AUTOMATION OF SPACECRAFT SHIFT OPERATION'S REPORT

PROJECT WORK DONE AT

ISRO TELEMETRY TRACKING AND COMMAND NETWORK

PROJECT REPORT

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE AWARD OF THE DEGREE OF

MASTER OF COMPUTER APPLICATIONS

OF BHARATHIAR UNIVERSITY, COIMBATORE.

SUBMITTED BY

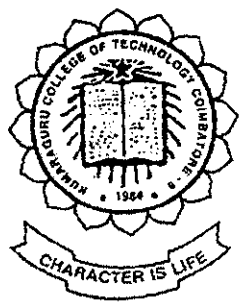
S. KRISHNARAJ

9938MO613

GUIDED BY

EXTERNAL GUIDE
MR. Y. PRAKASA RAO,
SCI/ENGINEER, SF-EIC.

INTERNAL GUIDE
DR. S. THANGASAMY, PH.D.,
PROF. & HEAD



Department Of Computer Science & Engineering

KUMARAGURU COLLEGE OF TECHNOLOGY

Coimbatore 641006

Department of Computer Science & Engineering

KUMARAGURU COLLEGE OF TECHNOLOGY

(Affiliated to the Bharathiar University)

Coimbatore – 641 006

CERTIFICATE

This is certify that the project work entitled

AUTOMATION OF SPACECRAFT SHIFT OPERATION'S REPORT

Done by

S. KRISHNARAJ,

9938M0613

Submitted in partial fulfillment of the requirements for the award of the degree of

Master of Computer Applications of Bharathiar University

S. Jhanjan 30/4/02

Professor and Head

S. Jh... 30/4/02

Internal Guide

Submitted for the University Examination held on 10-05-2002

ISRO TELEMETRY TRACKING AND COMMAND NETWORK

INDIAN SPACE RESEARCH ORGANISATION, DEPARTMENT OF SPACE
GOVERNMENT OF INDIA
BANGALORE-560 058

CERTIFICATE

This is to certify that Shri/Smt/Kum **KRISHNARAJ S** of **Kumaraguru College of Technology, COIMBATORE** of **Bharathiar University** has successfully completed the project work towards partial fulfilment for **MCA** Degree. The title of the project is **"AUTOMATION OF SPACECRAFT SHIFT OPERATIONS REPORT".**

Y PRAKASA RAO
(External Guide)
Sci./Engr-SF, SOCS/MOHA
ISTRAC/ISRO

DATE: 11/4/2002

N LAKSHMI NARAYANA
HRD OFFICER
ISTRAC

HRD SL.NO. 57/2002 (04)

DECLARATION

I here by declare that the project work entitled **" Automation of Spacecraft Shift Operation's Report"** submitted to **Bharathiar University** as the project work of Master Of Computer Applications Degree, is a record of original work done my me under the supervision and guidance of **Mr.Y.PRAKASA RAO Sci/Engineer, SF-EIC, ISTRAC/ISRO, Bangalore** and **Dr. S. THANGASAMY, Ph.D., Prof. & Head of the Department** , and this project work has not found the basis for the award of any Degree/Diploma/Associateship/Fellowship or similar title to any candidate of any University.

Place : COIMBATORE

Signature of the Student.

Date : 30-04-2002.

Countersigned by,

30/4/02

Internal Guide

Dr. S. Thangasamy, Ph.D.,
Prof. & Head,
Department of Computer Science & Engineering,
Kumaraguru College of Technology,
Coimbatore.

External Guide

Mr. Y. Prakasa Rao,
Sci/Engineer, SF-EIC,
ISTRAC/ISRO,
Bangalore.

ACKNOWLEDGEMENT

My Profound thanks and deep sense of gratitude to My External Guide **Mr.Y.PRAKASA RAO Sci/Engineer, SF-EIC ISTRAC/ISRO** and **Shri. K. SOMASUNDARAM, Group Head, SOPS**, for their support, encouragement, and valuable guidance.

My special thanks to **Mr.T.V.S.R.K.PRASAD, Sci/Engineer-SF, ISTRAC/ISRO** for their unfailingly good advice and encouragement.

I wish to place in record my gratitude to **Mr. S. K. SHIVA KUMAR, Director** and **Mr. N. LAKSHMI NARAYANA, Officer, Human Resources and Development Cell,** ISTRAC, for giving me an opportunity to work on this project and allowing me to make use of all the facilities of their esteemed organization, ISTRAC/ISRO.

I am indebted to extend my heartfelt thanks to our beloved **Principal Dr. K. K. PADMANABHAN, B.Sc., (Engg). M.Tech., Ph.D., Kumaraguru College of Technology, Coimbatore,** for giving this opportunity and permission to do this project.

I am grateful to My Project Internal Guide **Dr. S. THANGASAMY, Ph.D., Prof. & Head, Department of Computer Science & Engineering,** for granting permission and offering encouragement to do this contrivance.

I thank all the staff of the Department of Computer Science & Engineering, Kumaraguru College of Technology, Coimbatore, who encouraged through out the Project work.

Last but not the least, I extend my thanks to my family and my friends whose love, encouragement and support helped me a lot to complete this project.

TABLE OF CONTENTS

Introduction

Project Overview

1.1 PROJECT OVERVIEW

The objective of **Automation of Spacecraft Shift Operation's Report** is to display and store the operations that are scheduled, carried, and archived for a particular shift of a particular day. The schedule file is the input to this project, which is given by the scheduling division of Spacecraft Control Center, located at **ISTRAC.**

This software takes date, spacecraft name and shift as input, taking this input, the software generates the pass no's to each of the station basing on the LOS (Loss of signal) and AOS (Acquisition of signal) times, displays the orbit no (where the spacecraft is rotating).

This software also generates reports like Shift Operation Report, Anomoly Observation Report , Special Operation Report ,Daily operation report and scheduled deviation report .

This software is developed, tested, and implemented on Digital UNIX Work Station with **UNIX** as operating system. GUI is developed using **X-motif** tool kit. Accepting, requesting user requests are developed in **C** and **C++.**

About Organization

1.2 ORGANIZATION PROFILE

The Indian space program was formally organized in 1972 when the government of India set up the space commission with a view to promote the development and application of space technology and space sciences for the socioeconomic benefit of the nation.

The **Department Of Space (DOS)** is responsible for the execution of the activities in the country in space applications, space technology and space sciences through the **Indian space research Organization (ISRO)** . The Indian space program is directed towards the goal of self-reliant use of space technology for national development, its main thrusts being

- Satellite communications for various applications.
- Satellite Remote sensing for resources survey and management
- Environmental monitoring and meteorological services.
- Development and operationalization of indigenous satellite and launch vehicles providing this space services.

The **DOS/ISRO** headquarters at Bangalore provide overall direction to the technical, scientific, and administrative functioning of various units

- **VSSC**

VIKRAM SARABHAI SPACE CENTRE, TRIVANDRUM, engaged in the design and development of satellite launch vehicle technology.

- **SHAR**

SRIHARIKOTA RANGE, SRIHARIKOTA, which is the main operational base of ISRO, fully equipped with sophisticated launching pad facilities.

- **ISAC**

ISRO SATELITE CENTRE, BANGALORE, engaged in design and development of various subsystems for both **Indian Remote Sensing (IRS)** and **Communication Satellites (INSAT).**

- **SAC**

SPACE APPLICATION CENTRE, AHMEDBAD, which is ISRO's main application in Research & Development with activities in telecommunication and developing payloads for spacecraft's.

- **LPSC**

LIQUID PROPULSION SYSTEM'S CENTRE MAHENDRAGIRI, engaged in launch vehicle propulsion system and engine testing and development.

- **ISTRAC**

ISRO TELEMETRY TRACKING AND COMMAND NETWORK, BANGALORE, support for the launch vehicle and IRS satellite missions is also responsible for receiving and processing of search and rescue signals.

♦ NRSA

NATIONAL REMOTE SENSING AGENCY, HYDERABAD, engaged in receiving remote sensing data and developing final data utilizing modern remote sensing techniques and providing training and other operational supports to various end users.

♦ MCF

MASTER CONTROL FACILITY, HASSAN, having co-located ground stations for monitoring and control of INSAT spacecraft's through its lifetime.

♦ IISU

INDIAN INERTIAL SYSTEM UNIT, TRIVANDRUM. Decu Distance Education And Communication Unit.

♦ OTHER UNITS OF ISRO

INDIAN MISSION CONTROL CENTRE (INMCC) & LOCAL USER TERMINAL (LUT), ISTRAC operates two LUT's one located at Bangalore and other located at Lucknow. The facility operates on L-Band (1544.5 MHz) with COSAPS and SARSAT satellites and detects, characterizes and locates the origin of emergency signal radiated by beacon operating in 121.5MHz, 243MHz and406MHz bands. The location estimation of distress signal is based on the simpler Doppler positioning system. The objective is to provide information such as Latitude and Longitude of distress signal origin to rescue co-ordination team. INMCC, besides India, supports Bangladesh, Bhutan, Maldives, Nepal, Seychelles, Srilanka and Tanzania.

ISRO TELEMETRY TRACKING AND COMMAND NETWORK (ISTRAC)

Indian Space Research Organization (ISRO) has, over the years, established a comprehensive network of ground stations located at Bangalore, Sriharikota, Lucknow, Mauritius, Thiruvananthapuram and Car Nicobar to provide **Telemetry, Tracking and Command (TTC)** support to the Satellite and launch vehicle missions. These stations have been grouped under the **ISRO Telemetry, Tracking and Command Network (ISTRAC)** with headquarters at Bangalore.

OPERATIONS UNDERTAKEN BY ISTRAC

Tracking, commanding and Housekeeping data acquisition as well as Health analysis and Control, Orbit &Attitude determination and network coordination and support to all Low Earth Orbit Satellite (LEOS) mission life.

Telemetry data acquisition support for ISRO launch vehicle mission from life off till satellite acquisition and down range tracking for monitoring and determining the satellite injection parameter.

SCC (SPACECRAFT CONTROL CENTRE)

A **Spacecraft Control Center** (SCC) has been set up in Bangalore as part of ISTRAC, is the focal point for spacecraft health monitoring, control and analysis, planning of all operations and network co-ordination under the operational spacecraft programs, **IRS-1A, IRS-1B, IRS-1C, IRS-1D, IRS-P2, IRS-P3, SROSS-C2 and IRS-P4**. All the network stations are linked with SCC through satellite links.

All the ground stations of ISTRAC, set up at selected locations, are designed to meet international performance standards. It is possible to co-ordinate and control of the entire network from the SCC to meet the needs of different types of missions besides spacecraft missions involving the Orbit and Attitude related flight dynamics and spacecraft analysis, ISTRAC supports all the launch vehicle missions of ISRO for acquisitions of telemetry data, Tracking, Estimation of injection parameters, Transmission of data to mission control center, etc. The stations have certain common features to enable any station to be used as backup to any other station.

TRACKING

This provides information about the range, elevation and azimuth angle of the satellites. Thus changes in the orbit of spacecraft can be detected. Ground station of ISTRAC has two ten-meter diameters, Cassegrain monopolize dish antenna with a transmit/receive feed. The Station configured to receive S-band carrier in polarization, diversity mode. It receives both RCP &LCP signals simultaneously and combines them optimally before data detection. For transmission either LCP or RCP can be used.

Frequently band for reception is 2200-2300 MHz and for transmission is 2025-2125 MHz. The servo system is used to control the antenna movement consists of two 8 HP DC servo motorist elevation and azimuth axes operating in counter torque mode to achieve the required pointing accuracy. The antenna can be configured to operate in either program-track mode or auto -track mode, under the control of microprocessor based program track unit.

In addition to main antenna an acquisition antenna with a beam width of 8 degree is mounted on main antenna to aid satellite carrier acquisition until the satellite is well defined.

RANGING SYSTEM

Interface with **Range and Range Rate (RARR)** system is employed to find the range of the spacecraft by tone ranging principle which measures the time interval between the transmitted side tone (100 kHz major tone) and returned tone received back from the spacecraft transponder. The time taken will give an indication of the range of satellite. The range rate is obtained using Two-way Doppler principle.

TELEMETRY SYSTEM

This system automatically indicates or records at a distance from measuring instruments. Downlink data derived from the spacecraft are monitored by the controlling earth stations. The six-channel output from the antenna, which is the received signals from S-Band are amplified using LNA (Low Noise Amplifier) and down converted to 400 MHz using two different converters. This 400 MHz signal is fed to Multi-Function Receiver (MFR), whose functions include,

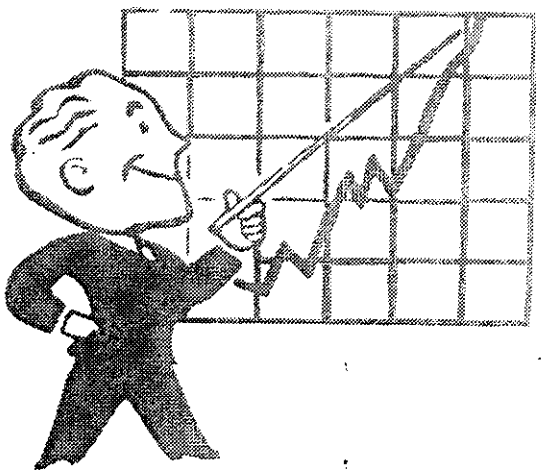
Telemetry and demodulation with polarization diversity, Generation of auto-track error signals with polarization diversity and Interface with Range and Range Rate (RARR) system.

This receiver can be configured to work in coherent and cross-correlation modes. The 70 MHz has the capability of telemetry data demodulation with polarization diversity. Sub-carrier demodulation is carried out using Phase shift Keying (PSK) demodulator (fixed and tunable versions). The station is equipped with PCM simulator and perturbation generator to evaluate the telemetry chain.

TELECOMMAND SYSTEM

The Telecommand system consists of Telecommand Encoder which generates the Telecommand video in PCM / FSK / FM and transmit system which consists of 70MHz Modem and UP / Down converter.

The Telecommand codes are originated either from SCC or locally at ground station using Telecommand encoder and transmitted to the spacecraft. All command are acknowledged, checked and verified before up linking to the modulation at 70 MHz. This IF signal is delivered to an up-converter, which translates it into S-Band uplink frequency. The 70MHz modulator can accept both ranging tones and command sub-carrier simultaneously to have simultaneous commanding and ranging capability. High Power Amplifier (HPA) comprising a Klystron tube of 2KW capability amplifies the S-Band uplink signal. The uplink signal is then routed through the selected diplexer (RCP or LCP) to the antenna feed and then radiated. The uplink modulator is fed back via a 70MHz demodulator to the Telecommand (TC) encoder for command verification. Two uplink chains are implemented for redundancy.



System Study & Analysis

2.1 SOFTWARE REQUIREMENT SPECIFICATION (SRS)

SRS is nothing but translating ideas in the minds of the client into formal documents. SRS forms the basis of Software development. It is a procedure for identifying requirements and at best set of guidelines. SRS is the medium through which the clients and the user needs are accurately specified. The software requirement specification consists of two basic activities.

1. **Problem analysis :**

Problem analysis deals with understanding of the existing problem, the goals, and constraints .

2. **Requirement specification :**

The Requirement Specification the focus is on clearly specifying what has been found during the system analysis.

SRS helps in reducing the development cost. The preparation cost of SRS forces rigorous specification of the requirements before the design begins. Careful development of SRS can reveal omissions, inconsistencies, and misunderstandings early in the development cycle.

2.2 SRS DOCUMENT

2.2.1 INTRODUCTION TO SRS

Producing the SRS is the basic goal of the System Analysis. The SRS is to bridge the communication gap between the user, client and developer.

2.2.2 PURPOSE OF SRS

The purpose of this document is to describe all external requirements of the Shift Operation's report. It also describes the interfaces of the system.

2.2.3 SCOPE OF SRS

This document is only one that describes the requirements of the system. By the end of this requirements document developer and the client(ISTRAC) has an idea about what the system will do for, this becomes the basis for validating the final product. This can be used as a reference or working manual for further modifications.

2.2.4 ABBREVIATIONS

During the operations of **"Automation of Spacecraft Shift Opearation's Report "** ISTRAC uses the following terminology.

S/C	:	Spacecraft Id
LOS	:	Loss Of Signal Time
AOS	:	Acquisition of Signal Time
TM	:	Telemetry
TR	:	Teletracking
TC	:	Telecommand
PB	:	Playback
P/L	:	Payload
STN	:	Station
I1C	:	IRS-1C Satellite
I1B	:	IRS-1B Satellite
I1D	:	IRS-1D Satellite
IP3	:	IRS-P3 Satellite
IP4	:	IRS-P4 Satellite

2.3 EXISTING SYSTEM

ISTRAC having committed for continuous improvement in Space Operations, effective management and access of information is essential, many of the reports like Shift Operation, Daily Operations Bulletin, Spacecrafts Performance Reports are generated manually in Hard copy format. The spacecraft's controller provides shift operations report in AltaVista discussion forum.

2.4 LIMITATIONS OF THE EXISTING SYSTEM

The present system has many limitations like

- In the present system retrieving the information is difficult.
- It amounts to the duplication of work.
- Manual Interaction is more and time consuming.
- One has to go through the logs to get the information.

2.5 PROPOSED SYSTEM

The Proposed system will provide database of Spacecraft operations information, filter the general schedule file and will assign pass no's to each of the files separately for the **TTC** operations and the **P/L** operations.

It should generate the reports like Shift Operations Report, Anomoly Observation Report , Special Operation Report , Daily Operations Report and Schedule Deviation Report.

The system will have feasibility to modify the records and to generate new reports.

2.6 USER CHARACTERSTRICS

The main users of this system are the Spacecraft Controllers, Shift Operations Manager, Spacecraft Operations Manager, Subsystem specialists, Operations Directors and Group Directors.

2.7 FUNCTIONAL REQUIREMENTS

As per requirements of the user, the project is divided into the Following **Modules.**

- Copying of General Schedule File
- Filtering of Schedule File and assigning Pass no's
- Updating Scheduled operations, Operations carried, Archival, Payload operations, Anomaly observations, and Special operations tables.
- Generating Reports.

- **Copying of General Schedule File :**

The General schedule file should be copied from the scheduling division of Spacecraft Control Center, located at ISTRAC.

- **Filtering of Schedule File and assigning Pass no's :**

After Copying the Schedule file, The schedule file should be filtered into respective files, i.e. the TTC operations of IRS-P3 satellite is stored in IRS-P3-TTC.sch file, and P/L operations are stored in IRS-P3-PL.sch file, and pass no is assigned to each of the files basing on the LOS(Loss Of Signal) and AOS(Acquisition of Signal) times.

- **Updating Corresponding satellite files :**

The corresponding files of satellites should be updated basing on the TM,TC,TR, and PB operations that are schedule, carried, and archived.

- **Generating Reports :**

The System has to generate the Reports like Shift-Operation's Report. Anomoly Observation's Report and Special Operation's Report.

2.8 EXTERNAL INTERFACE REQUIREMENTS

2.8.1 USER INTERFACE

The system has a number of forms developed in X-motif for the user to carry his operations. The system expects a mouse click on any of the enabled menu options to carry out the corresponding operation.

It provides :

- A Main Menu driven Form.
- A Form to Update the Shift Operation's Form.
- A Form to Update the Shift Operation's Form.
- A Form to Update the Anomoly Observation Form.
- A Form to Update the Special Operation Form.
- A Form to Generate the Shift Operation's Report
- A Form to Generate the Anomoly Observation Report.
- A Form to Generate the Special Operation Report.
- A Form to display the help about the Shift Operation Report package

2.9 PERFORMANCE REQUIREMENTS

All The requirements relating to the performance characteristic of the system must be clearly specified. There are two types of performance requirements static and dynamic. Automation of Spacecraft Shift Operation's Report satisfies the following performance requirements.

2.9.1 STATIC REQUIREMENTS

Static requirements are those which do not impose constraints on the execution characteristics of the system. These include the number of terminals to be supported, number of simultaneous to be supported, number of files. and their sizes that the system has to be processed.

The "Automation of Spacecraft Shift Operation's Report" is required to support all the terminals, which are connected to Spacecraft operations console and AltaVista discussion forum.

2.9.2 DYNAMIC REQUIREMENTS

Dynamic requirements are those which impose constraints on the execution behavior of the system. These include requirements like the response time and through put time.

2.10 DESIGN CONSTRAINTS

2.10.1 RELIABILITY OF THE SYSTEM

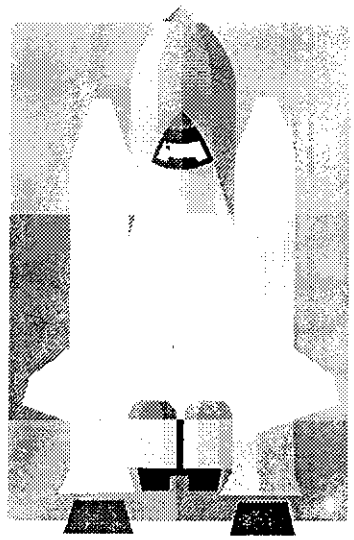
A system with 32MB RAM, on which the "Automation of Spacecraft Shift Operation's Report" is installed is expected to have the reliability that the results we get from the tables are completely dependable; Reports and views of the tables are updated after every data updation.

2.10.2 SECURITY CONSTRAINTS

The entire system is password protected, and the permissions are allocated to the valid users.

2.11 ACCEPTANCE CRITERIA

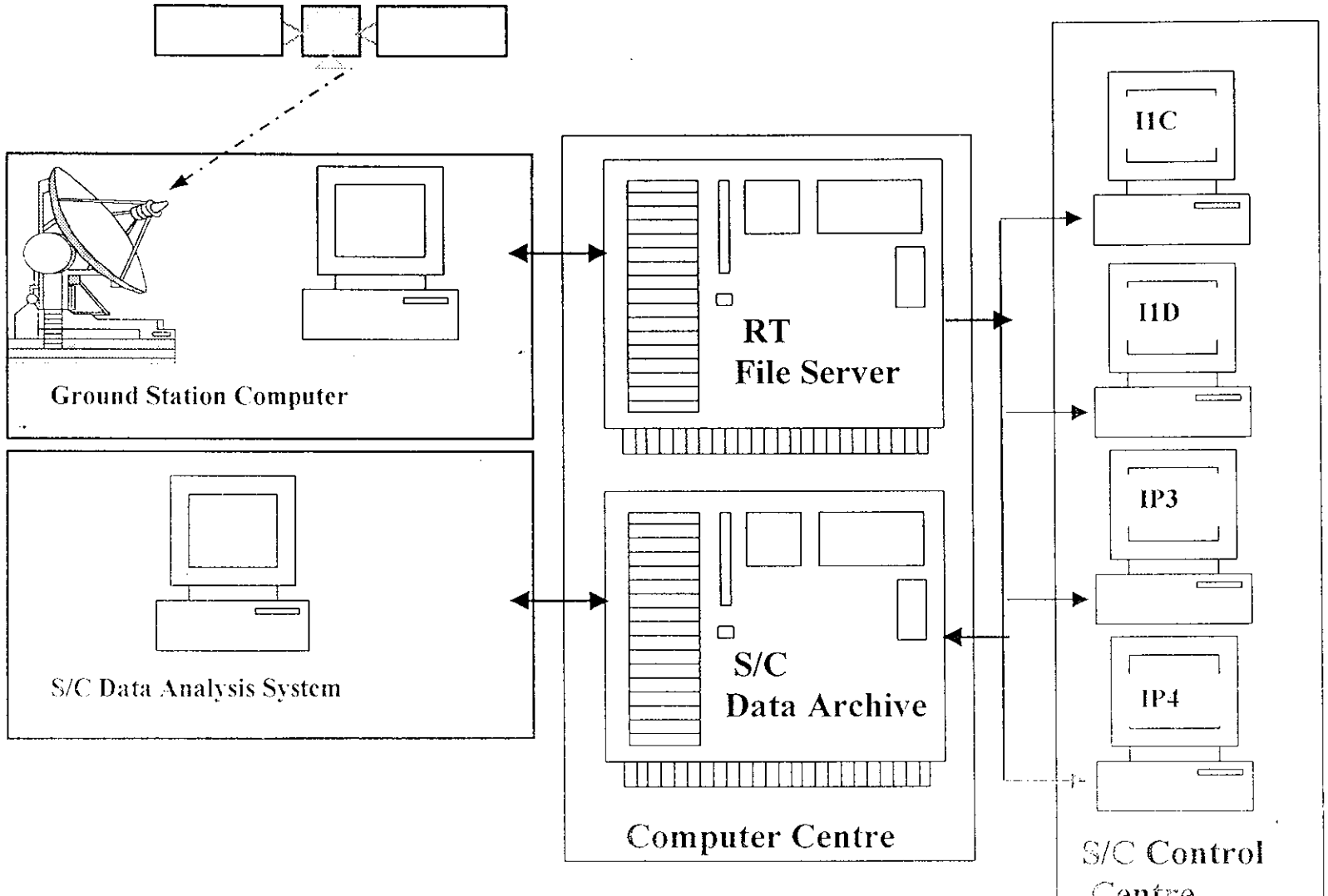
Before Accepting the system the developer will have to demonstrate that the system is working for all possible cases, by suing suitable test cases the developer should make clear to the user in what way the system deal the abnormal situations and how the system intelligent works in complex situations. The developer should train the users how to use the system for better results and performance.



Program Specification

System Flow Diagram

SYSTEM FLOW DIAGRAM



Dataflow Diagrams

3.2 DATA FLOW DIAGRAMS

A data flow diagram is a logical model of system. The model does not depend on hardware, software, data structure, or file organization. It only shows the data flow between modules to module of the entire system.

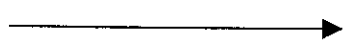
Graphic tools are used to describe and analyze the movement of data through the system manual or automated including the processes, stores the data, and the delays in the system. Data flow diagrams are central tool and the basis for which other components are developed.

Data flow diagrams can be completed using only four simple notations, i.e., special symbols or icons and the annotation that associates them with a specific system.

The use of specific icons associated with each element depends on whether the Yourdon or Gane and Sarson approaches are used. Symbols are given below.

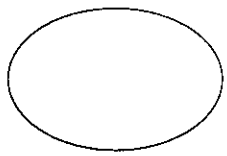
Data Flow :

Data move in specific direction from an origin to a destination. The data flow is a "packed" of data.



Process :

Procedures that produce data. The physical component is not identified.



