McIDAS

Man computer Interactive Data Access System

SDI Operator's Manual

Preliminary Issue November 1997

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Preface

This manual provides installation and operating procedures for your SSEC Desktop Ingestor (SDI). The ingestor consists of a desktop PC with a pre-installed custom interface card and custom software for processing a specific type of satellite data. While the hardware is common to all current user satellite data streams as well as those currently under development, custom software is required for each data type.

Each SDI is ready for operation when it is shipped from SSEC. That is, it has custom software installed for ingesting a specific data type, and the SDI has been tested as a system. This simplifies the installation process to little more than installing a typical PC. Though many of the operating procedures are generic with respect to data type, a separate chapter containing complete procedures is provided for each data type.

How this Manual is Organized

This manual consists of these sections:

- Overview (Chapter 1)
- Installation and Initial Checkout (Chapter 2)
- Signal-specific procedures chapters (Chapters 3-*n*)
- appendices

Chapter 1 describes the ingest process and common file structures.

Chapter 2 provides environmental considerations, data and clock connections, power requirements and initial checkout procedures.

After you have read and complied with Chapters 1 and 2, go to the procedures chapter for the data type your ingestor has been configured for.

Each procedures chapter assumes you are familiar with data characteristics of the data type you want to ingest. Data-specific appendices are provided at the back of this manual to provide you with additional information.

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Chapter 1
SDI Overview

The SSEC Desktop Ingestor (SDI) takes a simple approach to satellite data ingesting. A fast PC plus a modified third party interface card receives clock and data from a bit sync. For high data rate satellites, such as GVAR and POES, the entire serial data stream is ingested into memory, blocked into 1 Mbyte files, and written to disk. These files are called Stretched Data Format (SDF) files. An independent program analyzes the SDF files to build index files to the information in the SDFs. Data access is handled by an ADDE server running on the ingest processor without interfering with the ingest process. For low data rate satellites, such as METEOSAT PDUS, image files are built directly as the data is received. The Image Files contain the raw satellite transmission aligned on byte boundaries with sync removed.

The advantages to these approaches are:

- No frame synchronizer or SAS (Satellite Acquisition System) is required. The frame synchronization is done in software.
- For the high data rate approach, SDF files usually use less disk space than area files; therefore, more data can be stored on-line.
- The SDI runs without operator intervention, i.e., it is a black box. After attaching the clock and data cables to the card and booting up the PC, data ingestion begins.
- The same hardware works for multiple satellite families; i.e., the same hardware that handles GVAR handles POES, Meteosat, etc. Only the software running in the black box varies.

This chapter is divided into the following sections:

- SDI Data Processing Overview
- SDI File Descriptions
- SDI Event Handling System

If you have questions, call the McIDAS Help Desk at (608) 262-2455.

SDI Data Processing Overview

Few meteorological satellites broadcast data directly to the user. Because of the satellite's complexity, the raw sensor data is usually downlinked to a ground station, which preprocesses and formats it into blocks. The data blocks are uplinked to a geostationary satellite (may be the originating satellite), which broadcasts the data to users.

Most meteorological satellites simultaneously scan a portion (sector) or all of the earth with several sensors having different spectral characteristics. Only the data from sensors having the same spectral characteristics can be used to generate a specific image. For example, a GVAR satellite's imager, provides data for generating several IR images and one visible image during a scan of a sector. To generate a visible image, only the visible spectrum data is used; to generate an IR image, only the data from a specific IR sensor is used.

The satellite sends all data to the ground station in near real time. For most satellite types, the ground station delays data only long enough to form complete blocks. When block is formed, it is queued for retransmission. Therefore, serial data, as received from a meteorological satellite, consists of interleaved sensor data blocks, as well as nondisplayable data such as documentation and calibration blocks. To generate an image, the data from a specific sensor or group of sensors must be sorted out of the incoming data stream and presented to a display device.

SDI's approach to the sorting process when handling high data rates is to store all received data in fixed length files (SDF Files) in the order it is received. Then, create a data location file for each possible image that points to the data blocks in the SDFs that are required to build the image. If a specific image is requested, the entries in its location file are used by transfer software to locate the beginning and length of each data block in the image. The transfer software simply reads the blocks in the sequential order listed in the data location files. In this way, SDF data is never actually sorted or moved; it is only inventoried and read. This approach is used by the SDI for the higher data rate satellites because there is not enough time between incoming data transfers to decommutate the data into areas.

SDI's approach to the sorting process when handling low data rates is to initially store all received data in a buffer. Then, locate the beginning of a data block and read its data type from the block's header information. Finally, the data block is transferred to the appropriate image file. A separate image file is created for each data sensor type received.

SDI File Descriptions

The types of SDI files common to all high data rate satellite types are:

- Stretched Data Format (SDF) files
- Index files
- Descriptor files
- Image Files

SDF Files

The SDI hardware converts the serial data and clock to 32-bit parallel words and stores them in an 8K by 32-bit FIFO. When 4,096 words have been collected, the ingestor software transfers 4,096 words to an SDF File in the ingestor's hard drive. Sixty-four transfers are required to build a 1,048,576 byte (1 Mbyte) SDF File. Thus, each SDF contains 8,388,608 satellite data bits.

Data Storage Requirements

To determine the number of seconds per SDF, divide 8,388,608 by the satellite's bit rate. For example, GVAR's data rate is 2,111,360 bits per second. Therefore, each SDF provides 3.973 seconds of data storage (8,388,608/2,111,360=3.973). At this rate, 906 SDFs are generated per hour.

The data in each SDF file includes all data types sent. Nothing is stripped out and there are no byte aligned boundaries. Thus, new data blocks can start anywhere in any SDF word.

SDF File Naming Convention

SDF files are named using the following convention.

signal_type.ccyy.ddd.hhmmss

Where:

signal_type	is the satellite signal type, e.g., gvar, poes, etc.
cc	is the century when the file was written to disk
yy	is the year when the file was written to disk
ddd	is the julian day the file was written to disk
hh	is the UTC hour the file was written to disk
mm	is the minute the file was written to disk
ss	is the second the file was written to disk

Index Files

The data location files are called Index files, and one is created for each image type detected in the SDFs. An Index file consists of a series of text lines, one for each data block or frame in the image. If the image consists of 1800 blocks, its Index file contains 1800 text lines. Each text line describes the location of a data block in an SDF that is required to create the complete image. For example, if a certain image consists of 1,000 blocks distributed in 400 SDFs, its Index file has 1,000 ASCII text lines. Since the index files are in ASCII format, they can be viewed using most Unix file viewing commands.

Index file text entries are generated by an SDF scanning process that looks for the beginnings of blocks. When block's beginning is located, its length, type and location information, including the SDF file name, are formed into a text line and stored in the appropriate Index file.

For some satellites, multiple Index Files are created simultaneously. For example, GVAR imager data block descriptions are stored in one index file (Blocks 0 through 10), while all Block 11 descriptions are stored in another index file.

Index File Format

The Index File format is different for different satellites types. Refer to the Index File Format description in the satellite-specific chapter for a complete description of the Index File format for your ingestor.

Descriptor Files

A descriptor file contains a list of currently available index files (images) for a specific data type and area of coverage. The file name indicates the area of coverage or type of data. Each satellite type has a unique set of descriptor file names, which are described in its ingestor procedures chapter. However, all satellite types have a descriptor file name called ALL. This descriptor file contains a list of all available images for this satellite type, regardless of the area of coverage.

> **Note!**
> The descriptor names are designed to be used as a search tool for images and their times over your areas of interest only. No sectorizing is done by the SDI system.

