```
DDDD    PPPP    DDDD            TTTTT   M   M
D   D   P   P   D   D             T     MM MM
D   D   PPPP    D   D    ---      T     M M M
D   D   P       D   D             T     M   M
DDDD    P       DDDD             T      M   M


 #  #   77777   888              000      1     5555   DDDD
#####       7   8   8       0   0    11     5        D    D
 #  #       7   888     ---  0   0    1     555      D    D
#####       7   8   8        0   0    1          5   D    D
 #  #       7   888           000    111    555       DDDD
```

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Approval: *E. Shaw 21March 79.*

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Format Specifications for SEASAT SAR Image CCT

TABLE OF CONTENTS

Format Specifications for SEASAT SAR Image CCT

1.   INTRODUCTION

This document contains a description of the digital
SEASAT-1 SAR image product followed by a definition of
the universal Johnson Space Center (JSC) CCT format tailored
to this particular product. This document contains all the
information required by the user to read the CCTs and to
interpret their contents.

The SEASAT-1 SAR image CCT is referred in this document
as the SEASAT image CCT and should not be confused with the
SEASAT-1 SAR signal CCT which is used as input to the SEASAT-1
SAR processor.

In the SEASAT image CCT format definition, one of the JSC
format rules has been relaxed in order to allow for a full image
line in one single record. As a consequence the CCT maximum rec-
ord size is 8100 8-bit bytes.

The same basic CCT format structure can be used for either
azimuth line imagery CCT or range line imagery CCT. However,
some of the actual parameters which are specified here are
applicable to the azimuth line imagery only. Consequently,
the scope of this document is limited to the azimuth line format
only.

Format Specifications for SEASAT SAR Image CCT

2.   SEASAT-1 SAR IMAGERY

The SEASAT-1 SAR image is framed over a 48.0 Km x 42.6 Km maximum
area. A nominal image is composed of 3840 azimuth lines where
each line has 3408 pixels. The spatial pixel size is 12.5 m x
12.5 m. This amounts to 3 processing blocks in azimuth and 2
processing blocks in range. On a CCT each image consists of a
maximum of 4376 azimuth lines where each line contains 3960
16-bit pixels.

The imagery has been corrected for earth rotation and usually for
slant range to ground range distortion. In order to obtain an image
composed of range lines a 'corner-turning' operation has to be
performed on the data.

For the SEASAT image CCT the time is expressed as GMT and it
refers to the zero Doppler time of the point target, (i.e.:
when the distance between a point target and the satellite
radar is minimum).

Format Specifications for SEASAT SAR Image CCT

3.   SEASAT IMAGE CCT FORMAT

The SEASAT image CCT consists of three files
stored on a 9-track tape recorded at 1600 bpi:

- universal header file,

- SEASAT image header file,

- SEASAT image data file.

A SEASAT image CCT would require some 2200 feet of magnetic
tape at 1600 bpi, (assuming an inter-record gap of 0.75").

3.1   UNIVERSAL HEADER FILE

The universal JSC header file consists of a single record
containing general information about the mission, the sensor
parameters, and the format of the CCT.   The record size is 3060
bytes long.   Its content is either in EBCDIC or in
binary where binary data is right-justified.   The format of the
universal header record is given below.   When double-byte
data is recorded on tape the high-order byte is always
recorded first.

In the early versions of the SAR processor software there are
fields in the universal header whose contents could be zero or
blank without causing major problems to the users.   The fields
which are mandatory are marked by ´+´ or ´*´ where

> ´+´ indicates that field content is required for CCT data
> specification;

> ´*´ indicates that field content is required for CCT format
> specification.

Some of the fields are extracted from the SEASAT SAR signal
CCT universal header file which is described in Appendix A.

Format Specifications for SEASAT SAR Image CCT

Byte no.	Description	Type	No. of bytes
1- 32+	Computing System ID. for SEASAT image CCT this will be : "MDA, INTERDATA, SAR PROCESSOR"	EBCDIC	32
33- 52	Library ID. of master tape for SEASAT image CCT this will be provided by the operator	EBCDIC	20
53- 60+	Sensor ID. for SEASAT image CCT this will be "SS-1 SAR"	EBCDIC	8
61- 63+	Master tape generation date		
	Day	BINARY	1
	Month	BINARY	1
	Year(last two digits)	BINARY	1
	for SEASAT image CCT these will be generated internally		
64*	Tape sequence ID. for SEASAT image CCT this will be 1	BINARY	1
65- 66+	Mission number for SEASAT image CCT this will be 41	BINARY	2
67- 68	Site number, (frame) for SEASAT image CCT this will be 0, (unused)	BINARY	2
69	Line number, (track) for SEASAT image CCT this will be 0, (unused)	BINARY	1
70	Run number, (cycle) for SEASAT image CCT this will be 0, (unused)	BINARY	1
71- 72+	Orbit number for SEASAT image CCT this will be extracted from SAR signal CCT or provided by the operator	BINARY	2

