United States
Mission Control Center
(USMCC)

Functional Description Document

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Version 1.2

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Functional Description Document

1 Introduction

1.1 General

The Functional Description Document (FDD) provides a brief summary description of the major hardware components and software processes used by the United States Mission Control Center (USMCC). The main purpose of the USMCC is to process information from emergency beacons that are detected by satellites and Local User Terminals (LUTs), and to relay results to appropriate Search and Rescue (SAR) authorities. The USMCC operates as part of the United States Sarsat Ground System which, in turn, is part of the international Cospas-Sarsat search and rescue satellite system.

The USMCC is operated by the National Oceanic and Atmospheric Administration (NOAA) on behalf of the U.S. Department of Commerce. The equipment described herein is located at Federal Building 4 in Suitland, Maryland. The system consists of a series of personal computers that perform specific function(s) and exchange processed information via local area networks (LANs).

1.2 Overview

The USMCC is based upon detailed requirements that are described in the Functional Requirements Document (FRD). It consists of 12 sub-systems that are identified in the FRD. Microsoft New Technology (NT) networking software and Microsoft Structured Query Language (SQL) servers form the operating environment for these processes. Interface is also provided to the Novell Network, dBase III databases and to workstations.

Table 1 lists the software sub-systems of the USMCC. The number and acronym for each function is also given. Figure 1-1 depicts the relationship between the various functions. Figure 1-2 depicts where the functions reside (on which personal computer) and uses numbers to indicate what functions are present on which machines. Sections 2 and 3 of this document provide a brief summary description of each function and hardware item.

The Detailed Design Document (DDD) contains more detailed descriptions and diagrams that depict the relationship between units, control elements, data flow, validation, exception handling and dynamic tasks. The Baseline Source Document (BSD) describes input, output, configuration and source code files together with installation and initialization procedures.

No	Sub-system	Functions	Acronym
1	Alert Processing	Validation, Match/Merge, Message Content, Message Destination	ALRT
2	Communication	Receipt, Data Formatting & Distribution	COMM
3	Operator Interface	Alert Site Query, Input/Output Message Query, Log	OPER
4	System Data	Telemetry & Orbit Vector Processing, SIT 605, Spacecraft Commanding and Narrative Messages	SDAT
5	System Monitoring	LUT, MCC and Satellite Performance, Large Location Error Reporting	SMON
6	Registration Database	Entry, Confirmation Process, Report Generation	RGDB
7	Incident History Database	Entry, Report Generation	IHDB
8	Self-test & Monitoring	Availability, Performance, Statistical Reports	SAMS
9	LUT Monitoring Database	Availability, Contract Accounting	LMDB
10	Interference Monitoring	Interference Match/Merge, Report Generation	INTF
11	Database Maintenance	Archive, Purge, Backup, Database Performance	DBMN
12	SAR Mapping and Geo-sort	Map displays, Geo-Sort, Region Definitions	SMAP

Table 1: USMCC Subsystems

1.3 Reference Documents

The following documents contain additional information about the USMCC and its functional processes:

- Baseline Source Document (BSD). *This document contains details about the software modules of the USMCC*

- C/S A.001, Cospas-Sarsat Data Distribution Plan. *This document defines conditions and routing procedures for messages to other Cospas-Sarsat MCCs and SPOCs.*

- C/S A.002, Cospas-Sarsat Standard Interface Document. *This document defines message formats that are used by Cospas-Sarsat MCCs for international data exchange*

- C/S A.005, Cospas-Sarsat Mission Control Center Performance Specification and Design Guidelines. *This document details the international specifications for MCCs.*

- Detailed Design Document (DDD). *This document contains details on the software and data processes of the USMCC*

- Data Structures Document (DSD). *This document lists the details for every table and field that is stored on the SQL server.*

- Data Transfer Specifications (DTS). *This document defines the message format for data exchange between the USMCC and its LUTs.*

- Functional Requirements Document (FRD). *This document outlines the essential requirements of the USMCC*

- Operator Interface Description (OID). *This document provides a detailed description of the screen formats and functionality that are used by the Operator Interface subsystem*

- United States Mission Control Center (USMCC) National Rescue Coordination Center (RCC) and Search and Rescue Point of Contact (SPOC) Alert and Support Messages. *This document describes the format and content for messages that are sent to the national RCCs and SPOCs and international SPOCs.*

- Telemetry and Command Procedures (TCP). *This document contains guidance on handling spacecraft telemetry data and commanding procedures.*

- CEMSCS/IPD[1] Data Interface. *This document describes the data format and the data exchange procedures between CEMSCS/IPD and the USMCC for Telemetry data.*

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[1] Central Environmental Meteorological Satellite Computer System / Information Processing Division.