Descriptor File Naming Convention

The naming convention is: **/data/***descriptor*

Where:*descriptor* is the Descriptor File name.

As an example, the file **/data/HRPT** contains a list of all the Index Files for POES HRPT images on the SDI computer.

DESCRIPTOR File Format

The Descriptor File format is different for different satellite types. Refer to the Descriptor File Format description in the satellite-specific chapter for your ingestor for details.

Image Files

Image files contain a very raw format of the satellite signal. The ingestor removes only the sync blocks and aligns the data on byte boundaries if it is 8-bit data.

Image File formats depend on the transmission format of the satellite. Therefore, refer to the Image File Format description in the satellite-specific chapter of your ingestor for details.

SDI Event Handling System

The SDI ingestor implements an event handling system via the electronic mail medium. When the ingestor detects an event; e.g. a start of a new image, it sends a mail message to a list of users defined in an event notifier list file. The content of the mail message describes the event. Content differs depending on the source and type of the event. The following is an example of the content of an event mailed by the GVAR ingestor:

```
gvar.1997.202.205303.INDX 16537 21512 2973 5368
```

Please refer to the satellite specific chapter for a complete description of the event types and contents of event mail messages for your satellite.

Format of the Event Notifier List File

The list of users who wish to receive ingestor events are placed in the **/data/notify.list** file. The format of this file is one e-mail address per line. For example, to send events to the following users; john@doe, mary@jane and tomato@soup.wisc.edu, the notify.list file would look like:

```
john@doe
mary@jane
tomato@soup.wisc.edu
```

There may be additional event notifier list files for satellite-specific processes, such as GVAR Sounder.

Chapter 2
SDI Installation

The SDI is built on an [1]IBM® PC Server 310 computer running a Solaris operating system. SSEC's application software and custom hardware have been installed, and the complete SDI is tested prior to shipment. This reduces the installation to the following:

- Location
- Power Requirements
- Component Interconnections
- Bit Sync Requirements
- Connecting External Inputs and Outputs

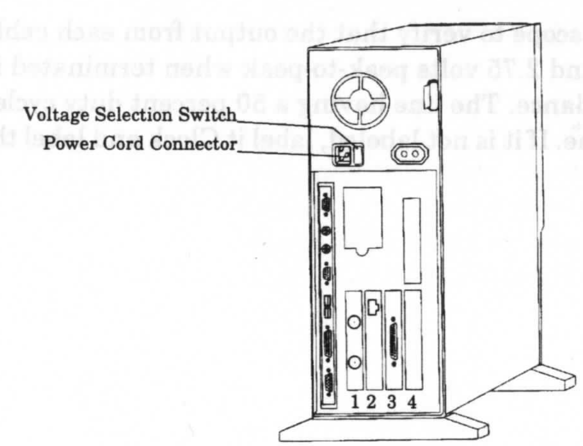
Perform the steps below to install your SDI.

Location

1. The SDI requires a standard PC environment that has access to the data and clock outputs from your satellite antenna chain. Since the SDI functions as an ADDE server, your location must also have a TCP/IP connection so that it can be accessed by ADDE clients.

Power Requirements

2. The PC Server 310 runs on one of two switch selectable AC voltage ranges, 90-137 VAC or 180-265 VAC



The voltage-selection switch is located immediately to the right of the AC power cord connector, as shown in the drawing at the left. If your voltage is between 90 VAC and 137 VAC check to see that **115** is visible on the switch; if your voltage is between 180 VAC and 265 VAC, check to see that **230** is visible on the switch.

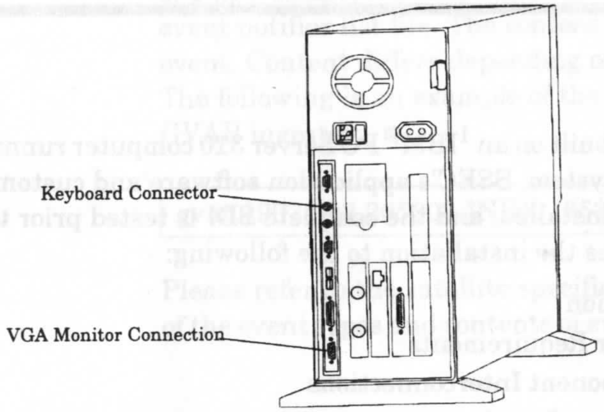
CAUTION

If you set the voltage switch to the wrong position, you might permanently damage your SDI when you turn it on.

1. IBM is a registered trademark of International Business Machines Corporation

Component Interconnections

3. The SDI does not include or require a monitor or mouse. However, you may want to use a monitor to initially verify normal operation.



You can use any color or monochrome VGA monitor by connecting its data cable connector to the 15-pin D-connector located at the bottom-left corner of the computer, as shown in the drawing at the left.

The SDI is normally operated from a remote location by Telnet. Therefore, once normal operation is confirmed, there is no need for a monitor.

4. Connect the keyboard to the connector indicated in the drawing above.

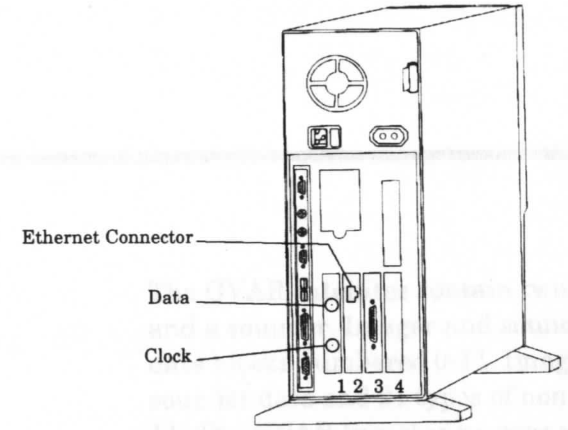
Bit Sync Requirements

The bit sync requirement is different for different satellite types. Refer to the *Bit Sync Requirements* description in the satellite-specific chapter for your ingestor for details.

Connecting External Inputs and Outputs

5. Your antenna chain provides two 75-ohm outputs from its bit synchronizer. They should be labeled data and clock. If the cables are not labeled, you will identify and mark them during the completion of this step.

   Use an oscilloscope to verify that the output from each cable is between 2.0 and 2.75 volts peak-to-peak when terminated in a 75-ohm impedance. The line having a 50 percent duty cycle signal is the clock line. If it is not labeled, label it Clock and label the other line Data.



Connect the Data and Clock inputs shown in the drawing at the left. This completes the SDI installation process.

Connect the Ethernet cable to the connector indicated in the drawing at the left.

Continue with the chapter that contains the operating instructions for your data type.

Chapter 3
GVAR Ingestor

The GVAR satellites contain two independent instruments, an imager and a sounder. Imager and sounder data are transmitted in formatted data blocks numbered 0-11. Imager data is transmitted via blocks 0-10; sounder data and 21 types of non-image data are transmitted via block 11. The GVAR Ingestor process writes all data to one megabyte files called Stretched Data Format (SDF) files. Between data writing cycles, the GVAR Ingestor process searches the SDF files for block starts. It stores the search results in one of two index file types, imager index files (.INDX file extension) or sounder index files (.B11 file extension). A new imager index file is created for each new image. A new block 11 index file is created every 10 minutes.

Since there are 22 types of block 11 data, a separate decoder called the GVAR Sounder Decoder is used to process sounder data from the 22 types of block 11 data

The GVAR Sounder Decoder process reads the BK11 index files that were created by the GVAR ingestor. It decodes the block 11 sounder blocks into McIDAS AREA files, which are written to the **/data** directory.