Format Specifications for SEASAT SAR Image CCT

Byte no.	Description	Type	No. of bytes
73- 80	G.M. Time of first scan line,		
	73-74 Tens of milliseconds	BINARY	2
	75 Seconds	BINARY	1
	76 Minutes	BINARY	1
	77 Hours	BINARY	1
	78 Day of Month	BINARY	1
	79 Month of Year	BINARY	1
	80 Year(last two digits)	BINARY	1
	for SEASAT image CCT these will be 0, (unused)		
81- 88+	Channels active on this CCT it can accommodate up to 64 channels, 1 bit per channel from left to right for SEASAT image CCT these will be: 81: 128 82-88: 0	BINARY	8
89+	Processing flag for SEASAT image CCT this will be 1	BINARY	1
90*	Number of channels on this tape for SEASAT image CCT this will be 1	BINARY	1
91*	Number of bits per picture element for SEASAT image CCT this will be 16	BINARY	1
92- 93*	Byte location of start of effective video data within a scan line for SEASAT image CCT this will be 1	BINARY	2
94- 95*	Byte location of start of first calibration area within a scan line for SEASAT image CCT this will be 0	BINARY	2
96- 97*	Number of video elements per scan within a single channel for SEASAT image CCT this will be 3960	BINARY	2
98- 99*	Number of calibration elements in the first calibration area within the	BINARY	2

Format Specifications for SEASAT SAR Image CCT

Byte no.	Description	Type	No. of bytes
	scan in a single channel for SEASAT image CCT this will be 0		
100- 101*	Physical record size in bytes for SEASAT image CCT this will be 8100.	BINARY	2
102*	Number of channels per physical record, excluding first record for SEASAT image CCT this will be 0	BINARY	1
103*	Number of physical records per scan per channel for SEASAT image CCT this will be 1	BINARY	1
104*	Number of physical records to make a complete data set for SEASAT image CCT this will be 1	BINARY	1
105- 106*	Number of bytes of ancillary data included in each data set for SEASAT image CCT this will be 178	BINARY	2
107*	Data order indicator 0 = video ordered by band 1 = video ordered by pixel for SEASAT image CCT this will be 0	BINARY	1
108- 109*	Start pixel number referenced to the original SEASAT image, for SEASAT image CCT this will be 1	BINARY	2
110- 111*	Stop pixel number referenced to the original SEASAT image, for SEASAT image CCT this will be 3960	BINARY	2
112- 239	A0 Coefficient (2-bytes per channel) for SEASAT image CCT this will be 0, (unused)	BINARY	128

Format Specifications for SEASAT SAR Image CCT

Byte no.	Description	Type	No. of bytes
240- 367	E0 Exponent (2-bytes per channel) for SEASAT image CCT this will be 0, (unused)	BINARY	128
368- 495	Al Coefficient (2-bytes per channel) for SEASAT image CCT this will be 0, (unused)	BINARY	128
496- 623	El Exponent (2-bytes per channel) for SEASAT image CCT this will be 0, (unused)	BINARY	128
624- 687	Colour code data (1-byte per channel) 　　　　0 - not active 　　　　1 - red 　　　　2 - green 　　　　3 - blue for SEASAT image CCT this will be 0, (unused)	BINARY	64
688	Offset value. Used with gain values bytes 689-750 for SEASAT image CCT this will be 0, (unused)	BINARY	1
689- 750	Gain values. To be applied to signal levels from channels 1-62 for linear combination for SEASAT image CCT this will be 0, (unused)	BINARY	62
751*	Picture element field width. Smallest multiple of 8 which equals or is greater than the number of bits in a pixel. for SEASAT image CCT this will be 16	BINARY	1
752*	Pixel registration. Number of bits that LSB of pixel is displaced from LSB of pixel field. Zero if pixel size equals picture element field width. for SEASAT image CCT this will be 0	BINARY	1
753*	Word size of generating computer for SEASAT image CCT this will be 32	BINARY	1
754-1777+	Wavelength of each channel 8 bytes	EBCDIC	1024

Format Specifications for SEASAT SAR Image CCT

Byte no.	Description	Type	No. of bytes
	per limit, 16 bytes per channel (in millimicrons), for SEASAT image CCT this will be 754- 769: 0000000235130000 770-1777: zeros		
1778*	Number of data sets per physical record for SEASAT image CCT this will be 1	BINARY	1
1779-1780*	Byte address of start of second cali-bration within scan for SEASAT image CCT this will be 0	BINARY	2
1781-1782*	Number of calibration elements in the second calibration area within scan of single channel for SEASAT image CCT this will be 0	BINARY	2
1783	Calibration source indicator LSB =second source cal. area LSB+1=first cal. area 0 = low cal.source data present 1 = high cal. source data for SEASAT image CCT this will be 0	BINARY	1
1784*	File skip flag for SEASAT image CCT this will be 2	BINARY	1
1785-1786*	Number of bands in the first phy-sical record of data set for SEASAT image CCT this will be 1	BINARY	2
1787-1788*	Total number of bytes per scan per channel for SEASAT image CCT this will be 7920	BINARY	2
1789-1790+	Pixel skip factor for SEASAT image CCT this will be 1	BINARY	2
1791-1792+	Scan skip factor for SEASAT image CCT this	BINARY	2