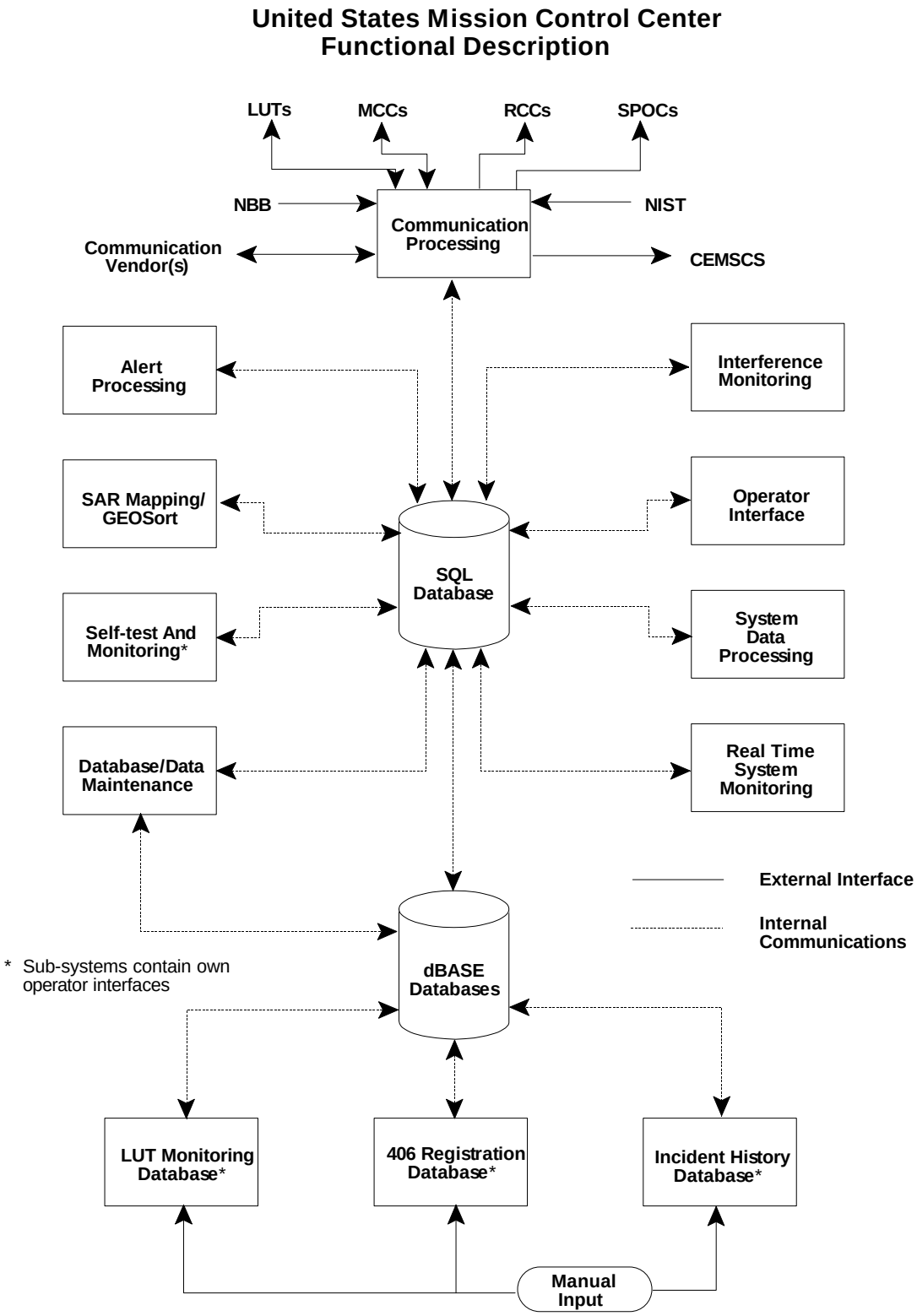

Figure 1-1: USMCC Functional Description

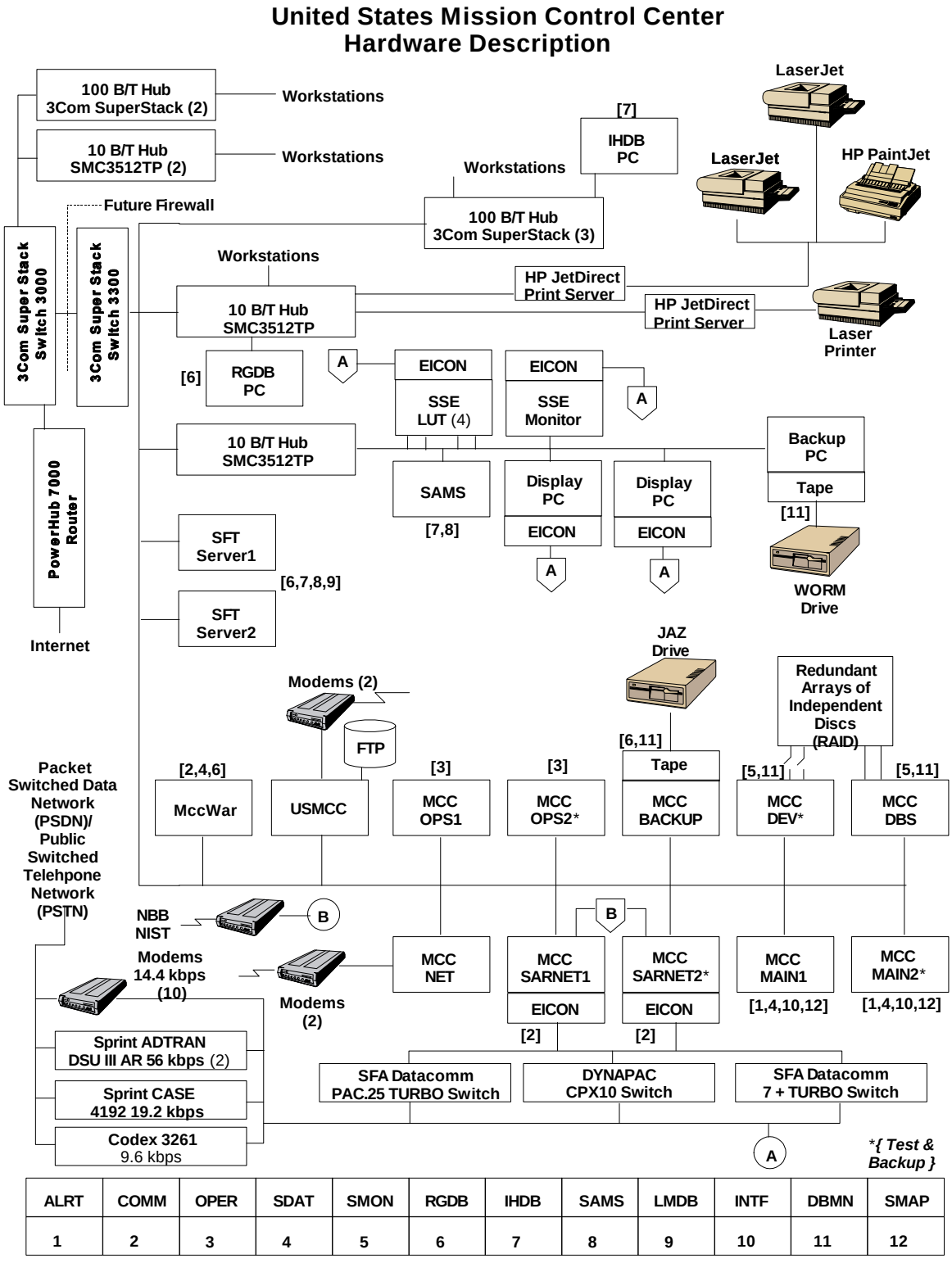

Figure 1-2: USMCC Functional Hardware Description

2 Software Functional Description

2.1 COTS and System Software

2.1.1 Microsoft SQL

In Figure 1-2, the SQL (Structured Query Language) database is shown at the center of the figure, with all the other processes connected to it. The Microsoft SQL server is the focal point for other processes because:

a) it stores both permanent and temporary data records that are received from, produced by, or passed to the other processors;
b) it stores configuration information that is used by other processors such as primary communication circuit and circuit information for a particular communication destination; and
c) it also performs some data validation when data is stored within a database field.

For example, when a message is received from a United States LUT, it is stored in a database table for incoming messages; other database fields are used to indicate the type of message that was received and whether or not it has been processed. Functions that handle incoming messages periodically check the table to determine whether there is any new data to be processed. As additional processing is completed, the results are written to specific output tables. Similar procedures are used throughout the system. Some functions check for configuration changes (i.e. message routing) before executing. Other functions read SQL database tables or use SQL to access dBase III information. Limited data validation is achieved by defining acceptable values or numeric ranges for data that is inserted into various database fields. Values are checked when data is written to the SQL database table.

A comprehensive description of all database tables that are used in the SQL database is contained in the Data Structures Document. Data formats that are used internally by the USMCC are defined in this document together with acceptable values. The field definitions contained in this document serve as a data definition dictionary. Definition of and modification to SQL tables is subject to configuration management review and approval process.

Because SQL server plays such a critical role, data is mirrored on another disk drive (Section 3).

2.1.2 Operating Systems

Microsoft New Technology (NT) provides the operating system software on which the USMCC applications software run. NT services are used to ensure that applications can always run, even if a user is not logged on. NT registries provide configuration parameters for NT services and for application software.

2.1.3 MapInfo

MapInfo is used to define geographic boundaries for search and rescue regions. It is also used by the Alert Processing subsystem to geographically sort data and determine a corresponding organization responsible for a given search and rescue region. Lastly, it is used as a geographical information service to display active alerts.

2.1.4 Other Software Products

USMCC historical data is stored in dBase III format. Processes that use older software include pass scheduling, orbit vector handling, LUT monitoring database, Self Test and Monitoring, 406 Registration Database and Incident History Database, and an assortment of database files. DOS version 6, Clipper, Mountain Menus and PlotIt are older software/programming packages that are used in the USMCC. New software was developed using Microsoft Visual Studio as the software development environment, with Visual C++ and Visual Basic as programming languages.

Orbit Vector handling and LUT Pass Scheduling are two key stand alone processes used by the USMCC. Each day, orbit vectors are obtained, validated, then used to generate daily LUT schedules. Subsequent distribution of orbit vectors and LUT schedules is handled by USMCC software as presented in 2.2.3.5 and 2.2.4.2.

2.2 Software Subsystems

2.2.1 Alert Processing

The functions carried out in Alert Processing are shown in Figure 2-1. It consists of a series of ten sub-processes, identified by the oval boxes, which are executed in sequence. In addition to the ten sub-processes, the Figure shows the relationship of the sub-processes to the SQL data base and the SMAP function. The Message Type List shown is an internal table.

The sub-processes are described briefly as follows:

2.2.1.1 Data Transfer

The Transfer sub-process: (1) converts data from the Input Message tables of the SQL Database to Input Data Items; (2) groups the Input Data Items into Data Processing Groups (DPGs); (3) assigns a Processing Time to each DPG; and, (4) passes the DPGs to the Validation sub-processes. The Transfer also performs some elementary checks on the data and, if necessary, attaches one or more Control Codes to the DPG.

2.2.1.2 Validation

Data Validation consists of checks applied to selected parameters in each Input Data Item (IDI) of a Data Processing Group (DPG). The parameters are specified in the Alert Validation Configuration tables of the SQL Database. The tables list: (1) the ValidationID (CheckCode); (2) the name and units of the parameter to be checked; (3) the limits or discrete values allowed for the parameter; and, (4) the actions to be taken if the test fails. Data Validation is performed separately for data received from US LUTs and for data received from foreign MCCs.

Message Validation procedures are broader than Data Validation procedures in that they cover more than one field at once and may include some pre-processing. Message Validation is carried out for data received from US LUTs and foreign MCCs. Validation is performed for reasonableness, self-consistency, agreement with the SID (e.g. one point beacon burst checks), agreement with USMCC information, and normal value ranges.

2.2.1.3 Data Classification

This sub-process breaks down the Input Data Items into Alert Data Items (ADI) for Match/Merge Processing. The ADI Type Code is a four-bit code associated with the ADI. The code bits indicate the information content of the ADI, as shown in the following table. These four-bit codes guide the processing of the ADI through Match/Merge.

Bit	Information in ADI	0 means	1 means:
0	Beacon ID	121.5/243-MHz	406-MHz
1	EventTime	GEO	LEO
2	DopplerLocation	Unlocated	Doppler
3	EncodedLocation	No encoded	Encoded

2.2.1.4 Data Filtering

This sub-process checks the Input Data Items against Configuration Parameters and attaches codes for Special Processing, Exceptions Processing, Match/Merge Processing, Site Maintenance, Message Routing, Message Formation, and other Alert sub-processes as required. Special Processing and Exceptions Processing involve a comparison of incoming data against entries in alert validation and configuration tables that identify action to be undertaken. The DSD and FRD documents contain further details on this subject.