Knowledge of the GVAR system and its data characteristics are not essential for routine operation of an SDI. However, if you experience difficulty, familiarity with these characteristics may help you diagnose operational problems. See *Appendix A* at the back of this manual for an overview of the GVAR data format.

Knowledge of the SDI files, their structures, or their naming conventions are not considered essential for normal operation of the SDI. However, if you request technical assistance from SSEC, you may be asked to examine these files to assist SSEC in diagnosing your SDI operational problems. Therefore, an overview of these files is provided at the end of this chapter.

Topics discussed in this chapter are:

- Bit Sync requirements
- GVAR Ingestor and Decoder Operating Procedures
- SDI GVAR File Descriptions
- Navigation
- ADDE Server Procedures
- SDI's GVAR Events System

Interpreting Bold and Italicized Terms

Throughout this chapter, actual keyboard entries appear in **BOLD** type. You will type these entries exactly as they appear. For example:

Type: **export DISPLAY=**

Variable entries appear in italics. For example,

Type: **export DISPLAY=***workstation***:0**

In this example, replace *workstation* with the workstation's name. For example, if you want to export the display to a workstation named zebra:

Type: export DISPLAY=zebra:0

Bit Sync Requirements

The bit sync used for the GVAR transmission must produce NRZ-L format clock and data, with the data changing on the rising edge of the clock. The output should be TTL level output and terminated at 75 ohms. The GVAR bit rate is 2.111360 megabits per second.

Ingestor and Sounder Decoder Operating Procedures

GVAR ingestor and Sounder Decoder operating procedures consist of the following:

- Using the Ingestor Console
- Starting the Ingestor and GVAR Sounder Decoder
- Interpreting Console Messages
- Stopping the Ingestor and GVAR Sounder Decoder
- Shutting Down the Ingestor
- Changing the Amount of Retained Data
- Changing the Amount of Decoded Sounder Data
- Editing the names.gvar File

Using the Ingestor Console

The Ingestor Console, referred to hereafter as *console*, displays the ingestor's status. This procedure describes two console choices, a local monitor and a remote monitor.

The console is either a VGA monitor that is physically connected to your SDI computer or a telnet session into the SDI computer from a remote workstation.

If you prefer to use a VGA monitor, refer to *Chapter 2 - SDI Installation* for installation instructions. You will need to acquire a monitor locally since the SDI is not shipped with a monitor.

To use a telnet session, perform the following steps.

1. Log into the SDI as root

2. Export the display to your workstation.

   Type: **export DISPLAY=***workstation***:0**

   where: *workstation* is the name of your workstation

   Type: **(xterm -C)**

Starting the Ingestor and GVAR Sounder Decoder

When the computer is powered up, the ingestor and decoder start automatically. If you are unsure about the state of the ingestor, shutting down and restarting is the recommended procedure.

Interpreting Console Messages

If you have a console, these are messages you may see:

- new image
- bit slip
- error

There may also be messages from the system that are unrelated to the satellite ingest process, for example disk error or full disk.

New Image

At the beginning of each new image, a line similar to the following appears on the console.

```
New image    gvar.1997.113.205414.INDX Names:ALL CONUS
```


The **gvar.1997.113.205414.INDX** portion of this message is an Index File name. Refer to page 3-8 for the Index File naming convention. Thus, **gvar.1997.113.205414** is interpreted as follows:

Field	Definition
gvar	is the satellite signal type (GVAR)
1997	is the year when the image started
113	is the day of the year the image started
20	is the UTC hour the image started
54	is the minute the image started
14	is the second the image started
INDX	is the Index File extension

The **Names:ALL CONUS** portion of the message above describes the ADDE dataset descriptors where the new Index File is listed. In this example, **gvar.1997.113.205414.INDX** is listed in the Descriptor Files named ALL and CONUS.

Bit Slip

When the SDI software detects the start of a new GVAR data block, it reads the block length information from the block's header to compute the beginning of the next block. If the next block does not start at the predicted location, the current block contains more or less bits than its header indicated. A message appears on the console indicating the time and the words *bit slip*. You can expect to see some bit slips, and this may result in the loss of some data.

An increase in the number of bit slip errors may indicate a:

- deteriorating signal
- antenna positioning errors
- degradation of antenna chain electronics
- cable problem

Error

If the next block's synchronization code can't be located, the entire data block is lost and a message labeled as *error* appears on the console. This will result in the loss of data.

Stopping and Restarting the Ingestor or GVAR Sounder Decoder

Perform the following procedure to stop the ingestor or GVAR Sounder Decoder.

1. To stop the ingestor process, issue a stop command from the console

   Type: **/etc/init.d/ingcntl stop**

2. To stop the GVAR Sounder Decoder process, issue a stop command from the console

   Type: **/etc/init.d/sndcntl stop**

To restart the ingestor or GVAR Sounder Decoder, either reboot (see *Shutting Down the Ingestor* below) or perform these two steps:

1. To start the ingestor process, issue the start command from the console.

   Type: **/etc/init.d/ingcntl start**

2. To start the GVAR Sounder Decoder process, issue the start command from the console.

   Type: **/etc/init.d/sndcntl start**

Shutting Down the Ingestor

Perform the step below to shut down the ingestor.

1. Issue the workstation shutdown command.

   Type: **init 0**

Changing the Amount of Retained Data

SSEC sets a default of one hour for the amount of GVAR data to be retained (900 SDF files) prior to shipment. Perform the following procedure if you want to change the amount of data retained in your ingestor.

1. From the console, edit the file **/etc/init.d/ingcntl**

2. Change the value of the variable named SAVE_FILES= to the number of files to retain. For example, a GVAR SDF file represents 4 seconds of time. Therefore, 900 SDF files are generated during one hour of continuous transmission time, requiring about 1 gigabyte of data storage.

3. Stop and restart the ingestor process as described above.

Changing the Amount of Decoded Sounder Data

The GVAR Sounder Decoder images are written to a rotating spool of McIDAS area files. The amount of data retained is determined by the size of this spool, which may be adjusted to fit your needs by editing the beginning and ending range numbers in the file **/sounder/.soundrc**. Below is a sample of this file:

```
# This file defines the AREA loop for the sounder
# decoder.
################################################
area1=1001
area2=1336
```

Where:

area1 is the beginning number in the AREA spool

area2 is the ending number in the AREA spool

To adjust the amount of retained sounder areas, perform the following steps:

1. Modify the *area1* and *area2* variables in the **/sounder/.soundrc** sounder configuration file. The variable *area2* must always be greater than or equal to *area1*.

2. Update the R1 and R2 fields of the appropriate sounder datasets in the ADDE dataset resolution table. See *Changing Server Dataset Names* in this chapter. The R1 and R2 fields should be set to those values defined for *area1* and *area2* respectively.

Editing the names.gvar File

The **names.gvar** file is a configuration file that is used only with GVAR ingestors. It lists the GVAR Descriptor File names and defines their sector boundaries (see the GVAR Descriptor Files description on page 3-10). Operators can edit this file to change descriptor boundaries if desired. Though most SDI GVAR ingestors have the same descriptors, each ingestor may define them differently via its **names.gvar** configuration file.

GVAR descriptors are used as search tools for locating GVAR images and their times for your geographical area of interest. For an image to be listed under a particular descriptor, it must include all of the sector area described by the descriptor's sector boundaries. This is a minimum requirement and some images may contain much more data than the descriptor indicates. For example, if you create a descriptor called WISC (Wisconsin) and set its sector boundaries just large enough to include all of the state of Wisconsin, WISC will contain any GVAR image that shows the entire state of Wisconsin. These images will include:

- all full disk images from GOES 8 and GOES 9
- all northern hemisphere images from GOES 8 and GOES 9
- all USA images from GOES 8 and GOES 9
- any other images from GOES 8 and GOES 9 that includes all of Wisconsin

To change Descriptor names or their boundaries, perform the following procedure.

