ROTATION AND “INTELLIGENT” PIXELS

For the chip to properly access the support data coverage offered by the full image, the chip’s corner points must be indicative of pixels possessing intelligence.

Accordingly, this example will deviate from the previous ones in that OP Pt 1,1 will not reflect corner point indices of 0.5, 0.5. Since this chip will contain unintelligent, pad pixels in the first column, the corner point values of Pt 1,1 will now be 0.5, 1.5, avoiding the unintelligent pixel present at 0, 0.

The remaining OP point values are the same and the corresponding FI point values are determined in the same manner as before. Accordingly, the following values, which are again estimates for the purpose of this illustration and discussion, are used to complete the ICHIPB corner point index fields:

Pt (1,1)	OP_ROW_11:	00000000.500	FI_ROW_11:	00000004.100
	OP_COL_11:	00000001.500	FI_COL_11:	00000000.000

Pt (1,2)	OP_ROW_12:	00000000.500	FI_ROW_12:	00000003.150
	OP_COL_12:	00000003.500	FI_COL_12:	00000001.750
Pt (2,1)	OP_ROW_21:	00000002.500	FI_ROW_21:	00000006.300
	OP_COL_21:	00000000.500	FI_COL_21:	00000000.000
Pt (2,2)	OP_ROW_22:	00000002.500	FI_ROW_22:	00000004.650
	OP_COL_22:	00000003.500	FI_COL_22:	00000002.650

With the corner point values representing intelligent pixels, as shown above, and other related information, an NSIF interpreter should again be able to mensurate and ascertain other information from the chip, just as if the interpreter was mensurating across this portion of the full image.

Annex B, Chipped Output Product

This example demonstrates the relationship of a chip the size of NROWS = 120 and NCOLS = 100 with a full image of the size NROWS = 400 and NCOLS = 300. The chip's NSIF 0,0 pixel corresponds to the full image's pixel 099, 099 location. For this example, the image should be considered full frame, with no scan blocks, with regards to format.