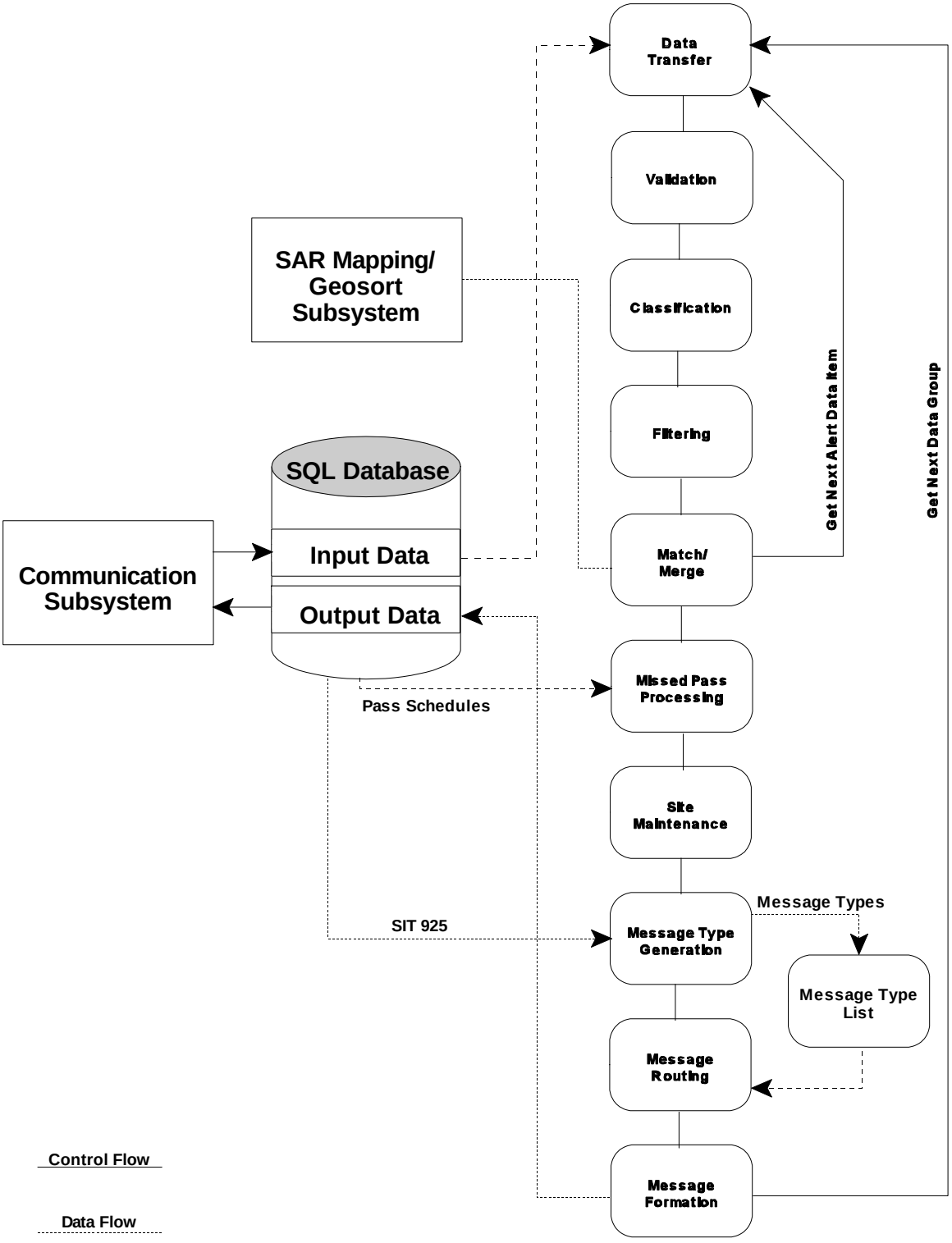

Figure 2-1: Alert Process Overview

2.2.1.5 Match/Merge

This sub-process matches and merges Alert Data Items into the 121.5/243-MHz Alert Sites and the 406-MHz Alert Sites. When alert data arrives at the USMCC, it is checked to determine whether or not the data matches data recorded in an existing site. If no match is found, a new site is created. If a match is found, the data is merged into the site as either new or redundant information. The basic criteria used to determine whether data is new or redundant is described in C/S A.001. The creation of a new site will trigger a first alert message. Updates to a site (new merged data) will cause ambiguity resolution or continued composite message types (see 2.2.1.8) to be produced, depending upon the current status of the alert site. A more detailed description of messages may be found in C/S A.002 (messages to MCCs) and the USMCC RCC and SPOC Alert Support Messages document.

2.2.1.6 Missed Pass Computation

This sub-process computes the missed pass information for USMCC alert messages. The Missed Pass computation is performed when all ADIs of a US LUT Data Processing Group have been processed. The process is the same for 121.5/243-MHz as for 406-MHz beacons.

2.2.1.7 Site Maintenance

This sub-process includes Site Frequency Determination (updates site frequency), Site Closing Conditions (sets a toggle to identify when a site should be closed), Archiving (identifiy site data that needs to be archived), extraction of data for the Morning Report, updating information for the Site Summary Report and other housekeeping functions.

2.2.1.8 Message Type Generation

The Message Type Generation sub-process modifies some of the Message Types produced by Match/Merge, and adds several other Message Types based on the results of the Match/Merge, Missed Pass and Site Maintenance sub-processes. These include Better A-B, Position Conflicts, Detection Update, NOCR, 406 Beacon Registration (SIT 925), Missed Pass, and Site Closing Message Types.

At the end of the Message Type Generation sub-process, a Message Type list is passed to Message Routing.

2.2.1.9 Message Routing

Message Routing (1) determines the destination list for the Alert Message Types produced by Message Type Generation and (2) specifies the contents of the Alert Message Routing list. Message Routing includes the Alert Site Send Checks, the SAR Table Send Checks, SAR Table Trace Procedures, and

the SAR Table Echo Procedures.

2.2.1.10 Message Formation

This sub-process forms the USMCC alert message types based on the results of Alert Message Routing and the data in the Alert Site and places them on the Output Data Base for transmission by Communications. It includes Next Pass Computation for use on the Output Messages. (See section 2.2.3.6 for narrative messages handling)

2.2.2 Communications

The communication function processes incoming and outgoing messages. Two way data communication occurs between the USMCC and the United States Local User Terminals (LUTs), other Cospas-Sarsat Mission Control Centers (MCCs), and with communication vendors. Generally one way communication occurs between the USMCC and United States Rescue Coordination Centers (RCCs), and foreign SPOCs. Orbit vector information for NOAA satellites is received from the Naval Bulletin Board (NBB), time information from the National Institute of Standards and Technology (NIST) and SARSAT telemetry is received from Central Environmental Meteorological Satellite Computer System (CEMSCS). X.25 packet switched data is the primary communication media with LUTs, RCCs, and MCCs with Telex serving as a secondary method with other MCCs. FAX is the secondary method to most RCCs and the primary method to most national SPOCs. FAX is the primary method and Telex the secondary method with international SPOCs. File Transfer Protocol (FTP) is the only communication method with CEMSCS, the primary communication method with CMC and secondary method with CMCC. Data is exchanged among MCCs, RCCs and SPOCs as ASCII messages. Binary data is exchanged with the LUTs and CEMSCS.

The communication function obtains configuration information from SQL configuration tables that is needed to receive data or to connect to a specific destination in order to transmit data. Due to the different types of messages, some decoding and conversion must also be performed. For example, dates reported by LUTs are expressed in seconds since 1980. MCCs use Julian dates, RCCs use year/month/date, but the SQL server stores dates in its own standard format. Thus, some input/output conversion is also performed as part of the communications function. Flat files are used to stage input/output data and are defined in the Baseline Document. Figures 2-2 through 2-4 detail the communication interface at the USMCC, LUTs and RCCs.

Figure 2-4 describes in detail the main module involved with the communication subsystem. The communication module runs to provide X.25 and X.400 communications to/from Sprint and MCI. MCI converts X.400 data from the USMCC to facsimile or Telex for those sites configured to receive facsimile or Telex. Data exchange via the Internet uses FTP. Input data is processed from a local FTP server, and output data is placed on a remote FTP server. An input convertor communicates with the

LUTs and handles all inbound data. The output convertor is responsible for formatting and transmitting data from the USMCC to all site types except LUTs.