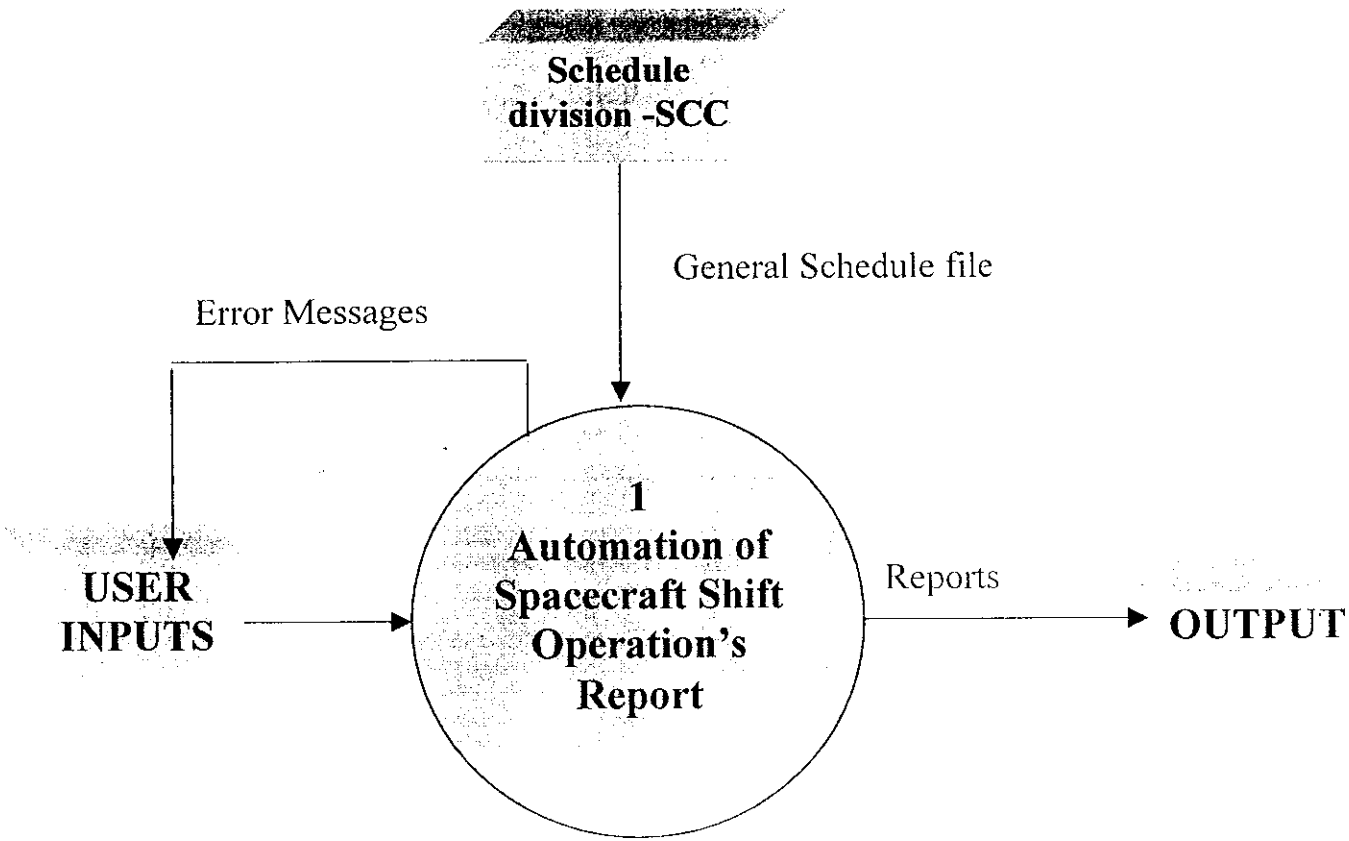
Source or destination of data :

External sources or Destinations of data, which may be people or organizations or other entities.

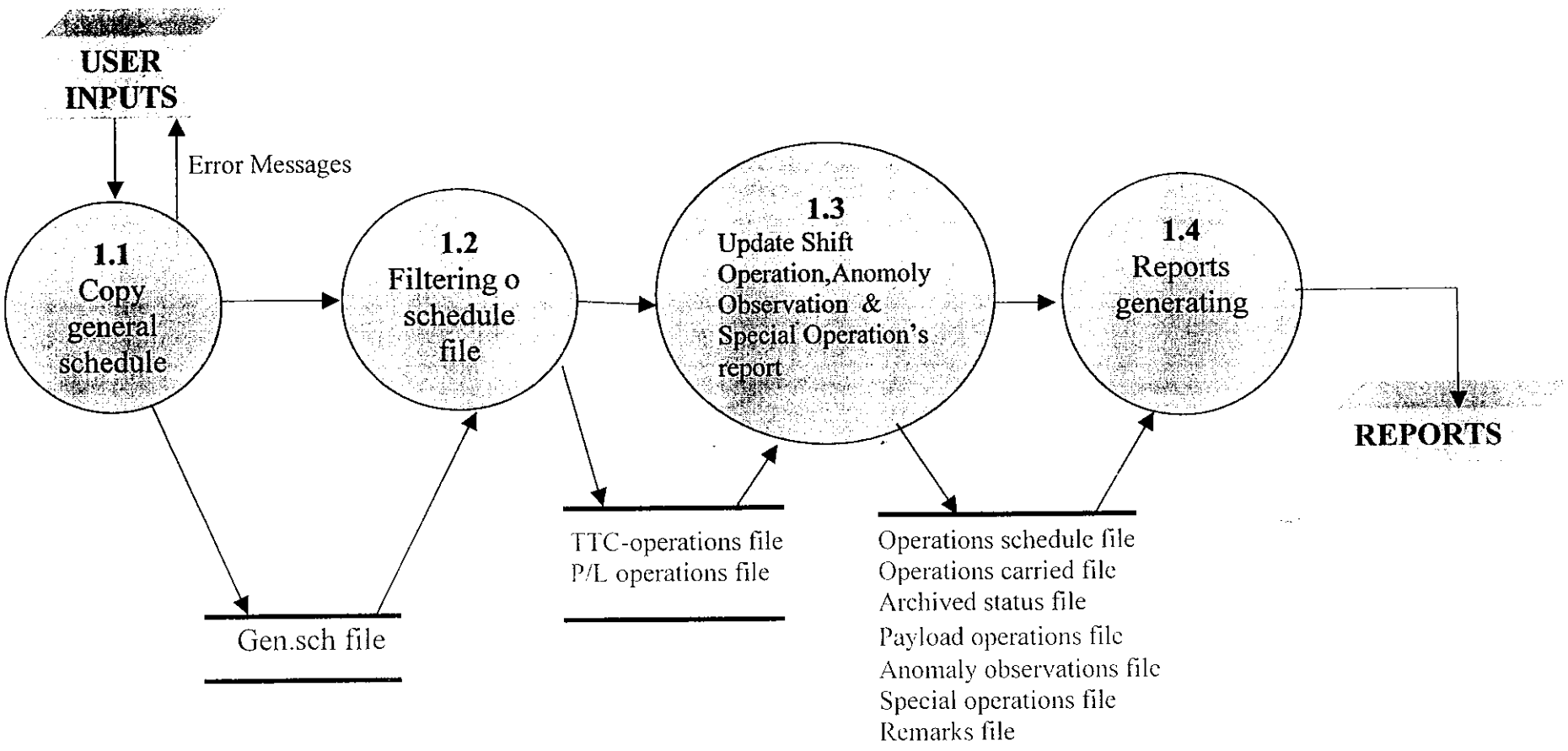
Data store :

Here the data are stored referenced by a process in the system.

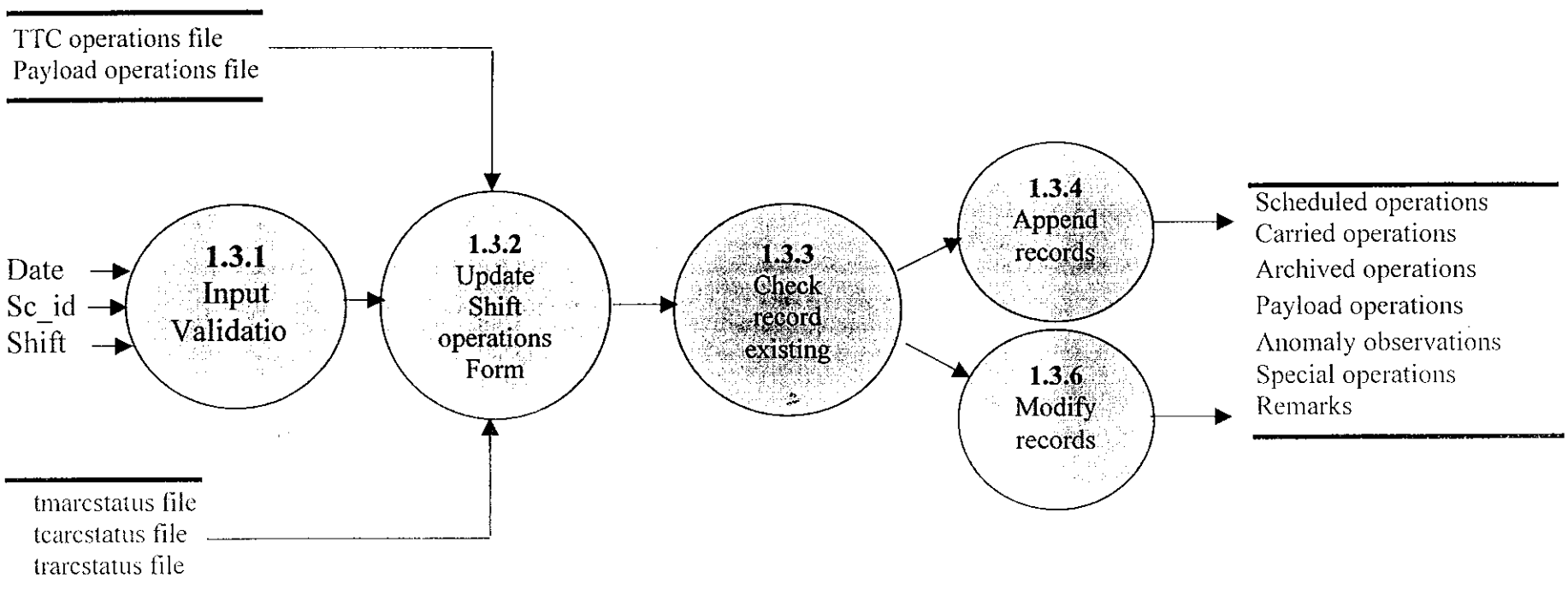
Context Diagram



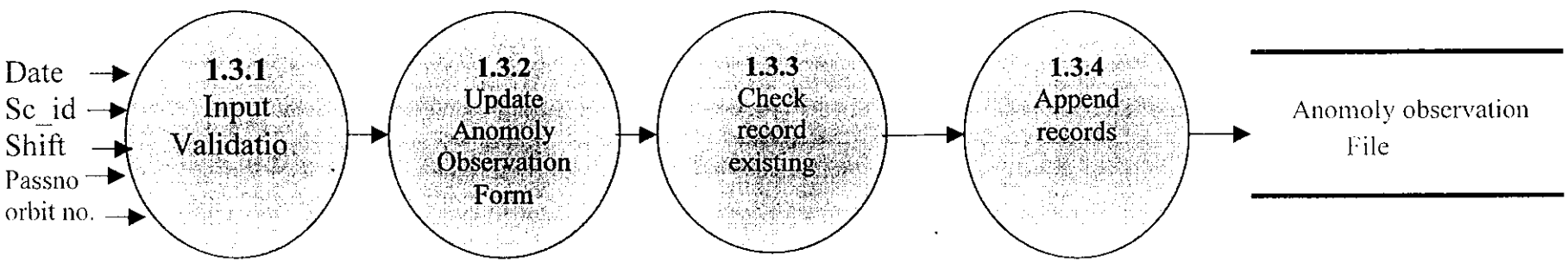
First level DFD



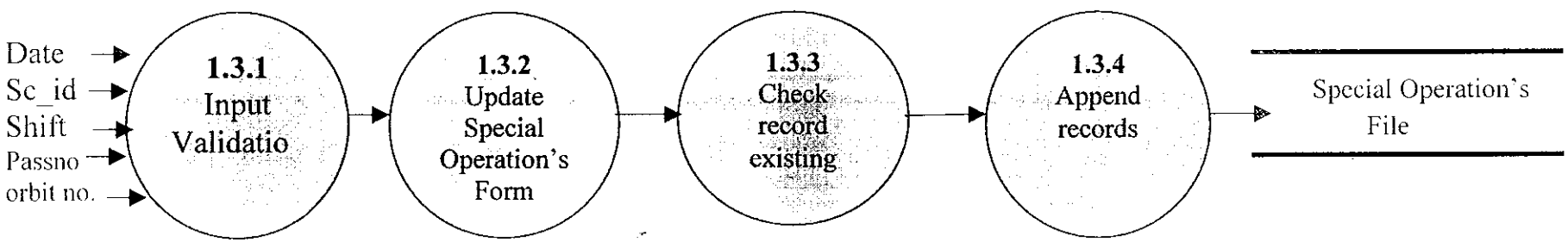
Updating shift operations Form



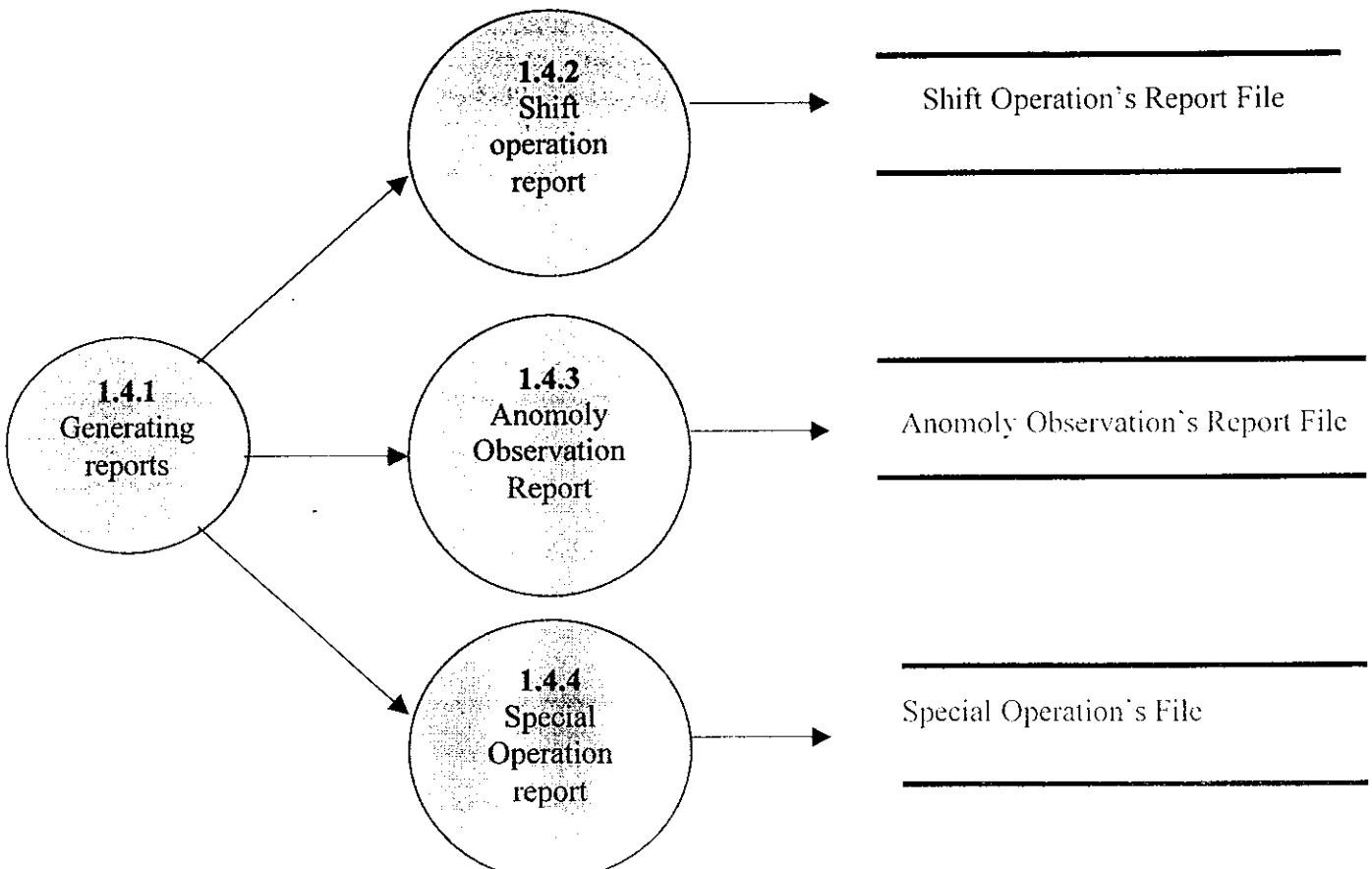
Updating Anomoly observation's Form



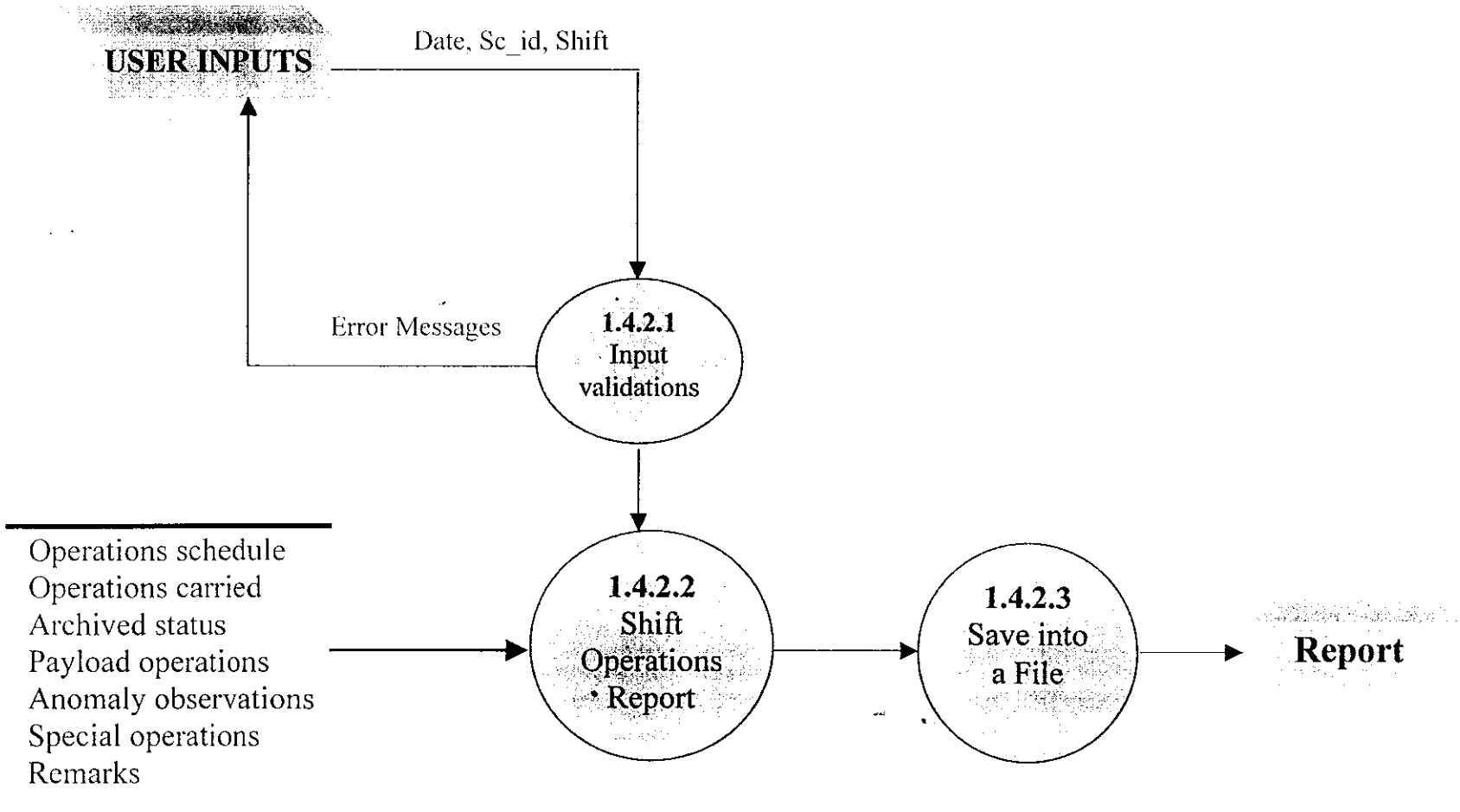
Updating Special Operation's Form



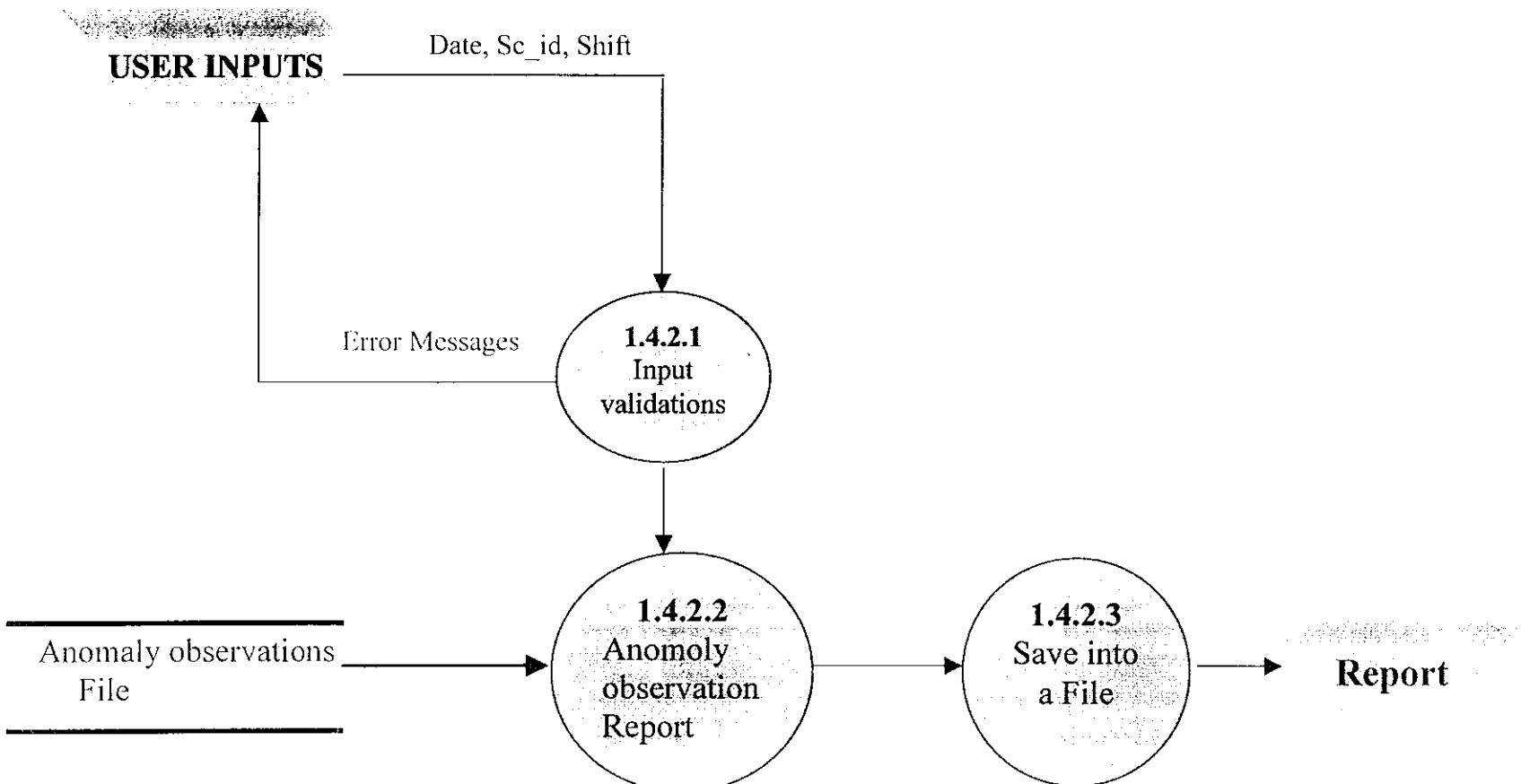
Generating reports



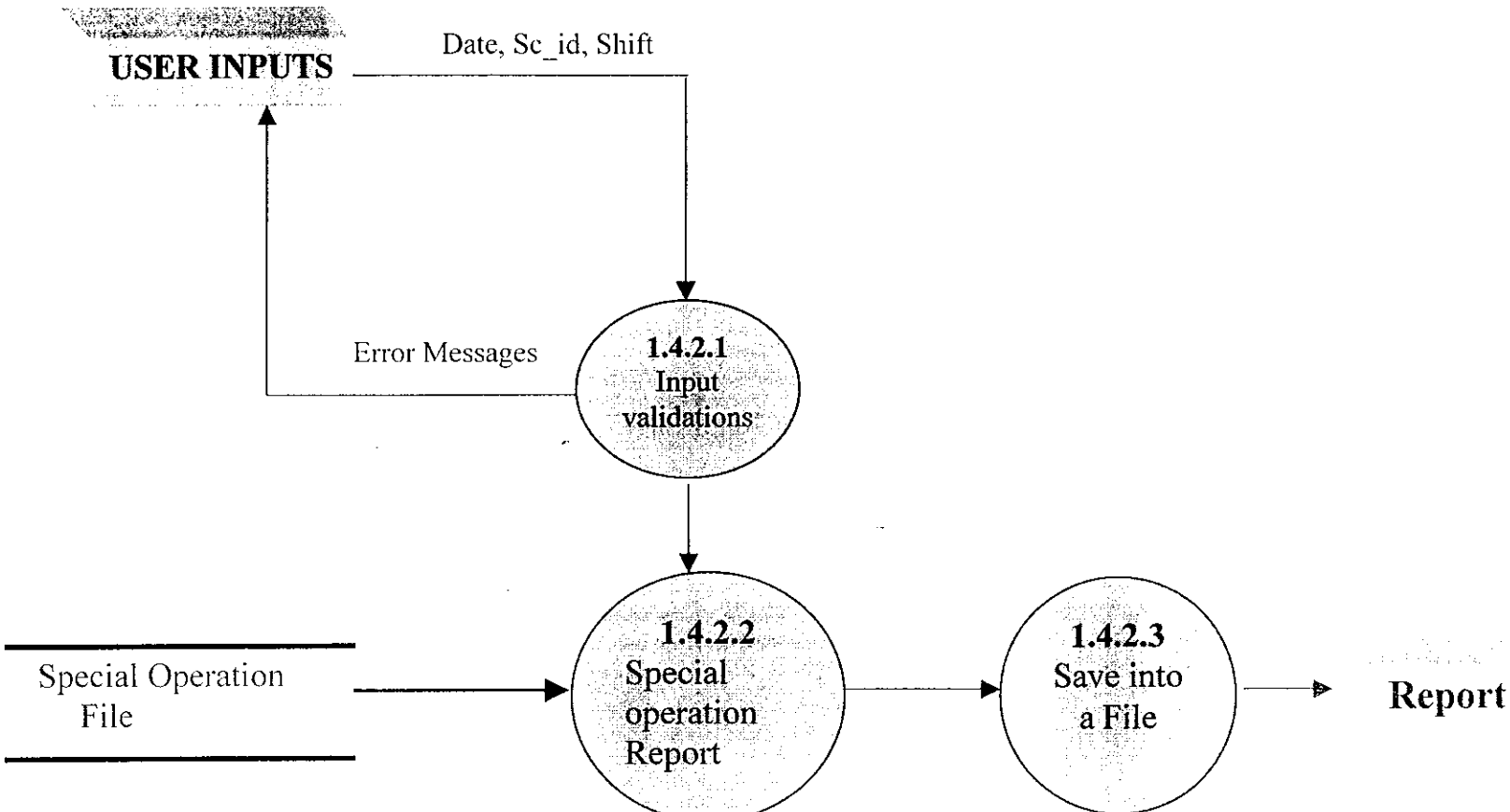
Shift Operations Report

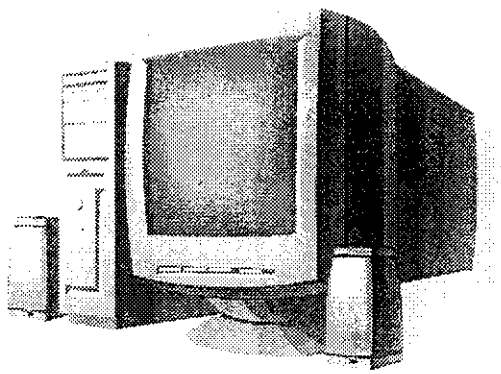


Anomoly Observation's Report



Special Operation's Report





Programming Environment

Hardware & Software Specification

4.1 HARDWARE REQUIREMENTS

The minimum Hardware required for developing the Shift Operations Report is

Work Station	:	**Digital UNIX**
Server	:	**Development Server**
Processor	:	**64 Bit – Alpha 21164 Digital Processor**
Clock Speed	:	**333 MHz**
RAM	:	**32 MB**
Disk Space	:	**2 GB**
Display Type	:	**EGA/VGA**
Display Capability	:	**1600 * 1400 pixels**
Keyboard	:	**101 Keys**
Mouse	:	**Logitech**

4.2 SOFTWARE REQUIREMENTS

The software required for developing Shift Operation Report is

Operating System	:	**UNIX 4.0**
Languages	:	**C, C++ & UNIX Shell Script**
Graphical User Interface	:	**X-Motif**

4.3 DESCRIPTION OF SOFTWARE & TOOLS

Selecting a right programming language is an important aspect. We all know that C under UNIX is powerful for scientific application. In this context 'C' Language under UNIX operating system is chose. The reason for this choice is explained in detail.

