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<b>TIDI Data Processing Software</b>	CAGE No.	0TK63
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<b>Cross Talk Matrix File Format</b>	Project	TIDI
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REVISION RECORD

Rev	Description	Date	Author
<b>A</b>	• Add reference temperature to global attributes	27 Jan 2004	D. Gell
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## 1. References

1. Gell, David, "File Naming Convention Summary", SPRL File 055-3545, 3 Feb 1998
2. Russ Rew, Glen Davis, Steve Emmerson, and Harvey Davies, *NetCDF User's Guide for C, Version 3*, Unidata Program Center, June 1997

## 2. Introduction

The cross-talk matrix contains models the redistribution of light in the TIDI instrument due to scattering from ice contaminated surfaces in the instrument. The model consists of matrices determined by the analysis of in-flight normalization measurements. Two matrices are produced in each analysis, a forward model and an inverse model. For the inverse model each matrix element indicates the contribution of light in one channel due to light scattered from another. There may be a different matrix for each filter wheel configuration, for direction of flight and for different time periods.

This document describes the format of the files used to contain a cross talk matrix. Each file contains the matrices corresponding to one combination of time period, filter wheel configuration and direction of flight.

## 3. File Organization and Content

Cross talk matrices will be stored in NetCDF (ref 2) files. These files are organized as if they contained a series of arrays, one array for each data item. In addition to the data, a NetCDF file contains attributes. These attributes may be attached to a data item or they may be global, applying to the entire file. The global attributes for this file are specified in section 3.1.

Attributes attached to each data item will include units, long name (description), maximum valid value, minimum valid value and missing value, as appropriate. The attributes and their definitions are specified in Table 1. The values used for the attributes are specified in subsequent sections. However when using the NetCDF file data, it is best to obtain the missing value and range for each variable by reading the appropriate attribute, as that information is always reliable.

<i>attribute name</i>	<i>description</i>
<b>units</b>	a string containing the SI standard abbreviations for the units associated with the data item
<b>long_name</b>	a string containing a description of the data item, sufficiently detailed that a knowledgeable outsider can interpret the description
<b>valid_min</b>	the minimum value ever expected of the data item
<b>valid_max</b>	the maximum value ever expected of the data item
<b>missing_value</b>	a value either greater than valid_max or less than valid_min used to fill the data item in the absence of valid data. Missing values for variance quantities will be negative.

These files consist of two logical segments, a "header" consisting of the global attributes and the data records. The data consists of the two matrices resulting from the analysis of normalization measurements made in flight.

### 3.1 File Header

The global attributes which constitute the header of the line of sight file are listed in Table 2, below. The column labeled "Attribute Name" specifies the exact name to be used for the global attribute. The column labeled "Type" specifies whether the attribute is a character string, an integer number or a floating point number. In this column, items labeled Rev ID are a string consisting of a major revision number and a minor revision number separated by a decimal point. In the column labeled "Description", items in **bold courier** type are the exact constant value to be assigned to the attribute.

Table 2, Global Attributes		
<i>Attribute Name</i>	<i>Type</i>	<i>Description</i>
title	String	text description of the data file
data_product_type	String	<b>Calibration Data</b>
mission	String	<b>TIMED</b>
source	String	<b>TIDI_POC</b>
data_product_version	I2	Version of the data product contained in the file. The version is a three digit number starting at 001 and incremented each time the data file is regenerated. The Data Product Version may be incremented independently of the Product Format Version.
product_format_version	Rev ID	Version of the file format. The major format is incremented whenever the major software version number is incremented. The minor version number will be incremented whenever a variable is added or removed from the file format.
software_version	Rev ID	Major and Minor version numbers of the software used to produce the file. The major version number is incremented whenever there is a major change to the program that will likely affect the quality of the data product. The minor version number is incremented for bug fixes, interface changes or other changes that do not substantially change the quality of the data.
filter_wheel_config	I2	The filter wheel configuration to which the contents apply.
flight_direction	String	The direction of flight to which the data applies. <b>F</b> indicates forward flight and <b>B</b> indicates backwards flight. A blank indicates that the data applies equally to forward and reverse flight.
initial_date	I2	The initial date to which the data applies.
final_date	I2	The final date to which the data applies. If the period of applicability is open ended, the final_date will be 2099365.
ref_temperature	F4	Reference baseplate temperature in °C.
date_created	String	The date that the file was created, in the TIMED standard ASCII format with fractional seconds omitted.
filename	String	The name assigned to this file at the time of its creation.

### 3.2 Data Segment

The data segment contains the two arrays that constitute the forward and reverse model of the instrument scattering. The arrays are defined in the table below. In the table, the columns specify the attributes of the data item. The short name is to be used as the variable name for the data item. The description is the string to be used as the NetCDF `long_name` attribute. The units column specifies the string to be used as the NetCDF `units` attribute. The type column indicates the type of the variable, where I indicates a signed integer type, C a character type and F a floating point type. The suffix digit indicates the length. A short integer in this notation is I2 and a single precision floating point number is F4. Arrays are dimensioned as shown in the dimension column. The range column defines a range of valid values for each item. These values shall be used as the `valid_min` and `valid_max` NetCDF attributes. The value for the `missing_value` attribute shall be outside of the valid range and is indicated in parenthesis following the range.

In a netCDF file, the dimensions of an array are contained in named dimension variables. The dimension used for the matrices is `nchan`. The note to Table 3 defines these dimensions.

<b>Table 3, Data Variables</b>					
<i>short name</i>	<i>Description</i>	<i>units</i>	<i>type</i>	<i>dim.</i>	<i>range (missing)</i>
distr_matrix	The light distribution matrix	unitless	F4	255 <sup>†</sup> , 255 <sup>†</sup>	$ x  < 10^5$ (-9•10 <sup>5</sup> )
norm_matrix	The cross-talk removal matrix	unitless	F4	255 <sup>†</sup> , 255 <sup>†</sup>	$ x  < 10^5$ (-9•10 <sup>5</sup> )

<sup>†</sup>nchan: The number of spectral channels in the CCD readout.

### 4. Naming Convention

File names consist of a file description string and a file type string separated by the period "." character. TIDI cross talk matrix files have the file type ".XTK" and will be named according to the convention specified in reference 1.