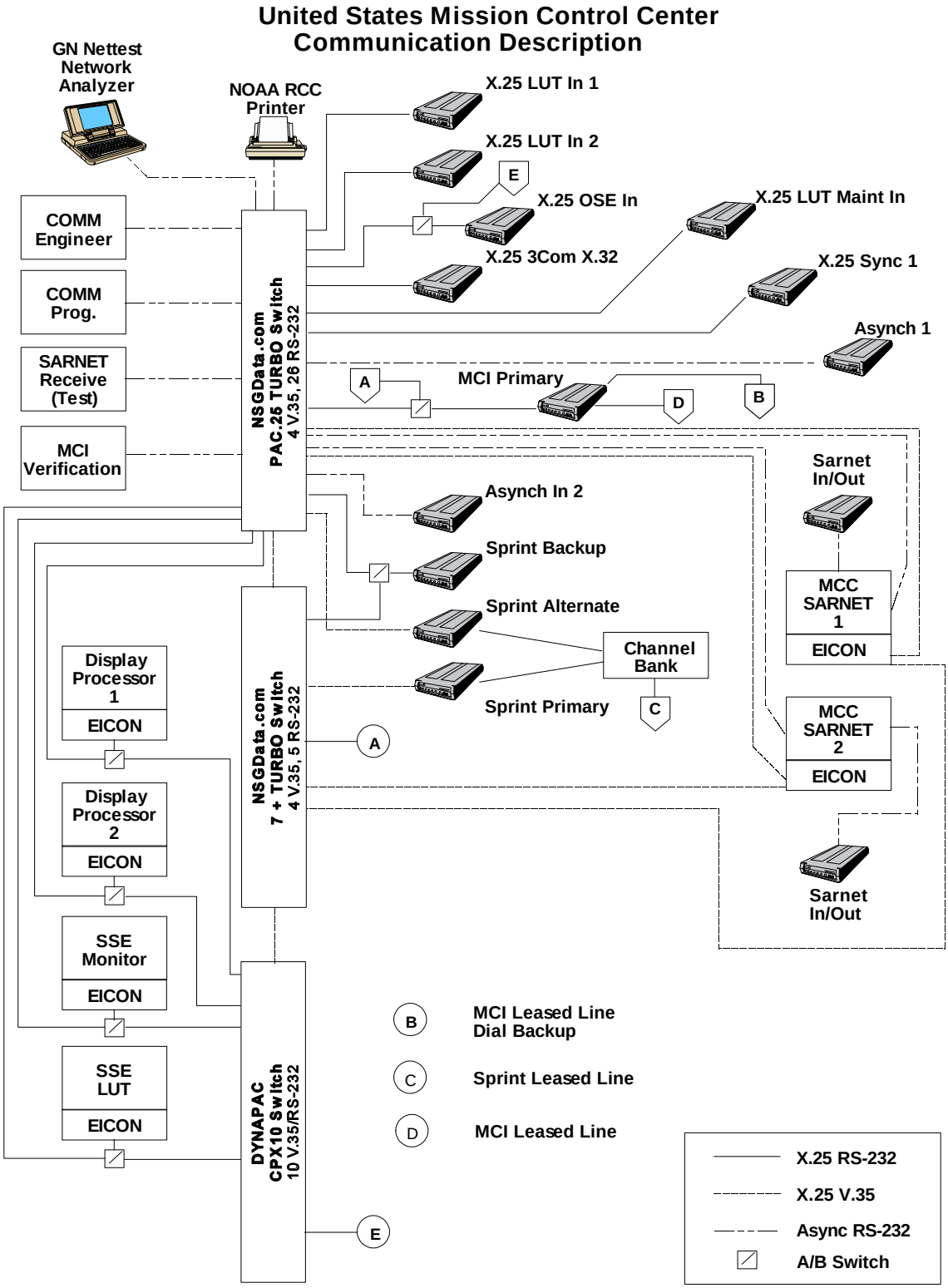

Figure 2-2: USMCC Communications

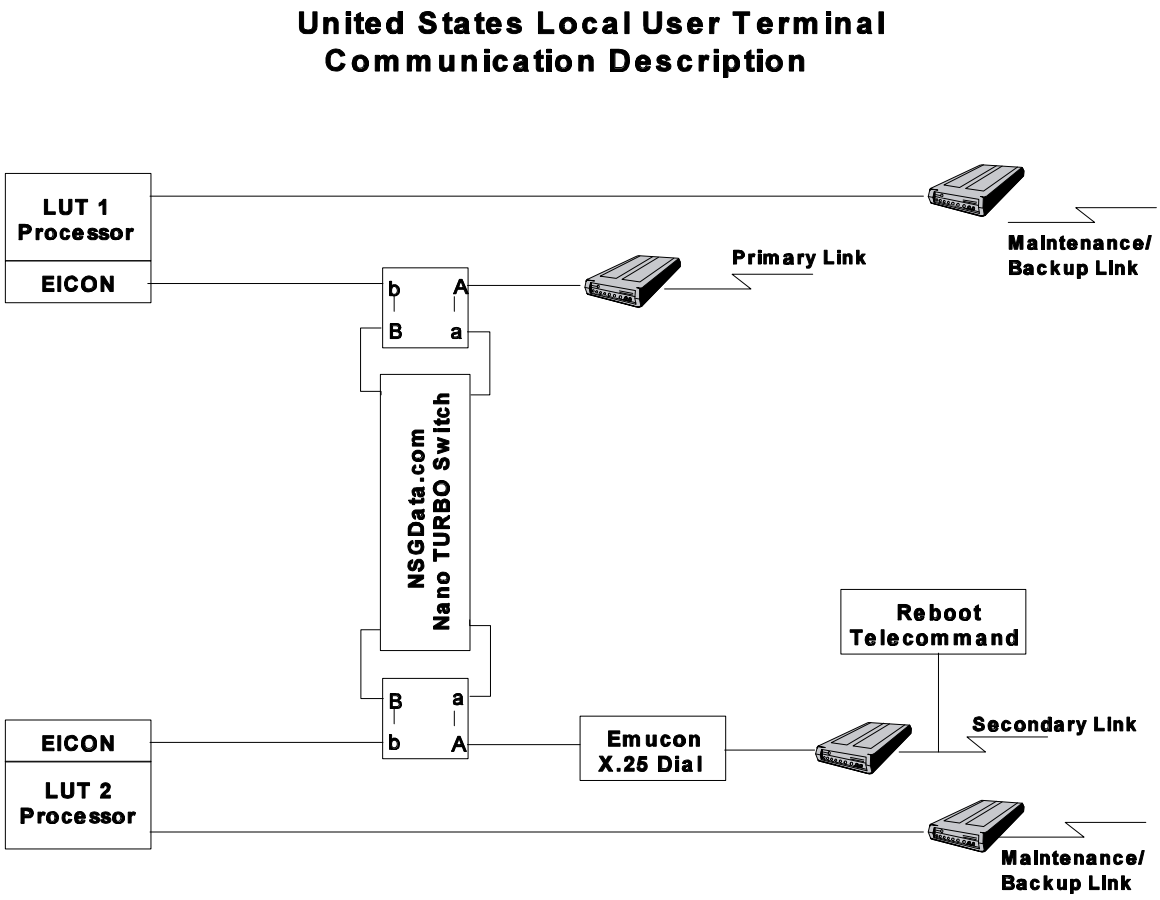

Figure 2-3: USMCC LUT and RCC Communications

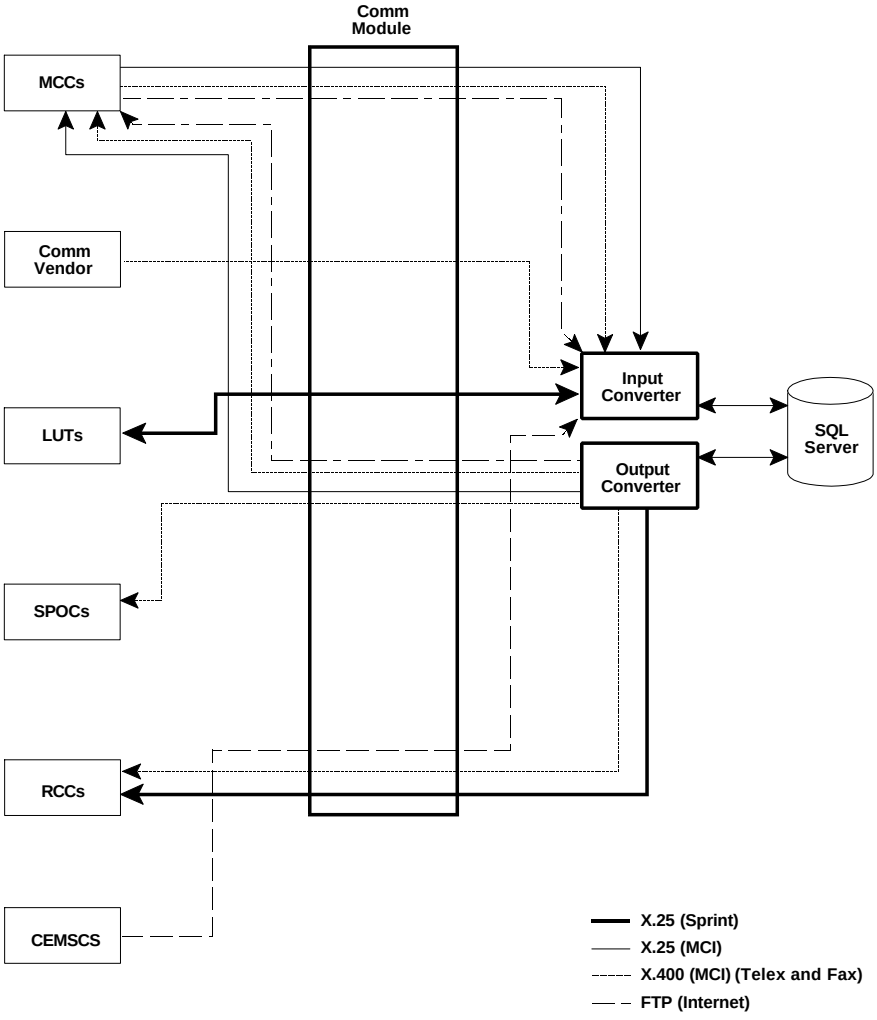

Figure 2-4: Description of Communication Module

2.2.3 Operator Interface

The Operator Interface provides the tools that the Duty Controller uses to monitor and control the USMCC processes. All screens that are described below are available to any authorized user. A future enhancement will restrict acknowledging of alarms to the Duty Controller.

The main Operator Interface functions are:

- operator message log and message log query;
- alert site queries;
- message queries;
- communications status and control;
- LUT pass control and monitoring;
- support messages;
- SRR determination;
- morning briefing; and,
- configuration modification of the USMCC.

Several stand alone modules are also described in this section such as support messages that allows the duty controller to generate narrative style messages for transmission to other MCCs, RCCs and SPOCs.

Each Operator Interface screen has two menu selections: "Connect" and "Print". These selections are situated in the upper left hand corner of the screen, immediately below the title bar. The Connect selection is used to identify the database that the screen will use (Operational, Test or Developer and in the future Archive). The Print selection allows the contents of the displayed menu window to be printed. Printer output will be to the default printer for the workstation that is running the program.

The operator interface screens were implemented using common Microsoft windows practices. A detailed functional description can be found in the Operator Interface Details document.

2.2.3.1 Operator Message Log and Message Log Query

The various USMCC processes/modules pass messages to the operator interface while they are executing. These messages describe the current state of the process and/or any unusual conditions that are encountered during processing. Each status message is assigned a numerical value between 0 and 49 for programming priority and operations priority. The former is to assist programmers and software maintenance personnel in troubleshooting conditions that lead up to a problem; the latter is used to prioritize problems for USMCC Controller consideration/action. Messages with high operations priority are considered to be alarms and require acknowledgment by the Duty Controller. In a future enhancement, numeric threshold settings will control the degree of detail that the operator views with

minimum thresholds customized for individual Controllers. The series of tables that are used for this function are described in detail in the Data Structures Document.