Why 'C' language?

'***C***' was invented and first implemented by Dennis Ritchie on DEC PDP-11 that used the ***UNIX*** operating system. For many years, the defect standard for 'C' was the supplied with the ***UNIX*** operating system. With the rise in popularity of personal computers, numerous '***C***' implementations were created. Since '***C***' is the host language for ***UNIX*** in data processing and scientific programming will undoubtedly enhance the use of '***C***' in their areas also. As a middle-level language, '***C***' allows the manipulation of bits, bytes and addresses-the basic elements with which the computer functions.

Initially, '***C***' was used for system programming. System programming forms a portion of the operating system of the computer or its support for utilities. For example, the following are usually called system programs.

- Operating System
- Interpreter
- Editors
- Compilers
- Database
- Spreadsheets

As '*C*' grew in popularity, many programmers began to use it to program all tasks because of its portability and efficiency. '*C*' provides for global variables, call-by-value and call by reference can be simulated by means of pointers. For the development of scientific application we need the programming language to perform faster. We all know that, '*C*' is born for ***UNIX*** environment. Not only that '*C*' provides more scientific function comparing other programming languages. The fact that you can often use '**C**' in place of assembly language is a major in its popularity among programmers. Assembly language uses a symbolic representation of the actual binary code that the computer executes directly.

Why C++?

C++ is a hybrid language in which some entities are object and language. Many added features are orthogonal to Object Oriented Programming some or not. *C++* is an extension of '*C*' language. Implemented to add object oriented capabilities but also to redress some of the weakness of the '*C*', Such as online expansion of subroutine, overloading of function and function Prototypes because of it's origin as an extension of c, its backing by major Computer venders, the perception of it as a nonproprietary language and the availability of free compiler. *C++* seems likely to become the dominant object oriented language generally use.

C++ is a strongly typed language developed by Bjarne Stroustrup at AT & T's bell laboratories. It was originally implemented, as a preprocessor that translate *C++* into standard *C*. *C++* does not contain a standard class library as part of its environment. *C++* contains facilities for inheritance and runtime method resolution. But a *C++* data structure is not automatically object oriented. *C++* contain good facilities for specifying access to attribute & operating of a class. Access may be

permitted by method of any class (public), restricted to method of subclass of the class (protected) or restricted to direct method of class (private).

C++ support overloading operators. Several methods that share the same name but where arguments vary in number or type.

Why UNIX?

One of the most powerful and fastest operating system is UNIX. Multi-user operating system is one of the important advantages of UNIX it can support around 256 user simultaneously at a time to share the Host. A multi-user system generally costs less than equivalent number of single user system. Because, it does not need any processor at the client side. Only hardware for communicating to user and host is sufficient. This type of networking is called dummy network. Where the client are called dumb terminals where only keyword, monitor and some hardware to communicate to host.

There are two important things to know in UNIX. They are

- Shell
- Kernel

Shell : -

The appearance of $ on the screen means that UNIX is ready to accept command. Then appearance is # means the user now is in administrator login and it gives special power to access every command in UNIX. Even those, which can be used to erase or even, damage the entire UNIX system itself.

As UNIX has evolved, different versions of shell have been created in the Bourne shell is the most popular shell.

Kernel : -

The kernel is the heart of the system, since it is only program that has direct access and control of the system hardware, including the Processor, primary memory and I/O devices. The function of the kernel is to provide these processes with access to the system resource, including the file system.

The following are the some of the **Important Features of UNIX.**

Background Processing : -

By means of background processing a user can perform more than one job simultaneously. This helps to increase productivity for those users who can concentrate on a number of things simultaneously.

Hierarchical File System : -

A file is a unit of data that stored on a magnetic disk. A collection of files is called file system. With the hierarchy provided by the file system, a user can organize the information in structured fashion. So user can handle with more chart or inverted tree.

Time sharing : -

This is the way to allow more than one user to use computer at the same time. While many users are using the computer simultaneously, the operating system ensures that their job does not get mixed with each other.

Security : -

The operating system protects one use from another. No user is allowed to see the information manipulated by another user except supervisor or administrator.

Finally, by considering all above factors the project " **AUTOMATION OF SPACECRAFT SHIFT OPERATION'S REPORT** " is developed in **C, C++** Languages under **UNIX** ***and*** **X-Motif** as Graphical User Interface (GUI).

ABOUT X-MOTIF

X-Motif is a library of routines that makes the programming of user Interfaces in an X-WINDOWS environment fairly easy and straightforward. The *X-**Motif*** libraries handle a lot of the low level X-WINDOWS junk, so that user is able to create nice and sophisticated Interface without having to counted with the all complexity of X-WINDOWS.

The **X-Motif** toolkit is based on the **X-Toolkit Intrinics(Xt)**. Which is the standard mechanism on which many of the toolkits return for the X-WINDOWS systems are based. Xt provides a library of user interface objects called widgets and gadgets, which provide a convenient interface for creating and manipulating X-WINDOWS, color maps, events and other cosmetic attributes of the display. In

short, widgets can be thought of us building blocks that the programmer uses to construct a complete application. However, the widgets that Xt provides are generic in nature and impose no user interface policy whatsoever. That is the job of a user-interface toolkit such as X-Motif. The user interacts with the application by typing at the keyboard and by clicking, selecting and dragging various graphic elements of the application with the mouse. The windows can be made larger or smaller dragging any of the resize corners with a press of a mouse.

Most applications support "buttons" that be clicked with the mouse to initiate applications actions.

Motif user elever highlighting adowing to make buttons (and the border around the application window) look three-dimensional. Buttons appear to be actually pressed in and released when they are clicked on. A row of buttons the top of most application from a menu bar. Clicking on any the titles in the menu of additional buttons.

Buttons can also be arranged in pallets that are always visible on the screen. When a button is clicked, The application can take immediate action or it can popup and additional window called dialog box that asks the user for more information or present additional options. ***X-Motif*** was designed by the Open Software Foundation (OSF), a nonprofit consortiums of companies such as Hewlett Packard, Digital IBM and dozens of other corporations. OSF's character calls for the development of technologies that will enhance interoperability between computers from different manufacture. Target technology range from user interface to the Operating Systems.

The **X-Motif** specification is broken down into two parts:

- **Output model**
- **Input model**

The **Output model** describes what the objects on the screen look like. This model includes the shape of the button; the use of three-dimensional affects the use of the cursors and bitmaps, and the positioning of windows and subwindows.

The **Input model** specifies how the user interacts with the elements on the screen. ***X-Motif*** can be used for virtually any application that interacts with a computer user, Programs a conceptually different as CAD/CAM Package or electronic mail applications will still use the same types of user goes more quickly to the point where he is working with the application, rather than just mastering to machine's.

The ***X-Motif*** interface was internationally modeled after the Microsoft's Common User Access (CUA) specifications, which define the interface for Microsoft windows.

The reason for this is two fields :

- ❖ There is a proven business model for profiting from an "Open System" philosophy;

- ❖ The level of the success and acceptance of Microsoft windows in the PC world is expected to by quite substantial. As a result, more vendors are jumping on the bandwagon and are supporting ***X-Motif*** as their native graphical interface environment.

System Design & Development

5.1 INTRODUCTION

This document gives the system design for the Spacecraft's operations Report.

5.2 DATA MODELING

The major data structures used in the Shift Operation's are specified here.

General Schedule File :

Field	Description
DATE	To store the Date
SAT_ID	Satellite Identification
STN	Station Name
ORBIT	Orbit Number where spacecraft is rotating
MAX_ELE	Maximum Elevation
LOS_TIME	Loss of Signal time
AOS_TIME	Acquisition of Signal time
OPERATIONS	Operations that are schedule, carried, archived, and payload operations.

Description (about General Schedule File) :

The general schedule file is copied from the scheduling division of Spacecraft Control Center, which specifies that what operations are carried scheduled, carried, archived, and payload operations for all the IRS satellites in the space, this also contains the orbit no where the spacecraft is rotating, station from which the operations are performed, the maximum elevation, and the LOS and AOS times.

TTC Operations File :

Field	Description
TDATE	To store the Date
TSAT_ID	Satellite Identification
TPASSNO	Pass number
TSTN	Station Name
TORBIT	Orbit Number where spacecraft is rotating
TLOS_TIME	Loss of Signal time
TAOS_TIME	Acquisition of Signal time
TOPERATIONS	Operations that are schedule, carried, and archived.

Description (about TTC operations file)

This file is used to store the TTC operations i.e. TM (Telemetry), TC (Telecommand), TR (Teletracking), and PB (Playback) operations for each of the satellites separately. This file also contains date, pass no, station name, orbit no, los_time, and aos_time. This file is generated from the general schedule file.

Payload Operations File :

Field	Description
PDATE	To store the Date
PSAT_ID	Satellite Identification
PSTN	Station Name
PORBIT	Orbit Number where spacecraft is rotating
PMAX_ELE	Maximum Elevation
PLOS_TIME	Loss of Signal time
PAOS_TIME	Acquisition of Signal time
POPERATIONS	Payload Operations.

Description (about Pay load operations file)

This file is used to store the Payload operations for each of the satellites separately. This file also contains date, pass no, station name, orbit no, los_time, and aos_time. This file is also generated from the general schedule file.

Operations Schedule File :

Field	Description
SCDATE	To store the Date
SCSHIFT	To store the shift
SCSC_ID	To store satellite id
SCPASS	To store the pass number
SCORBIT	To store orbit number
SCSTN	To store the station name
SCOPERATIONS	Operations that are schedule.

Description (about operations schedule file)

This file is used to store the TTC operations that are scheduled for each of the satellites separately. This file also contains date, pass no, station name, orbit no, and shift. This file is updated when we update the TTC operations file.

Operations Carried Out File :

Field	Description
CADATE	To store the Date
CASHIFT	To store the shift
CASC_ID	To store satellite id
CAPASS	To store the pass number
CAORBIT	To store orbit number
CASTN	To store the station name
CAOPERATIONS	Operations that are carried out.

Description (about operations carried out file)

This file is used to store the TTC operations that are carried out for each of the satellites separately. This file also contains date, pass no, station name, orbit no, and shift. This file is updated when we update the TTC operations file.

Archived Status File :

Field	Description
ARDATE	To store the Date
ARSHIFT	To store the shift
ARSC_ID	To store satellite id
ARPASS	To store the pass number
ARORBIT	To store orbit number
ARSTN	To store the station name
ARSTATUS	Operations that are archived.

Description (about archived status file)

This file is used to store the TTC operations that are archived for each of the satellites separately. This file also contains date, pass no, station name, orbit no, and shift. This file is updated when we update the TTC operations file.

Payload operations with path no's file :

Field	Description
PLDATE	To store the Date
PLSHIFT	To store the shift
PLSC_ID	To store satellite id
PLORBIT	To store orbit number
PATHNO	To store the path no
PLSTN	To store the payload stations.

Description (about payload operations with path no's file)

This file is used to store the path no, and stations from where PL operations that are carried. This file also contains date and orbit no. This file is updated when we update the Payload operations file.

Special Operations File :

Field	Description
SPDATE	To store the Date
SPSHIFT	To store the shift
SPSC_ID	To store satellite id
SP_OPE	To store the special operations

Description (about Special operations file)

This file is used to store the special operations that are archived for each of the satellites separately. This file also contains date, shift and spacecraft id. This file is also updated when we update the shift operations report.

Anomaly Observations File :

Field	Description
ANDATE	To store the Date
ANSHIFT	To store the shift
ANSC_ID	To store satellite id
AN_OBS	To store the Anomaly observations

Description (about Anomaly observations file)

This file is used to store the Anomaly observations about the shift operations report for each of the satellites separately. This file also contains date, shift and spacecraft id. This file is updated when we update the shift operations report.

Remarks File :

Field	Description
REDATE	To store the Date
RESHIFT	To store the shift
RESC_ID	To store satellite id
REMARKS	To store the remarks

Description (about Remarks file)

This file is used to store the remarks about the shift operations report for a particular shift for each of the satellites separately. This file also contains date, shift and spacecraft id. This file is generated when we update the shift operations report.

Sat-id_code.tab File

Field	Description
SAT_NAME	To store the satellite name
SAT_CODE	To store the satellite code

Description(about sat-id_code.tab file)

This file is used to store the satellite names and their codes.

Shift . tab File :

Field	Description
SHIFT	To store the shift
S_TIME	To store the starting time
E_TIME	To store the ending time

Description (about shift.tab file)

This is a table, which contains the shift, starting time and ending time for each of the shift.

Filepath.tab file :

Field	Description
FILE_NAME	To store the file name
PATH	To store the path of the file

Description (about filepath.tab file)

This is a table, which contains the file names and the respective paths where the files are existing.

5.3 MODULE SPECIFICATIONS

COPYING OF GENERAL SCHEDULE FILE

The General schedule file should be copied from the scheduling division of Spacecraft Control Center, located at ISTRAC.

FILTERING OF SCHEDULE FILE AND ASSIGNING PASS NO'S

After Copying the Schedule file, The schedule file should be filtered into respective files, i.e. the TTC operations of IRS-P3 satellite is stored in IRS-P3-TTC.sch file, and P/L operations are stored in IRS-P3-PL.sch file, and pass no is assigned to each of the files basing on the LOS(Loss Of Signal) and AOS(Acquisition of Signal) times. This module is developed in C++ language.

Input : **General schedule file**

Output : **TTC operations file and**
Pay Load operations file

UPDATING CORRESPONDING SATELLITE FILES

The corresponding files of satellites should be updated basing on the TM(Telemetry), TC(Telecommand), TR(Teletracking), and PB(Playback) operations that are schedule, carried, and archived. This module is developed in C language.

Input : **Date, Shift, and Space-craft-id**

Output : **Operation schedule file**
Operation carried out file
Archived status file
Payload operations file
Special operations file
Anomaly observations file
Remarks file

GENERATING REPORTS

The System has to generate the Reports like shift-operations report, daily operations report, scheduled deviation report and P/L cancellation report. This module is developed in C language.

- **Shift-operations report :**

Input : **Date, shift and space-craft id, TTC Operations payload operation, special operation, anomaly observation, remark file.**

Output : **TTC operations, payload operations special operations, anomaly observations, and remarks.**

- **Anomoly Observation's report :**

  Input : **Date, space-craft id, Pass No, Orbit No**
  Anomaly Observations, Remarks.

  Output : **Date, Space-craft id,Shift, Pass No, Orbit No ,**
  Anomaly Observations, Remarks.

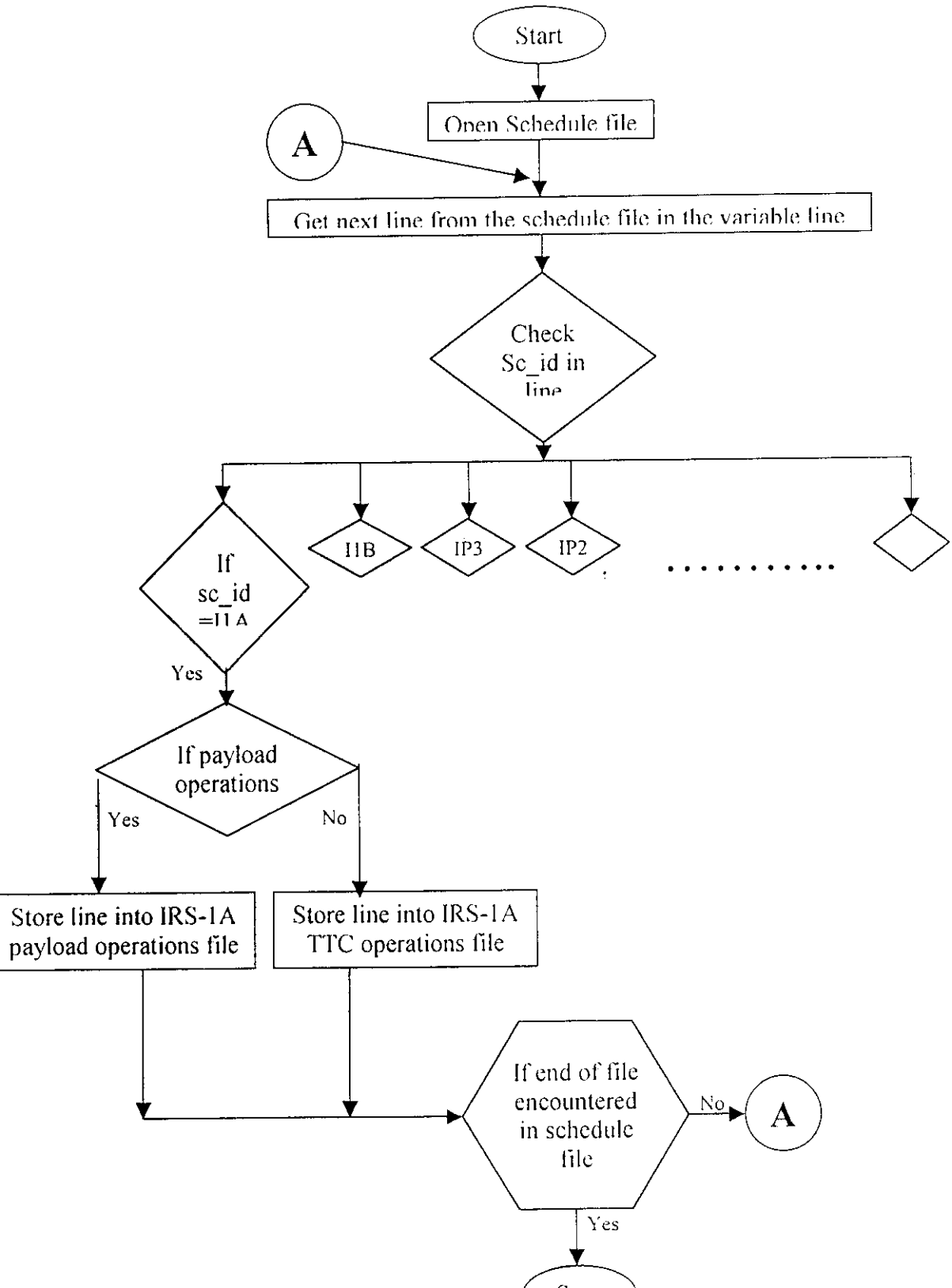
- **Special Operation's report :**

  Input : **Date, space-craft id, Pass No, Orbit No**
  Special Operations, Remarks.

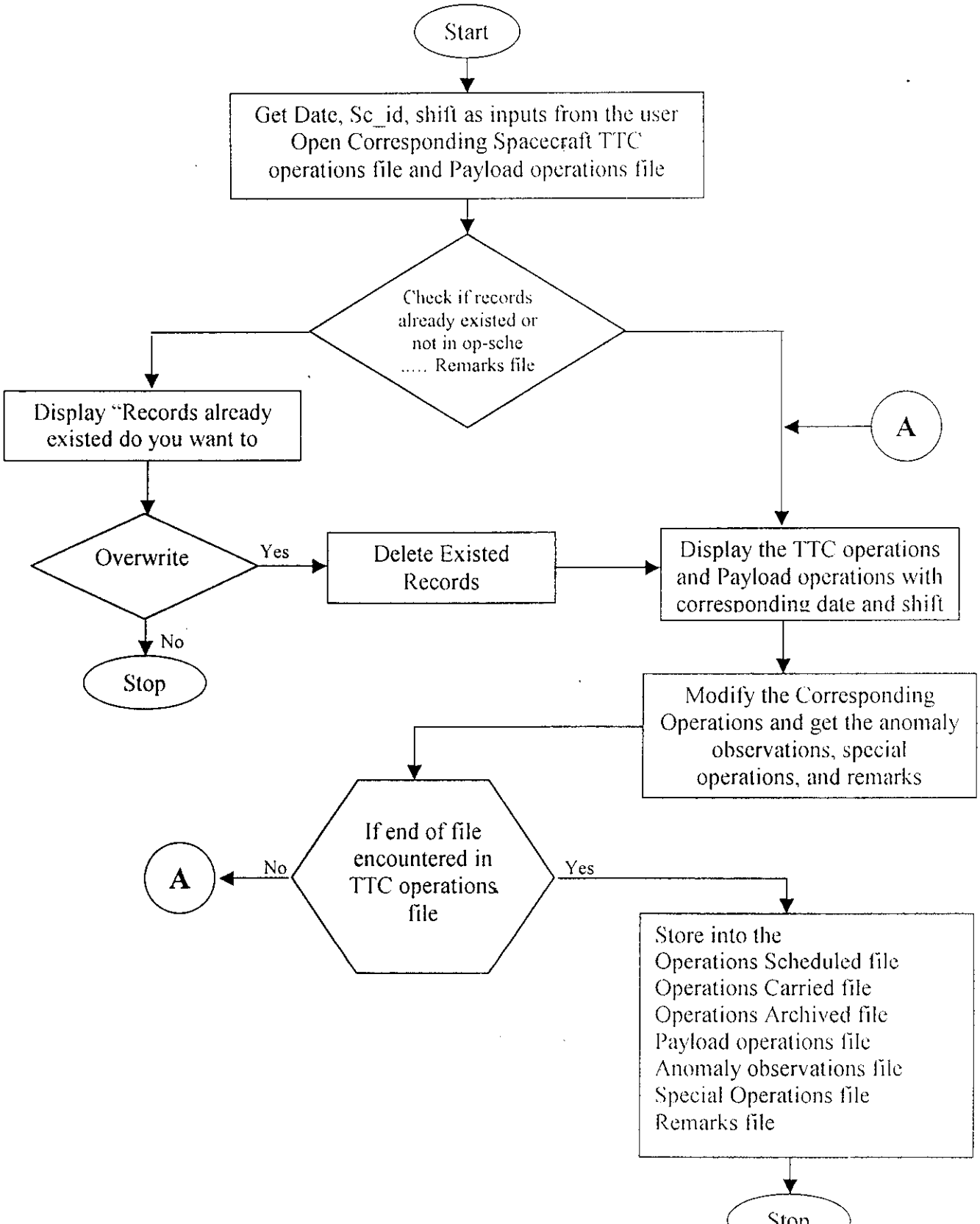
  Output : **Date, Space-craft id,Shift, Pass No, Orbit No ,**
  Special Operations, Remarks.