1. Turn on the SDI computer if it is currently off.
2. From the console, login as root or telnet into the ingestor as root.
3. Edit the file **/data/names.gvar.**

   The first line in the file must always be

   ALL 0 0 0 0

   The last line in file must always be

   OTHER 1 0 0 0

The format of the file is: *descriptor_name sline eline sele eele*

Where:

descriptor_name	descriptor name (e.g., NH for Northern Hemisphere)
sline	starting image line number
eline	ending image line number
sele	starting image element
eele	ending image element

The table below is a sample GVAR descriptor file

ALL	0	0	0	0
CONUS	3200	6200	11000	16000
NH	2850	7400	11000	20000
SH	10400	11500	11000	12000
FD	2800	11500	11000	20000
FD-E	2800	11500	4000	24000
FD-W	2800	11500	6000	26000
NH	2850	7400	11000	20000
OTHER	1	0	0	0

Table 3-1. Sample Descriptor File Format (fields are space delimited)

Example:

Using the ***names.gvar*** file above, any image that completely covers the area from image lines 3200 to 6200, and image elements 11000 to 16000 is listed in the descriptor file named **CONUS**.

4. Save the file.

SDI GVAR File Descriptions

The following GVAR files are described:

- GVAR Image Index Files
- GVAR Block 11 Index Files
- GVAR Descriptor Files
- Names.gvar File

GVAR Image Index Files

GVAR Index File Naming Convention

The naming convention is: *signal_type.ccyy.ddd.hhmmss.***INDX**

Where:

signal_type	is the satellite signal type, e.g., gvar
cc	is the century when the image started
yy	is the year when the image started
ddd	is the julian day the image started
hh	is the UTC hour the image started
mm	is the minute the image started
ss	is the second the image started

As an example, the Index File name for a 1996 GVAR image, whose nominal image date and time are 228 and 12:20:00, respectively, has the name **gvar.1996.228.122000.INDX**. This date and time is the "priority frame start time" from the satellite.

GVAR Index File Format

Each GVAR Index File text entry has the following six fields

Field Name	***Description***
SDF name	name of the Stretched Data Format File containing the block
Word Offset	a four-byte word offset into the SDF file that locates the word containing the starting bit of this block.
Bit Offset	a bit offset into the word pointed to by the Word Offset to locate the block's starting bit
Length	the length of the block in bits
Block Type	the data block type identified; values are 0 to 10 (see *Appendix A*)
Image Line	the image line this block is associated with (GVAR block 0's only)

Sync errors and bit-slip errors are also logged in the GVAR Image Index Files

GVAR Block 11 Index Files

Unlike an image index file, which describes a complete image, a new Block 11 index file is created every 10 minutes. The time portion of the Block 11 index file's name is the time the index file was created. Unlike the image index files, the time in the Block 11 index name is a local workstation time. When a Block 11 is located in an SDF file, an entry is made in the current Block 11 index file. Block 11 index files are in ASCII format and therefore can be viewed using most unix file viewing commands.

The naming convention for the block 11 index files is:

gvar. *ccyy.ddd.hhmm.***B11**

Where:

cc	is the century when the image started
yy	is the year when the image started
ddd	is the Julian day when the image started
hh	is the UTC hour when the image started
mm	is the minute when the image started

Every entry in the block 11 index file identifies a data block in an SDF file and it's location within the SDF file. As in the imager index files, sync errors and slipped bits are also logged in the block 11 index file entries.

The fields in the Block 11 index have the same meanings as the imager index.

GVAR Descriptor Files

Descriptor File Naming Convention

The naming convention is: **/data/*descriptor*,** where *descriptor* is the Descriptor File name. The descriptor file names used for GVAR are

- ALL (list of all available GVAR images)
- CONUS (Continental US)
- NH (Northern Hemisphere
- SH (Southern Hemisphere
- FD-E (Full Disk - East)
- FD-W (Full Disk - West)
- USA
- OTHER (list of images that do not fall into any other category other than ALL)

Because of the variable scan characteristic of GVAR, a nearly infinite number of image sectors are possible, making rigidly defined descriptor file names impractical. Therefore, GVAR descriptor file names describe the minimum coverage an image must have to be listed in the respective file. Except for descriptor files ALL and OTHER, each GVAR descriptor file name listed above is defined locally in a configuration file by listing the line and element of its four corners. When a new GVAR image becomes available (new index file), its four corners are compared to those of each GVAR descriptor listed above. If the new image falls completely inside the descriptor's boundary, it is listed in that file. All images are listed in at least two files. Some images are listed in several files. For example, an FD-E image is listed in the FD-E, NH, SH, CONUS, USA and ALL files. No image is listed in the OTHER listing if it is listed in any file besides ALL.

As an example, the file **/data/USA** contains a list of all the GVAR Index Files on the SDI computer containing, as a minimum, an image of the USA.

Descriptor File Format

Each GVAR Descriptor File text entry has the following six fields

Field Name	***Description***
INDX_name	name of the Index File describing this image
sline	starting line number
eline	ending line number
sele	starting element number
eele	ending element number
pos	absolute position number in the dataset - used by the ADDE Server

GVAR descriptors are defined in your site's **/data/names.gvar** configuration file. They indicate the image's area of coverage (e.g., CONUS for the continental US, or NHE for the northern hemisphere) for a particular image. This file can be edited to help you find images for particular areas of interest using the *Editing the names.gvar File* procedure on page 3-6. However, remember that the images the SDI indicates for your specified area of interest contain entire images (at full resolution) for that time period. For example, if your area of interest is CONUS, NHE and FD (full disk) images also cover this area. However, much more data must be transferred for an FD image than for a CONUS image. Descriptor files are also used by the ADDE server.

The table below is an example of the GVAR ALL Descriptor File.

gvar.1997.030.160143.INDX	2973	9249	6512	17752	2
gvar.1997.030.160923.INDX	10037	9049	12496	22900	3
gvar.1997.030.161514.INDX	2805	9049	10120	22900	4
gvar.1997.030.163143.INDX	2973	9249	6512	17752	5
gvar.1997.030.163923.INDX	10037	9049	12496	22900	6
gvar.1997.030.164514.INDX	2805	9049	10120	22900	7

Table 3-2. GVAR/ALL Descriptor File Format

Names.gvar Configuration File

See the *Editing the names.gvar File* procedure on page 3-6 for a description of the names.gvar Configuration File.

Navigation

GVAR navigation is filed in the McIDAS SYSNAV file format. The SDI Event System is configured to execute **/usr/local/bin/sysnav.sh** at the start of a new image. This program reads the navigation information from the current image and files navigation if any of the following conditions are true:

- this is the first image of a new day
- the navigation in the current image differs from the navigation of the most recently filed navigation

Navigation File Naming Convention

The naming convention of the McIDAS SYSNAV files for GVAR is: **/navigation/SYSNAV*YYSS***

Where:

YY	is the julian year of the navigation
SS	is the McIDAS sensor source number of the satellite

ADDE Server Procedures

The procedures discussed in this section are:

- Accessing the Data via ADDE
- Changing Imager Server Dataset Names
- Changing Sounder Server Dataset Names
- Managing the Server's Routing Table

Accessing the Data via ADDE

Once the SDI begins to ingest data and is connected to the network, the data can be accessed on McIDAS workstations via ADDE. The ADDE group name, by default, is GVAR.

Perform these steps to access the SDI's data.