The Scroll module displays messages that scroll by on the Duty Controller screen and alerts the Controller to priority messages. High priority system messages require USMCC Controller acknowledgment. When the USMCC Controller acknowledges a message, the time and user identification is recorded in the database.

The volume of messages produced for display is very high. To assist the Duty Controller in locating messages, a second program called OpQuery is provided. This program will search the operator log by subsystem (default is All), by programmer priority and/or operator priority (default with operator priority equal to or greater than 20), time range (default is the last 2 hours), and message number range. Future enhancements will add specific options to include program name or predefined groups of messages associated system problem.

The modules above are dependent upon the SQL server being up. A third module notifies the USMCC Controller when a program cannot access the SQL server.

2.2.3.2 Alert Site Query

The locations of active beacons are stored as Alert Sites. Each Alert Site is assigned a unique number and is linked to historical data that is associated with that beacon activation. This operator interface screen allows the user to query basic site information based upon site status (open/closed), site id (site number or 406 beacon information), time range, frequency band(s), whether composite sites or all sites are displayed, and/or location constraints.

This program is called AlertSiteQuery may be run from workstations other than the Duty Controller. The Controller may query site for information based on a defined geographical area, frequency band, site status, defined time period, and/or beacon identification code. The information returned provides the controller with details concerning the alert location, responsible SRR(s), source of the alert information (LUT and satellite), beacon identification or frequency, time of first and last site updates, or time and reason for site closure for historical data. Links are also available to source/destination messages that result from site activity.. The default setting is to display all currently active sites on all frequency bands.

After a site search query is done, a short list of site information is displayed in a window at the bottom of the screen. Selecting a specific site in this window will display an additional “Site Functions” screen. This screen is a Tab Box and the functionality is selected by clicking the appropriate tab:

- Site Status. This screen shows the SRRs for the site and their status, any changes made to the site and actions that can be performed (Hold Open or Close). Modifications to the site are

record in a change log along with the time of the change, person making the change and reason for the change.

- Summary Report. This provides a summary of information at the Alert site level.
- Intermediate Report. This option produces a summary of search results together with details for each pass on which the beacon was detected.
- Detailed Report (a future enhancement). This option produces a detailed summary of search results. All information available at the USMCC is displayed.

Each report may be printed or sent to a specific destination.

2.2.3.3 Message Query

This screen is used by the USMCC Controller to retrieve either incoming or outgoing messages for viewing, printing and/or transmission. Messages are categorized by Type of Site (MCCs, SPOCs, RCCs, LUTs, CEMSCS, or Unknown). Messages may be selected by the type of site, specific destination (or all), incoming or outgoing, Message Type (Subject Indicator Type per C/S A.002), and/or time range (default is the most recent four hours). Message Query may be performed from any workstation.

When a message query is performed, the user is provided with a short summary list of messages that met the search criteria. The user may then select one or more messages from the list for further action. A selected message can be transmitted in the appropriate format to another MCC, RCC or SPOC by selecting the appropriate entries in the drop down list boxes under “Send To:”. Message details can be viewed by selecting the desired message(s) and clicking the “Display” button. This action will bring up a new window that displays the entire contents of the message. A print button at the bottom of this window allows the contents of the display window to be printed.

2.2.3.4 Communications Status and Control.

ComSiteDisplay is a module provided to the USMCC Controller to monitor and modify communications. This program initially presents the controller with a screen that is composed of two tabbed selections: 1) Communications Status; or, 2) Modify Com Site. This program may be run from any workstation.

The Communication Status screen requires the user to select a tab for the type of communication site (MCC, RCC, SPOC, LUT or CEMSCS) to be displayed. The tab selection will produce a detailed listing of information pertaining to all sites of the type of site that was selected. Key information includes site name, path name, on line status and time/message number for the last communications exchange. Color coding is implemented to identify significant information.

The Modify Com Site screen is used by the Duty Controller to modify communications for a specific

destination. The type of site and specific site are selected by using drop down list boxes that cause the current path and settings to be displayed. The controller may then select an alternate path from a second display window or alter settings. The Controller must provide a brief explanation for each change. An alternative information window is provided to record tracking information such as ticket number used by the communication provider. A window at the bottom of this screen allows the user to view the recent history of changes made to the selected site.

2.2.3.5 LUT Scheduling and Control

LutInterface is the main module that is used to control US LUTs. This screen allows the Duty Controller to:

- request a status message, schedule or pass data from a LUT
- send an MCC status, orbit vectors, LUT schedule, Time Calibration (Tcal) message, or communications test message
- change a LUT schedule (track or suppress specific passes)
- to activate the transfer of graphic files from a LUT to the USMCC, or
- allow specific LUTs or satellites to be excluded from use for missed pass calculations by frequency band(s)
- control the graphics display computers output (a future enhancement)

Changes to next pass/missed pass and to a LUT schedule require the Duty Controller to enter a note explaining the change. LUT schedule changes are password protected in order to avoid accidental alteration by occasional users.

PassSchedule is a complimentary module that is used to monitor LUT performance. It is based upon the master schedule for all LUTs. Using default settings, the screen will display the past two hours and the next two hours for all scheduled LUT passes. The user may select a specific LUT and/or satellite, change the time period, and display all passes or problem passes or scheduled passes. The query is initiated by selecting the appropriate parameters then clicking the “SRCH” button. For satellite orbit that was tracked by a LUT, a summary of results is displayed in a window on the screen. This summary includes the actual satellite AOS/LOS times, the time that the MCC processed the data, the number of solutions received on each frequency band and observed anomalies such as a discrepancy between the number of solutions reported by the LUT versus the actual number that were received.

Each of the foregoing programs can be run from any workstation.

2.2.3.6 Support Messages

“SupportMessages is used to create one of four types of narrative messages that the Duty Controller uses. These are narrative messages (SIT 915), 406 Registration Database message (normally SIT

925), a System Narrative message (SIT 605) or a Next Visibility message (SIT 953). The 406 registration database message screen allows the user to enter criteria that can be used to search the 406 database. This information can then be inserted into a SIT 925 message. The next visibility function allows the user to enter criteria for the calculation of the next time of beacon visibility for a specified location.

2.2.3.7 SRR Determination

AxBzCli is a module that the user can invoke to determine the Search and Rescue Region (SRR) and buffer zones for a particular latitude/longitude.

2.2.3.8 Morning Briefing

MBrief collects information that is used for the morning briefing. It supports the portion of the morning briefing that is based upon 406 beacon activations that contain a US Country code or were activated in a USA Area of Operational Responsibility (AOR). Information is presented by calendar day based upon the time at which a 406 MHz beacon site is closed. Many data fields are copied from the AlertSite406Sum table to this form. Data fields that require user input are highlighted in yellow. Data from this form is automatically extracted into the Incident History database.

2.2.3.9 Configuration Modification Interface

Some limited recording of configuration changes occurs when actions are performed by the Duty Controller. These were described under previous sections. An interface will be developed later to handle other modifications that currently are made using MS Access or SQL query.

2.2.4 System Data

System Data provides information that is critical to the proper functioning of the Cospas-Sarsat ground system. System data is exchanged primarily amongst Cospas-Sarsat Mission Control Centers. There are three different types of system data: 1) status messages that are exchanged amongst MCCs; 2) satellite information that is required by the LUTs to track the satellites and to process received data accurately; and, 3) space segment provider messages.

2.2.4.1 System Status

The Cospas-Sarsat ground segment must function reliably and efficiently if Search and Rescue authorities are to receive satellite data in a timely manner. Each MCC is responsible for monitoring its portion of the ground segment. In the event that significant changes occur in either the space or ground segments, system status messages are used to notify other MCCs. Nodal MCCs, such as the USMCC, may be required to inform several MCCs of any such changes. This is accomplished by using messages with a unique Subject Indicator Type code and are called System Status Messages. If the USMCC receives a System Status Message, an alarm is passed to the Operator Interface to alert the Duty controller. This alarm must be acknowledged by the USMCC Controller. Conversely, if the message originates in the USMCC, a separate software module allows the Duty Controller to create and send a System Status Message. Procedures for handling system status are described in C/S A.001.

2.2.4.2 Orbit Vectors and Time Calibration

LUTs require accurate orbit vector information in order to track satellites. The Russian MCC (CMC) sends orbit vector information for Nadezhda (COSPAS) satellites to the USMCC where it is validated and stored. The USMCC also obtains orbit vector information from the US Navy Bulletin Board for NOAA TIROS and Russian Nadezhda satellites, validates and stores it. At predetermined times each day, the USMCC forwards the latest orbit vector information to other MCCs using the orbit vector message as described in C/S A.002. Orbit vector information is also forwarded to USA LUTs twice daily at preset times using DTS format and protocol. The USMCC Controller may update orbit vectors for one or more United States LUTs at any time using the LutInterface.exe screen described in 2.2.3.5..

Time Calibration (TCAL) information is needed by the LUTs to process 406 data that is received from the SARP processor onboard Sarsat spacecraft. This message provides information related to the oscillator frequency used onboard the processor and date of rollover time of the onboard clock. TCAL information is received from France and distributed to other Cospas-Sarsat MCCs in accordance with procedures outlined in C/S A.001 with formats described in C/S A.002. The Duty Controller can also send TCAL to a USA LUT manually, using the LutInterface screen.