Format Specifications for SEASAT SAR Image CCT

Byte no.	Description	Type	No. of bytes
	will be 1		
1793	High frequency filter number range (1-36) by PDP. for SEASAT image CCT this will be 0, (unused)	BINARY	1
1794	Spectral band filtered by this filter 1 bit per band MSB to LSB = band 8 to band 1 in order by PDP for SEASAT image CCT this will be 0, (unused)	BINARY	1
1795	High frequency filter number range (1-36) by CYBER at JSC. for SEASAT image CCT this will be 0, (unused)	BINARY	1
1796	Spectral band filtered by this filter 1 bit per band MSB to LSB = band 8 to band 1 in order by CYBER at JSC for SEASAT image CCT this will be 0, (unused)	BINARY	1
1797-2488	General information - reserved, for SEASAT image CCT these will be blank	EBCDIC	692
2489-2496+	Latitude of pixel 1 of scan line 1 in degrees, (III.FFFF) for SEASAT image CCT this will be generated internally	EBCDIC	8
2497-2504+	Longitude of pixel 1 of scan line 1 in degrees, (III.FFFF) for SEASAT image CCT these will be generated internally	EBCDIC	8
2505-2512	Latitude scale factor in degrees/pixel, (I.FFFFFF) for SEASAT image CCT these will be blank, (unused)	EBCDIC	8
2513-2520	Longitude scale factor in degrees/pixel, (I.FFFFFF) for SEASAT image CCT these will be blank, (unused)	EBCDIC	8

Format Specifications for SEASAT SAR Image CCT

Byte no.	Description	Type	No. of bytes
2521-2528+	Pixel width (azimuth) in metres, for SEASAT image CCT this will be generated internally, (III.FFFF)	EBCDIC	8
2529-2536+	Pixel length (range) in metres, for SEASAT image CCT this will be generated internally, (III.FFFF)	EBCDIC	8
2537-2753	Fill blanks for SEASAT image CCT these will be blank, (unused)	EBCDIC	217
2754*	Number of auxiliary files between JSC header file and imagery file for SEASAT image CCT this will be 1	BINARY	1
2755-2756*	Start scan line number referenced to the original SEASAT image, for SEASAT image CCT this will be 1	BINARY	2
2757-2758*	Stop scan line maximum number referenced to the original SEASAT image, for SEASAT image CCT this will be 4376	BINARY	2
2759*	'n' - Thousand scan lines per frame for SEASAT image CCT this will be 4	BINARY	1
2760-2789+	SEASAT-1 SAR image annotation data eg: S 17 09 78 Year (2) Month (2) Day (2) Satellite station (1): 'S' for SEASAT image CCT this will be generated internally or provided by the operator	EBCDIC	30
2790-2792	Altitude in metres for SEASAT image CCT this will be generated internally, (nominal)	BINARY	3

Format Specifications for SEASAT SAR Image CCT

Byte no.	Description	Type	No. of bytes
2793-2794	Ground speed in metres/seconds for SEASAT image CCT this will be generated internally, (nominal)	BINARY	2
2795	Scan type: 0 = linear, 1 = smoothed for SEASAT image CCT this will be 0 (unused)	BINARY	1
2796	Angle of arc in degrees for SEASAT image CCT this will be 0 (unused)	BINARY	1
2797	Camera : 0 = 70mm 1 = 127mm (5 inch) 2 = 240mm (9.5 inch) 255 = no camera for SEASAT image CCT this will be 255	BINARY	1
2798	Input device : 0 = CCT 1 = HDT for SEASAT image CCT this will be 0	BINARY	1
2799	Truncation : 0 = 2 low order bits 1 = 2 high order bits 2 = no truncation for SEASAT image CCT this will be 2	BINARY	1
2800-2807+	Channel requested, one bit per channel for SEASAT image CCT this will be 2800: 128 2801-2807: 0	BINARY	8
2808	Processing mode : 0 = serially 1 = concurently for SEASAT image CCT this will be 0 (unused)	BINARY	1
2809-2873	Overlay image factors for SEASAT image CCT these will be 0, (unused)	BINARY	65
2874	Color select : 0 = no color 1 = assigned color 2 = false color	BINARY	1

Format Specifications for SEASAT SAR Image CCT

Format Specifications for SEASAT SAR Image CCT

Byte no.	Description	Type	No. of bytes
	for SEASAT image CCT this will be 0		
2875	Image format : 0 = single image 1 = overlay image 2 = abut image 3 = offset image for SEASAT image CCT this will be 2	BINARY	1
2876+	Repeat of pixels per scan 0 = none n = n-repeat for SEASAT image CCT this will be 0	BINARY	1
2877+	Repeat of scan 0 = none n = n-repeats for SEASAT image CCT this will be 0	BINARY	1
2878-2881	Partial scan 2878-2879 = from pixel number 2880-2881 = to pixel number for SEASAT image CCT this will be 0 (unused)	BINARY	4
2882-2883+	Sensor scan rate in scans/second, (PRF) for SEASAT image CCT this will be generated internally	BINARY	2
2884*	Pixel size in bytes for SEASAT image CCT this will be 2	BINARY	1
2885-2886	Angle of drift (earth rotation) in degrees 2885 = sign-magnitude integer 2886 = fraction for SEASAT image CCT this will be generated internally	BINARY	2
2887-2894+	Zero Doppler time (GMT) for the start of the SAR image: 2887-2890 millisec. of day 2891-2892 day of year	BINARY BINARY	4 2