1. From a McIDAS workstation:

   Type: **DATALOC ADD GVAR** *SDI IP address*

   For example, if the SDI has an IP address of 144.92.108.32

   Type: **DATALOC ADD GVAR 144.92.108.32**

2. Use the ADDE command named DSINFO to determine the descriptor names:

   Type: **DSINFO I GVAR**

   The output should look something like:

Dataset Names of Type: IMAGE in Group: GVAR

Name	NumPos	Content
ALL	100	GOES-8 all images
BLK11	11	GVAR sounder areas
CONUS	20	GOES-8 continental U.S.
FD	20	GOES-8 full disk
FD-E	20	GOES-8 full disk east
FD-W	20	GOES-8 full disk west
NH	20	GOES-8 northern hemisphere
OTHER	100	GOES-8 unknown
SH	20	GOES-8 southern hemisphere

DSINFO -- done

At this point the suite of ADDE commands can be used with the data.

Changing Imager Server Dataset Names

Perform steps 1-3 in the following procedure to change or update imager server dataset names; perform steps 4-6 in the following procedure to change GVAR sounder dataset names.

1. From the console, login as mcadde or telnet into the ingestor as user mcadde.

2. To change ADDE names associated with particular datasets, edit the **~mcadde/mcidas/data/RESOLV.SRV** file. The following is a sample of this file. Notice that all fields are comma delimited.

```
N1=GVAR,N2=ALL,TYPE=IMAGE,K=GVAR,R1=1,R2=2500,C=GOES-8 all images
N1=GVAR,N2=CONUS,TYPE=IMAGE,K=GVAR,R1=1,R2=2500,C=GOES-8 continental U.S.
N1=GVAR,N2=NH,TYPE=IMAGE,K=GVAR,R1=1,R2=2500,C=GOES-8 northern hemisphere
N1=GVAR,N2=SH,TYPE=IMAGE,K=GVAR,R1=1,R2=2500,C=GOES-8 southern hemisphere
N1=GVAR,N2=FD,TYPE=IMAGE,K=GVAR,R1=1,R2=2500,C=GOES-8 full disk
N1=GVAR,N2=FD-E,TYPE=IMAGE,K=GVAR,R1=1,R2=2500,C=GOES-8 full disk east
N1=GVAR,N2=FD-W,TYPE=IMAGE,K=GVAR,R1=1,R2=2500,C=GOES-8 full disk west
N1=GVAR,N2=OTHER,TYPE=IMAGE,K=GVAR,R1=1,R2=2500,C=GOES-8 unknown
N1=CRUD,N2=CONUS,TYPE=IMAGE,K=AREA,R1=1,R2=2500,C=GOES-8 continental U.S.
```

Where:

N1	is the ADDE group name
N2	is the ADDE descriptor name
TYPE	is the data type
K	is the data format or kind
R1	is the beginning dataset position number (usually 1)
R2	is the ending dataset position number; this number should always be greater than the total number of images the ingestor has been configured to retain
C	is the comment field displayed with **DSINFO**

3. Save the file.

   The ADDE command called IMGLIST list the images in a dataset. It always shows the image resolution as 1 (full resolution) and the image size as the complete image size. All sectorizing or image blowdowns are done via other ADDE commands such as IMGDISP, IMGCOPY, etc.

Changing Sounder Server Dataset Names

4. From the console, login as mcadde or telnet into the ingestor as user mcadde.

5. To change ADDE names associated with particular datasets, edit the file **~mcadde/mcidas/data/RESOLV.SRV**. The following is an example of sounder datasets defined in this file. Notice that all fields are comma delimited. You can not place a comma in the comment field.

```
N1=GOES8L,N2=BLK11,TYPE=IMAGE,RT=N,K=AREA,R1=2001,R2=2336,C=GOES8 SOUNDER AREAS,
N1=GOES9S,N2=BLK11,TYPE=IMAGE,RT=N,K=AREA,R1=1001,R2=1336,C=GOES9 SOUNDER AREAS,
```

Where:

N1	is the ADDE group name
N2	is the ADDE descriptor name
TYPE	is the data type - IMAGE
K	is the data format or kind - area
R1	is the beginning AREA number in the range
R2	is the ending AREA number in the range, which should always be greater than or equal to R1
C	is the comment field displayed with **DSINFO**

6. Change the values of R1 and r2 in the **/sounder/.soundrc** file to match R1 and R2 in **~mcadde/mcidas/data/RESOLV.SRV**.

Managing the Server's Routing Table

Users (clients) of the SDI ingestor's data must update their routing tables to link the SDI ingestor's group names to IP addresses. To do this, you must create or update a site routing table that contains the routing information for your site's clients.

The site's routing table can be created and updated in any McIDAS-X session by using the ADDE command named DATALOC to link group names to the IP addresses of remote servers. You will need to copy the table to a directory that is accessible to all clients. Clients must NFS mount the directory to access the file.

The default file name for all client routing tables is **MCTABLE.TXT**. To use a different name when creating or updating the site table, you must specify the file name in the **MCTABLE_WRITE** environment variable of the account running the McIDAS-X session. Write-protect the file so it can't be modified or deleted by your clients.

To make the table accessible to your McIDAS-X and McIDAS-OS2 clients, each client's **MCTABLE_READ** environment variable must be modified to include this table.

SDI GVAR Events

As described in Chapter 2, the SDI ingestor implements an electronic mail event system. The GVAR ingestor and sounder decoder generate three types of events:

- Index Created (imager start of image)
- Sounder SOI (Start Of Image)
- Sounder EOI (End Of Image)

These events are sent to the listin the **/data/notify.bk11** file.

Index Created

The Index Created event is generated any time the GVAR ingestor sees a new image and creates an index file. The body of the e-mail for this event is in the following format: *index_file_name bele eele bline eline*

Where:

index_file_name	is the name of the index file; see *Index File Format* in this chapter for a complete description of the format of this file name
bele	is the beginning element of this image
bline	is the beginning line of this image
eline	is the ending line of this image

Sounder SOI

The Sounder SOI event is generated any time the GVAR sounder decoder detects the start of a new sounder image and is creating a new McIDAS AREA file. The body of the e-mail for this event is in the following format:

SOI *bline nline bele nele jday time ss bscan escan area.*

Where:

SOI	indicates this is a sounder start of image
bline	is the beginning detector scan line in sounder image (see Note 1)
nline	is the number of detector scan lines in sounder image (see Note 1)
bele	is the beginning element of sounder image
nele	is the number of elements in sounder image
jday	is the nominal julian day (yyddd) of sounder image
time	is the nominal time (hhmmss) of sounder image
ss	is the McIDAS sensor source number of satellite
bscan	is the beginning scan number of sounder image
escan	is the ending scan number of sounder image
area	is the McIDAS AREA number of decoded sounder image

Note 1: There are four detector scan lines in each GVAR sounder scan line.

Sounder EOI

The Sounder EOI event is generated any time the GVAR sounder decoder finishes the decoding of a sounder image. The body of the e-mail for this event is in the following format:

EOI *area*

Where:

EOI	indicates this is a sounder end of image
area	is the McIDAS AREA number if decoded sounder image

Chapter 4
POES Ingestor

Knowledge of the POES system and its data characteristics are not essential for routine operation of an SDI. However, if you experience difficulty, familiarity with these characteristics may help you diagnose operational problems.

Knowledge of the SDI files, their structures, or their naming conventions are not considered essential for normal operation of the SDI. However, if you request technical assistance from SSEC, you may be asked to examine these files to assist SSEC in diagnosing your SDI operational problems. Therefore, an overview of these files is provided in this chapter.

Throughout this chapter, you will see the related terms: Satellite ID, Satellite Name and McIDAS Sensor Source (SS). The following table shows the current mappings between these terms.