Data formats and parameters that determine the transmit time and message routings are stored in SQL configuration tables. A more detailed description is provided in the Data Structures Document.

2.2.4.3 Space Segment Monitoring

Each space segment provider monitors and controls its own satellite equipment. If critical changes occur with satellites, other MCCs will be notified using system status messages (described above).

If status changes involve Cospas satellites, the Russian MCC (CMC) will notify other MCCs using system data distribution procedures described in C/S A.001.

The Sarsat space segment involves equipment from three different nations. Thus, the process is more complex. Canada provides the instrumentation for the Search and Rescue Repeaters (SARR) and the downlink transmitter. France provides the instrumentation for the Search and Rescue Processor (SARP). NOAA controls the satellite on which these instruments are carried and receives and processes telemetry information (data that monitors the health of these instruments).

As various SARSAT satellites are tracked, telemetry information is received at CEMSCS. Information pertaining to SARSAT instruments is extracted and forwarded to the USMCC where data is stored in appropriate SQL tables. Separate SARR and SARP tables are kept for each SARSAT satellite. Some limited statistical processing is carried out (minimum, maximum, average values) and included in daily messages that are sent to Canada and France. One message per day is sent to Canada and one

message per week is sent to France (as per their requirements to the USMCC) for each satellite that has active, serviceable instruments.

In addition to routine telemetry messages, special messages are used to report critical problems. Should a particular instrument report a value that falls outside predefined acceptable limits, an "Out of Limits" message is created and dispatched to the appropriate nation. When such a condition arises, an alarm is also sent to the Duty Controller at the USMCC.

The third aspect of space segment monitoring and control involves commanding the satellites to alter their configuration based on space segment commands and procedures defined in the TCP. When such a message is received from Canada or France, it is forwarded to the NOAA SOCC who schedules the command for execution. Once the change has been made, NOAA SOCC sends a "Command Verification" message to the USMCC, where it is forwarded to the appropriate nation. These messages also raise an operator alarm for the Duty Controller.

Message formats and SQL Tables that store this data are described in C/S A.002, Cospas-Sarsat Standard Interface Description, the Telemetry and Command Procedures, and the Data Structures Document respectively.

2.2.4.4 Pass Scheduling

Each day, a 48 hour master schedule for the USA LUTs is calculated by this stand alone process. It uses the most current orbit vectors, Lut and satellite configuration information, and satellite tracking priority that are stored in the SQL tables. The schedules are passed to the communication process for transmission.

2.2.5 System Monitoring

This function serves to detect possible malfunctions in the Cospas-Sarsat system and in the USMCC and to bring them to immediate Controller attention. The SMON function is carried out in realtime (or near realtime) and comprises six sub-functions.

2.2.5.1 LUT Pass Check

This check is performed by the USMCC controller using the "Pass Schedule" interface. All Pass Completion Reports (PCRs), Headers, Solution Files, Pass Start and Status Reports received from the LUTs are examined for time of receipt and content. Completed passes are correlated with USMCC Pass Schedules sent to the LUT and checked for: LUT status indicators, time of completion, number of solutions (121.5-MHz, 243-MHz, 406 intf, 406 PDS), LOS, and AOS.

Additionally, missing, late, incomplete and unscheduled passes, and passes out of normal limits with

regard to the checked parameters, cause a message to the operator. Severity level of the message is determined by the nature of the discrepancy in the check.

2.2.5.2 LUT Orbit Vector Check

The orbit vectors returned to the USMCC as the result of sending orbit vectors to a LUT are examined. Values are compared with orbit vectors at the USMCC. In a future enhancement, orbit vectors received from the LUTs in solution headers will also be checked against orbit vectors on file in the USMCC. An alarm raised to the USMCC controller when either check detects an out of tolerances condition.

2.2.5.3 Beacon Location Accuracy Check

In a future enhancement, solutions from the US LUTs will be scanned for known test and orbitography beacons. Locations in error by more than a nominal distance will cause an alarm to be raised to the USMCC controller and also be written to a Location Error file for future reference and analysis. This enhancement will utilize software written for Large Location Error monitoring. Location errors identified by this check may be indicative of a LUT problem that can be resolved by Controller procedures.

2.2.5.4 LUT Communications Check

This software tests and reports on the communications lines from the USMCC to the US LUTs. Testing is done on a weekly cycle. Calls are made to the maintenance line of each LUT at a site and then an X.25 call is placed to the MCC out of the primary and into the secondary circuits.
The results of the test, including detected errors, are sent in a narrative message to the USMCC Controller.

2.2.5.5 MCC Processing Checks

A set of stored procedures in the SQL Database are regularly activated in order to test US MCC readiness. These procedures check: (1) time expired since last USMCC output message; (2) time for completion of USMCC processes; (3) time since last input to USMCC by MCC; and, (4) time for processing of Alert data from US LUTs. Out-of-tolerance cases are reported to the USMCC Controller and logged for future reference.

2.2.5.6 Large Location Error Check

This process automatically extracts all 406-MHz location errors greater than 120 kilometers. Large Location errors are reported each day according to Cospas/Sarsat procedures. Data are also analyzed manually by comparison with SAR reports from RCCs and other sources, and commentary is appended to the Cospas/Sarsat reports. Unlike the Beacon Location Accuracy check (2.2.5.3), this check is only applied to operational beacons.

2.2.6 Registration Database

When United States coded beacons are purchased by users, additional information is provided by the owner and recorded in a database for use by Search and Rescue Forces. This process is referred to as beacon registration. The 406 Registration Database (406 RDB) is managed by NOAA/NESDIS at the USMCC facility. The format for registration data varies based on the type of beacon registered. Emergency Position Indicating Radio Beacons (EPIRB) for vessels, Emergency Locator Transmitters (ELT) for aircraft, and Personal Locator Beacons (PLB), as well as some special beacon programs all have different formats. Examples of these formats may be found in Appendix 2 to the USMCC National RCC and SPOC Alert and Support Messages document.

When the USMCC receives a 406 beacon alert, some of the beacon information is decoded and stored in the alert database tables. The 15 character hexa-decimal identifier of the beacon is then used to access the 406 Registration Database (406 RDB) to obtain additional information about the owner, vehicle identification, etc. This information is attached to alert messages that are sent to RCCs. If a USA registered beacon is activated in an area outside the USA AOR, the USMCC Controller can access the database, using the beacon identification code, and forward registration information to appropriate search and rescue authorities when requested, using a SIT 925 message format (2.2.3.6).

Information is provided in the 406 RDB such as owners name, mailing address, telephone numbers for the owner, points of contact, vessel name, type, size, capacity, radio call sign, registration number, communications equipment, home base.

Registration information is manually entered into the 406 RDB by a clerk. The information is stored as dBase III files supported by Clipper programs for data entry and reports. After a beacon is registered in the database, update reports are generated and mailed to each owner to confirm that the beacon was registered. Other reports involve decal confirmation mailings to obtain new beacon decals (every two years, owners are contacted in order to verify that registration information is correct and up to date). The 406 RDB is used in conjunction with the IHDB (discussed below) to monitor overall effectiveness of 406 beacons. A user reports program is provided to support other user queries and some software utilities are provided to support database backup and maintenance. The USMCC uses a timed procedure to check the dBase III tables for updates and to copy new information over to the USMCC SQL tables.

2.2.7 Incident History Database

The IHDB is used to generate national and international reports, and to identify opportunities to improve beacon design, regulation, information processing and alert response. The Air Force, Coast Guard, and NOAA have worked together to establish the minimum information required to improve the system.

When the USMCC creates a 121/243 MHz site and the composite location lies within the US AOR,

an incident feedback report is attached to the site information for transmission to an RCC. This form requests information from the RCCs on the outcome of distress signals which is only available at the RCC. Satellite derived information includes Site ID, time that the composite site was formed, and calculated latitude and longitude. When a site closes, a program is run that adds the site information to the IHDB if appropriate.

For 406 MHz beacons, a similar procedure is followed except that information is written to the IHDB for first alerts where one location lies within the US AOR or where the beacon contains a USA country code. Additional encoded information included in the Incident Report is the Beacon Identification code (15 hexadecimal), Manufacturer, Model and Type. If the beacon code is listed in the 406 Beacon Registration Database, additional information about the owner, vehicle, etc. is extracted from the 406 406 RDB and added to the IHDB.

Information provided by RCCs includes the role that Cospas-Sarsat alert data played in the incident, RCC mission numbers, resources involved, mission status (distress/non-distress), time line information, actual location and reason for beacon activation. Presently, the Incident Feedback report is transmitted back to the USMCC by facsimile and by e-mail from AFRCC. The IHDB clerk then updates the IHDB. Information from the morning report to NOAA is also used to update the IHDB. These processes are partially automated, and are described in the FRD. Future work will focus on further automating external (RCC) inputs to the IHDB process.

Periodic reports are produced from the IHDB. These include information sent to 406 MHz beacon manufacturers concerning beacon activations in distress and non distress situations. Similar reports are provided to US RCCs each quarter and annually to the Cospas-Sarsat Secretariat. Updates, Monitoring and quality control of the IHDB is provided by other Clipper and Flipper programs and screens. One such program is run periodically to identify outstanding incident feedback reports that were not returned by RCCs.

2.2.8 Self-Test And Monitoring System

2.2.8.1 General

The Self-test and Monitoring System monitors the satellites, LUTs, orbitography beacons, and LUT-MCC operations. The major parameters monitored by SAMS have to do with availability (which components are working), performance (how well they are working) and activity level (how many beacons the system is handling). Unlike SMON which is concerned with realtime error reporting, SAMS is more oriented towards identifying longer term trends.