Flow Charts

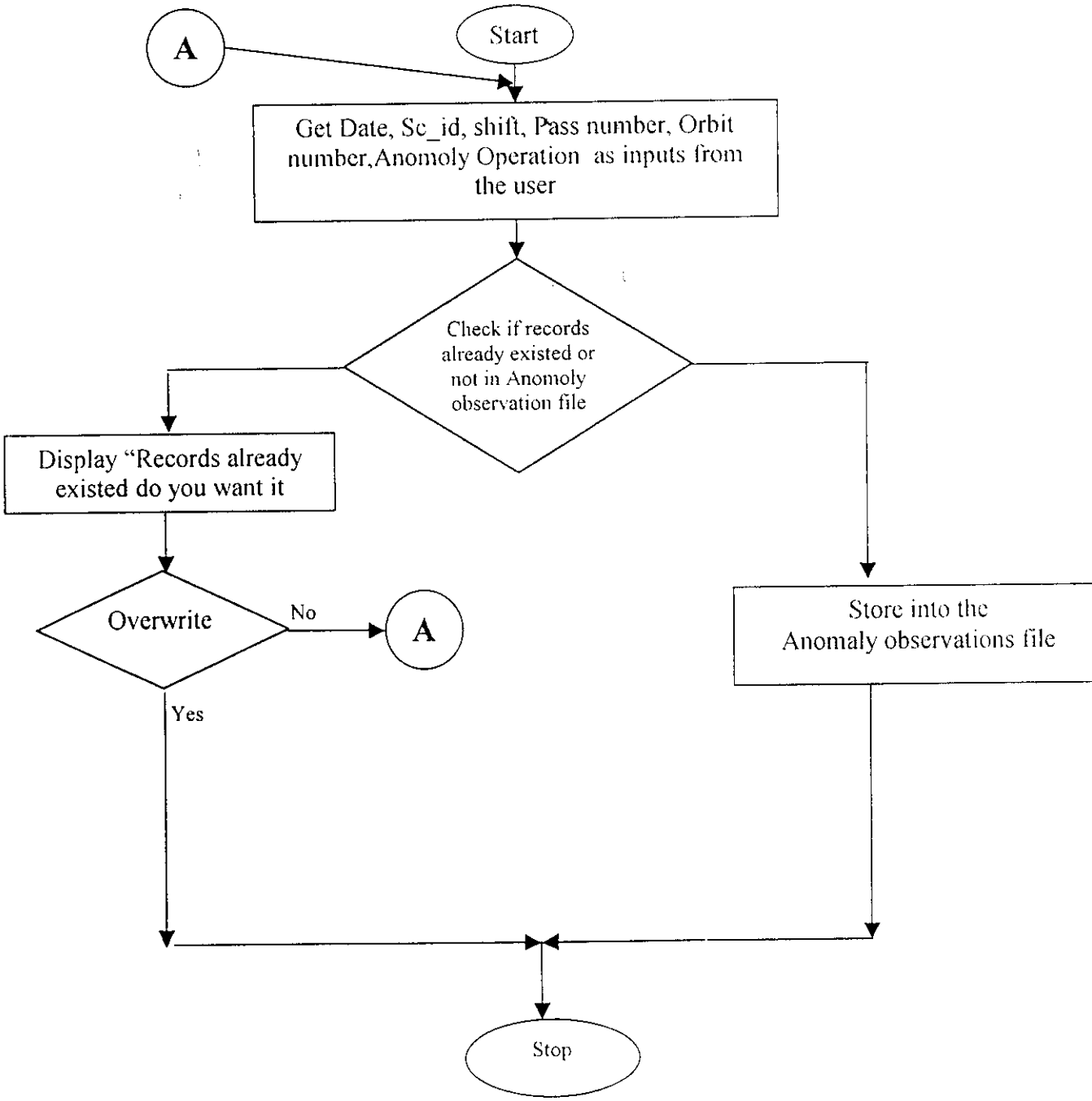
Flowchart for filtering scheduling file



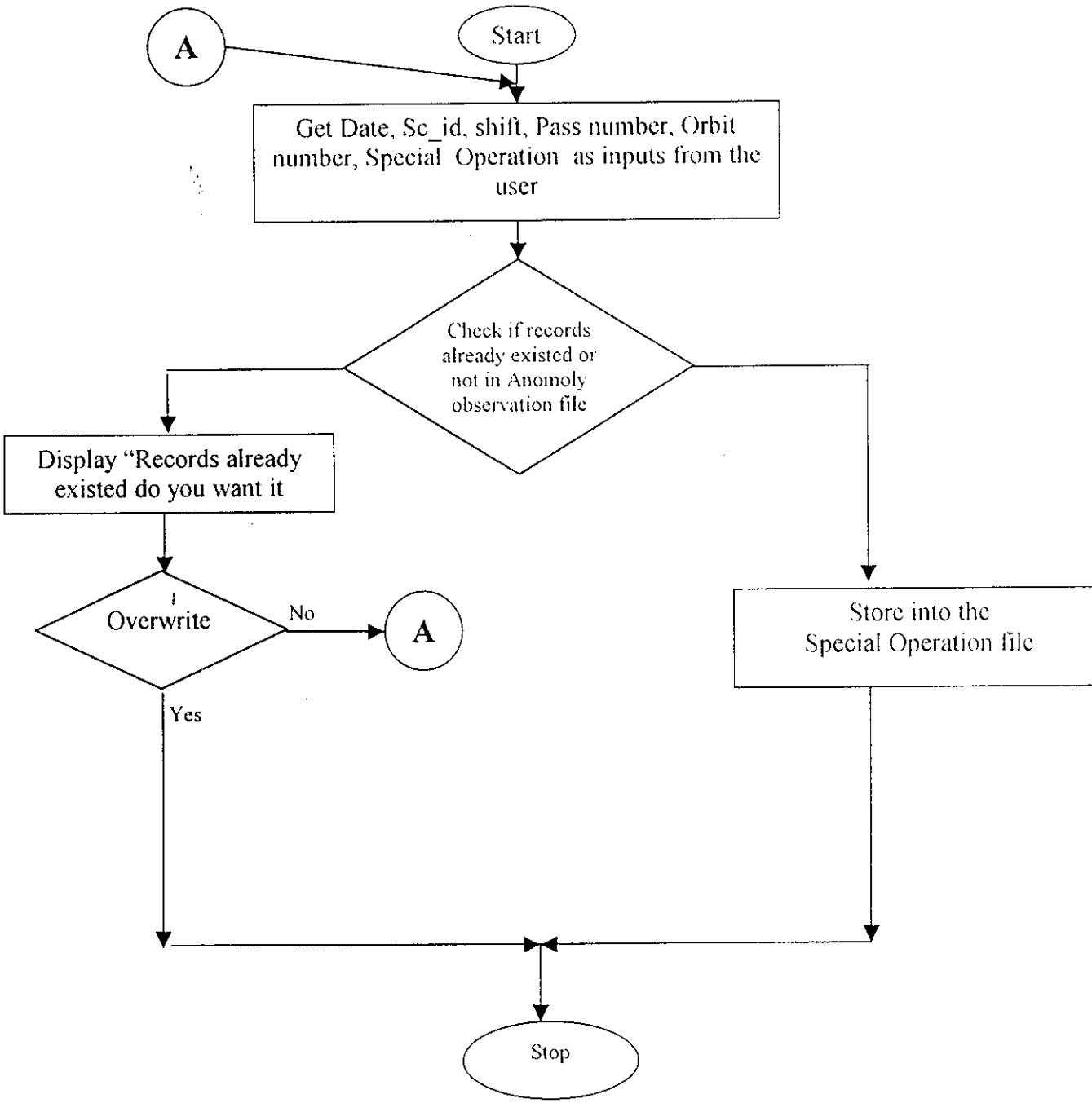
Flow chart for updation of shift Operation's Form



Flow chart for updation of Anomoly Observation's Form



Flow chart for updation of Special Operation's Form



System Implementation

6.1 SYSTEM IMPLEMENTATION

The implementation phase of software development is concerned with translating design specifications into source code. The primary goal of implementation is to write source code and internal document. So that conformance of the code to its specification can be easily verified and so that debugging, testing and modification are erased. This goal can be achieved by making the source code as clear and straight forward as possible. Simplicity, clarity and elegance are the hallmarks of good programs.

This software is developed in development area such as **C, C++** and **Motif** . Here the filtering of data from the file is done with the use of **ANSI C & C++**. The analyst accesses the software and carryout the desired analysis using GUI developed in Motif.

Motif is an event driven programming environment. Motif tries to be an object-oriented sort of programming environment and under X the objects used to implement user interfaces are called **WIDGETS.**

Some of the *Widgets* used to design this package are as follows along with their *Header files*:

❖ Label Widget	<Xm/Label.h>
❖ Primitive Widget	<Xm/Xm.h>
❖ WindowWidget	<Xm/MainW.h>
❖ PushButton Widget	<Xm/PushB.h>
❖ Form Widget	<Xm/Form.h>
❖ MenuBar Widget	<Xm/RowColumn.h>
❖ MessageBox Widget	<Xm/MessageB.h>
❖ MessageDialog Widget	<Xm/MessageB.h>
❖ SelectionBox Widget	<Xm/SelectionB.h>
❖ Text Widget	<Xm/Text.h>
❖ Radiobox Widget	<Xm/ToggleB.h>
❖ ListWidget	<Xm/List.h>

All these Widgets are being used when we include the header files of Xmotif.

Using these widgets the package has been designed in a user-friendly manner for the system analysts. They have callback Widgets, which is used to link with the backend programs when the corresponding event occurred.

Testing

6.2 TESTING

6.2.1 INTRODUCTION

Testing is one of the most important phases in software development activity. In **Software Development Life Cycle (SDLC)**, the main aim of testing process is the Quality. The developed is tested against the for attaining the required functionality and performance.

During the testing process the software is worked with some particular test case, and the output of the test cases are analyzed whether the software is working according to the expectations or not.

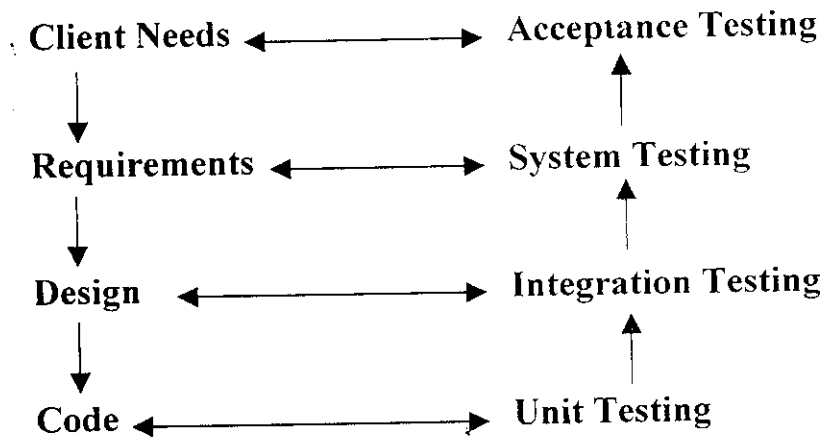
The success of the testing process in determining the errors is mostly depends upon the test case criteria. For testing any software we need to have a description of the expected behavior of the system and a method of determining whether the observed behavior confirmed to the expected behavior.

6.2.2 LEVELS OF TESTING

Since the errors in the software can be injected at any stage. So we have to carry out the testing process at different levels during the development. The basic levels of testing are unit testing, Integration testing, System and Acceptance testing.

The Unit testing is carried out on coding. Here different modules are tested against the specifications produced during design for the modules.

In case of integration testing different tested modules are combined into subsystems and tested. In case of System testing the full software is tested and in next level of testing the system is tested with user requirement document prepared during SRS.



There are two basic approaches for testing functional testing and structural testing.

Functional Testing :

In functional testing test cases are decided solely on the basis of requirements of the program or module and the internals of the program or modules are not considered for selection of test case. This is also called black box testing.

Structural Testing :

In structural testing test cases are generated on actual code of the program or module to be tested. This is called white box or glass box testing.

6.2.3 TESTING PROCESS

A number of activities must be performed for testing software. Testing starts with test plan. Test plan identifies all testing related activities that need to be performed along with the schedule and guidelines for testing. The plan also specifies the levels of testing that need to be done, by identifying the different testing unit. For each unit specified in the plan first the test cases are selected and specified. Then the unit is executed with the test cases and reports are produced. These reports are analyzed.

Test plan :

Test plan is general document for entire project, which defines the scope, approach to be taken and the personal responsible for different activities of testing. The inputs for forming test plan are

Requirements Document

System Design

Test Case Specification :

Although there is one test plan for entire project test cases have to be specified separately for each test case. Test case specification gives, for each item to be tested, all test cases and outputs expected for those test cases.

Test Case Execution And Analysis :

The steps to be performed for executing the test cases are specified in a separate document called test procedure specification. This document specifies any special requirements that exist for setting the test environment and describes the methods and formats for reporting the results of testing.

6.2.4 UNIT TESTING

Unit testing mainly focused first on the smallest and low-level modules, proceeding one at a time. Bottom-up testing was performed on each module. As developing a driver program, that tests modules by developed or used. But for the purpose of testing modules themselves are used as stubs, to print verification of the actions performed. After the lower level modules were tested, the module that modules in the next higher level that make use of the lower modules were tested.

Each module was tested against required functionality and test cases were developed to test the boundary values.

6.2.5 INTEGRATION TESTING

Integration testing is a systematic technique for constructing the program structure, while at the same time conducting tests to uncover errors associated with interfacing.

As the system consists of the number of modules the interfaces to be tested were, between the edges of the two modules. The software tested under this was incremental bottom-up approach.

Bottom-up approach integration strategy was implemented with the following steps.

- Low-level modules were combined into clusters that perform specific software sub-functions
- The clusters were then tested.

6.2.6 SYSTEM TESTING

purpose is to fully exercise the computer-based system. It also tests to fine discrepancies between the system and its original objective, current specifications.

6.2.7 TEST CASES

In the system no error should be generated, if there is an error in the system then it should be displayed by the system as a message to the user and the error cause is to be mentioned. The error occurrences are as follows.

COPYING OF SCHEDULE FILE :

We have to copy this file from Scheduling division of **Spacecraft Control Center of ISTRAC**, if file not found then we have to display the Error message **"Schedule file not found".**

FILTERING OF SCHEDULE FILE :

For Filtering the schedule file we have to check whether the following files are existed of not.

1. **sat-id_code.tab file**
2. **shift.tab file**

If not the software should give an error **"file not found load it and continue the program".**

UPDATING OF SHIFT-OPERATION'S FORM :

For this module we have find that whether the user has given correct date or not. Suppose if user has given Invalid date then the message **"Invalid date"** should be displayed.

The date should be less than or equal to present date other wise it has to give error message **"Date should be less than or equal to present date"**

We have to check to whether all files are existing or not if not then the error message that **"Respective file is not existing copy it and continue"**

If there are no passes for that shift of that day then the message that **"There are no passes in this shift check the base status of schedule file and continue".**

UPDATING OF ANOMOLY OBSERVATION'S FORM :

For this module we have find that whether the user has given correct date or not. Suppose if user has given Invalid date then the message **"Invalid date"** should be displayed.

The date should be less than or equal to present date other wise it has to give error message **"Date should be less than or equal to present date"**

We have to check to whether all files are existing or not if not then the error message that **"Respective file is not existing copy it and continue"**

UPDATING OF SPECIAL OPERATION'S FORM :

For this module we have find that whether the user has given correct date or not. Suppose if user has given Invalid date then the message **"Invalid date"** should be displayed.

The date should be less than or equal to present date other wise it has to give error message **"Date should be less than or equal to present date"**

We have to check to whether all files are existing or not if not then the error message that **"Respective file is not existing copy it and continue"**

GENERATING REPORTS :

For generating the reports the software should check whether the given date is valid or not if not it should display the message **"Invalid Date".**

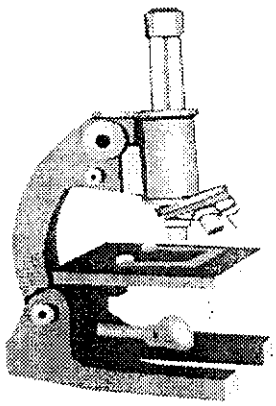
The software should check whether the given shift operations are updated or not. if not it should display the error message **"The corresponding shift operations are not updated".**

TEST CASES FOR SYSTEM TESTING :

Giving different dates and different shifts for each of the satellites tests the system, we have to check whether the system is giving correct output or not, and the corresponding files are updated or not.

6.2.8 ACCEPTANCE TEST REPORT :

Acceptance Testing is performed with realistic data of the client to demonstrate that the software is working satisfactorily. No errors were detected during acceptance testing.



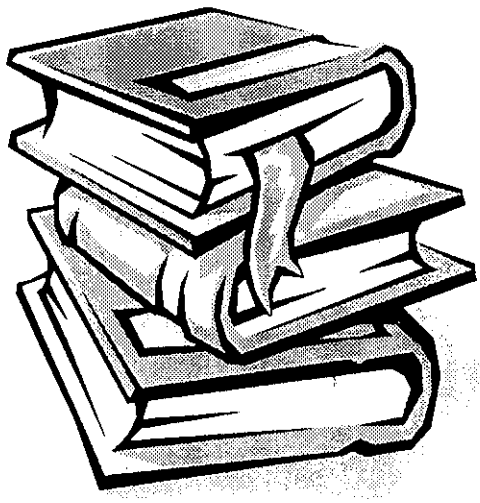
Conclusion

7. CONCLUSION

As specified earlier all the features that are required for **"Automation of Spacecraft Shift operation's Report"** are completed successfully.

All the combinations concerned with this project are successfully task. There is a scope for future development in view of adding various new Reports and to access data new spacecrafts.

- Various new Reports can be added.
- The access to the data of new Spacecraft which will be launched in future.



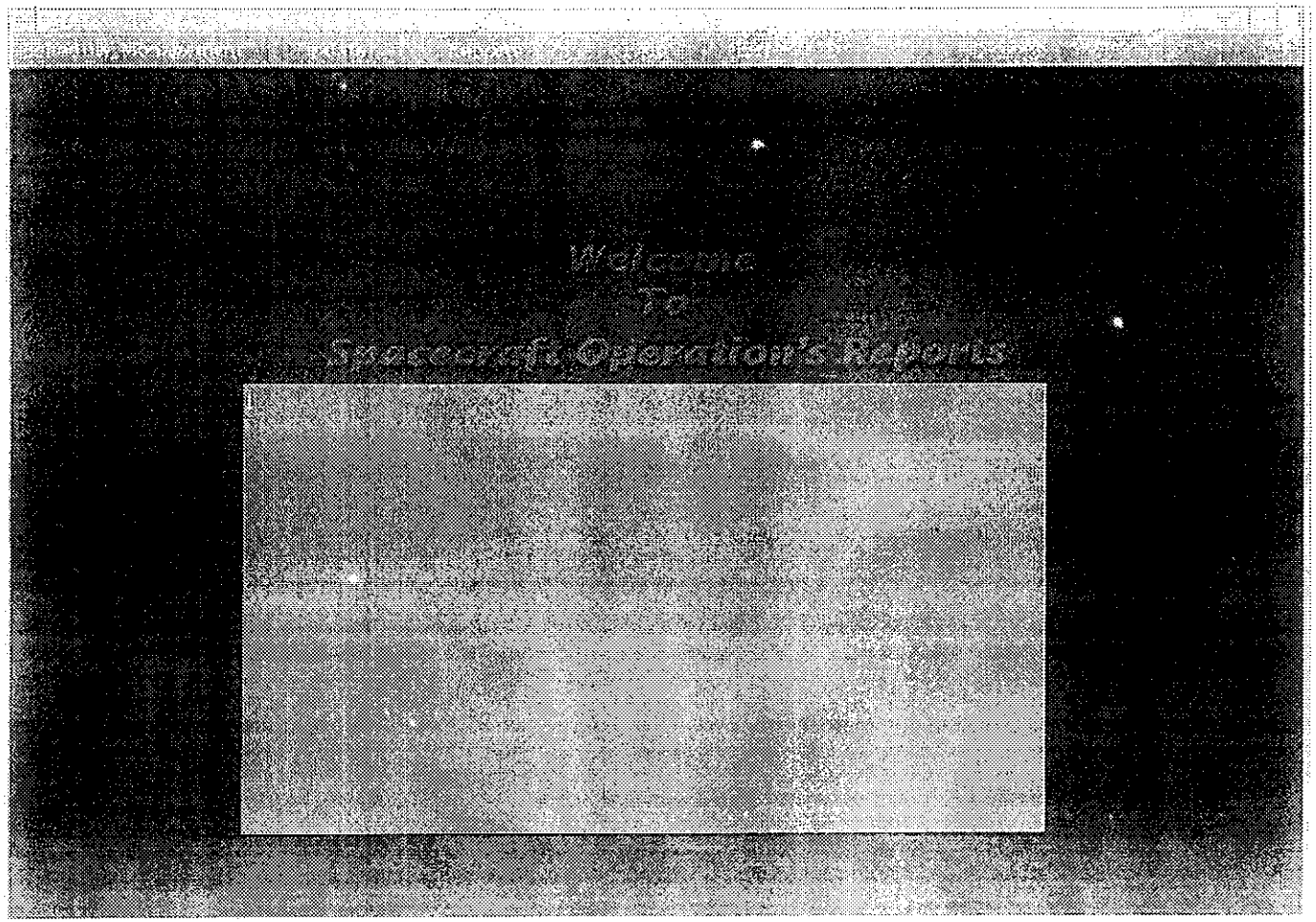
Bibliography

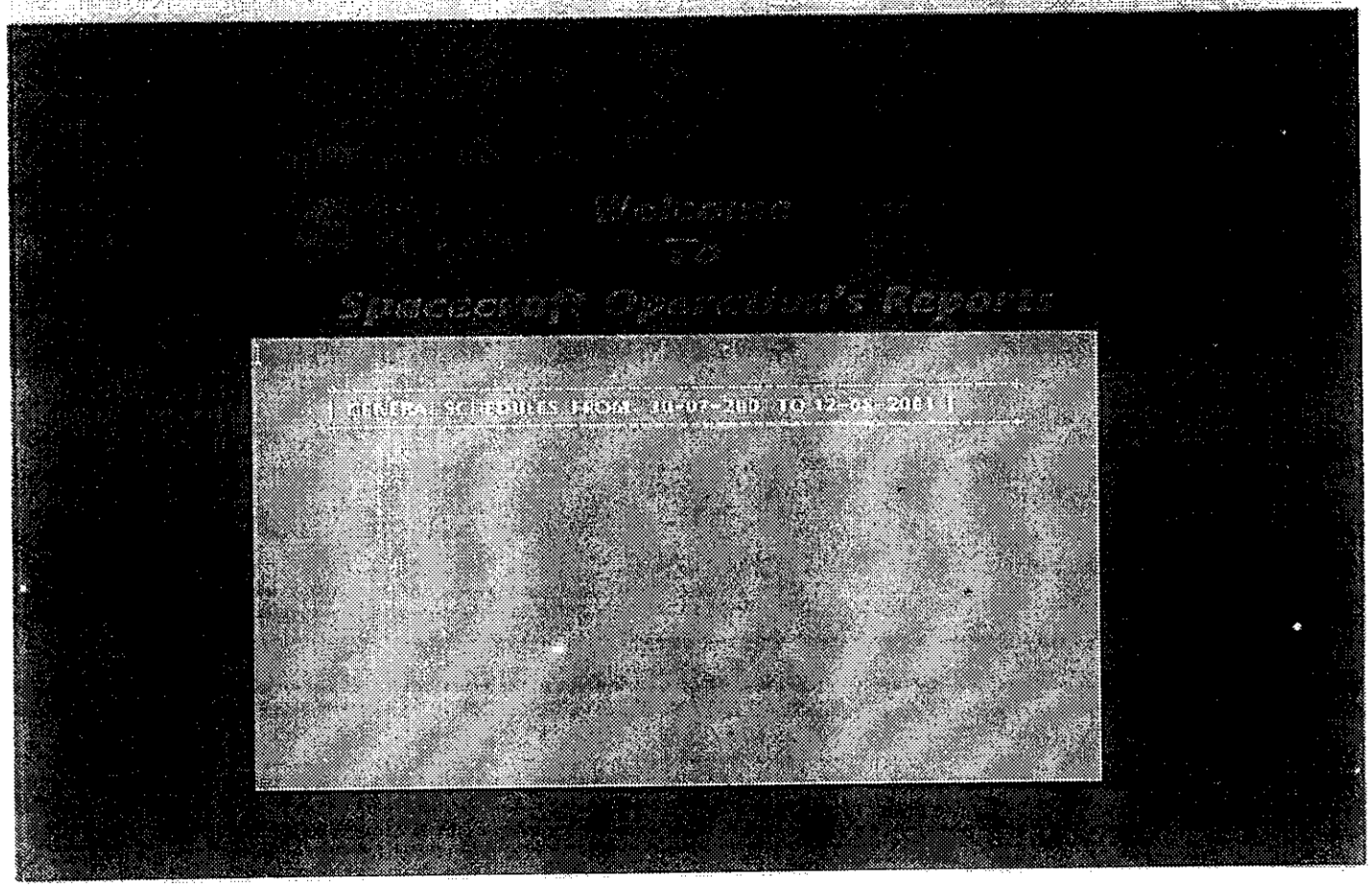
8. BIBLIOGRAPHY

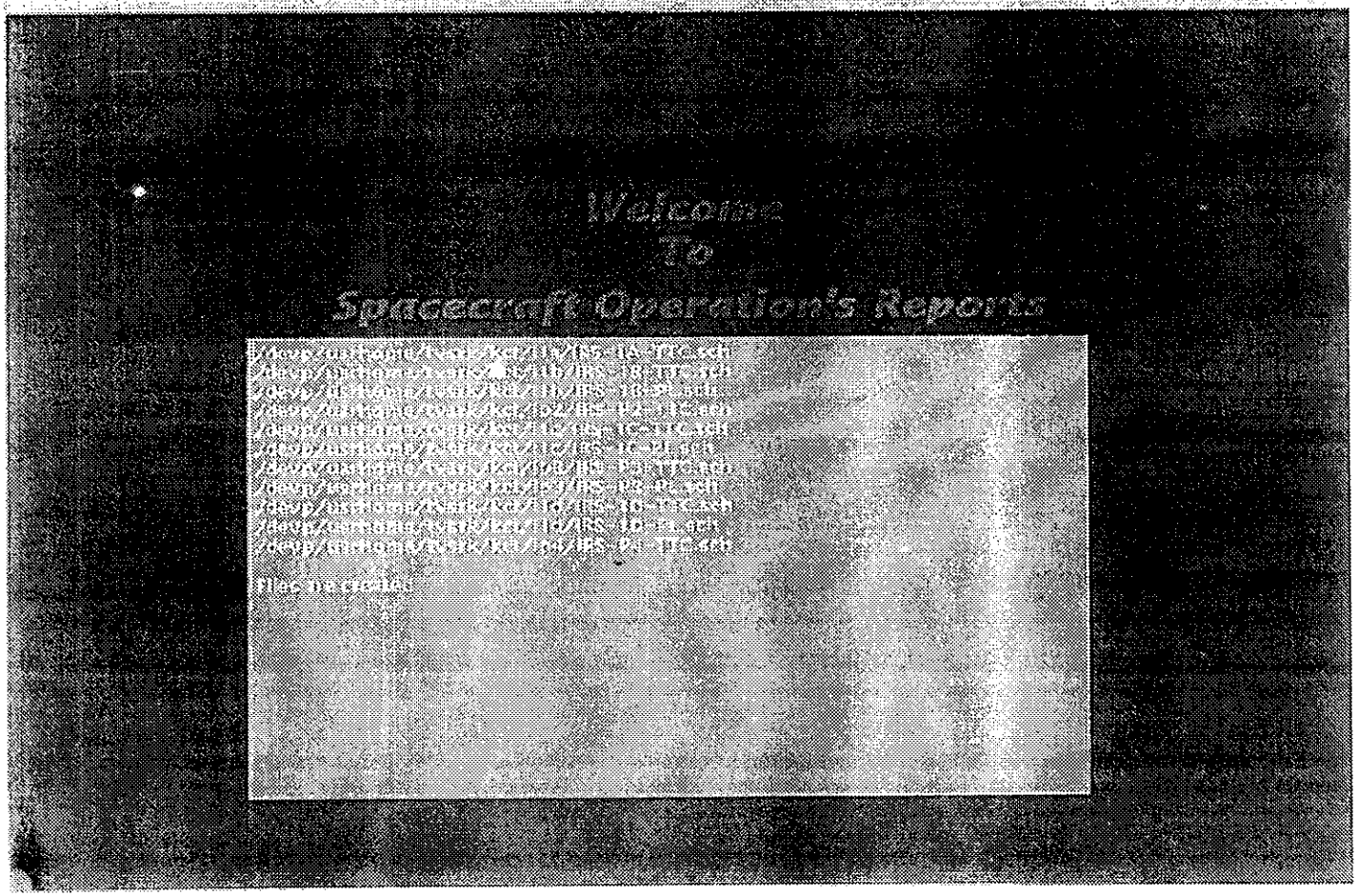
The following books, manuals are referred during the project.