Sat-ID	Satellite Name	McIDAS Sensor Source (SS)
1	NOAA-11	61
5	NOAA-14	64
9	NOAA-12	62
11	NOAA-9	45
15	NOAA-10	60

Topics discussed in this chapter include:

- POES Ingestor Operating Procedures
- POES File Descriptions
- Navigation
- ADDE Server Procedures
- SDI POES Events

Interpreting Bold and Italicized Terms

Throughout this chapter, actual keyboard entries appear in **BOLD** type. You will type these entries exactly as they appear. For example:

Type: **export DISPLAY=**

Variable entries appear in italics. For example,

Type: **export DISPLAY=***workstation***:0**

In this example, replace *workstation* with the workstation's name. For example, if you want to export the display to a workstation named zebra:

Type: **export DISPLAY=zebra:0**

POES Ingestor Operating Procedures

POES SDI operating procedures consist of the following:

- Using the Ingestor Console
- Starting the Ingestor Process
- Interpreting Console Messages
- Stopping the Ingestor Process
- Shutting Down the Ingestor Workstation
- Changing the Amount of Retained Data

Using the Ingestor Console

The Ingestor Console, referred to hereafter as *console*, displays the ingestor's status. This procedure describes two console choices, and provides a list of console messages and their interpretations.

The console is either a VGA monitor that is physically connected to your SDI computer or a telnet session into the SDI computer from a remote workstation.

If you prefer to use a VGA monitor, refer to *Chapter 2 - SDI Installation* for installation instructions. You will need to acquire a monitor locally since the SDI is not shipped with a monitor.

To use a telnet session, perform the following steps.

1. Log into the SDI as root
2. Export the display to your workstation.

   Type: **export DISPLAY=***worstation***:0**

   where: *workstation* is the name of your workstation

   Type: **(xterm -C)**

Starting the Ingestor Process

Perform the following procedure to start the ingestor. Refer to the next section for an interpretation of console messages that may appear once the ingestor is started.

1. If the computer is already on, go to step 2. Otherwise, turn on the SDI computer. The system startup scripts have already been configured at SSEC to start the ingestor at boot.

2. Issue the start command from the console.

   Type: **/etc/init.d/ingcntl start**

Interpreting Console Messages

If you have a console, these are the message types you may see:

- new image (index filed)
- deleted

New Image

When a new image arrives, an index is filed for that image and a line similar to the following appears on the console.

```
poes.1997.198.113827.LAC sat=9 day=197 time=115444 lines=13716 del=2 err=2
```

The **poes.1997.198.113827.LAC** portion of this message is an Index File name. Refer to the *Index File Naming Convention* section in this chapter for a complete description of this file name.

The **sat=9** portion of this message is the satellite ID number as it is defined in the data stream. This is not the McIDAS Sensor Source (SS) number (see page 4-1).

The **day=197** portion is the nominal julian start day of the image.

The **time=115444** portion is the nominal start time (hhmmss) of the image.

The **lines=13716** portion is the total number of lines in this image.

The **del=2** portion indicates the number of lines that have been deleted from this image. When the ground station plays back the recorded data for transmission, sometimes there is a small amount of data from the previous image at the start of the transmission. The **del=** parameter indicates how many of these lines have been deleted from the image.

The **err=2** portion indicates the number of bit slips or data errors detected in the image.

Deleted

Sometimes, a LAC image is preceded by a small amount of useless data (less than 200 lines), which is sent about seven to eight minutes before the real data. If a completely ingested POES image contains less than 200 lines, it is considered to be one of these useless data segments and is deleted.

When an image is deleted, a line similar to the following appears on the console.

```
poes.1997.198.122552.LAC deleted
```

The **poes.1997.198.122552.LAC** portion of this message is an Index File name. Refer to the *Index File Naming Convention* section in this chapter for a complete description of this file name.

The **deleted** portion of this message indicates that this image has been deleted.

Stopping the Ingestor Process

Perform the following procedure to stop the ingestor. This will stop all processes associated with the ingest of POES data.

1. Issue a stop command from the ingestor console

   Type: **/etc/init.d/ingcntl stop**

Shutting Down the Ingestor Workstation

Perform the following procedures to shut down the ingestor workstation.

1. Stop the ingestor by issuing a stop command as described in the preceding procedure to stop the ingestor.

2. Issue the workstation shutdown command.

   Type: **shutdown -y -g60 -I0**

Changing the Amount of Retained Data

SSEC sets the default of just over five hours for the amount of POES data to be retained (900 SDF files) prior to shipment. Perform the following procedure if you want to change the amount of data retained in your ingestor.

1. From the console, edit the file **/etc/init.d/ingcntl**.

2. Change the value of the variable named SAVE_FILES= to the number of files to retain. One SDF file represents about 12 seconds of time. Therefore, 300 SDF files are generated during one hour of continuous transmission, requiring about 300 megabytes of data storage. The values realized operationally will vary because POES is not a continuous transmission. You will likely have to watch disk space utilization and adjust the SAVE_FILES= variable accordingly.

3. Stop and restart the ingestor process as described above.

POES File Descriptions

The following POES files are described:

- POES Index Files
- POES Descriptor Files

POES Index Files

One index file is generated for each image detected in the SDFs.

Index File Naming Convention

The naming convention is: *signal_type.ccyy.ddd.hhmmss.mode*

Where:

signal_type	Is the satellite signal type, e.g., poes
cc	is the century when the image started
yy	is the year when the image started
ddd	is the julian day the image started
hh	is the UTC hour the image started
mm	is the minute the image started
ss	is the second the image started
mode	is the transmission mode of the satellite, e.g., LAC, GAC, HRPT

As an example, the index file name for a 1996 GAC image, whose nominal image date and time are 228 and 12:20:00, respectively, has the name **poes.1996.228.122000.GAC**.

Index File Format

Each index file text entry has the following eight fields. One entry exists in the index file for each data frame.

Field Name	**Description**
SDF name	name of the Stretched Data Format (SDF) file containing the frame
Word Offset	a four-byte word offset into the SDF file that locates the word containing the starting bit of this frame
Bit Offset	a bit offset into the word pointed to by the Word Offset to locate the frame's starting bit
Sat ID	is the raw ID number of the satellite; this is the raw satellite ID number, not the McIDAS sensor source (SS) number; see page 4-1
Sub Frame #	subframe number
Day	julian day (ddd) of this frame
Time	time (hhmmss) of this frame
Milliseconds	milliseconds of this frame

POES Descriptor Files

POES descriptor files contain a list of currently available images for a specific data type. The data type is typically defined as the transfer mode. The file name indicates the transfer mode and each has a unique descriptor file name. The descriptor file names used for POES are:

- ALL (list of all available POES images)
- GAC (Global Area Coverage)
- HRPT (High Resolution Picture Transfer)
- LAC (Local Area Coverage)

All images are filed in descriptor name ALL. The descriptor name is designed to be used as a search tool for images and their times. No sectorizing is done by the SDI system.