The SAMS provides enough history to detect failure patterns and performance trends for medium and long term monitoring. It is not intended to provide the rapid response information needed for failure detection and repair on a near real time or day-to-day basis, which is provided by the Real-Time System Monitoring function.

2.2.8.2 Data

Data for SAMS are obtained from the Alert Processing, System Data, and Communication subsystems. The data cover all satellites, orbitography beacons, and US LUTs. SAMS collects and stores selected data every day and displays them on a 30-day time line. SAMS is updated overnight

and is made available by 9:00 AM local time. The displays are both graphical and tabular. Users may access the last day's information at any time.

2.2.8.3 Operation

SAMS is created on a PC which downloads its data from the online USMCC SQL Database at 1:00 AM EST (0600 UTC) each day. The SAMS PC prepares the plots and reports, every morning so that they are available to the local terminals prior to 1400 UTC. The monitoring period covered by the data is the thirty days ending at the last UTC midnight.

2.2.8.4 Exceptions Reports

The Exceptions Report provides a brief summary of instances meeting certain exception criteria. Review of the Exceptions Report provides a rapid overview of unusual system operations in the last 30 days. The report may be printed after viewing.

2.2.8.5 Availability

The 'availability plots' in SAMS are intended to indicate the extent to which the various system components were functioning or not functioning during the preceding 30 days. The system components treated are LUTs, satellites, and selected orbitography beacons.

(1) LUTs: The Single LUTs menu selection displays information for each of the fourteen LUT units considered independently. The plots shown under "Dual LUTs" are the same as those for "Single LUTs", except that the two LUT units at a site are treated as a single unit. Thus a pass is considered to be completed by the combined LUT if it is completed by either unit, and not completed only if neither unit completes it.

(2) Satellites: Satellite availability is measured by its 406-MHz burst message throughput. This is defined for each pass over an orbitography beacon as the number of beacon burst messages transmitted out of the satellite, divided by the number received by the satellite, times 100. Practically, the number out of the satellite is taken to be the maximum number of bursts recorded by any of the US LUTs, and the number into the satellite is determined by dividing the time from first to last point by the orbitography beacon period, and adding one. Average throughput is displayed in SAMS by day over the last thirty days for each satellite and beacon.

(3) Beacons: These plots provide an overview of burst reception from each orbitography beacon over the last 30 days.

2.2.8.6 Performance

The Performance plots in SAMS are intended to indicate how well the various system elements functioned during the preceding 30 days. The performance measures shown in SAMS are those of location accuracy and system timing.

Location Accuracy

(1) The location accuracy of operational 121.5/243-MHz beacons is derived by SAMS from all Active Sites that have been closed in the thirty days prior to GMT midnight. The data are derived from the USMCC Alert Site File. They consist of solutions for the site composite and for the pass composites.

(2) The location accuracy of operational 406-MHz beacons shown is derived by SAMS from all Alert Sites that have been closed in the thirty days prior to GMT midnight. The data are derived from the USMCC Alert Site File. They consist of solutions for the site composite and for the pass composites.

(3) SAMS displays the orbitography beacon location errors in various formats in order to help identify the error sources. The formats are: (A) Scatter Plots by LUT, by satellite, and by orbeacon. These show the location error in kilometers in the east and north directions. (B) Daily Plots by LUT and satellite, giving the average error by day for errors under 10 kilometers.
(C) by Pass Parameters: number of points, curve duration, elevation angle, central angle, measurement noise, A-Probability, window factor, frequency bias, bias standard deviation, satellite, LUT and MCC.
(D) by quality filter. These plots show the percent of errors greater than 5 kilometers by LUT, satellite, and beacon for solutions with (i) three or more points, (ii) window factor between -1 and +1, and (iii) Central Angle between 1 and 30 degrees.

System Timing

(1) LUT processing time is the time from satellite loss of signal (LOS) time to LUT processing complete time (LPC), as reported by the LUT in the Pass Completion Report (PCR) for the pass. It is shown by SAMS for the US LUTs in a set of four plots covering the last 30 days.

(2) LUT-MCC communication time is the time from LUT processing complete, as reported in the PCR, to time the last message for the pass was received by the USMCC from the LUT, as recorded by the MCC. A set of four screens shows communication time for each of the LUTs over the last 30 days.

(3) The MCC Processing Times plot shows, in the upper half, the times from first receive at the MCC to first send from the MCC, for each LUT pass during the preceding 30 days. All LUTs are included. The lower half of the screen shows the time from receipt of the last data for a LUT pass to the time the MCC processing is complete for that pass.

2.2.8.7 SAR Activity

The SAR Activities plots in SAMS are intended to display various measures of SARSAT operations volume directly related to Search and Rescue messages and sites. Five plots are implemented.

Messages

(1) Messages Sent - Last 30 Days: This plot shows the number of messages per day sent out of the USMCC, by destination, averaged over the last 30 days. The destination categories are US RCCs, SPOCs, MCCs, LUTs, Others. Method of transmittal is shown as X.25 for PSDN, TELX for TELEX, FAX, and OTHER for all other.

(2) Messages to RCCs: This is a single plot showing the time history of messages to the US RCCs over the last 30 days. All message types are counted. Each bar represents the number of messages sent in the day.

(3) Messages to SPOCs, MCCs, LUTs, and Others: These three plots are similar to those for the preceding, except for the destination groups.

Active Sites

Two plots for 121.5/243-MHz Sites are derived from records of the Alert Site Files closed in the last 30 days. The first shows the number of sites closed in each day, broken down by the number of passes per site. The second shows the same time history broken down by beacon frequency. Two plots for 406-MHz Sites show the number of sites closed in the last 30 days, broken down by site multiplicity (first screen) and by beacon protocol (second screen).

2.2.8.8 Statistical Reports

This menu item provides access to the data underlying the SAMS plots. The reports may be viewed or printed. The following reports are provided:

- LUT Pass Schedules
- LUT and MCC Timing
- Orbitography Beacon Errors Less than 120 kilometers
- Orbitography Beacon Errors less than 10 KM
- Orbitography Beacon Periods
- Solution Filter Statistics
- Orbitography Beacon Missing Points and Errors at US LUTs
- Orbitography Beacon Location Error Distributions by Pass Parameter
- 406 MHz Location Error Distributions
- 121/243 Active Site Summary Tables
- 406 Active Site Summary Tables

2.2.9 LUT Monitoring Data Base

LUT pass completions are monitored daily to compile a monthly LUT pass completion record for contractual purposes. The software executes every day, compiling data for the previous day. The

data accumulate indefinitely. The software provides four types of report and two operator sub-functions.

2.2.9.1 LUT Maintenance Report

This report is a monthly summary of missed and completed passes for contractual purposes. It Lists scheduled passes, missed passes, and the payment schedule.

2.2.9.2 LUT Availability Reports

The LUT Availability Reports provide availability data (scheduled passes, missed passes) for either single LUTs or for LUT sites (pairs at one location). The user may select the time period covered: (1) last 12 months; (2) year to date; (3) previous year; (4) last quarter; (5) last two quarters; (6) last four quarters; or, (7) a manually entered date.

2.2.9.3 LUT Monitoring Reports

These reports provide statistics on location accuracy of orbitography beacons as computed by US LUTs for the current month. Reports are available for the LUT pair at any site, for single LUT units at any site, and for LUT pairs at all sites.

2.2.9.4 LUT Daily Pass Summary

This function provides a summary of availability and accuracy of the US LUTs for any interval of days. The report includes scheduled and missed passes, number of location errors, number of solutions by frequency, LUT processing time and LUT-MCC transfer time.

2.2.9.5 Operator Logging of Missed Passes

This function allows the Controller to log missed passes for any LUT. The Duty Controller inserts satellite, orbit number, LUT, and reason for the missed pass.

2.2.9.6 Operator Charge or Excuse Missed Passes

This function enables LUT passes to be charged or excused manually, which affects the payment to the LUT maintenance contractor.. The purpose of the function is to allow manual adjustment of the LUT Missed Pass Reports based on data and conditions not known by the automated system. Access is restricted to authorized personnel; some changes are made by the USMCC Controller and some changes made by NOAA personnel.

2.2.10 Interference Monitoring

The frequency spectrum between 406.000 - 406.100 MHz has been reserved by the International Telecommunications Union for the use of emergency beacons transmitting in the earth to space direction. Nevertheless, some earlier users have not vacated this portion of the spectrum, and new users appear from time to time. Non-distress signals that are present in this portion of the spectrum (or strong signals adjacent to this band) can affect the ability of the spacecraft instruments to detect distress beacons. Non-distress signals are termed interference. Cospas-Sarsat monitors this portion of the spectrum in order to identify and locate interfering signals.

Interfering signals that are located in the USA Service Area by other Cospas-Sarsat providers are forwarded to the USMCC using SIT 121 messages formats. These messages are processed and stored in special database tables on the SQL server.

USA LUTs can also be configured to locate interfering signals. Doppler information from the signal is used to calculate the location of the interfering signal. Specifications for processing the signals at the USMCC have not been define but it is anticipated that it will be similar to the Alert Processing described in Section 2.2.1. The location information for interfering signals is stored in separate database tables which will be move to a separate database when the process is implemented. Additionally, the LUTs can be configured to routinely send selected graphics files to the Display Computers at the USMCC to assist in the identification and characterization of the signal. The Display Computers can be configured to store and or print the files in color or black and white.