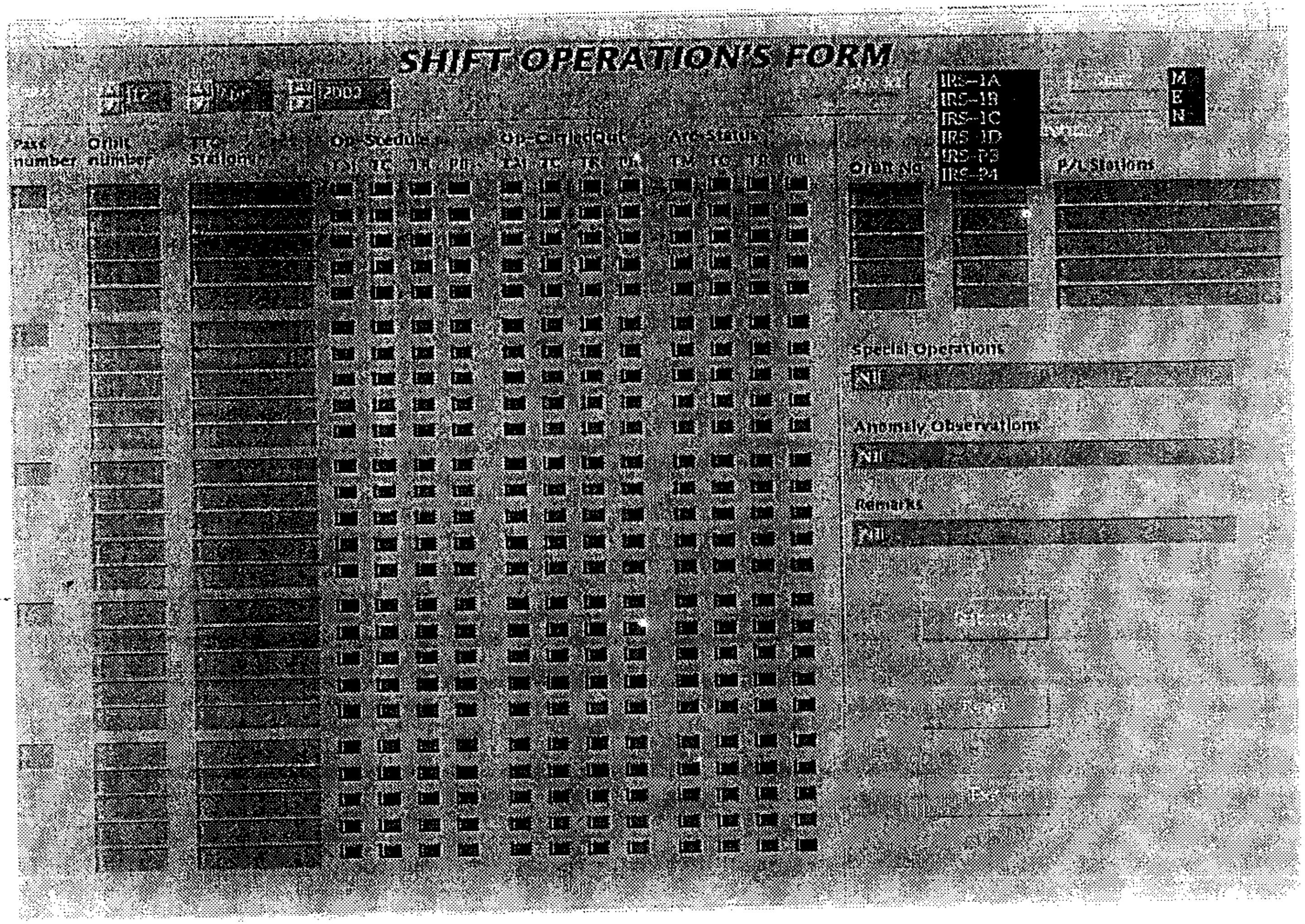
E.Balaguruswamy	**PROGRAMMING WITH ANSI C, BPB publications**
Dan Haller	**MOTIF PROGRAMMING MANUAL**
Herbert Schildt	**C++ THE COMPLETE REFERENCE**
ISTRAC	**ISRO ANNUAL REPORT**
Rajendra rao k	**X WINDOWS APPLICATIONS PROGRAMMING USING MOTIF.**
Roger S.Pressman	**SOFTWARE ENGINEERING**
Sumitabha Das	**YOUR UNIX THE ULTIMATE GUIDE**
Sumitabha Das.	**UNIX CONCEPTS & APPLICATIONS**
Yeshvant p kanetkar	**LET US C**

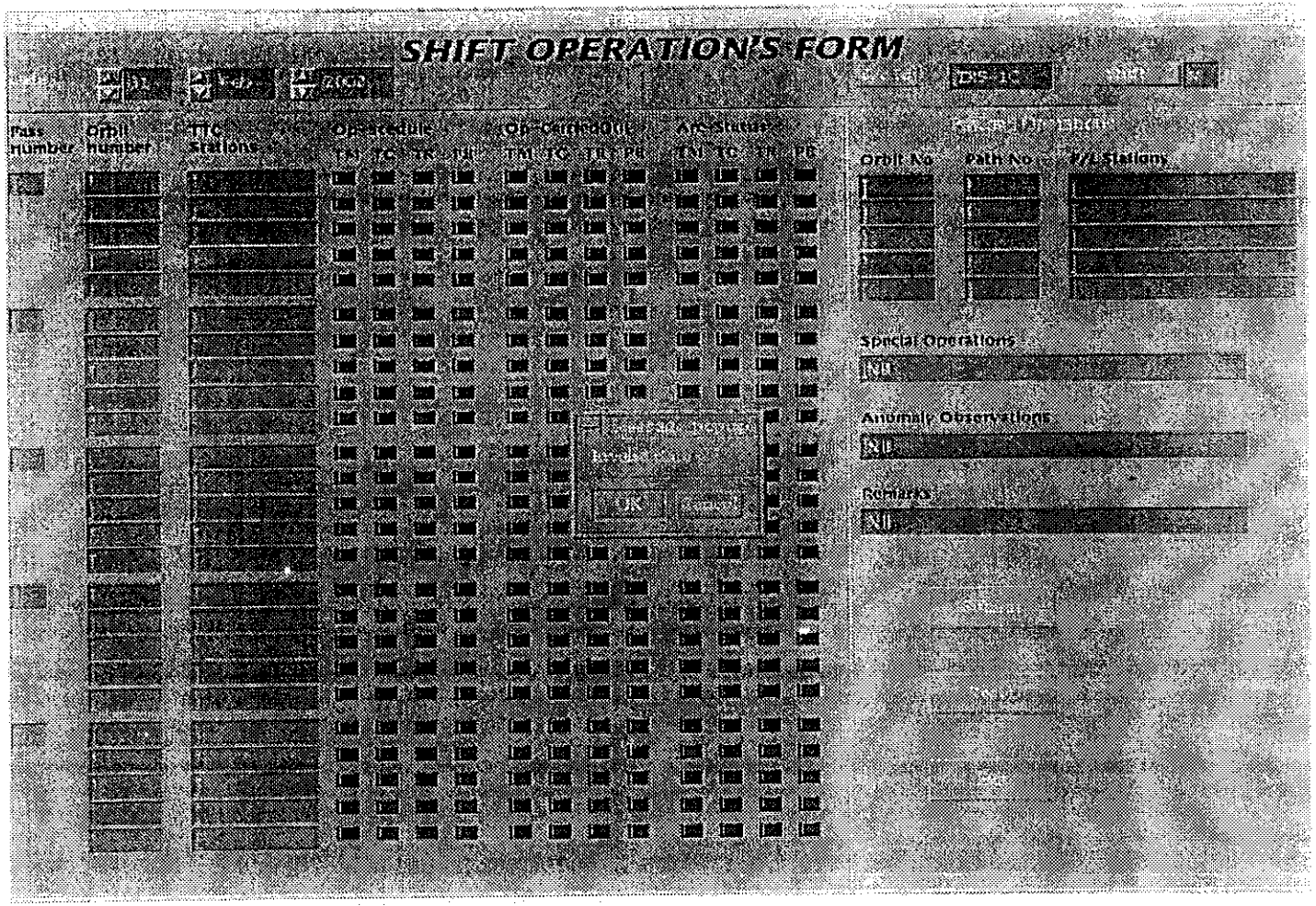
Screens

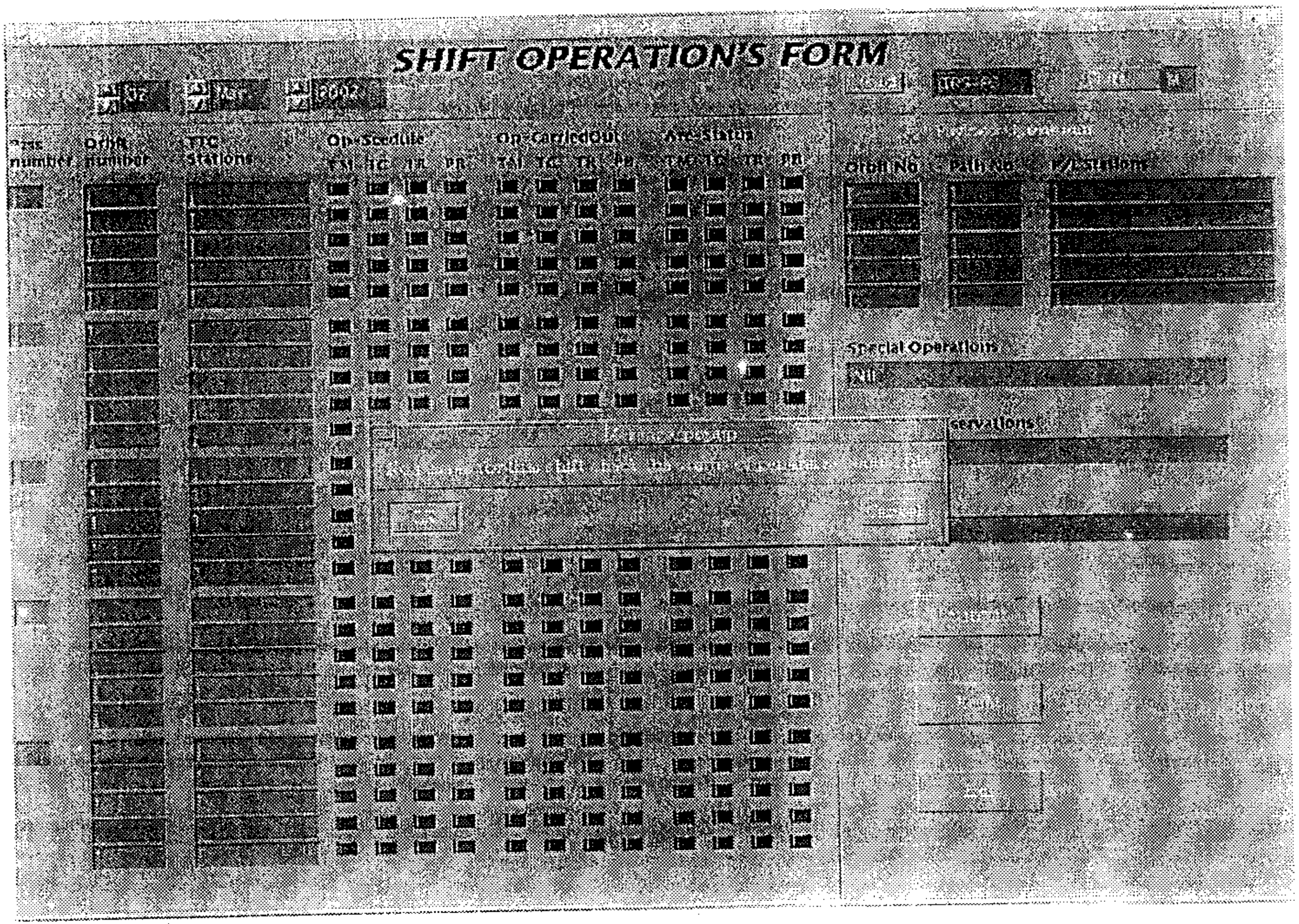

Welcome
To
Spacecraft Operations Reports

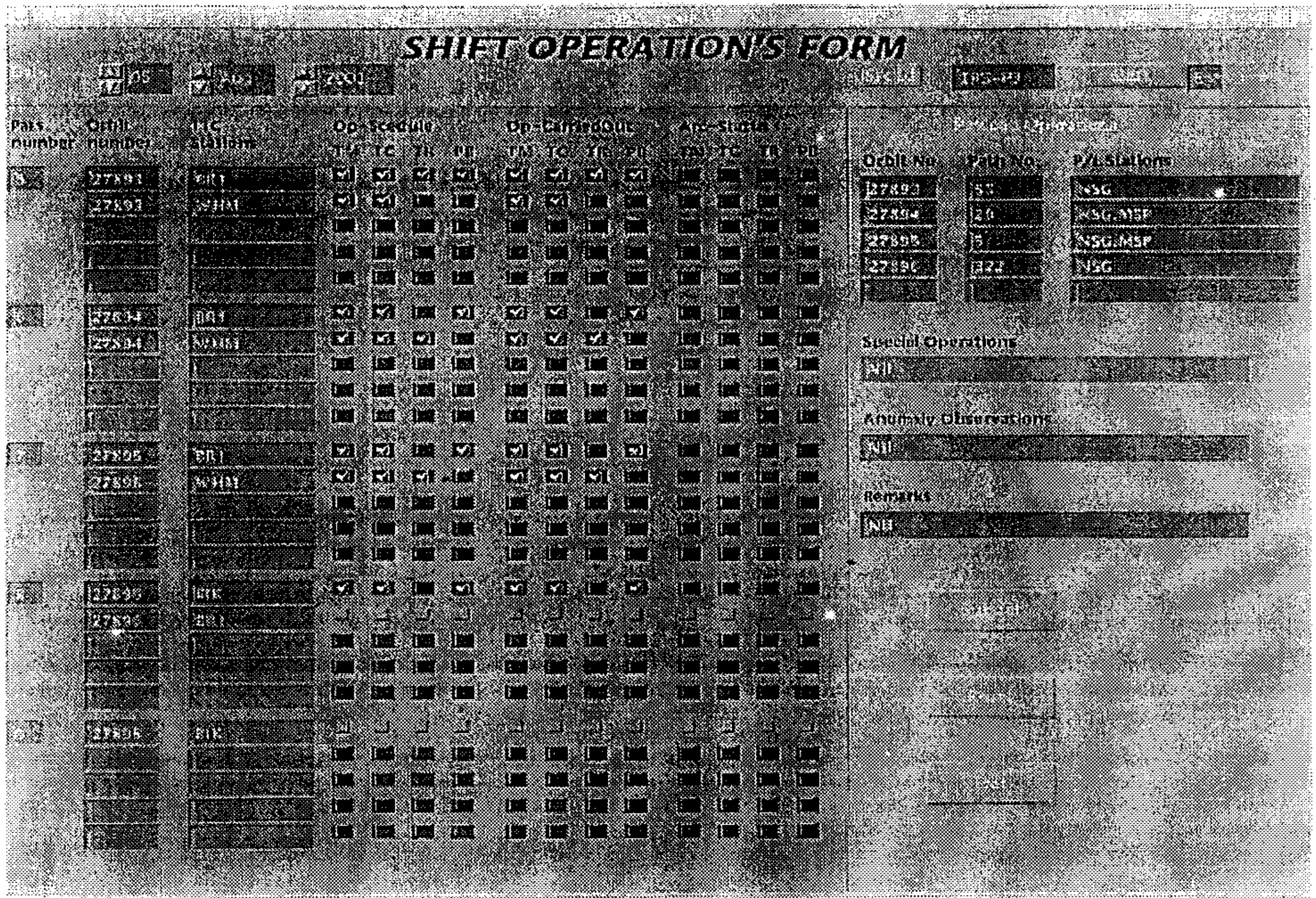

Welcome
To
Spacecraft Operation's Report
Mission Schedules From: 10-07-2010 To: 12-09-2081

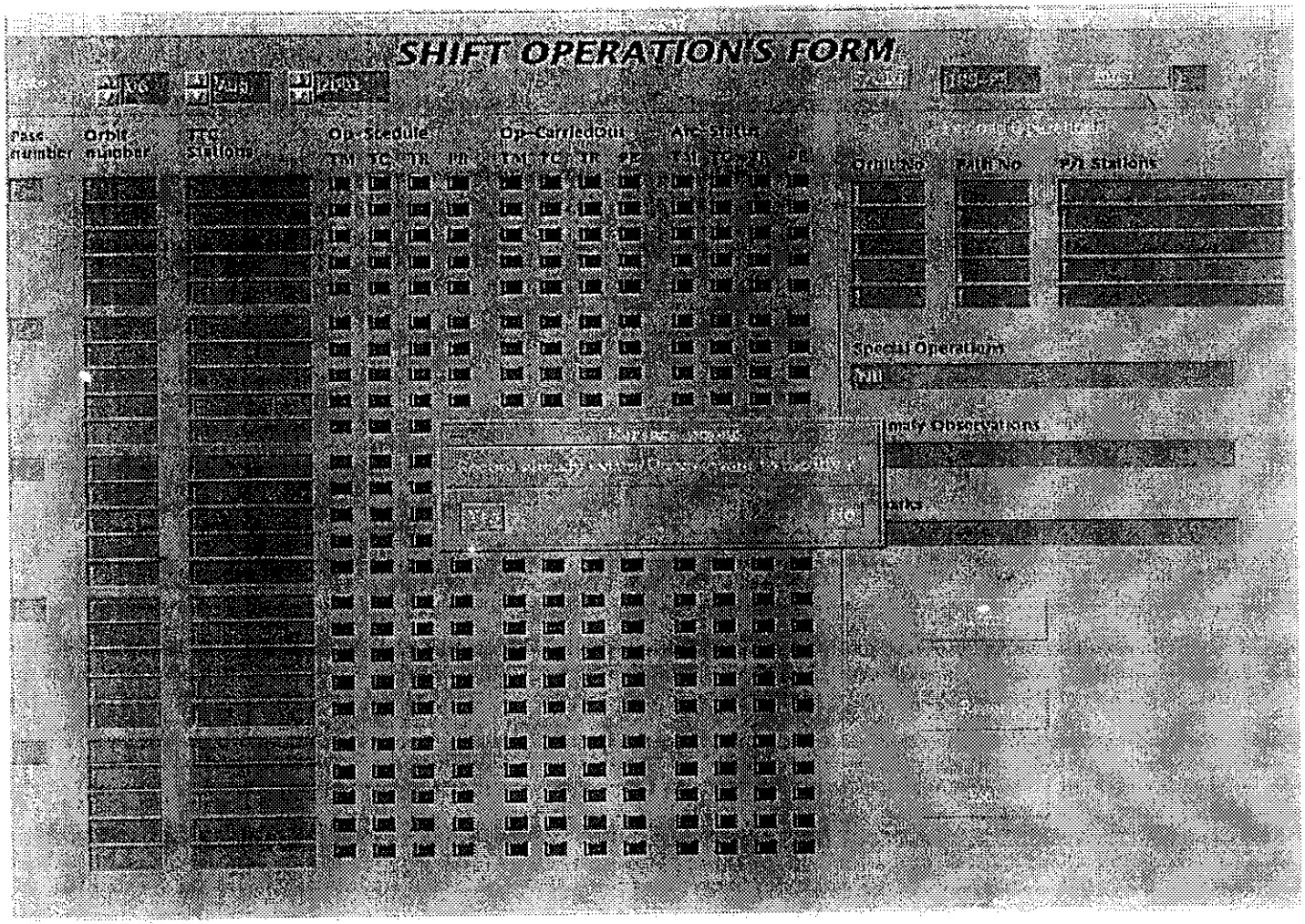

Welcome
To
Spacecraft Operation's Reports

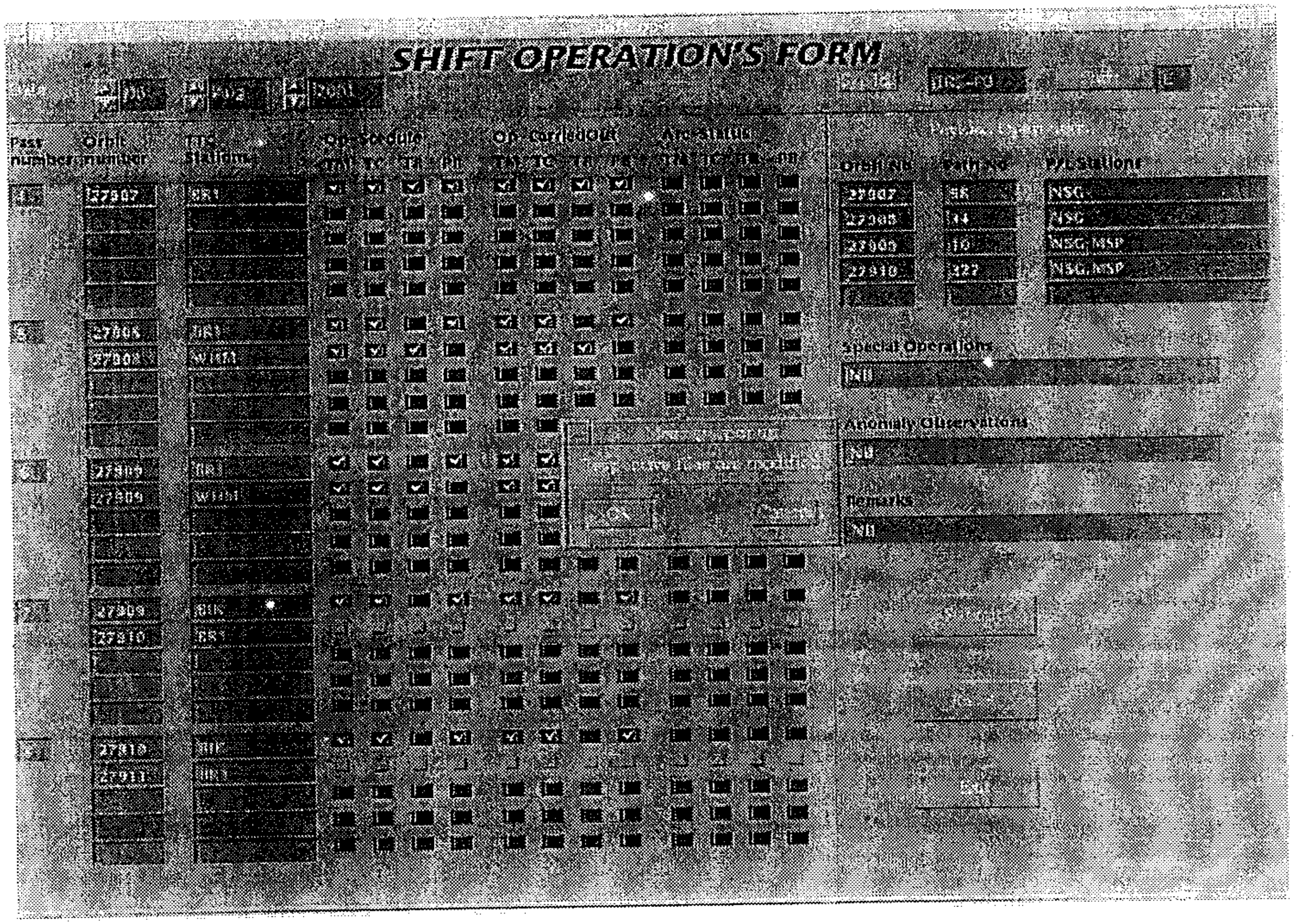

SHIFT OPERATION'S FORM
2000
IRS–1A
IRS–1B
IRS–1C
IRS–1D
IRS–P3
IRS–P4
M
E
N
Pass number
Orbit number
Stations
Op-Scedule
TC
Op-Carried Out
Orb. No
P/L Stations
Special Operations
Nil
Anomaly Observations
Nil
Remarks
Nil