Descriptor File Naming Convention

The naming convention is: **/data/***descriptor*, where *descriptor* is the Descriptor File name as defined by the transfer mode of the satellite, e.g., HRPT, LAC, GAC

Descriptor File Format

Each text entry in the Descriptor File has the following five fields

Field Name	***Description***
INDX_name	is the name of the Index File describing this image
Sat ID	is the raw ID number of the satellite; this is the raw satellite ID number, not the McIDAS sensor source (SS) number; see page 4-1
Day	is the nominal start julian day (ddd) of the image
Time	is the nominal start time (hhmmss) of the image
eline	is the ending line number of the image

The table below show an example of the POES GAC Descriptor File

poes.1997.198.135033.GAC 5 198 104700 12779
poes.1997.198.143122.GAC 5 198 122800 12781
poes.1997.198.150627.GAC 9 198 132130 11100
poes.1997.198.151214.GAC 9 198 113230 13738
poes.1997.198.160938.GAC 5 198 141038 12525
poes.1997.198.164741.GAC 9 198 144851 12630

Navigation

The SDI POES Ingestor does not perform any navigation processing. Navigation exists on the SDI ingestor system for the purpose of serving the image data. The server requires navigation because it must navigate the images in order to process requests and subsect the images.

The navigation file used by the ADDE image server is the McIDAS format SYSNAV1 file. This navigation file is updated with the latest POES navigation information from the TBUS messages transmitted on the Domestic Data Service conventional data circuit. The TBUS messages are decoded by the McIDAS-XCD conventional data ingestor/decoder, filed into the SYSNAV1 navigation file and predictions made. Twice daily, the SYSNAV1 file is copied from the -XCD decoder workstation to the SDI ingestor workstation and placed in the directory **~mcadde/mcidas/data**.

ADDE Server Procedures

The procedures discussed in this section are:

- Accessing Data via ADDE
- Changing Server Dataset Names

Accessing the Data via ADDE

Once the SDI begins to ingest data and is connected to the network, the data can be accessed on workstations running McIDAS via ADDE. The ADDE group name, by default, is POES.

Perform these steps to access the SDI's data.

1. From a McIDAS workstation:

   Type: **DATALOC ADD POES** *SDI_IP_address*

2. For example, if the SDI has an IP address of 144.92.108.32

   Type: **DATALOC ADD POES 144.92.108.32**

3. Use the ADDE command named DSINFO to determine the descriptor names:

   Type: **DSINFO I POES**

The output should look something like:

Dataset Names of Type: IMAGE in Group: POES

Name	NumPos	Content	
N09GAC	100	POES	NOAA-09 GAC images
N09HRPT	100	POES	NOAA-09 HRPT images
N09LAC	100	POES	NOAA-09 LAC images
N10GAC	100	POES	NOAA-10 GAC images
N10HRPT	100	POES	NOAA-10 HRPT images
N10LAC	100	POES	NOAA-10 LAC images
N11GAC	100	POES	NOAA-11 GAC images
N11HRPT	100	POES	NOAA-11 HRPT images
N11LAC	100	POES	NOAA-11 LAC images
N12GAC	100	POES	NOAA-12 GAC images
N12HRPT	100	POES	NOAA-12 HRPT images
N12LAC	100	POES	NOAA-12 LAC images
N14GAC	100	POES	NOAA-14 GAC images
N14HRPT	100	POES	NOAA-14 HRPT images
N14LAC	100	POES	NOAA-14 LAC images

DSINFO -- done

At this point the suite of ADDE commands can be used with the data.

Changing Server Dataset Names

Perform the following procedure to change or update server dataset names.

1. From the console, login as mcadde or telnet into the ingestor as user mcadde.

2. To change ADDE names associated with particular datasets, edit the file **~mcadde/mcidas/data/RESOLV.SRV**. The following is an example of this file. Notice that all fields are comma delimited. You can not place a comma in the comment field.

```
N1=POES,N2=N09LAC,TYPE=IMAGE,K=POES,R1=1,R2=100,Q=/data,C=POES NOAA-09 LAC images,
N1=POES,N2=N10LAC,TYPE=IMAGE,K=POES,R1=1,R2=100,Q=/data,C=POES NOAA-10 LAC images,
N1=POES,N2=N11LAC,TYPE=IMAGE,K=POES,R1=1,R2=100,Q=/data,C=POES NOAA-11 LAC images,
N1=POES,N2=N12LAC,TYPE=IMAGE,K=POES,R1=1,R2=100,Q=/data,C=POES NOAA-12 LAC images,
N1=POES,N2=N14LAC,TYPE=IMAGE,K=POES,R1=1,R2=100,Q=/data,C=POES NOAA-14 LAC images,
N1=POES,N2=N09GAC,TYPE=IMAGE,K=POES,R1=1,R2=100,Q=/data,C=POES NOAA-09 GAC images,
N1=POES,N2=N10GAC,TYPE=IMAGE,K=POES,R1=1,R2=100,Q=/data,C=POES NOAA-10 GAC images,
N1=POES,N2=N11GAC,TYPE=IMAGE,K=POES,R1=1,R2=100,Q=/data,C=POES NOAA-11 GAC images,
```

Where:

N1	is the ADDE group name (these names are fixed for POES and must not be changed)
N2	is the ADDE descriptor name (these names are fixed for POES and must not be changed)
TYPE	is the data type - IMAGE
K	is the data format or kind - POES
R1	is the beginning dataset position number (usually set to 1)
R2	is the ending dataset position number. This number should always be greater than the total number of images the ingestor has been configured to retain.
C	is the comment field displayed with **DSINFO**

SDI POES Events

As described in Chapter 1, the SDI ingestor implements an electronic mail event system. The POES ingestor generates only one event:

Index Created (new image)

The Index Created event is generated any time the POES ingestor sees a new image and creates an index file. The body of the e-mail for this event is in the following format:

index_file_name sat_id ddd hhmmss nlines

Where:

index_file_name	is the name of the index file; See *Index File Format* in this chapter for a complete description of the format of this file name.
sat_id	is the raw ID number of the satellite; this is the raw satellite ID number, not the McIDAS sensor source (SS) number. See page 4-1
ddd	is the julian day in DDD of the start of this image
hhmmss	is the time in HHMMSS of the start of this image
nlines	is the total number of lines in this image

Appendix A
GVAR Signal Characteristics

GVAR System Overview

GVAR (GOES VARiable) is the data transmission format used with the new generation of GOES meteorological satellites. These satellites are designated GOES I-M. Unlike the evolutionary format of the former GOES system (GOES A superseded by GOES AAA), the GVAR format is not compatible with the previous GOES AAA format. The GVAR format greatly impacts the data ingest hardware.

The purpose of this appendix is to provide sufficient information about the GOES I-M satellite capabilities and the GVAR format for you to understand the data ingesting and processing requirements.

The variable scan length is a major difference between GVAR and GOES. Another difference is that GOES operated in either the imager or sounder mode, whereas GVAR can operate in both modes simultaneously. In fact, the GVAR sensor groups can scan unrelated areas of the earth at the same time.

DOC	IR1	IR2	VIS 1	VIS 2	VIS 3	VIS 4	VIS 5	VIS 6	VIS 7	VIS 8	SAD
0	1	2	3	4	5	6	7	8	9	10	11

Each GVAR block has: 10032-bit synchronization code
720-bit header
N-bit information field
16-bit CRC

Blocks 0 and 11 have a fixed length information field of 64,320 bits

Blocks 1 through 10 have variable length information fields directly dependent on the scan width, with a minimum information field length of 21440 bits

A single imager scan generates blocks 0-10 in sequence

Blocks 0 through 10 may be followed by any number of block 11s (0-N) depending on what is available. In priority order, the next block(s) transmitted will be:

1 Next Imager Scan - blocks 0-10
2 Imager Compensation and Servo Errors - 1 block 11
3 Sounder Compensation and Servo Errors - 1 block 11
4 Imager Telemetry Statistics - 1 block 11
5 Imager Spacelook Statistics and Data - 2 block 11s
6 Imager Calibration Coefficients and Limits - 1 block 11
7 Imager ECAL Statistics and Data - 2 block 11s
8 Imager Blackbody Statistics and Data - 1 block 11
9 Imager Visible NLUIS - 2 block 11s
10 Imager Star Sense Data - 9 block 11s
11 Sounder Scan Data - 2 to 400 block 11s
12 Sounder Telemetry Statistics - 1 block 11
13 Sounder Spacelook Statistics and Data - 5 block 11s
14 Sounder Calibration Coefficients and Limits - 2 block 11s
15 Sounder ECAL Statistics and Data - 3 block 11s
16 Sounder Blackbody Statistics and Data - 5 block 11s
17 Sounder Visible NLUTS - 9 block 11s
18 Sounder Star Sense Data - 3 block 11s
19 GIMTACS Text Messages - 1 to 2 block 11s
20 SPS Text Messages - 1 block 11
21 Auxiliary Data - 1 to N block 11s
22 Fill Data - 1 block 11

Figure A-1. GVAR Format

The GVAR format has its origin in the Operational VAS Mode AAA (Triple A) format. The AAA format consists of a repeating sequence of twelve fixed-length, equal size blocks.