Format Specifications for SEASAT SAR Image CCT

Byte no.	Description	Type	No. of bytes
	2893-2894 year (last 2 digits) for SEASAT image CCT this will be generated internally	BINARY	2
2895-2898+	Spacecraft real track heading 2895-2896: degrees, (sign+magnitude) 2897-2898: minutes for SEASAT image CCT this will be generated internally	BINARY	4
2899-2904+	Image frame centre latitude 2899-2900: degrees, (positive North and negative South) 2901-2902: minutes 2903-2904: seconds for SEASAT image CCT this will be generated internally	BINARY	6
2905-2910+	Image frame centre longitude 2905-2906: degrees, (positive East) 2907-2908: minutes 2909-2910: seconds for SEASAT image CCT this will be generated internally	BINARY	6
2911-2940	Fill zeros for SEASAT image CCT these will be 0	BINARY	46
2941-3000	Fill blanks for SEASAT image CCT these will be blank	EBCDIC	60
3001-3060	Fill zeros for SEASAT image CCT these will be 0	BINARY	60

Format Specifications for SEASAT SAR Image CCT

3.2   SEASAT IMAGE HEADER FILE

The SEASAT image header file consists of 223 records:

- one SEASAT header record,
- one SEASAT definitive orbit record,
- one SEASAT definitive attitude record,
- 220 range line ancillary records.

These records provide annotation and ancillary information
at the global image and at the range line level.
The SEASAT image header file is recorded in ASCII.

3.2.1   SEASAT HEADER RECORD

This record consists of 1440 bytes which can be reproduced
as 18 lines of alphanumeric information where each line has
10 numerical characters followed by 70 alphanumeric characters.

n0...n9	CCRS/SCSS/SAR PROCESSOR	CCT/SSSC/PROCESSEUR RAS
n0...n9	SEASAT	SEASAT
n0...n9	DAY NUMBER SINCE LAUNCH	JOURS DEPUIS LE LANCEMENT
n0...n9	ORBIT NUMBER	NUMERO DE L'ORBITE
n0...n9	FRAME ID	IDENTIFICATION DU CADRE
n0...n9	CENTRE LATITUDE (DDDMM)	LATITUDE DU CENTRE (DDDMM)
n0...n9	CENTRE LONGITUDE (DDDMM)	LONGITUDE DU CENTRE (DDDMM)
n0...n9	UTM ZONE NUMBER	NUMERO DE LA ZONE UTM
n0...n9	TRACK NUMBER	NUMERO DE LA TRAJECTOIRE
n0...n9	FRAME NUMBER	NUMERO DU CADRE
n0...n9	CYCLE NUMBER	NUMERO DU CYCLE
n0...n9	FRAME IMAGED (DDMMMYY)	CADRE ENREGISTRE (JJMMMAA)
n0...n9	SAR SIGNAL CCT GENERATED	BANDE DE SIGNAUX RAS CREE
n0...n9	SEASAT IMAGE CCT GENERATED	BANDE SEASAT CREE
n0...n9	SATELLITE HEADING (DDDMM)	CAP DU SATELLITE (DDDMM)
n0...n9	CCT SEQUENTIAL NUMBER	NUMERO SEQUENTIEL DE LA BANDE
n0...n9	CCT START TIME	TEMPS AU DEBUT DE LA BANDE
n0...n9	PROCESS FLAGS	INDICATEURS DU TRAITEMENT

Line 1: Production system identification.
This is in the form of 100 * (receiving station code) +
(processing centre code) where:
        1 = NASA, GSFC
        2 = NASA, JSC
        3 = EDC

Format Specifications for SEASAT SAR Image CCT

```
        4 = CCRS, OTTAWA
        5 = CCRS, PASS
        6 = CCRS, SCSS
        7 = CCRS, West Coast
```

Line 2: Mission.
The SEASAT mission is:
```
        41 = SEASAT-1
```

Line 3: Number of days since launch.
(unused)

Line 4: Orbit number.
This refers to the orbit number of the original SEASAT data.
It is defined in terms of the number of orbits since launch.

Line 5: Frame identification.
(unused)

Line 6: Frame centre latitude.
This refers to the latitude of the SEASAT frame centre
given in degrees and minutes, (DDDMM).

Line 7: Frame centre longitude.
This refers to the longitude of the SEASAT frame centre
given in degrees and minutes, (DDDMM).

Line 8: UTM zone number.
(unused)

Line 9: Track number.
(unused)

Line 10: Frame number.
(unused)

Line 11: Cycle number.
(unused)

Line 12: Date of frame acquisition.
This refers to the date of the SEASAT data acquisition
expressed in days, months, years, (DDMMYY).

Line 13: Date of SAR signal CCT.
This refers to the date when the CCT containing the
SEASAT SAR signal data was created, (DDMMYY).

Line 14: Date of SEASAT image CCT.

Format Specifications for SEASAT SAR Image CCT

This refers to the date when the SEASAT image master CCT was
created, (DDMMYY).

Line 15: Satellite heading.
This refers to the heading of the SEASAT satellite at the centre
of the frame in degrees and minutes, (DDDMM).

Line 16: Sequential number of CCT.
This is always 1 for 1600-bpi CCTs.

Line 17: SEASAT image CCT start time.
This refers to the time in microseconds when the
SEASAT image CCT starts with respect to the beginning of
the standard SEASAT frame start time.