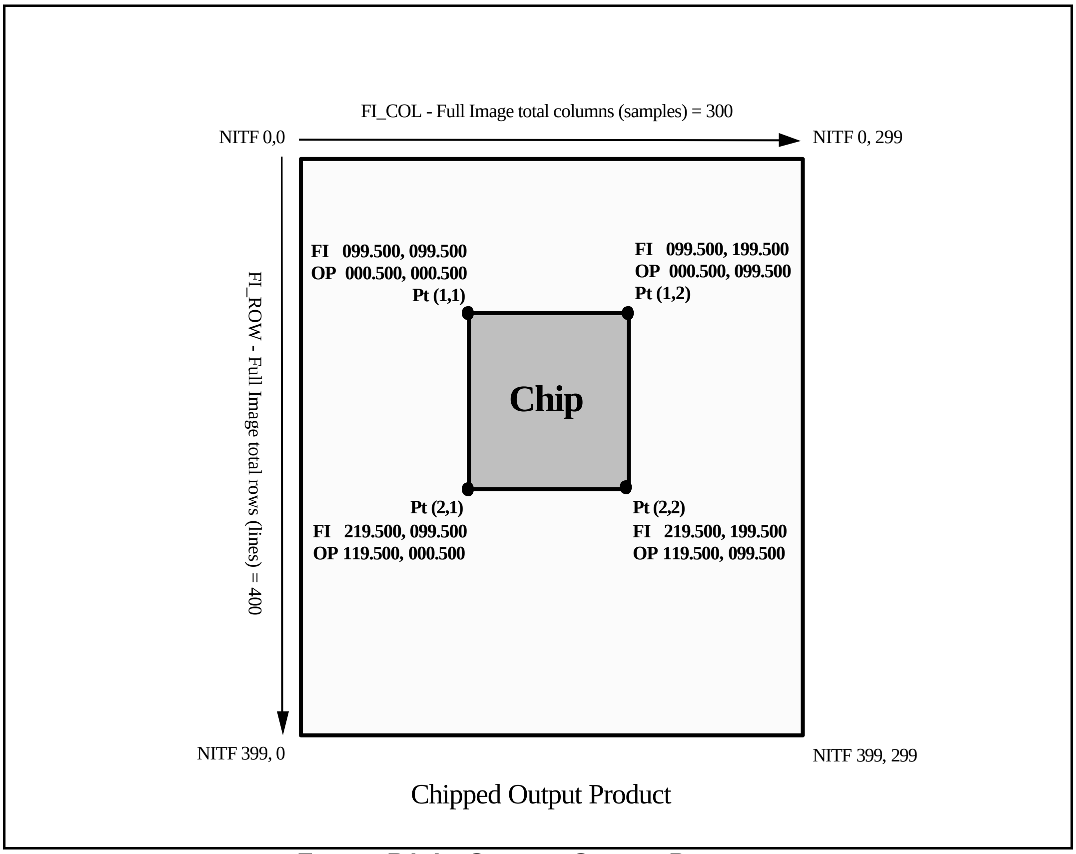


FIGURE B1-1. CHIPPED OUTPUT PRODUCT

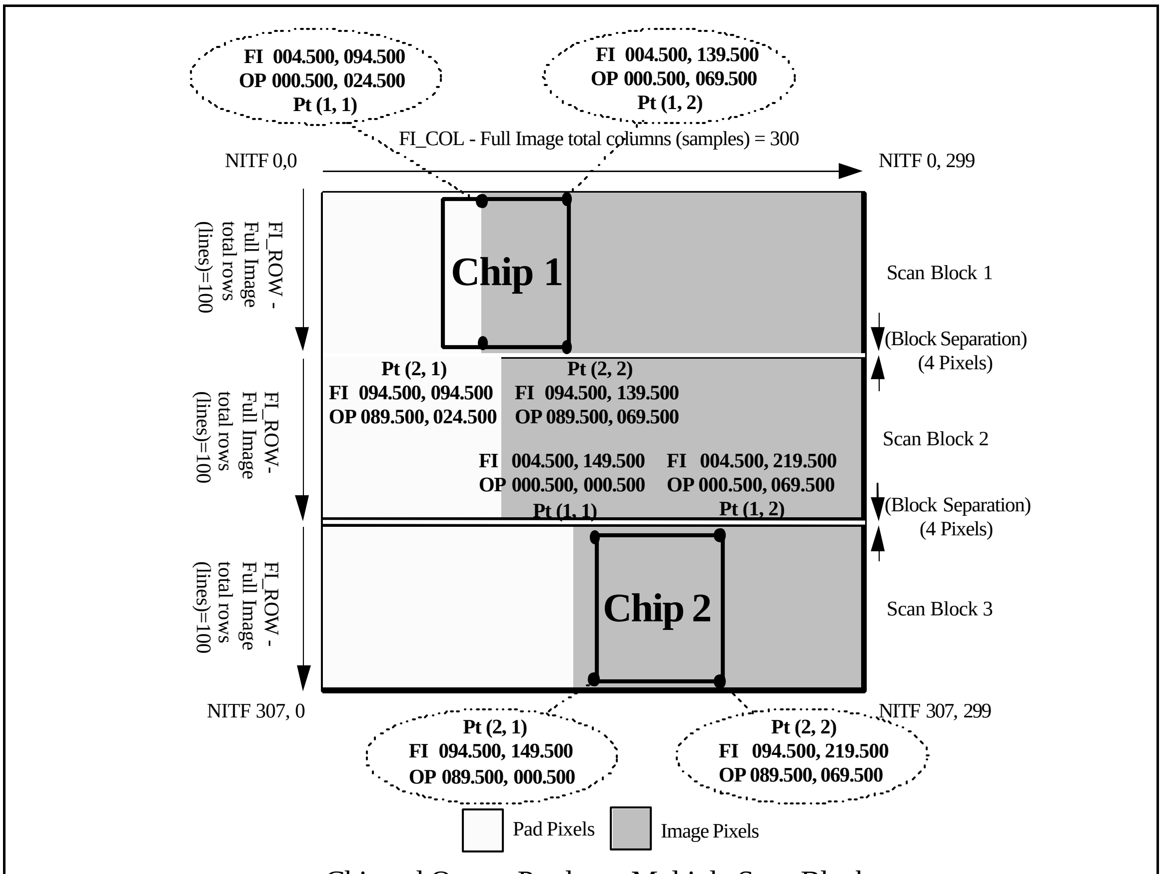
In the above example, Output Product (OP) values reflect the actual grid corner points of the image chip as it would stand independently, while the Full Image (FI) values provide those same OP points' values in the full image's corresponding grid space. Since the Support Data Extensions (SDEs) that will be included with the image chip will provide coverage for the entire 400 x 300 FI, ICHIPB's FI_ROW and FI_COL will be populated with the values 00000400 and 00000300, respectively. The ICHIPB grid corner point fields will be populated as follows:

Pt (1,1) OP_ROW_11: 00000000.500 FI_ROW_11: 00000099.500

	OP_COL_11:	00000000.500	FI_COL_11:	00000099.500
Pt (1,2)	OP_ROW_12:	00000000.500	FI_ROW_12:	00000099.500
	OP_COL_12:	00000099.500	FI_COL_12:	00000199.500
Pt (2,1)	OP_ROW_21:	00000119.500	FI_ROW_21:	00000219.500
	OP_COL_21:	00000000.500	FI_COL_21:	00000099.500
Pt (2,2)	OP_ROW_22:	00000119.500	FI_ROW_22:	00000219.500
	OP_COL_22:	00000099.500	FI_COL_22:	00000199.500

Annex C, Chipped Output Product - Multiple Scan Blocks

This example demonstrates generation of two chips, each the size of NROWS = 90 and NCOLS = 70. The source image is of the size NROWS = 308 and NCOLS = 300 and is comprised of 3 scan blocks, each of size NROWS = 100 and NCOLS = 300, and 4 rows of pad pixel separation between each adjacent scan block pair. One chip will be taken from the first scan block starting with scan block 1's pixel 004, 069. The second chip will be taken from the third scan block starting with its pixel 004,149 (Note: Using each individual scan block's 0,0 pixel to determine a chip's relative location in the block is a generic approach used in this document. Sensor products, both now and in the future, may use different scan block separation schemes and, as such, cannot be addressed in this document. If a scan block separation scheme is known, it would be possible for a NSIF interpreter to calculate the chip's offsets from the beginning of the entire NSIF image data; however, the interpreter would have to be cognizant of all schemes it will process to be able to produce chips in this manner. Since ICHIPB is not intended to be community or sensor specific, and support data is specific to each scan block, individual 0,0 pixel points are used to determine chip offsets within scan blocks.)



Chipped Output Product - Multiple Scan Blocks

Figure C1-1. <u>Chipped Output Product - Multiple Scan Blocks</u>

For this example, consideration should be given to cases where applications cut chips on some fixed row and column multiple, such as those that chip on "FAF boundaries." If these conditions exist and there is a desire for the area of interest to be in the center of the image chip, the resulting chip may include some pad pixels as part of its significant image data. While this may not be desirable from an aesthetic perspective, it does not present any functional limitations. With proper application of ICHIPB corner points and use of the support data that will accompany the chip, the means exist to navigate beyond the pad pixels and into the intelligent pixels in the resulting chip.

In the above examples, Output Product (OP) values reflect the actual intelligent pixel grid corner points of the image chips as they would stand independently, while the Full Image (FI) values provide those same OP points' values in the full image's (scan block 1 for Chip 1; scan block 3 for Chip 2) corresponding grid space. Since the Support Data Extensions (SDEs) that will be included with each image chip will provide separate coverage for each 100 x 300 FI scan block individually, ICHIPB's FI_ROW and FI_COL in each example will be populated with the values 00000100 and 00000300, respectively. Since Chip 1 was cut from scan block 1 and Chip 2 was cut from scan block 3, each chip's ICHIPB SCANBLK_NUM field will be populated with 01 and 03, respectively. The ICHIPB grid corner point fields will be populated as follows:

ICHIPB Grid Corner Points - Chip 1

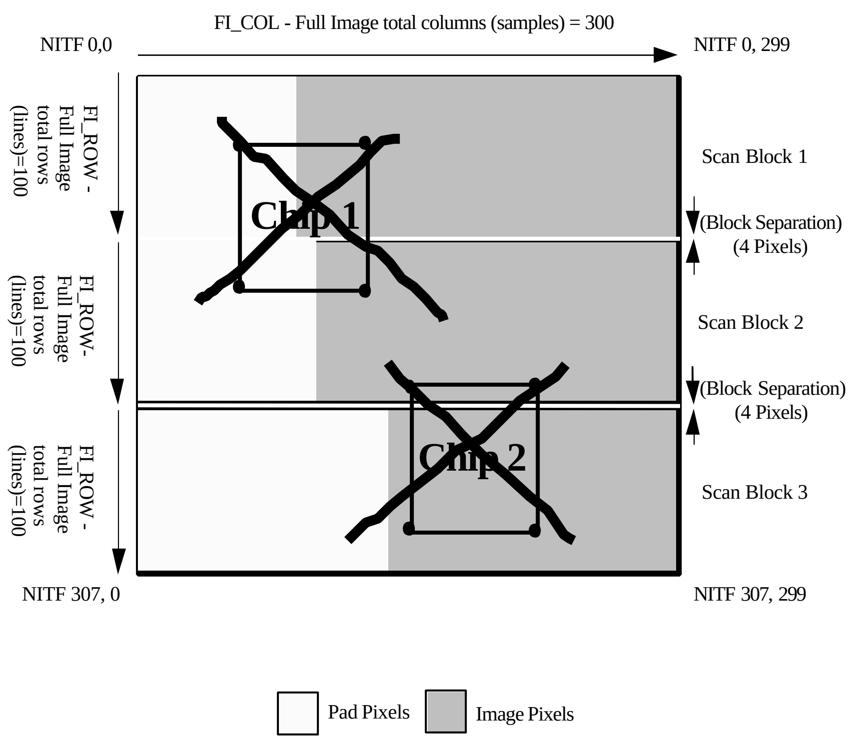
Pt (1,1)	OP_ROW_11:	00000000.500	FI_ROW_11:	00000004.500
	OP_COL_11:	00000024.500	FI_COL_11:	00000094.500
Pt (1,2)	OP_ROW_12:	00000000.500	FI_ROW_12:	00000004.500
	OP_COL_12:	00000069.500	FI_COL_12:	00000139.500
Pt (2,1)	OP_ROW_21:	00000089.500	FI_ROW_21:	00000094.500
	OP_COL_21:	00000024.500	FI_COL_21:	00000094.500
Pt (2,2)	OP_ROW_22:	00000089.500	FI_ROW_22:	00000094.500
	OP_COL_22:	00000069.500	FI_COL_22:	00000139.500

ICHIPB Grid Corner Points - Chip 2

Pt (1,1)	OP_ROW_11:	00000000.500	FI_ROW_11:	00000004.500
	OP_COL_11:	00000000.500	FI_COL_11:	00000149.500
Pt (1,2)	OP_ROW_12:	00000000.500	FI_ROW_12:	00000004.500
	OP_COL_12:	00000069.500	FI_COL_12:	00000219.500
Pt (2,1)	OP_ROW_21:	00000089.500	FI_ROW_21:	00000094.500
	OP_COL_21:	00000000.500	FI_COL_21:	00000149.500

Pt (2,2) OP_ROW_22: 00000089.500 FI_ROW_22: 00000094.500
OP_COL_22: 00000069.500 FI_COL_22: 00000219.500

Cutting chips across scan blocks is highly discouraged at this time because of the complications that may arise from the independent support data that exists for each scan block. Since only one set of support data can be referred to via the ICHIPB's SCANBLK_NUM, coverage for the entire chip will not be possible and errors or incorrect values may result when attempting geographical point positioning or performing other measurements in the other areas represented by the "uncovered" scan blocks. Accordingly, chips resembling those in the following examples should be avoided.



Chipped Output Product - Multiple Scan Blocks - Discouraged Practices

Figure C1-2. Chipped Output Product - Multiple Scan Blocks - Discouraged Practices