The range and flexibility of satellite operations has increased with the advent of the three-axis stabilized GOES I-M craft employing two independent instruments, each having two-degree of freedom scanning mirrors. Using a fixed length transmission format would have placed operational limitations on the satellite's capabilities. The GVAR format was developed to permit full use of the new capabilities while maintaining as much commonality with AAA reception equipment as possible.

Scan Format

The GVAR transmission sequence is depicted in Figure D-1 on the adjacent page. It consists of twelve blocks numbered 0 thru 11. Blocks 0 thru 10 are transmitted when an Imager scan line is completed. Block 10 is followed by a variable number of block 11s (0-N) according to the data available for transmission. Block 11 (Sounder/Auxiliary Data-SAD) transmits sounder data and all non-imager data. Blocks 1 through 10 vary in length directly in accordance with the length of the imaging instrument scan line. Table D-1 on the next page provides further details about the structure of the GVAR format. In turn, Figures D-2 through D-6 further explain the GVAR block formats.

Scan Characteristics

Period	Variable
Blocks/Imager Scan	11
Bit Rate	2,111,360 bits/second

Block Characteristics

Period	15.25 to 104.6 msec
Sync Length	10032 bits
Header Word Length	8 bits/word
Header Length (triple redundant)	90 words (720 bits)

Information Field:

Block 0 - Documentation Block (Figure D-2)	
Word Size	8 bits
Field Length	8040 words (64,320 bits)
Block 1 - Infrared Block 1 (Figure D-3)	
Word Size	10 bits
Field Length	68 to 21008 words*
Number of Records	4 per block
Line Documentation	16 words
IR Detector Data	1 to 5236 words
Block 2 - Infrared Block 2 (Figure D-4)	
Word Size	10 bits
Field Length	51 to 15756 words*
Number of Records	3 per block
Line Documentation	16 words
IR Detector Data	1 to 5236 words
Blocks 3 to 10 - Visible Blocks (Figure D-5)	
Word Size	10 bits
Field Length	20 to 20960 words*
Number of Records	1 per block
Line Documentation	16 words
Visible Detector Data	4 to 20944 words
Block 11 - Sounder Auxiliary Data (Figure D-6)	
Word Size	6, 8 or 10 bits
Field Length	10720, 8040 or 6432 words
Record Types	1 to 8

Cyclic Redundancy Check (CRC)
16

* Variable length information fields are subjected to zero packing to meet the minimum block length of 32208 bits. The maximum values above assume a 19.2 degree scan width.

Table A-3. GVAR Format

Sync Code 1254 Bytes	Header 90 Bytes Tripple Redundant	Information Field - 8,040 Bytes						CRCC 2 Bytes
		Instrument and Scan Status	Orbit and Attitude Parameters 1412 Bytes	Scan Reference Data 616 Bytes	Grid Data 3080 Bytes	Spares 918 Bytes	Factory Parameters 1736 Bytes	
(10032 Bits)	(720 Bits)	(2,224 Bits)	(11,296 Bits)	(4,928 Bits)	(2,4640 Bits)	(7,344 Bits)	(13,888 Bits	(16 Bits)

Note: Block 0 provides Documentation for blocks 1-10 (Imager Data blocks only. It does not apply to Block 11.

Figure A-2. GVAR Block 0 (Documentation Block) Format

Sync Code 1254 Bytes	Header 90 Bytes Tripple Redundant	Data Field - Maximum 15,756 Words (10-bit)						CRCC 2 Bytes
		Channel 4, Detector 1		Channel 4, Detector 2		Channel 5, Detector 2		
		Line Doc. 16 Words	Data * 1 - 5,236 Words (10- Bits to 52,360 Bits)	Line Doc. 16 Words	Data * 1 - 5,236 Words (10- Bits to 52,360 Bits)	Line Doc. 16 Words	Data * 1 - 5,236 Words (10- Bits to 52,360 Bits)	
(10032 Bits)	(720 Bits)	(160 Bits)		(160 Bits)		(160 Bits)		(16 Bits)

* The minimum Data Field is specified at 21,440 bits (2,1440 words). Therefore, the minimum detector field length, including the 160-bit Line Doc, is 715 words. Detector data fields less than 715 words are padded out to 715 words with zeros.

Figure A-3. GVAR Block 1 (IR Block) Format

Sync Code 1254 Bytes (10032 Bits)	Header 90 Bytes Tripple Redundant (720 Bits)	Data Field - Variable, Maximum 15.756 Words (10-bit)						CRCC 2 Bytes (16 Bits)
		Channel 2, Detector 1		Channel 2, Detector 2		Channel 3		
		Line Doc. 16 Words (160 Bits)	Data * 1 - 5,236 Words (10- Bits to 52,360 Bits)	Line Doc. 16 Words (160 Bits)	Data * 1 - 5,236 Words (10- Bits to 52,360 Bits)	Line Doc. 16 Words (160 Bits)	Data * 1 - 5,236 Words (10- Bits to 52,360 Bits)	

* The minimum Data Field is specified at 21,440 bits (2,1440 words). Therefore, the minimum detector field length, including the 160-bit Line Doc, is 715 words. Detector data fields less than 715 words are padded out to 715 words with zeros.

Figure A-4. GVAR Block 2 (IR2 Block) Format

Sync Code 1254 Bytes (10032 Bits)	Header 90 Bytes Tripple Redundant (720 Bits)	Data Field - Variable Length, 2,144 - 20,960 Words (10-bit)			CRCC 2 Bytes (16 Bits)
		Line Doc. 16 Words (160 Bits)	Data 4 -20,944 Words (40 Bits to 209,440 Bits)	Zeros * 0 - 2,124 Words (0 to 21,240 Zero Bits)	

* The minimum Data Field is specified at 21,440 bits (2,1440 words). Therefore, blocks having less than 2,128 data words (21,280 bits) are padded with zeros to achieve the minimum Data Field length.

Figure A-5. GVAR Blocks 3-10 (Visible Image Data) Format

Sync Code 1254 Bytes (10032 Bits)	Header 90 Bytes Tripple Redundant (720 Bits)	Data Field 64,320 Bits (6-, 8- or 10-bit Words)				CRCC 2 Bytes (16 Bits)
		SAD Block ID 40 6-bit Words (240 Bits)	Data - 64,080 Bits			
			Twelve blocks of raw data samples consisting of one sample from each of 76 sensors. (4,096 Bits/Block) (49,152 Bits Total)	Line and pixel locators (336 Bits)	Seventy-six calibrated channels of 12 pixels each (16 Bits/Pixel) (14,592 Bits Total)	

Figure A-6. GVAR Block 11 Format for Sounder Scan Data