Line 18: Process flags.
From left to right, the ten flags are:

        flag 0   (undefined),

        flag 1   geometric correction
                  0 for no geometric correction
                  1 for a priori system correction

        flag 2   resampling algorithm
                  0 for nearest neighbor
                  1 for cubic convolution

        flag 3   radiometric calibration
                  0 for no radiometric calibration
                  1 for radiometric calibration

        flag 4   radiometric resolution
                  1 for 256 quantum levels
                  9 for 65536 quantum levels

        flag 5   earth rotation correction
                  0 for no earth rotation correction
                  1 for earth rotation correction

        flag 6   slant range to ground range correction
                  0 for no correction
                  1 for correction

        flag 7   radiometric correction
                  0 for linear correction, (16 bits)
                  1 for compressed correction, (8 bits)

Format Specifications for SEASAT SAR Image CCT

flag 8   SEASAT image orientation
          0 for range lines
          1 for azimuth lines

flag 9   alphanumeric character code
          0 for EBCDIC
          1 for ASCII

For SEASAT image CCTs, the process flags are: 0X0091X011
where the X's are user specified options.

3.2.2   SEASAT DEFINITIVE ORBIT RECORD

The Definitive Orbit Record (DOR) contains an exact replica of the
DOR from the SAR signal CCT used in the first processing block.
In this way the DOR contains orbital data for the entire image and
is 720 bytes long, with ASCII format, (see Section 2.5.3 of Ref-
erence 1).

3.2.3   SEASAT DEFINITIVE ATTITUDE RECORD

The Definitive Attitude Record (DAR) contains an exact replica of
the DAR from the SAR signal CCT used in the first processing block.
Like the DOR, the DAR encompasses the entire image. It is 3240 bytes
long and in ASCII format, (see Section 2.5.3 of Reference 1).

3.2.4   RANGE LINE ANCILLARY RECORDS

The range line ancillary records consist of 3960 sets of orbit pos-
ition data, each set corresponding to a unique azimuth pixel on the
SEASAT image CCT.   Since the number of separate range lines on the
SEASAT image CCT is a function of effective yaw of the satellite,
maximum allowance of 360 extra range lines over the maximum number
of range lines in 3 azimuth processing blocks (3600) yields the
indicated 3960 sets of position data.   Each position data set
contains sufficient position data processed from the contents of
the DOR to uniquely determine the earth centre rotating (ECR)
coordinates or time code marks for imaging each pixel in the line,
for both slant range and ground range presentations of the image data
in the image data file.   The formulas for this purpose are described
in Section 3.3.4 of Reference 2.

These consist of 220 records 3960 bytes long written in ASCII.
Each record contains the parameters for 18 range lines in the foll-

Format Specifications for SEASAT SAR Image CCT

owing format:

18(2I4,5D22.15,3E14.6,2D22.15,I2,7I2)

where the definition of each field is:

Field 1:	Range line number,	I4	4 bytes
Field 2:	Day of year,	I4	4 bytes
Field 3:	Seconds of day,	D22.15	22 bytes
Field 4:	Slant range of first range point	D22.15	22 bytes
Field 5:	Satellite Orbit Radius, (H)	D22.15	22 bytes
Field 6:	Satellite ECR polar angle, (PHI)	D22.15	22 bytes
Field 7:	Satellite ECR azimuth angle, (THETA)	D22.15	22 bytes
Field 8:	Associated Heading angle, (PSI)	E14.6	14 bytes
Field 9:	dH/dT	E14.6	14 bytes
Field 10:	Rotating frequency, (W1)	E14.6	14 bytes
Field 11:	Earth radius, (Re), (unused)	D22.15	22 bytes
Field 12:	Real track heading, (HEAD)	D22.15	22 bytes
Field 13:	SAR pointing flag	I2	2 bytes
Field 14:	Zero fill	I2	2 bytes
Field 15:	Zero fill	I2	2 bytes
Field 16:	Zero fill	I2	2 bytes
Field 17:	Zero fill	I2	2 bytes
Field 18:	Zero fill	I2	2 bytes
Field 19:	Zero fill	I2	2 bytes
Field 20:	Zero fill	I2	2 bytes

Format Specifications for SEASAT SAR Image CCT

3.3   SEASAT IMAGE DATA FILE

The SEASAT image data file contains the SEASAT SAR image data
and the azimuth line dependent ancillary information. The file
consists of a maximum of 4376 data sets where a data set contains
all the data relative to one azimuth line. A data set is recorded
as one physical record. For each data set the data organization is:

Record 1   Byte 1-2   cyclic counter, content = 1
                  Byte 3-180   ancillary data block
                  Byte 181-8100   imagery data block

In the following two sections byte numbers refers to the ordering
within the respective data block and does not include the
absolute block offset.

3.3.1   ANCILLARY DATA BLOCK

The ancillary data block is 178 bytes long and it contains the
binary ancillary data for one azimuth line, (azimuth line CCT).
The following describes the content of the ancillary data block.

Byte 1-4   Time in GMT.
This refers to the time at the start of the image line in tens
of milliseconds. (For azimuth line this field is not used.)

Byte 5-68   Channel status indicator.
Byte 1 indicates status for band 1,
where 0 indicates that image data exist for current channel and
1 indicates that no-image data (zeros) exist for current channel.

Byte 69-70   Azimuth line number.
This is the azimuth line or data set number of each line of
imagery. The first line is 1.

Byte 71-74   Latitude at centre of azimuth line.
(unused)

Byte 75-78   Longitude at centre of azimuth line
(unused)

Byte 79-104   Zeros, (undefined).

Byte 105-106   Data start position.
This is the first non-zero pixel referenced to the first pixel
of the current azimuth line. If no zero pixel then the value is 1.