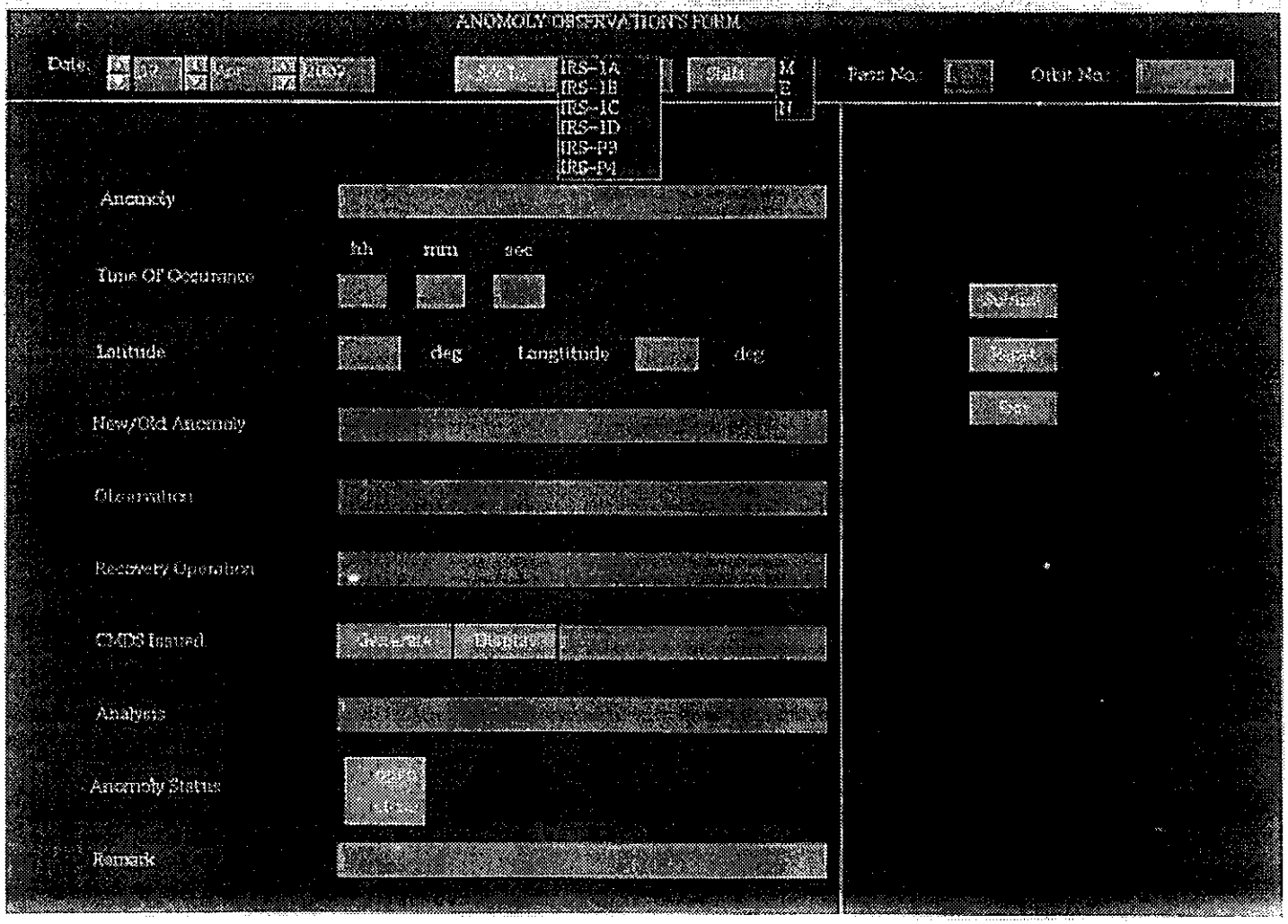

SHIFT OPERATION'S FORM
Pass Number
Orbit Number
TTC Stations
Operations
Commands
Archives
Orbit No
Path No
P/L Stations
Special Operations
Anomaly Observations
Remarks

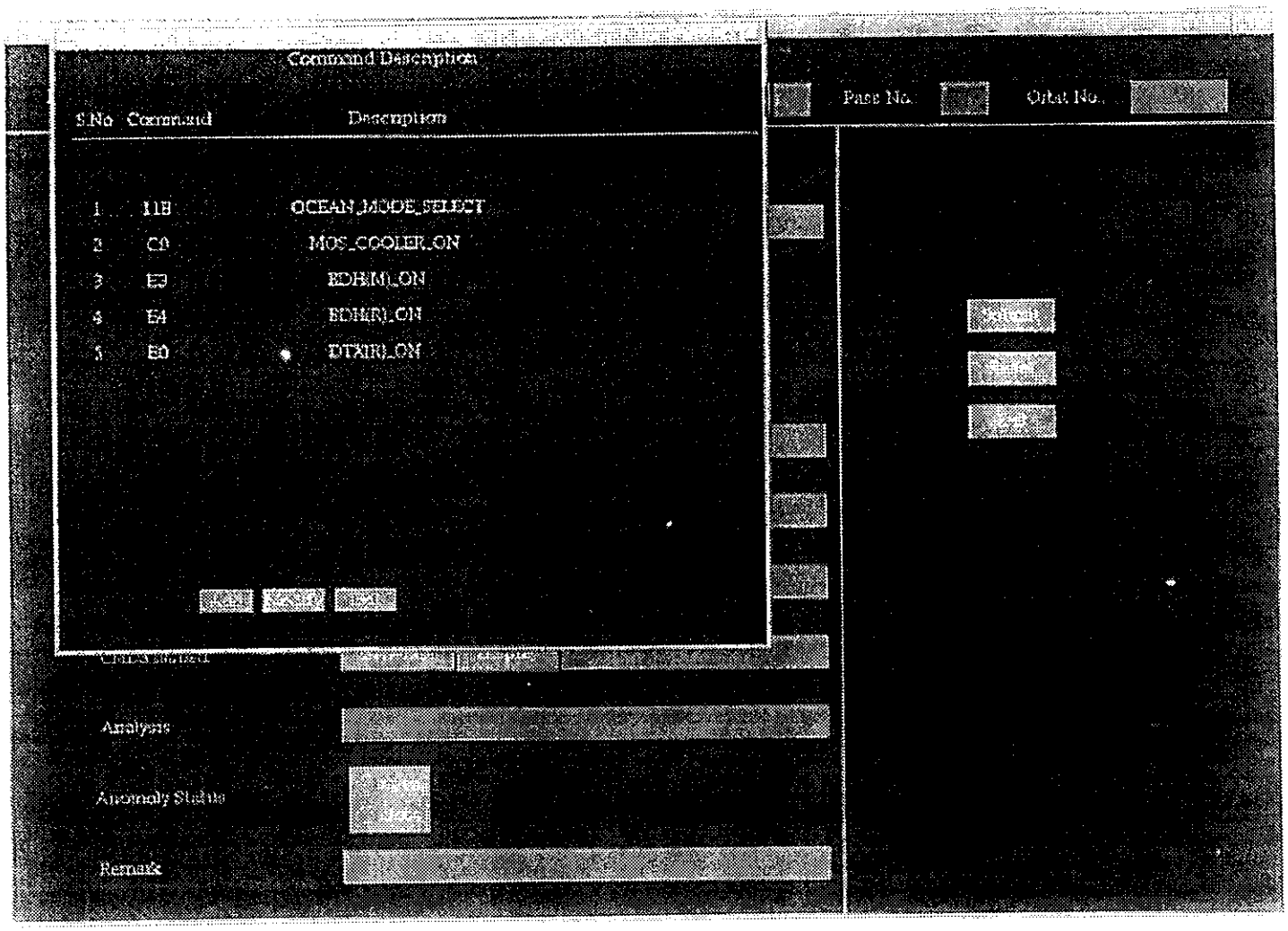

SHIFT OPERATION'S FORM
Orbit number
TTC stations
On Schedule
On Carried Out
Orbit No
Path No
Special Operations
Nil

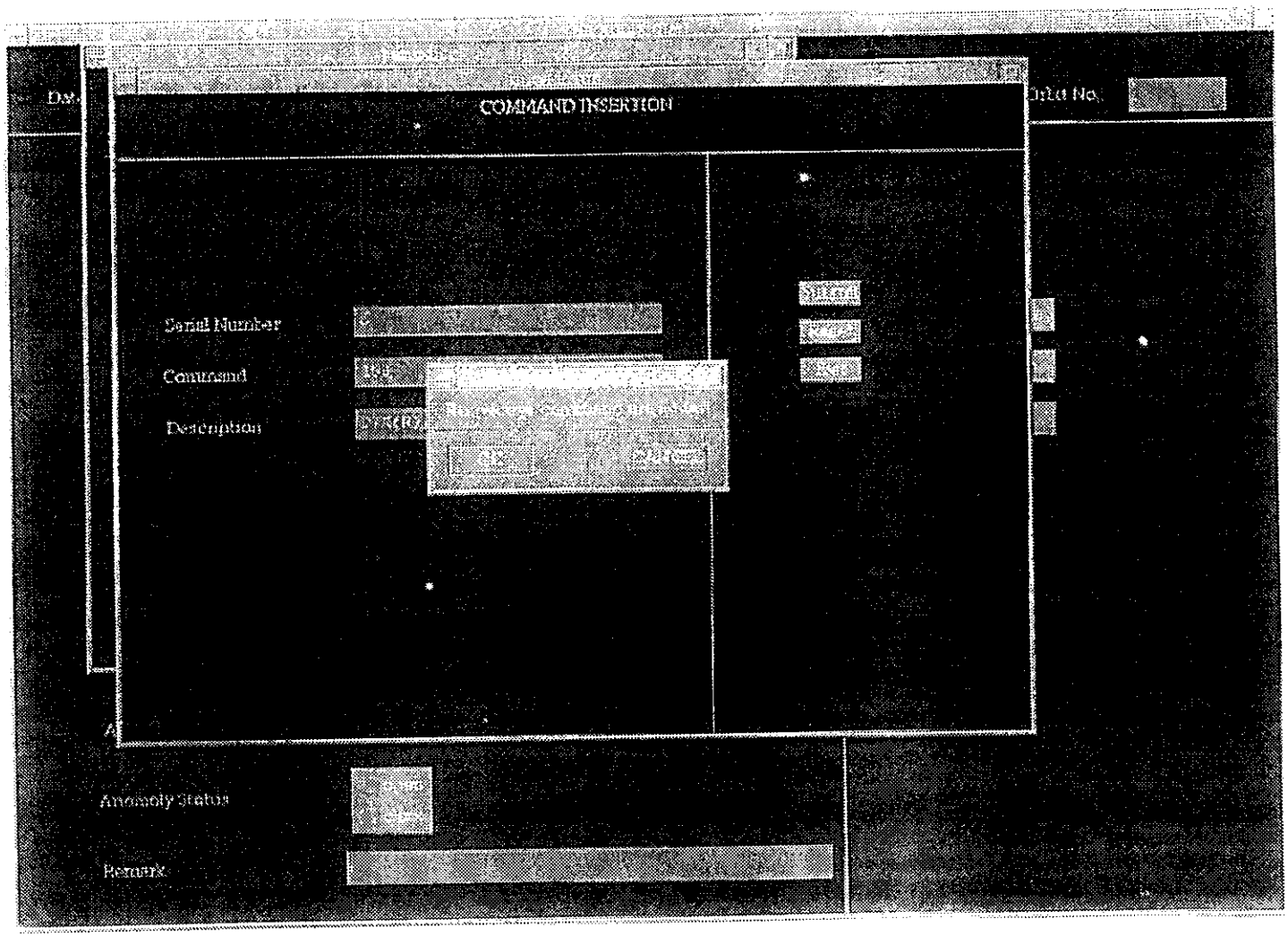

SHIFT OPERATION'S FORM
Pass number
Orbit number
TTC Station
Op-Scedule
Op-CarriedOut
TM
TC
TR
PB
Orbit No.
Path No.
P/L Stations
27893
27894
NSG
NSG,MSP
Special Operations
Nil
Anomaly Observations
Nil
Remarks
Nil

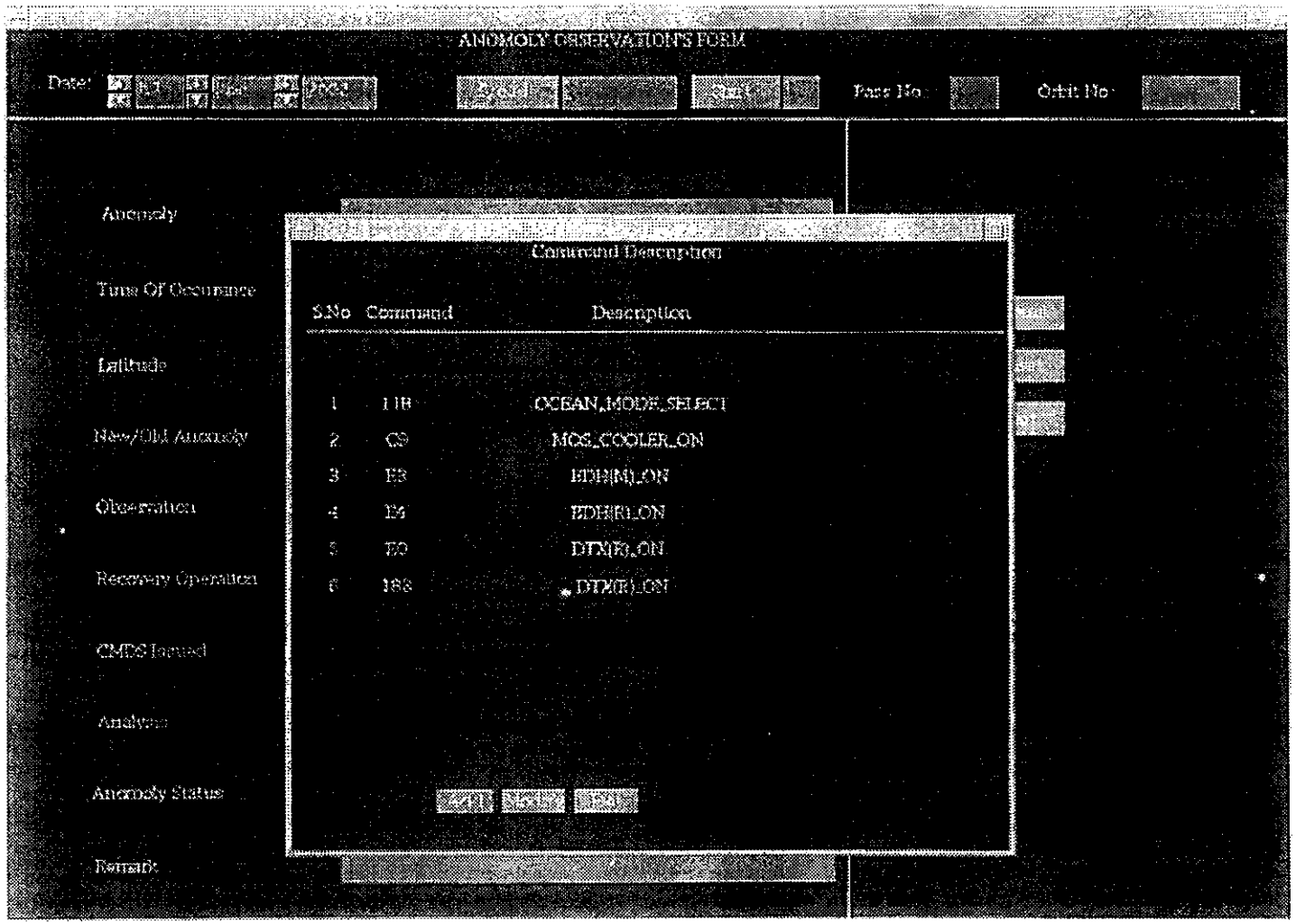

SHIFT OPERATIONS FORM
Pass number
Orbit number
TTC Stations
Op.Sceduled
Op.Carriedout
Arc Status
TM
TC
TR
PR
Orbit No
Path No
P/L Stations
Special Operations
Daily Observations
Data

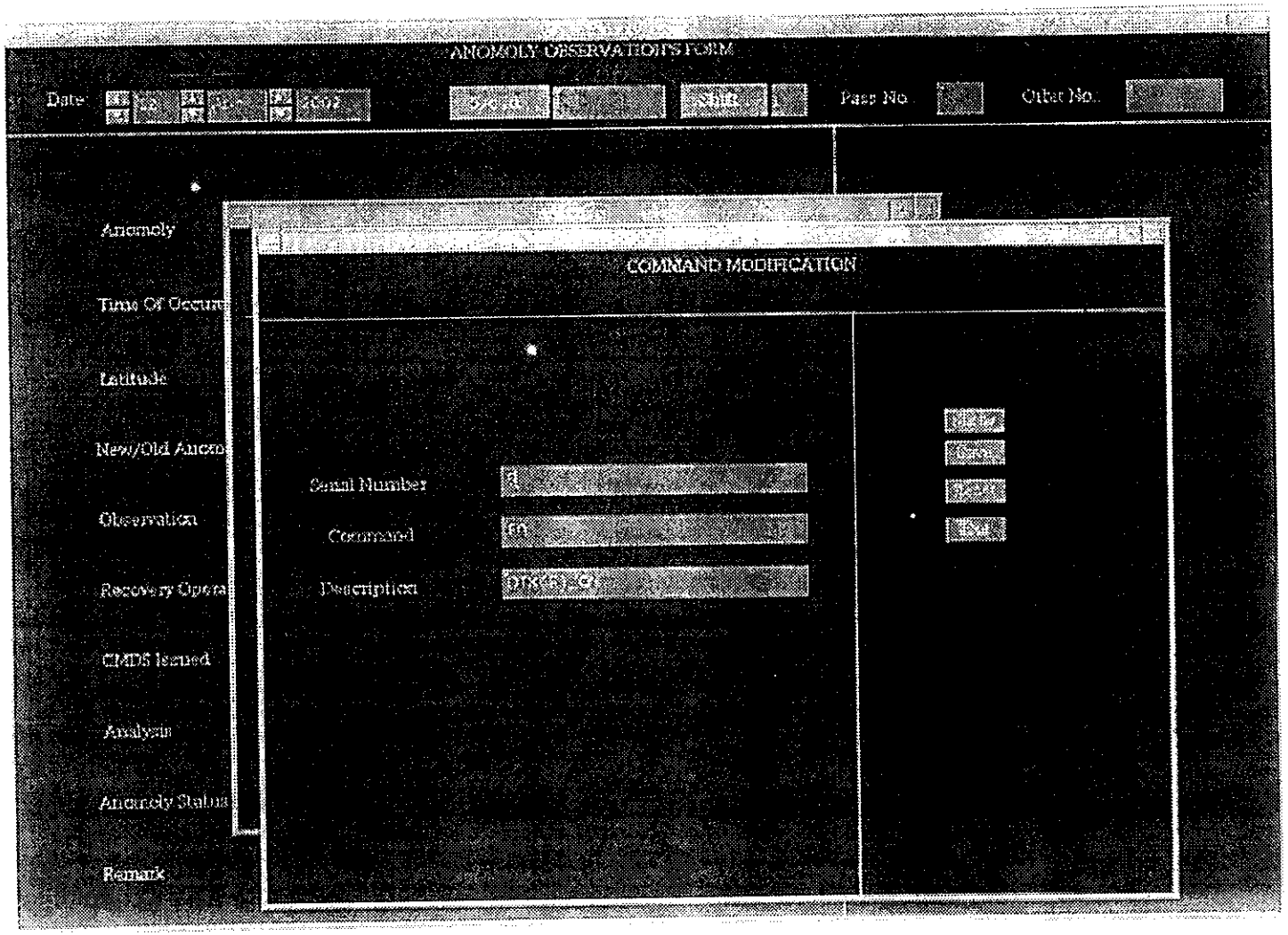

SHIFT OPERATION'S FORM
Pass number
Orbit number
TTC Stations
Op. Schedule
Op. Carried Out
Orbit No
Path No
PL Stations
27907
27908
27909
27910
27911
NSG
NSG
NSG,MSP
NSG,MSP
Special Operations
Nil
Anomaly Observations
Nil
Remarks
Nil

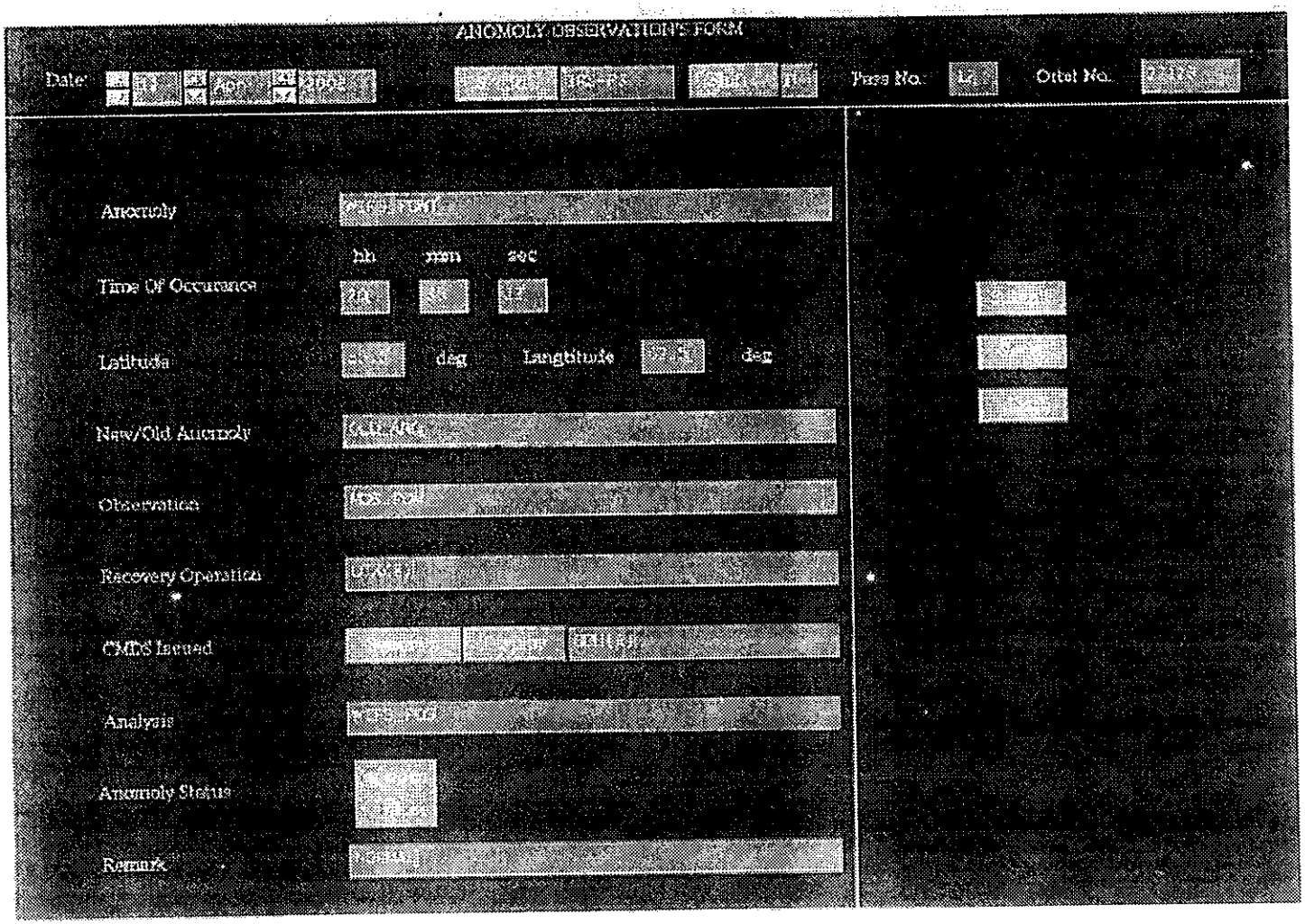

ANOMOLY OBSERVATION'S FORM
Date:
IRS-1A
IRS-1B
IRS-1C
IRS-1D
IRS-P3
IRS-P4
Pass No:
Orbit No:
Anomoly
hh
mm
sec
Time Of Occurance
Latitude
deg
Longitude
deg
New/Old Anomoly
Observation
Recovery Operation
CMDS Issued
Analysis
Anomoly Status
Remark

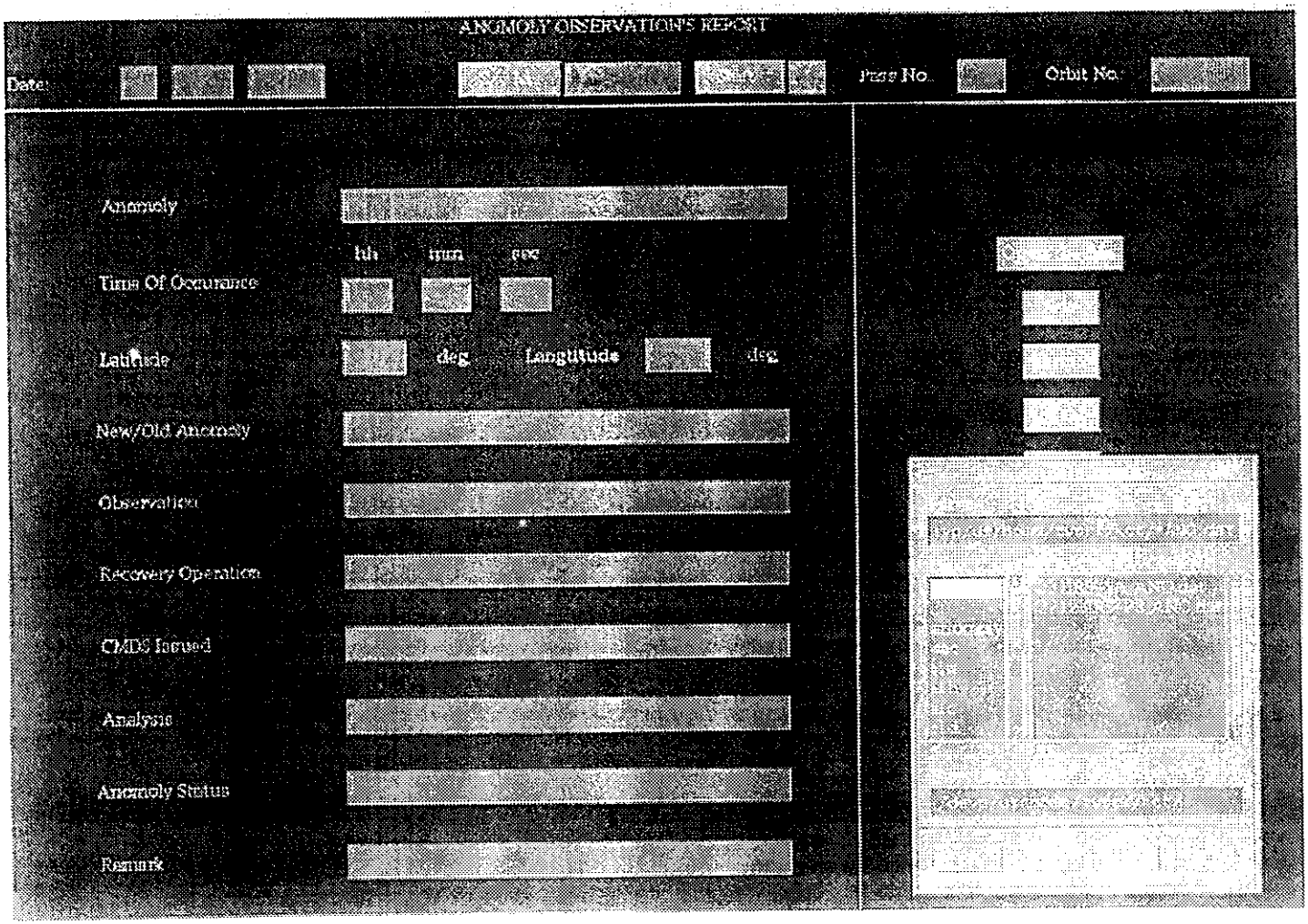

Command Description
S.No Command Description
1 11B OCEAN_MODE_SELECT
2 C0 MOS_COOLER_ON
3 E3 EDH(M)_ON
4 E4 EDH(R)_ON
5 E0 DTXIR()_ON
Pass No.
Orbit No.
Analysis
Anomaly Status
Remark