Although the Sarsat SARR repeater is the main instrument used to locate interference, later generation Sarsat SARP instruments have been modified to assist in this task. This method uses pseudo-codes in the 406 messages to report interference. Future software may be added to process these messages.

A definition of the SIT 121 message format is provided in C/S A.002. A definition of the 406 Interference message format that is sent to the MCC by LUTs is provided in the LUT Data Transfer Specification (DTS). A description of the SQL tables is provided in the Data Structures document.

2.2.11 Database Maintenance

The database monitoring subsystem is used to archive, purge and backup data and to monitor database performance.

2.2.11.1 Archive/Purge

The archive/purge functions reside on the SQL server where the database resides. Archiving is launched by SQL executive once per minute. It transfers any data that is more than 30 days old to the archive database and removes all corresponding files from the operational database.

2.2.11.2 Backup

For backup purposes, three software packages are used: 1) Seagate Backup Executive for Windows NT; 2) SQL Agent add-on; and 3) the Open File option. Backup is run daily for all shared files (MccNet and USMCC workstations), all NetWare volumes, and for the operational database, archive database and tables in the operational database. Future modifications will add development and test databases. Backup is made to 4mm DAT cassettes with a 24 GB capacity. Two PCs will be retained from the earlier MCC together with some legacy software and WORM drives were retained in order to retrieve archived historical information.

2.2.11.3 Monitoring

Database performance involves monitoring the databases for security, throughput, speed, capacity problems. Some database tools were provided with SQL software to troubleshoot problems after the fact. Future development will focus on software packages that can provide advance warning of problems such as a security penetration, low capacity, problems running archive/purge, and so forth. The goal will be to detect problems before a failure occurs.

2.2.12 SAR Mapping and Geo-sort

MapInfo mapping software is used to provide the controllers with visual maps and to define, maintain and modify boundaries for geographical regions that are used by the Alert Processing subsystem. MapInfo software is resident on the MccMain(1) and MccMain(2) workstations. One monitor and one mouse is available at each workstation to display mapping information.

Some MapInfo capabilities are used for viewing, such as zoom in/out. A custom USMCC program ("MapDisplay.exe") allows the user to select what is displayed and defines map symbols that are used. This program checks for open site locations in the AlertSite123Sum and AlertSite406Sum database tables and selects information to be displayed on the map. Clicking on a site will highlight ambiguous site A-B solutions. Additional site status information can be selected for display on the monitor's status bar. Map display can only be run on designated workstations.

Within the Cospas-Sarsat network, global data distribution is divided into regions called Search and Rescue Regions (SRRs). Map info is used to define these SRR regions. If a location is in close proximity to a border of one of these regions, a buffer zone, or area of secondary interest, is defined. Alert processing will pass locations for emergency beacons to the geo-sort program which in turn will return the prime and secondary SRRs for each location. More information on global data distribution arrangements is described in C/S A.001, the Cospas-Sarsat Data Distribution Plan. Definition, maintenance and modification of these regions is a USMCC responsibility.

3 Hardware Functional Description

A diagram of the hardware layout was presented in Figure 1-2. The system uses both Novell Network software and Microsoft New Technologies Network software. The devices shown as 10 B/T in the diagram are "10 BaseT" standard Ethernet hubs to which workstations and devices are connected that use the Novell Network. 100 B/T devices are the newer "100BaseT" standard and are part of the Microsoft NT network. The Router, Switch and Hubs are rack mounted in a locked equipment room adjacent to the USMCC work area.

3.1 Router

The Router is a hardware device used to provide a 10 megabit/second connection between the USMCC and the Internet. This interface allows personnel who work at the USMCC to send and receive E-mail. It also is configured to allow authorized personnel (i.e. contract programmers, duty staff on call) to remotely access the USMCC.

3.2 Switches

The two switches are high speed multiplexer devices that allows communications between other network devices that operate at different speeds. One of the switches is connected directly to the Router. The second switch (with all PCs that perform criticall MCC functions connected directly), Four 100 B/T Hubs, four 10 B/T Hubs, and the two Novell Networks servers the primary switch.

3.3 100 BaseT Hubs

Hubs are devices which allow personal computers (PCs)and other peripheral devices to connect to the network. Hubs allow one device to communicate with many other devices over the Local Area Network (LAN). The Windows NT LAN uses four 100 B/T Hubs. Three of these Hubs connect various workstations (office PCs) to the LAN. The work stations are described below.

3.3.1 MccNet

This workstation is the Primary Domain Controller (PDC) for the NOAA Data Services Division (DSD) Local Area Network (LAN). It is also the File Server and Gateway Server for Netware (GSNW) for the USMCC, and a Win Server. The GSNW maps data stored on the network for use by other workstations. Two modems are connected to this workstation to provide remote access service (RAS). One modem is dedicated for connection to NBS. The second modem is used by authorized USMCC personnel to access the computer from external locations via dial up telephone links.

3.3.2 MccSarnet1

This workstation handles USMCC communications including X.400 e-mail, X.25 messages, LUT communications, and connection to the NBB. It also runs converter programs that convert data between external format and an internal (SQL database) format. An EICON communication card is used to connect to commercial Packet Switched Data Networks (PSDN) for X.25 messages. Telex and Fax messages are sent over an X.25 circuit via X.400 to the communications vendor's mail service. Telex messages are received by the communication vendor's mail service via X.400 and retransmitted over the X.25 circuit.

3.3.3 MccSarnet2

This workstation functions as a backup to the MccSarnet1 workstation and is also connected to an EICON communications card. It also serves as a backup for any other workstation that is running MCC functions. All functions (other than Sarnet communications) are designed to run on any other USMCC workstation. It also serves as the communications terminal for MCC parallel testing.

3.3.4 MccMain1

This workstation handles core operational MCC data processing including Alert Processing, Geographical Sorting (Geosort), Map Displays and System Data (SDAT).

3.3.5 MccMain2

This workstation is the backup for MccMain(1). It is also runs the same processes as MccMain1 for parallel testing.

3.3.6 USMCC

This workstation is the File Server for the NOAA Data Services Division (DSD). Windows Primary Name Server functions are stored on this computer. It is also a FTP Server, the Web Server for the NOAA DSD LAN, and a Print Server. Two modems are connected to it that permit remote access service (RAS) to authorized USMCC staff.

3.3.7 MccOps1

The Operator Interface functions run on this workstation, which is the main workstation for the duty controller. (See 2.2.3 for details)

3.3.8 MccOps2

This workstation is a backup for MccOps1. It is also used as the workstation for running Operator Interface during parallel testing.

3.3.9 MccBackup

Database maintenance functions are performed by this workstation including backup of the Registration Database. This workstation has a built in Tape Drive unit and an IOMEGA JAZ drive for backing up large data files and software programs. The tape drive uses 24 GB (Gigabyte) tapes. The JAZ drive accomodates either 1GB or 2 GB disk packs. This workstation also acts as a backup GSNW and as the DSD Backup Domain Controller. Software to update the 406 RDB on the SQL table operates on this workstation.

3.3.10 MccDbs

The USMCC Operational and Archive databases reside on this workstation. (Operational data is archived once it is 30 days old). The workstation also stores Dynamic Link Libraries (DLLs) used by USMCC programs, and Archive Purge programs. System Monitoring (SMON) software executes on this work station as SQL stored procedures.

3.3.11 MccDev

Databases that are used for test and development purposes are stored on this workstation.

3.3.12 MccWar

This workstation runs Microsoft DOS, calculates pass schedules, and runs software to generate LUT pass schedules, to generate orbit vectors for MCCs and LUTs and to update the LUT monitoring database.

3.3.13 Data Analyzer

The PC functions as a data protocol analyzer. It has three X.25 interface cards for monitoring and analyzing three X.25 circuits simultaneously. Additionally it supports monitoring/analyzing of most other LAN/WAN protocols.

3.4 10 BaseT Hub

Four 10 BaseT Hubs are used with older work stations.

3.4.1 SSE Monitor

A specially configured PC with an X.25 interface card used to log on to remote LUTs for configuring and monitoring.

3.4.2 LUT Graphics

Two LUT graphics display PCs are used to display graphics files from all LUTs on fourteen monitors. These PCs are controlled by the USMCC.

3.4.3 SAMS

The self-test and monitoring software resides on this workstation.

3.4.4 Worm Drive

USMCC historical data is stored on a "Write Once Read Many" (WORM) optical drive. A PC with the WORM Drive attached is connected to the fourth 10 BaseT Hub and is used to write archive data and to recover archived data as part of database maintenance.

3.5 SFT III Servers

Two Novell Network fault tolerant servers are used to support dBase software. This includes the 406 Registration Database (406 RDB), and Incident History Database (IHDB), the LUT Monitoring Database (LMDB), and SAMS.

3.6 Redundant Array of Independent Disks (RAID)

Redundant Arrays of Independent Disks (RAID) are used to store and mirror data that is stored on the MccDbs and MccDev workstations. This rack of discs requires very short connectors and must be located between the MccDbs and MccDev workstations mentioned above.

3.7 X.25 Switches

The three X.25 switches in the USMCC perform packet switching functions for the USMCC X.25 network. They are synchronous and asynchronous communication devices that can be used as packet switches, packet assembler/disassemblers (PADs), protocol converters, or a combination of these functions.

These switches are arranged to provide redundancy in the USMCC X.25 network. They route X.25 communication from external sources to internal MCC processes and from internal processes to external sites. Additionally, data is routed between USMCC processors to support operational requirements and testing.