Format Specifications for SEASAT SAR Image CCT

Byte 107-108   Data stop position.
This is the last non-zero pixel referenced to the first pixel of
the current azimuth line.

Byte 109-111   Number of pixels per azimuth line.
This is the number of non-zero pixels per azimuth line.

Byte 112   Zero, (undefined).

Byte 113-114   Zero pad counter.

Byte 115-116   Slant range/ground range flag.

Byte 117-120   Range increment to next line.

Byte 121-178   Zeros, (undefined).

3.3.2   IMAGERY DATA BLOCK

Each imagery data block is 7920 bytes long.   It contains the image
information for one azimuth line.   The number of non-zero pixels
per line is less or equal to 3960.   Zero pixels are added at the start
of each azimuth line for purpose of azimuth registration, padding
zeros are added to the end of each line in order to maintain the
data block size constant.

Each pixel consists of two bytes with the higher order byte
to the left of the low order byte: H7H6H5H4H3H2H1H0L7L6L5L4L3L2L1L0.
According to the JSC format the high order byte is recorded first
on the CCT. This is the standard order followed by most systems
except the PDP-11 computers where the low order byte is recorded
first on the magnetic medium. As a consequence PDP-11 users of
SEASAT image CCTs will have to swap bytes internally in memory
on a pixel basis after reading or before writing a SEASAT
image CCT. On the input, this operation can be ignored
when only one of the two bytes needs to be accessed as part
of the user process.

Appendix A - SEASAT SAR Signal CCT Universal Header File

The universal header file of the SEASAT SAR signal CCT consists
of one record: the universal header record which is 3060 bytes
long. It should be noticed that the universal header files of the
SEASAT SAR image CCT and SEASAT SAR signal CCT have basically the
same format but the contents of most fields are different. A
complete specification of the SEASAT SAR signal CCT is given in
Reference 1.

The SEASAT SAR signal CCT contains a pseudo-image consisting
of range lines signal data. Consequently, terms such as video,
pixel, scan line refer to the pseudo-image.

The parameters defined here are applicable to CCTs at 1600 bpi or
at 6250 bpi.

Appendix A - SEASAT SAR Signal CCT Universal Header File

Byte no.	Description	Type	No. of bytes
1- 32+	Computing System ID. for SEASAT SAR signal CCT this will be : "CCRS/EMR CANADA, SEASAT-PERGS"	EBCDIC	32
33- 52	Library ID. of master tape for SEASAT SAR signal CCT this will be provided by the operator	EBCDIC	20
53- 60+	Sensor ID. for SEASAT SAR signal CCT this will be "SS-1 SAR"	EBCDIC	8
61- 63+	Master tape generation date		
	Day	BINARY	1
	Month	BINARY	1
	Year(last two digits)	BINARY	1
	for SEASAT SAR signal these will be generated internally		
64*	Tape sequence ID. for SEASAT SAR signal CCT this will be generated internally	BINARY	1
65- 66+	Mission number for SEASAT SAR signal CCT this will be 41	BINARY	2
67- 68	Site number, (frame) for SEASAT SAR signal CCT this will be 0, (unused)	BINARY	2
69	Line number, (track) for SEASAT SAR signal CCT this will be 0, (unused)	BINARY	1
70	Run number, (cycle) for SEASAT SAR signal CCT this will be 0, (unused)	BINARY	1
71- 72+	Orbit number for SEASAT SAR signal CCT this will be generated internally	BINARY	2
73- 80+	Time of first scan (range) line of the SEASAT SAR signal CCT: 73-74 Tens of milliseconds	BINARY	2

Appendix A - SEASAT SAR Signal CCT Universal Header File

Byte no.	Description	Type	No. of bytes
	75 Seconds	BINARY	1
	76 Minutes	BINARY	1
	77 Hours	BINARY	1
	78 Day of Month	BINARY	1
	79 Month of Year	BINARY	1
	80 Year(last two digits)	BINARY	1
	for SEASAT SAR signal these will be generated internally		
81- 88+	Channels active on this CCT it can accommodate up to 64 channels, 1 bit per channel from left to right for SEASAT SAR signal these will be: 81: 128 81-88: 0	BINARY	8
89+	Processing flag for SEASAT SAR signal CCT this will be 0	BINARY	1
90*	Number of channels on this tape for SEASAT SAR signal CCT this will be 1	BINARY	1
91*	Number of bits per picture element for SEASAT SAR signal CCT this will be 5	BINARY	1
92- 93*	Byte location of start of effective video data within a scan (range) line for SEASAT SAR signal CCT this will be 1	BINARY	2
94- 95*	Byte location of start of first cal-ibration area within a scan (range) line for SEASAT SAR signal CCT this will be 0	BINARY	2
96- 97*	Number of video elements per scan (range) line within a single channel for SEASAT SAR signal CCT this will be 13680	BINARY	2
98- 99*	Number of calibration elements in the first calibration area within the scan (range) line in a single channel for SEASAT SAR signal CCT this	BINARY	2