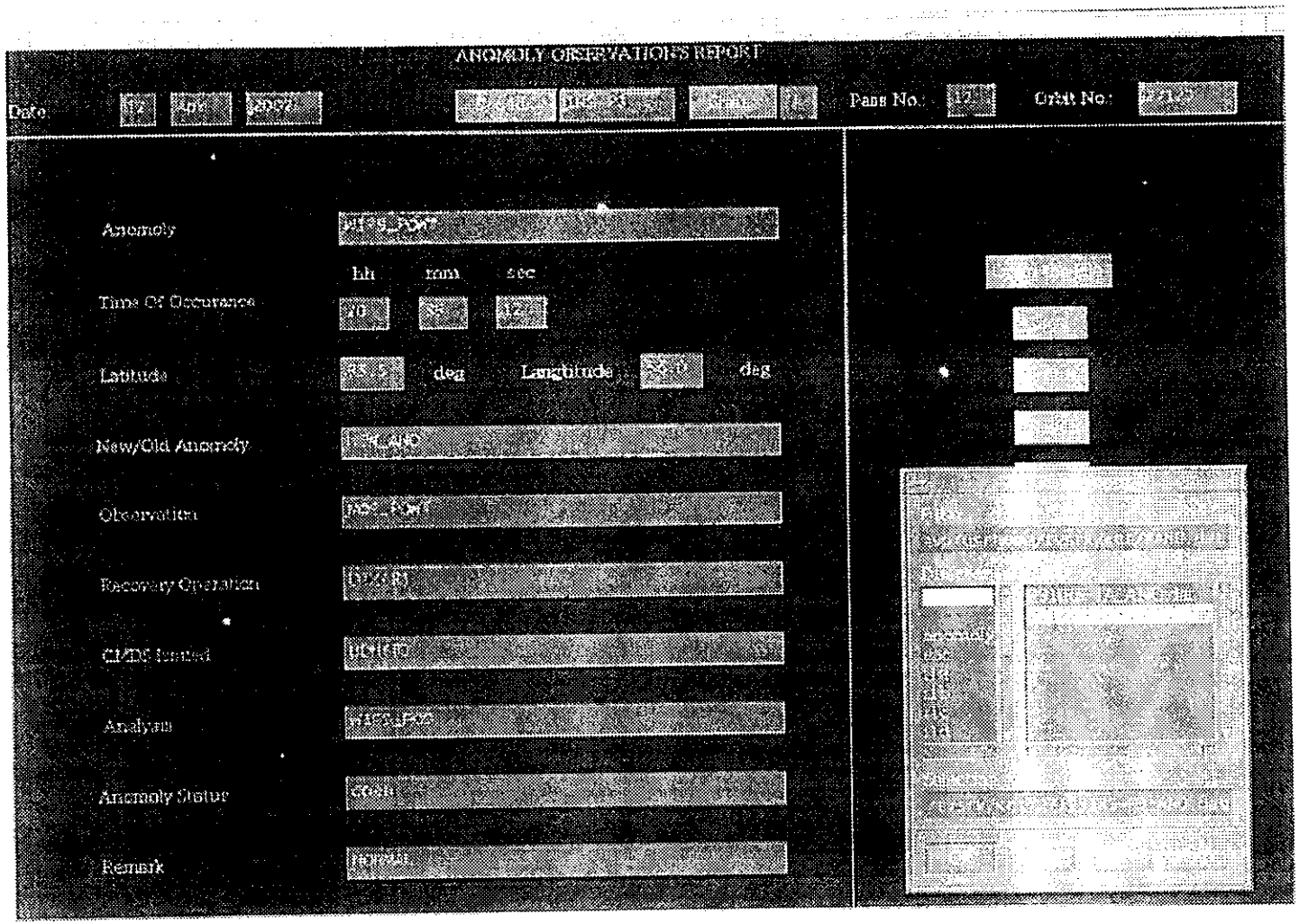

COMMAND INSERTION
Serial Number
Command
Description
Anomaly Status
Remark

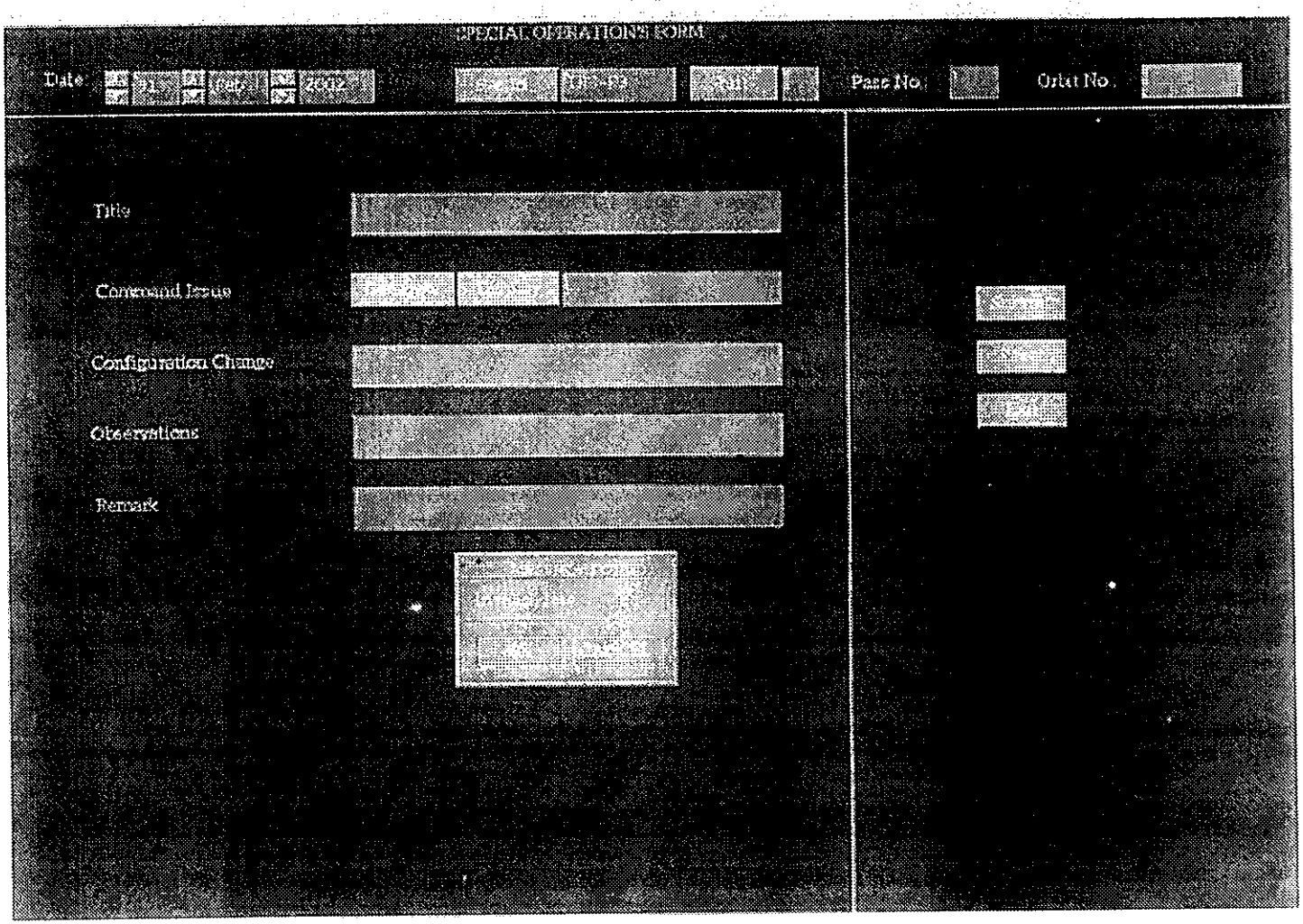

ANOMOLY OBSERVATION'S FORM
Date:
Pass No:
Orbit No:
Anomoly
Time Of Occurance
Latitude
New/Old Anomoly
Observation
Recovery Operation
CMDS Issued
Analysis
Anomoly Status
Remark
Command Description
S.No Command Description
1 11B OCEAN_MODE_SELECT
2 C9 MOS_COOLER_ON
3 E8 EDE(M)_ON
4 E6 EDE(R)_ON
5 E0 DTM(R)_ON
6 88 DTM(R)_ON

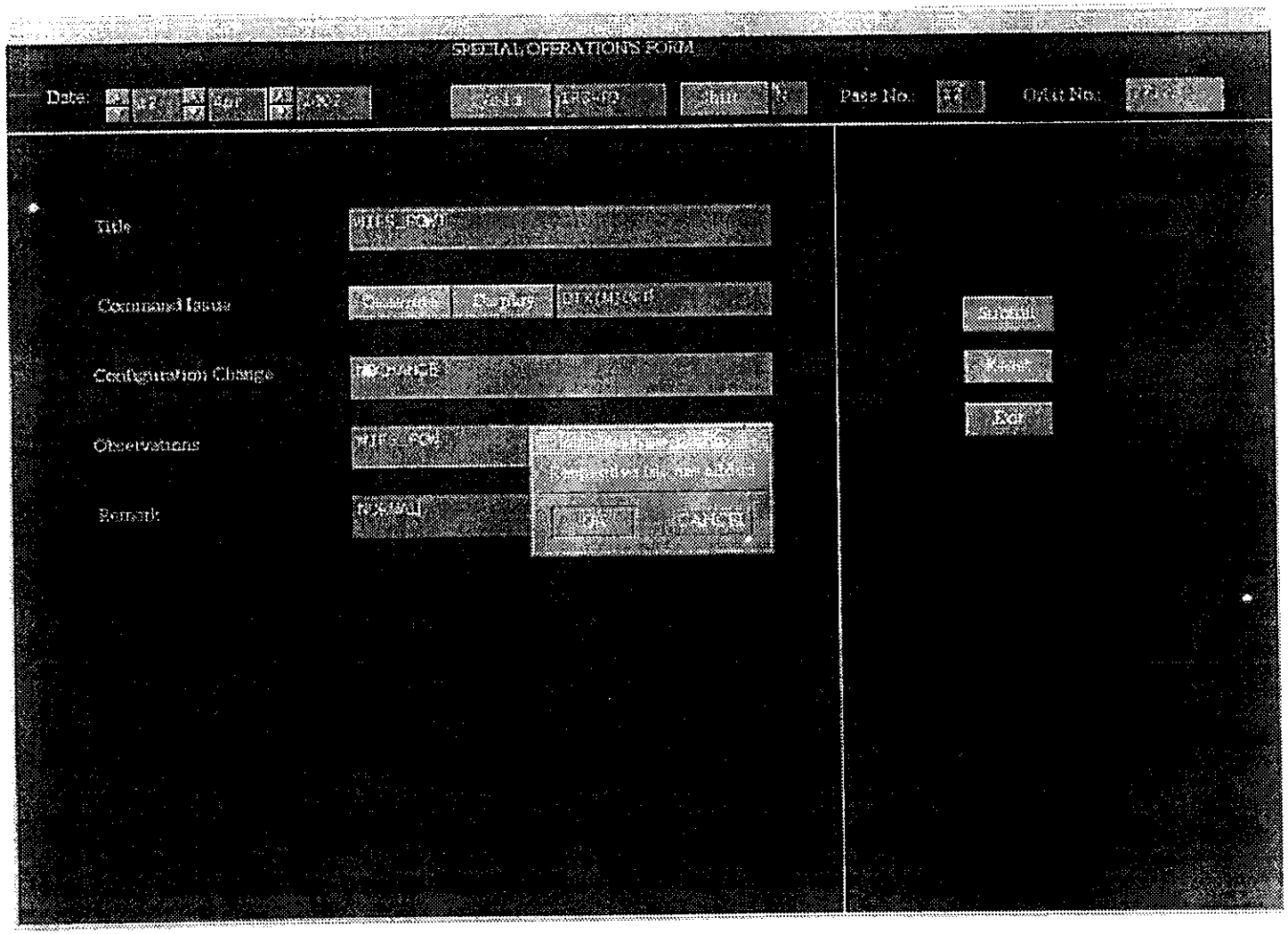

ANOMOLY OBSERVATION'S FORM
Date
Pass No.
Orbit No.
Anomoly
Time Of Occur
Latitude
New/Old Anom
Observation
Recovery Opera
CMDS learned
Analysis
Anomoly Status
Remark
COMMAND MODIFICATION
Serial Number
Command
Description
Exit

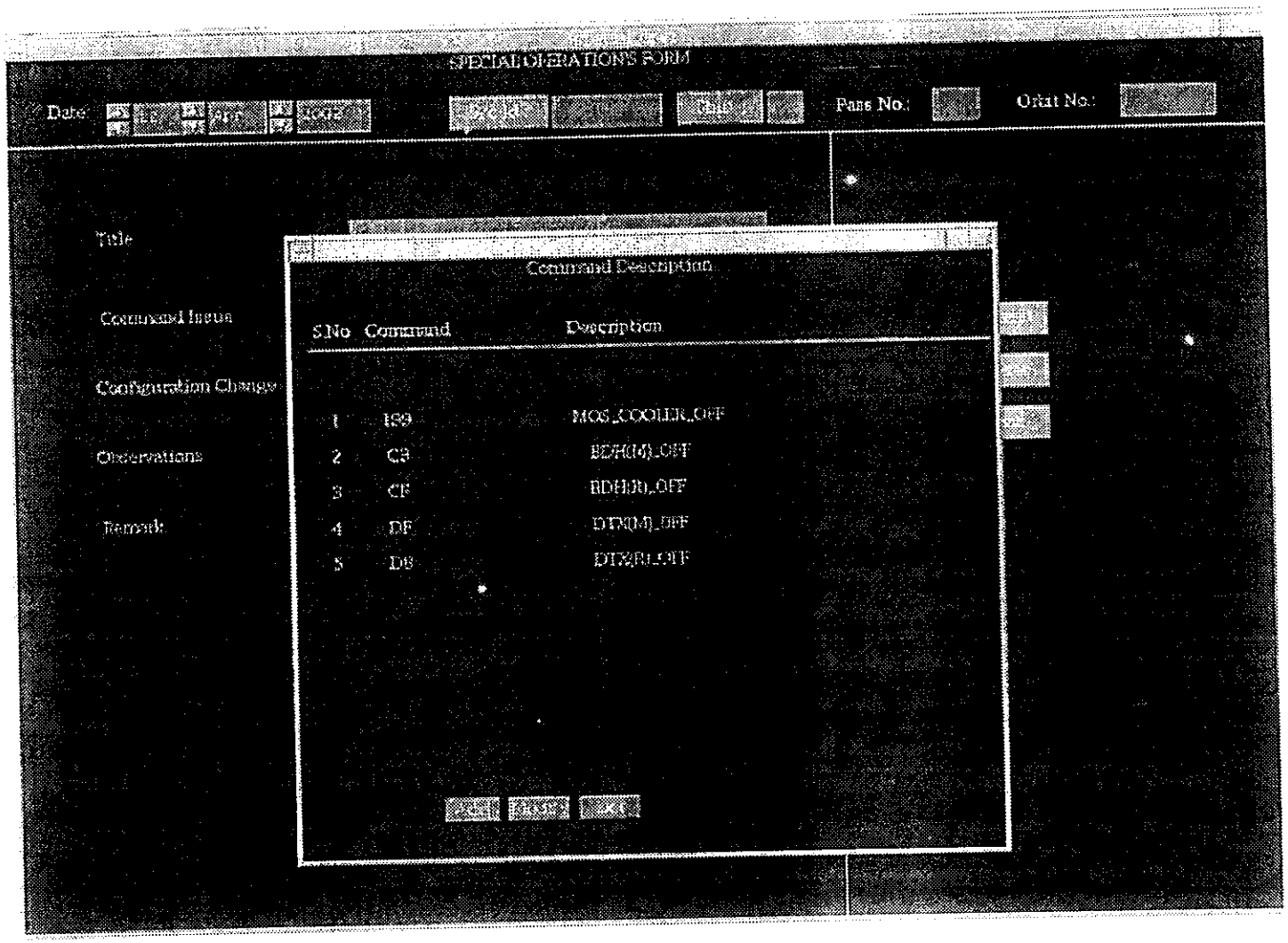

ANOMOLY OBSERVATION'S FORM
Date
Pass No.
Orbit No.
Anomoly
Time Of Occurance
hh
mm
sec
Latitude
deg
Langtitude
deg
New/Old Anomoly
Observation
Recovery Operation
CMDS Issued
Analysis
Anomoly Status
Remark

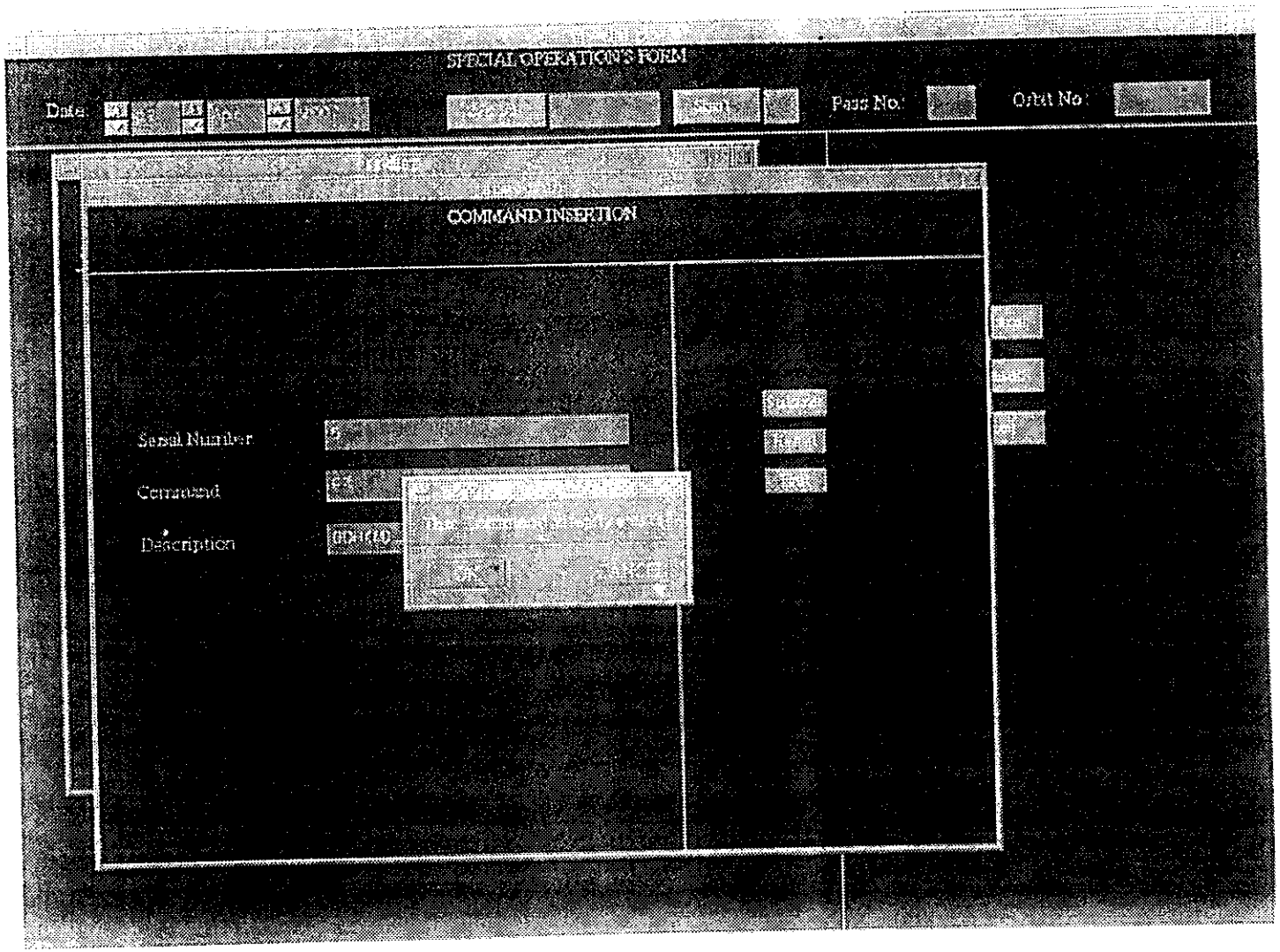

ANOMOLY OBSERVATION'S REPORT
Date:
Pass No.
Orbit No.
Anomaly
hh
mm
sec
Time Of Occurance
Latitude
deg
Longitude
deg
New/Old Anomaly
Observation
Recovery Operation
CMDS Issued
Analysis
Anomaly Status
Remark

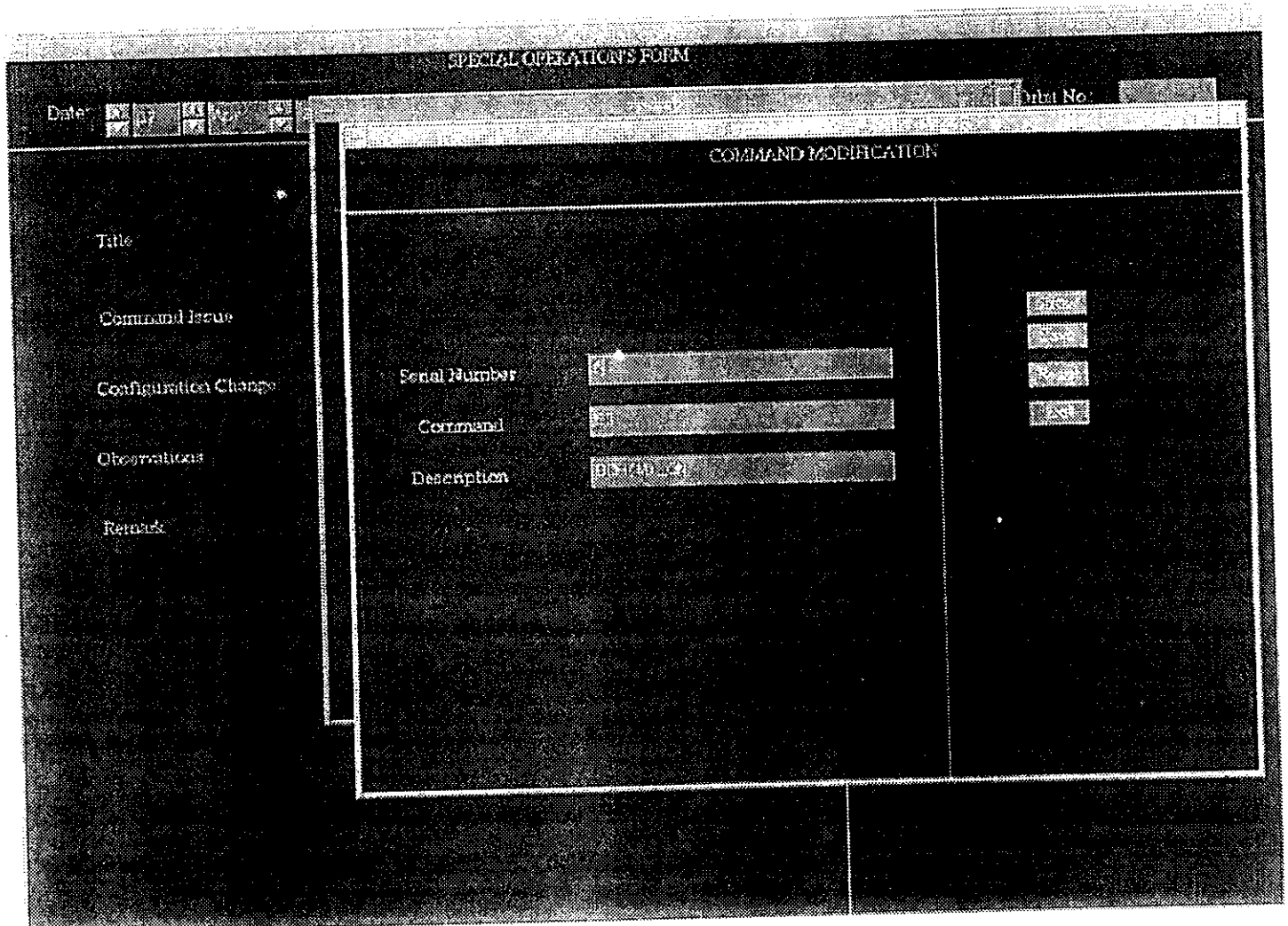

ANOMOLY OBSERVATIONS REPORT
Date
Pass No.
Orbit No.
Anomoly
hh
mm
sec
Time Of Occurance
Latitude
deg
Langhitude
deg
New/Old Anomoly
Observation
Recovery Operation
Analysis
Anomoly Status
Remark