Appendix A - SEASAT SAR Signal CCT Universal Header File

Byte no.	Description	Type	No. of bytes
	will be 0		
100- 101*	Physical record size in bytes for SEASAT SAR signal CCT this will be 9360.	BINARY	2
102*	Number of channels per physical record, excluding first record for SEASAT SAR signal CCT this will be 0	BINARY	1
103*	Number of physical records per scan (range) line per channel for SEASAT SAR signal CCT this will be 1	BINARY	1
104*	Number of physical records to make a complete data set for SEASAT SAR signal CCT this will be 1	BINARY	1
105- 106*	Number of bytes of ancillary data included in each data set for SEASAT SAR signal CCT this will be 178	BINARY	2
107*	Data order indicator 0 = video ordered by band 1 = video ordered by pixel for SEASAT SAR signal CCT this will be 0	BINARY	1
108- 109*	Start pixel number referenced to the original SEASAT pseudo-image, for SEASAT SAR signal CCT this will be 1	BINARY	2
110- 111*	Stop pixel number referenced to the original SEASAT pseudo-image, for SEASAT SAR signal CCT this will be 13680	BINARY	2
112- 239	A0 Coefficient (2-bytes per channel) for SEASAT SAR signal CCT this will be 0, (unused)	BINARY	128
240- 367	E0 Exponent (2-bytes per channel) for SEASAT SAR signal CCT this	BINARY	128

Appendix A - SEASAT SAR Signal CCT Universal Header File

Byte no.	Description	Type	No. of bytes
	will be 0, (unused)		
368- 495	A1 Coefficient (2-bytes per channel) for SEASAT SAR signal CCT this will be 0, (unused)	BINARY	128
496- 623	E1 Exponent (2-bytes per channel) for SEASAT SAR signal CCT this will be 0, (unused)	BINARY	128
624- 687	Colour code data (1-byte per channel) 0 - not active 1 - red 2 - green 3 - blue for SEASAT SAR signal CCT this will be 0, (unused)	BINARY	64
688	Offset value. Used with gain values bytes 689-750 for SEASAT SAR signal CCT this will be 0, (unused)	BINARY	1
689- 750	Gain values. To be applied to signal levels from channels 1-62 for linear combination for SEASAT SAR signal CCT this will be 0, (unused)	BINARY	62
751*	Picture element field width. Smallest multiple of 8 which equals or is greater than the number of bits in a pixel. for SEASAT SAR signal CCT this will be 8	BINARY	1
752*	Pixel registration. Number of bits that LSB of pixel is displaced from LSB of pixel field. Zero if pixel size equals picture element field width. for SEASAT SAR signal CCT this will be 0	BINARY	1
753*	Word size of generating computer for SEASAT SAR signal CCT this will be 32	BINARY	1
754-1777	Wavelength of each channel 8 bytes	EBCDIC	1024

Appendix A - SEASAT SAR Signal CCT Universal Header File

Byte no.	Description	Type	No. of bytes
	per limit, 16 bytes per channel (in millimicrons), for SEASAT SAR signal CCT this will be: 754- 769: 0 000000235130000, 770-1777: zeros		
1778*	Number of data sets per physical record for SEASAT SAR signal CCT this will be 1	BINARY	1
1779-1780*	Byte address of start of second calibration within scan (range) line for SEASAT SAR signal CCT this will be 0	BINARY	2
1781-1782*	Number of calibration elements in the second calibration area within scan (range) line of single channel for SEASAT SAR signal CCT this will be 0	BINARY	2
1783	Calibration source indicator LSB =second source cal. area LSB+1=first cal. area 0 = low cal.source data present 1 = high cal. source data for SEASAT SAR signal CCT this will be 0	BINARY	1
1784*	File skip flag for SEASAT SAR signal CCT this will be 2	BINARY	1
1785-1786*	Number of bands in the first physical record of data set for SEASAT SAR signal CCT this will be 1	BINARY	2
1787-1788*	Total number of bytes per scan (range) line per channel for SEASAT SAR signal CCT this will be 9120	BINARY	2
1789-1790+	Pixel skip factor for SEASAT SAR signal CCT this will be 1	BINARY	2

Appendix A - SEASAT SAR Signal CCT Universal Header File

Byte no.	Description	Type	No. of bytes
1791-1792+	Scan skip factor for SEASAT SAR signal CCT this will be 1	BINARY	2
1793	High frequency filter number range (1-36) by PDP. for SEASAT SAR signal CCT this will be 0, (unused)	BINARY	1
1794	Spectral band filtered by this filter 1 bit per band MSB to LSB = band 8 to band 1 in order by PDP for SEASAT SAR signal CCT this will be 0, (unused)	BINARY	1
1795	High frequency filter number range (1-36) by CYBER at JSC. for SEASAT SAR signal CCT this will be 0, (unused)	BINARY	1
1796	Spectral band filtered by this filter 1 bit per band MSB to LSB = band 8 to band 1 in order by CYBER at JSC for SEASAT SAR signal CCT this will be 0, (unused)	BINARY	1
1797-2488	General information - reserved, for SEASAT SAR signal these will be blank	EBCDIC	692
2489-2496	Latitude of pixel 1 of scan line 1 in degrees, (III.FFFF) for SEASAT SAR signal CCT this will be 0, (unused)	EBCDIC	8
2497-2504	Longitude of pixel 1 of scan line 1 in degrees, (III.FFFF) for SEASAT SAR signal this will be 0, (unused)	EBCDIC	8
2505-2512	Latitude scale factor in degrees/pixel, (I.FFFFFF) for SEASAT SAR signal this will be 0, (unused)	EBCDIC	8
2513-2520	Longitude scale factor in degrees/pixel, (I.FFFFFF)	EBCDIC	8

Appendix A – SEASAT SAR Signal CCT Universal Header File

Byte no.	Description	Type	No. of bytes
	for SEASAT SAR signal this will be 0, (unused)		
2521-2753	Fill blanks for SEASAT SAR signal these will be blank	EBCDIC	233
2754*	Number of auxiliary files between JSC header file and imagery file for SEASAT SAR signal CCT this will be 1	BINARY	1
2755-2756*	Start scan line number referenced to the original SEASAT pseudo-image, for SEASAT SAR signal CCT this will be generated internally	BINARY	2
2757-2758*	Stop scan line number referenced to the original SEASAT pseudo-image, for SEASAT SAR signal CCT this will be generated internally	BINARY	2
2759*	'n' - Thousand scan lines per frame for SEASAT SAR signal CCT this will be generated internally: 4 at 1600 bpi, 12 at 6250 bpi.	BINARY	1
2760-2789+	SEASAT-1 SAR image annotation data eg: S 17 09 78	EBCDIC	30

$$
\begin{array}{l}
\text{Year (2)}\\
\text{Month (2)}\\
\text{Day (2)}\\
\text{Satellite station (1): 'S'}
\end{array}
$$

for SEASAT image CCT this
will be generated internally or
provided by the operator

Byte no.	Description	Type	No. of bytes
2790-2792	Altitude in metres for SEASAT SAR signal CCT this will be generated internally, (nominal)	BINARY	3
2793-2794	Ground speed in metres/seconds for SEASAT SAR signal CCT this will be generated internally, (nominal)	BINARY	2

Appendix A - SEASAT SAR Signal CCT Universal Header File

Byte no.	Description	Type	No. of bytes
2795	Scan type: 0 = linear, 1 = smoothed for SEASAT SAR signal CCT this will be 0, (unused)	BINARY	1
2796	Angle of arc in degrees for SEASAT SAR signal CCT this will be 0, (unused)	BINARY	1
2797	Camera : 0 = 70mm 1 = 127mm (5 inch) 2 = 240mm (9.5 inch) 255 = no camera for SEASAT SAR signal CCT this will be 255	BINARY	1
2798	Input device : 0 = CCT 1 = HDT for SEASAT SAR signal CCT this will be 1	BINARY	1
2799	Truncation : 0 = 2 low order bits 1 = 2 high order bits 2 = no truncation for SEASAT SAR signal CCT this will be 2	BINARY	1
2800-2807+	Channel requested, one bit per channel for SEASAT SAR signal CCT this will be 2800: 128 2801-2807: 0	BINARY	8
2808	Processing mode : 0 = serially 1 = concurently for SEASAT SAR signal CCT this will be 0 (unused)	BINARY	1
2809-2873	Overlay pseudo-image factors for SEASAT SAR signal these will be generated internally	BINARY	65
2874	Color select : 0 = no color 1 = assigned color 2 = false color for SEASAT SAR signal CCT this will be 0	BINARY	1

Appendix A - SEASAT SAR Signal CCT Universal Header File

Byte no.	Description	Type	No. of bytes
2875	Pseudo-image format : 0 = single image 1 = overlay image 2 = abut image 3 = offset image for SEASAT SAR signal CCT this will be 2	BINARY	1
2876+	Repeat of pixels per scan 0 = none n = n-repeat for SEASAT SAR signal CCT this will be 0	BINARY	1
2877+	Repeat of scan 0 = none n = n-repeats for SEASAT SAR signal CCT this will be 0	BINARY	1
2878-2881	Partial scan 2878-2879 = from pixel number 2880-2881 = to pixel number for SEASAT SAR signal CCT this will be 0, (unused)	BINARY	4
2882-2883+	Sensor scan rate in scans/second, (PRF) for SEASAT SAR signal CCT this will be generated internally	BINARY	2
2884*	Pixel size in bytes for SEASAT SAR signal CCT this will be 0	BINARY	1
2885-2886+	Angle of drift (earth rotation) in degrees: 2885 = sign magnitude integer 2886 = fraction for SEASAT SAR signal CCT this will be generated internally	BINARY	2
2887-2940	Fill zeros for SEASAT SAR signal these will be 0	BINARY	54
2941-3000	Fill blanks for SEASAT SAR signal these will be blank	EBCDIC	60

Appendix A - SEASAT SAR Signal CCT Universal Header File

Byte no.	Description	Type	No. of bytes
3001-3060	Fill zeros for SEASAT SAR signal these will be 0	BINARY	60

Format Specifications for SEASAT SAR Image CCT

REFERENCES

1.   Specification "SEASAT HDDT to CCT Tape Translation System",
        MDA, April 1978, (revised August 8,1978).

2.   "A Theoretical Foundation for the Design of a Ground Data
        Processor for a Satellite Borne Synthetic Aperture Radar",
        MDA, August 1977.

Format Specifications for SEASAT SAR Image CCT

END OF DOCUMENT,   F.E. GUERTIN 19/3/79 12:00:00

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*** This Document was Produced at 16:22:31 on 19-Mar-79
*** by "QUIKOF-10" Version:        CVF02
***   INput file:                 tm0015.doc
*** OUTput file:                  lpt:

*** Lines Read:                   1409
*** Pages Generated:              36
*** Elapsed Time:                 90.50 SECS
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