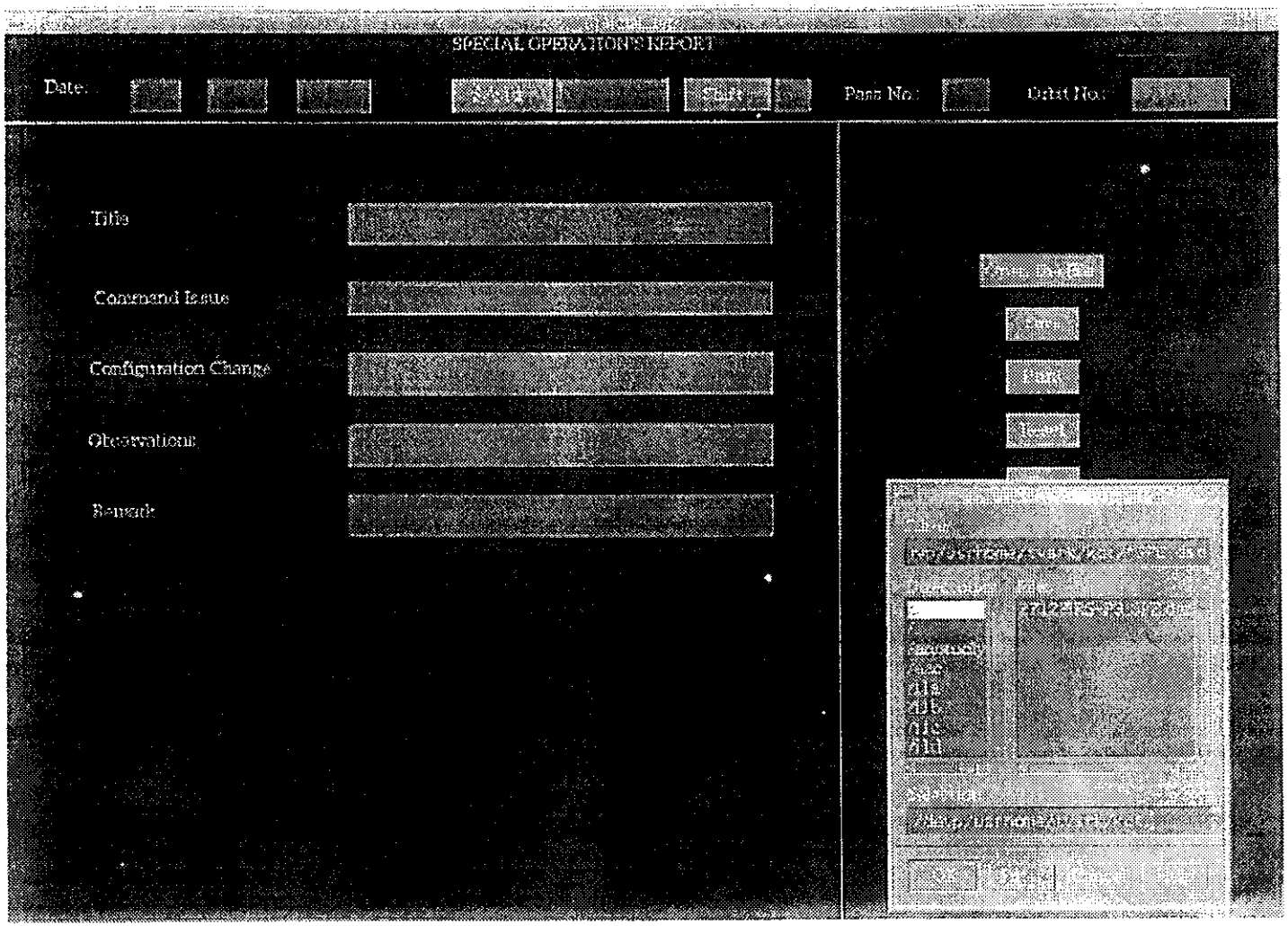

SPECIAL OPERATIONS FORM
Date
Pass No.
Orbit No.
Title
Command Issue
Configuration Change
Observations
Remark

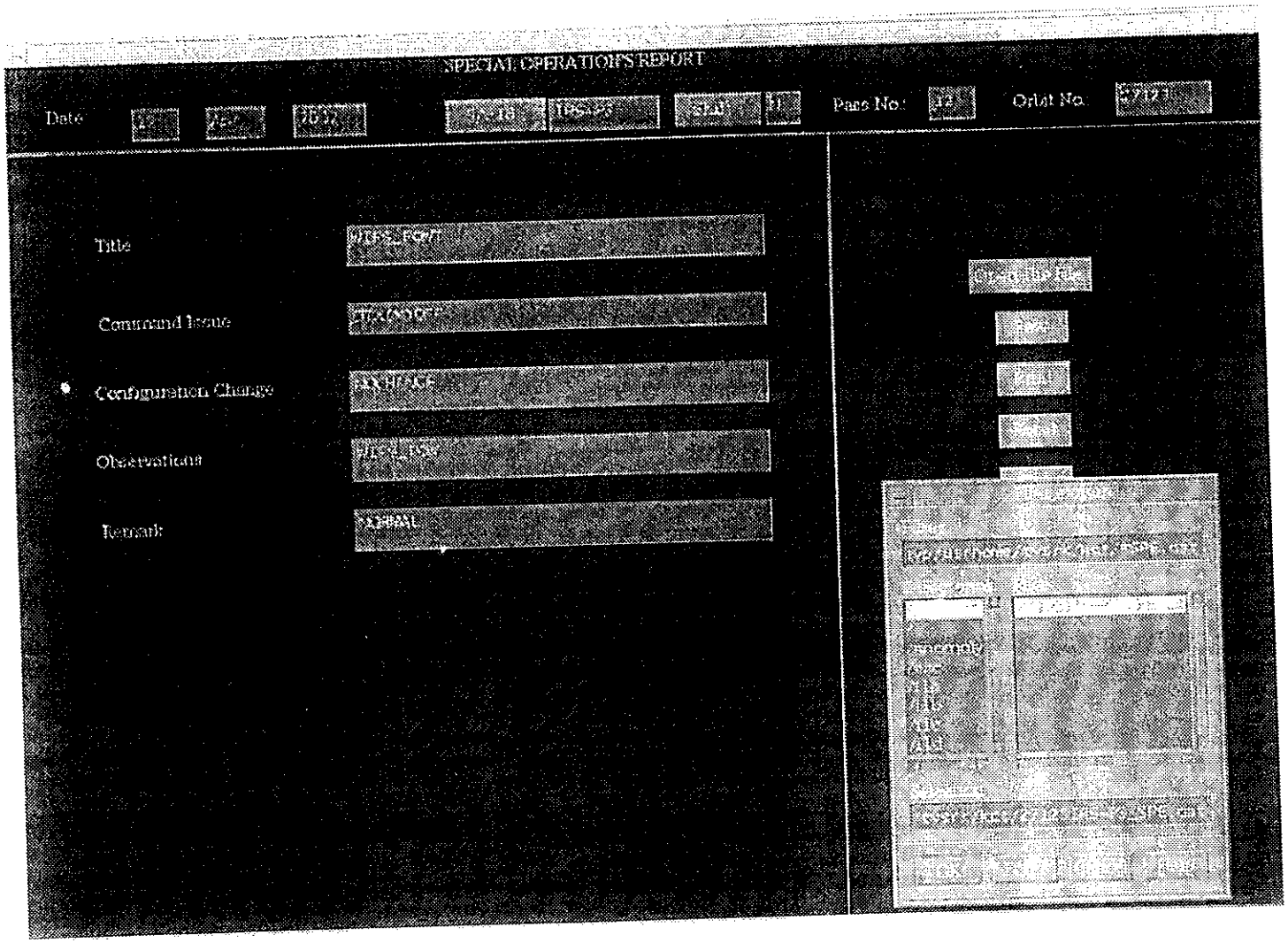

SPECIAL OPERATIONS FORM
Date:
Pass No:
Orbit No:
Title
Command Issue
Configuration Change
Observations
Remark
Exit

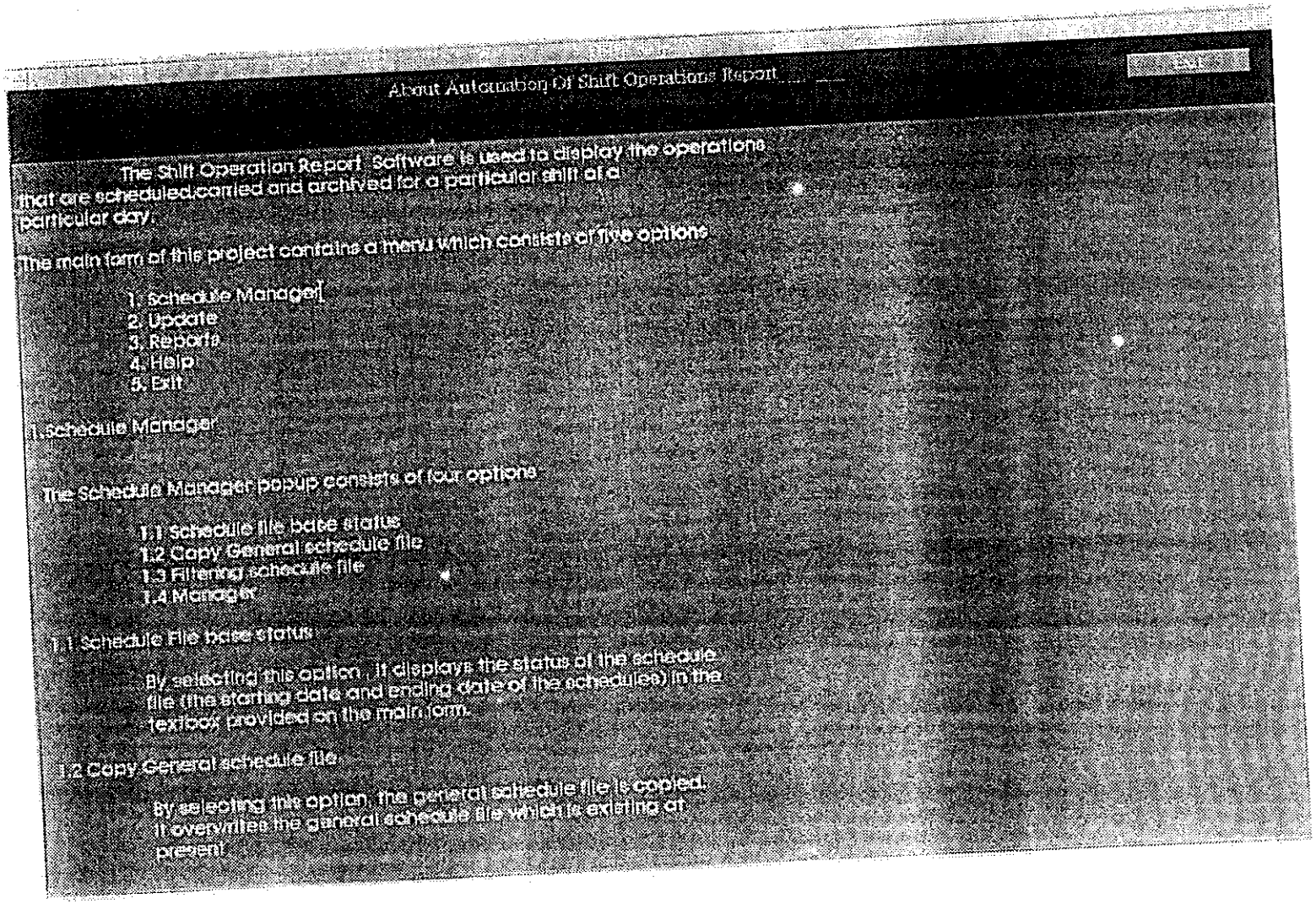

SPECIAL OPERATIONS FORM
Date:
Pass No.:
Orbit No.:
Title
Command Issue
Configuration Change
Observations
Remark
Command Description
S.No
Command
Description
1
189
MOS_COOLER_OFF
2
C3
BDH(04)_OFF
3
CF
BDH(0)_OFF
4
DF
DTM(04)_OFF
5
D9
DTM(0)_OFF


SPECIAL OPERATION'S FORM
Date:
Pass No:
Orbit No:
COMMAND INSERTION
Serial Number
Command
Description


SPECIAL OPERATION'S FORM
Date:
Orbit No:
Title
Command Issue
Configuration Change
Observations
Remarks
COMMAND MODIFICATION
Serial Number
Command
Description


SPECIAL OPERATION'S REPORT
Date:
Pass No:
Orbit No:
Title
Command Issue
Configuration Change
Observations
Remark


SPECIAL OPERATION'S REPORT
Date
Pass No:
Orbit No.
Title
Command Issue
Configuration Change
Observations
Remark


About Automation Of Shift Operations Report
The Shift Operation Report Software is used to display the operations that are scheduled,carried and archived for a particular shift of a particular day.
The main form of this project contains a menu which consists of five options
1. Schedule Manager
2. Update
3. Reports
4. Help
5. Exit
1.Schedule Manager
The Schedule Manager popup consists of four options
1.1 Schedule file base status
1.2 Copy General schedule file
1.3 Filtering schedule file
1.4 Manager
1.1 Schedule File base status
By selecting this option, it displays the status of the schedule file (the starting date and ending date of the schedules) in the textbox provided on the main form.
1.2 Copy General schedule file
By selecting this option, the general schedule file is copied. It overwrites the general schedule file which is existing at present.

Reports

PERATIONS REPORT FOR IRS-P3 SATELLITE ON 12th AUGUST 2001 FOR SHIFT 'M'

TTC OPERATIONS

n-dd	SHIFT	S/C	PASS no	ORBIT	STN	OPERATIONS scheduled	OPERATIONS carried	ARCHIVAL status
8 12	M	IP3	1	27988	BIK	TM,TC	TM,TC,PB	TC
8 12	M	IP3	2	27989	BIK	TM,TR,PB	TM,TC,TR,PB	TR,PB
8 12	M	IP3	3	27990	LK2	TM,TC	TM,TC	
8 12	M	IP3	3	27990	BLE	TM,TC	TM,TC	
8 12	M	IP3	3	27990	MAU	TM,TC	TM	
8 12	M	IP3	4	27991	BR1	TM	TM,TC,TR	
8 12	M	IP3	4	27991	LK2	TM,TC,TR	TM,TC,TR,PB	
8 12	M	IP3	4	27991	BLW	TM,TC,TR,PB	TM,TC,PB	
8 12	M	IP3	4	27991	MAU	TM,TC,PB		
8 12	M	IP3	5	27992	BR1			

PAY LOAD OPERATIONS

mm-dd	SHIFT	S/C	ORBIT NO	PATH NO	PAYLOAD STATIONS
08 12	M	IP3	27990	112	SN3
08 12	M	IP3	27991	88	SN3
08 12	M	IP3	27992	64	NSG

IAL OPERATIONS

OLY OBSERVATIONS

ARKS

T OPERATIONS REPORT FOR IRS-P3 SATELLITE ON 12th AUGUST 2001 FOR SHIFT 'N'

TTC OPERATIONS

-mm-dd	SHIFT	S/C	PASS no	ORBIT	STN	OPERATIONS scheduled	OPERATIONS carried	ARCHIVAL status
08 12	N	IP3	10	27997	BLE	TM,TC	TM,TC	TM,TR
08 12	N	IP3	10	27997	SN3			
08 12	N	IP3	10	27997	LK2	TM,TC,TR	TM,TC,TR	TR
08 12	N	IP3	10	27997	BR2	TM,TC,PB	TM,TC,PB	TM
08 12	N	IP3	11	27997	MAU			
08 12	N	IP3	11	27997	BLE	TM,TC,TR	TM,TC,TR	TM,TR
08 12	N	IP3	11	27997	SN3			
08 12	N	IP3	11	27997	LK2			
08 12	N	IP3	11	27998	BR1	TM,TC,PB	TM,TC,PB	TM
08 12	N	IP3	12	27998	MAU			
08 12	N	IP3	12	27999	BR1	TM,TC,TR,PB	TM,TC,TR,PB	TM,TR
08 12	N	IP3	13	27999	MAU			
08 12	N	IP3	13	28000	BR2	TM,TC,PB	TM,TC,PB	

PAY LOAD OPERATIONS

E y-mm-dd	SHIFT	S/C	ORBIT NO	PATH NO	PAYLOAD STATIONS
1 08 12	N	IP3	27997	285	WAL

CIAL OPERATIONS

MOLY OBSERVATIONS

MARKS

PERATIONS FOR IRS-P3 SATELLITE

E mm-dd	S/C	PASS no	STN	ORBIT	Max ele	AOS hh:mm:ss	LOS hh:mm:ss	OPERATIONS
08 11	IP3	6	WHM	27980	27.46	11:12:52	11:17:24	TM,TC,TR,PB
08 11	IP3	7	BIK	27980	23.80	12:10:44	12:24:40	TM,TC,PB
08 11	IP3	7	BR1	27981	3.26	12:41:17	12:48:23	NO SUPPORT
08 11	IP3	8	BIK	27981	22.39	13:50:38	14:04:26	NO SUPPORT<I1D><IP4>
08 11	IP3	8	BR1	27982	2.93	14:18:43	14:25:29	NO SUPPORT
08 11	IP3	9	BLW	27982	15.14	15:38:33	15:51:09	TM,TC,TR,PYS
08 11	IP3	9	SN3	27982	18.65	15:51:09	15:52:29	NO SUPPORT
08 11	IP3	9	LK2	27983	33.73	15:52:29	15:55:35	NO SUPPORT<I1D>
08 11	IP3	9	BR1	27983	10.15	15:55:35	16:05:19	TM,TC,PB
08 11	IP3	10	MAU	27983	12.35	17:10:19	17:22:26	NO SUPPORT
08 11	IP3	10	BLW	27983	37.38	17:22:26	17:31:59	TM,TC,TR
08 11	IP3	10	SN3	27983	32.20	17:31:59	17:32:57	NO SUPPORT
08 11	IP3	10	LK2	27984	20.97	17:32:57	17:35:13	NO SUPPORT<I1D><IP4>
08 11	IP3	10	BR1	27984	33.67	17:35:13	17:45:43	TM,TC,PB
08 11	IP3	11	MAU	27984	48.90	18:48:56	19:04:04	NO SUPPORT
08 11	IP3	11	BR2	27985	56.24	19:15:59	19:26:01	TM,TC,TR,PB #
08 11	IP3	12	BR1	27986	11.34	20:53:40	21:05:38	NO SUPPORT<I1D>
08 11	IP3	12	BIK	27988	74.32	00:52:30	01:05:25	TM,TC,PB #
08 12	IP3	1	BIK	27989	5.17	02:33:08	02:41:56	NO SUPPORT
08 12	IP3	2	LK2	27990	25.97	04:05:50	04:20:01	TM,TC,TR,PB
08 12	IP3	3	BLE	27990	23.06	04:20:01	04:23:56	TM,TC,PYS
08 12	IP3	3	MAU	27990	5.63	04:23:56	04:32:21	TM,TC
08 12	IP3	3	BR1	27991	5.56	05:40:45	05:50:06	TM
08 12	IP3	4	LK2	27991	27.36	05:50:06	05:59:56	NO SUPPORT<I1D><IP4><IP2>
08 12	IP3	4	BLW	27991	24.48	05:59:56	06:03:49	TM,TC,TR
08 12	IP3	4	MAU	27991	89.93	06:03:49	06:14:52	TM,TC,TR,PB * #
08 12	IP3	4	BR1	27992	34.71	07:19:47	07:34:38	TM,TC,PB
08 12	IP3	5	MAU	27992	4.58	07:43:14	07:51:44	NO SUPPORT
08 12	IP3	5	BR1	27993	51.34	08:59:58	09:15:05	NO SUPPORT<IP4>
08 12	IP3	6	WHM	27993	33.87	09:15:05	09:16:52	TM,TC,TR,PB
08 12	IP3	6	BR1	27994	14.52	10:40:23	10:52:45	NO SUPPORT<I13>
08 12	IP3	7	WHM	27994	38.74	10:52:45	10:57:02	TM,TC,TR,PB
08 12	IP3	7	BIK	27994	13.21	11:50:46	12:02:58	TM,TC,PB
08 12	IP3	8	BR1	27995	4.22	12:20:31	12:28:27	NO SUPPORT
08 12	IP3	8	WHM	27995	6.92	12:28:27	12:32:00	TM
08 12	IP3	8	BIK	27995	39.03	13:29:16	13:44:07	TM,TC,PB
08 12	IP3	9	BR1	27996	2.43	13:58:40	14:04:53	NO SUPPORT
08 12	IP3	9	BLE	27997	7.60	15:19:04	15:29:12	TM,TC
08 12	IP3	10	SN3	27997	10.29	15:29:12	15:30:47	NO SUPPORT
08 12	IP3	10	LK2	27997	20.88	15:30:47	15:34:19	TM,TC,TR
08 12	IP3	10	BR2	27997	7.86	15:34:19	15:44:22	TM,TC,PB
08 12	IP3	11	MAU	27997	5.50	16:50:47	16:59:57	NO SUPPORT
08 12	IP3	11	BLE	27997	66.32	16:59:57	17:11:20	TM,TC,TR,PYS
08 12	IP3	11	SN3	27997	56.13	17:11:20	17:12:21	NO SUPPORT
08 12	IP3	11	LK2	27997	34.69	17:12:21	17:14:44	NO SUPPORT<IP2>
08 12	IP3	11	BR1	27998	25.88	17:14:44	17:24:44	TM,TC,PB
08 12	IP3	12	MAU	27998	83.75	18:27:56	18:43:22	NO SUPPORT
08 12	IP3	12	BR1	27999	77.89	18:53:08	19:05:06	TM,TC,TR,PB #
08 12	IP3	13	MAU	27999	4.86	20:10:41	20:19:13	NO SUPPORT
08 12	IP3	13	BR2	28000	16.34	20:31:51	20:44:57	TM,TC,PB #

D OPERATIONS FOR IRS-P3 SATELLITE

mm-dd	S/C	PASS no	STN	ORBIT	Max ele	AOS hh:mm:ss	LOS hh:mm:ss	OPERATIONS
08 08	IP3	4	MSP	27937	27.07	10:40:41	10:48:31	PL,P20
08 08	IP3	5	NSG	27938	14.13	12:07:44	12:18:19	PL,P337
08 08	IP3	5	MSP	27938	26.83	12:18:19	12:28:21	PL,P337
08 08	IP3	6	WAL	27939	10.09	13:57:35	14:01:42	PL,P313
08 08	IP3	7	WAL	27940	84.84	15:35:32	15:47:18	PL,P289
08 08	IP3	8	WAL	27941	10.40	17:17:31	17:22:04	PL,P265
08 09	IP3	1	SN3	27947	7.10	03:33:22	03:43:24	PL,P121
08 09	IP3	2	SN3	27948	68.77	05:10:54	05:26:10	PL,P97
08 09	IP3	3	SN3	27949	2.12	06:54:50	07:00:44	PL,P73
08 09	IP3	4	NSG	27950	19.89	08:26:11	08:38:19	PL,P49
08 09	IP3	5	NSG	27951	80.10	10:05:48	10:19:54	PL,P25
08 09	IP3	5	MSP	27951	16.23	10:19:54	10:26:51	PL,P25
08 09	IP3	6	NSG	27952	18.61	11:46:33	11:58:09	PL,P1
08 09	IP3	6	MSP	27952	43.59	11:58:09	12:07:59	PL,P1
08 09	IP3	1	SN3	27962	69.58	04:50:01	05:05:19	PL,P102
08 10	IP3	2	SN3	27963	7.71	06:32:05	06:42:15	PL,P78
08 10	IP3	3	NSG	27964	13.83	08:05:43	08:16:33	PL,P54
08 10	IP3	4	NSG	27965	73.95	09:44:52	09:58:59	PL,P30
08 10	IP3	4	MSP	27965	8.72	09:58:59	10:04:43	PL,P30
08 10	IP3	5	NSG	27966	24.50	11:25:26	11:37:52	PL,P6
08 10	IP3	5	MSP	27966	72.98	11:37:52	11:47:21	PL,P6
08 10	IP3	6	NSG	27967	5.94	13:07:37	13:13:50	PL,P323
08 10	IP3	6	MSP	27967	5.14	13:18:12	13:23:10	PL,P323
08 10	IP3	7	WAL	27968	38.65	14:53:56	15:05:01	PL,P299
08 10	IP3	8	WAL	27969	25.00	16:34:22	16:44:10	PL,P275
08 10	IP3	1	SN3	27976	39.50	04:29:20	04:44:12	PL,P107
08 11	IP3	2	SN3	27977	15.05	06:10:12	06:22:44	PL,P83
08 11	IP3	3	NSG	27978	9.02	07:45:35	07:54:29	PL,P59
08 11	IP3	4	NSG	27979	52.04	09:23:59	09:37:55	PL,P35
08 11	IP3	5	NSG	27980	32.58	11:04:21	11:17:28	PL,P11
08 11	IP3	5	MSP	27980	68.43	11:17:28	11:26:28	PL,P11
08 11	IP3	6	NSG	27981	8.31	12:45:51	12:54:00	PL,P328
08 11	IP3	6	MSP	27981	10.77	12:54:30	13:03:56	PL,P328
08 11	IP3	7	WAL	27982	24.69	14:33:24	14:43:20	PL,P304
08 11	IP3	8	WAL	27983	37.95	16:13:08	16:24:03	PL,P280
08 11	IP3	1	SN3	27990	23.02	04:08:54	04:22:46	PL,P112
08 12	IP3	2	SN3	27991	25.77	05:48:43	06:02:44	PL,P88
08 12	IP3	3	NSG	27992	5.05	07:27:08	07:32:03	PL,P64
08 12	IP3	4	NSG	27993	36.67	09:03:09	09:16:42	PL,P40
08 12	IP3	5	NSG	27994	44.23	10:43:18	10:56:56	PL,P16
08 12	IP3	5	MSP	27994	40.48	10:56:56	11:05:21	PL,P16
08 12	IP3	6	NSG	27995	11.25	12:24:28	12:34:04	PL,P333
08 12	IP3	6	MSP	27995	18.31	12:34:04	12:44:10	PL,P333
08 12	IP3	7	WAL	27996	15.53	14:13:08	14:21:02	PL,P309
08 12	IP3	8	WAL	27997	59.40	15:52:02	16:03:36	PL,P285

P3 SCHEDULE OPERATIONS FILE

-mm-dd	SHIFT	S/C	PASS no	ORBIT	STN	OPERATIONS
08 12	M	IP3	1	27988	BIK	TM,TC
08 12	M	IP3	2	27989	BIK	
08 12	M	IP3	3	27990	LK2	TM,TC,PB
08 12	M	IP3	3	27990	BLE	TM,TC
08 12	M	IP3	3	27990	MAU	TM,TC
08 12	M	IP3	4	27991	BR1	TM
08 12	M	IP3	4	27991	LK2	
08 12	M	IP3	4	27991	BLW	TM,TC,TR
08 12	M	IP3	4	27991	MAU	TM,TC,TR,PB
08 12	M	IP3	5	27992	BR1	TM,TC,PB
08 12	N	IP3	10	27997	BLE	TM,TC
08 12	N	IP3	10	27997	SN3	
08 12	N	IP3	10	27997	LK2	TM,TC,TR
08 12	N	IP3	10	27997	BR2	TM,TC,PB
08 12	N	IP3	11	27997	MAU	
08 12	N	IP3	11	27997	BLE	TM,TC,TR
08 12	N	IP3	11	27997	SN3	
08 12	N	IP3	11	27997	LK2	
08 12	N	IP3	11	27998	BR1	TM,TC,PB
08 12	N	IP3	12	27998	MAU	
08 12	N	IP3	12	27999	BR1	TM,TC,TR,PB
08 12	N	IP3	13	27999	MAU	
08 12	N	IP3	13	28000	BR2	TM,TC,PB

RATIONS CARRIED OUT FILE OF IRS-P3

E y-mm-dd		SHIFT	S/C	PASS no	ORBIT	STN	OPERATIONS
1	08 12	M	IP3	1	27988	BIK	TM,TC,PB
1	08 12	M	IP3	2	27989	BIK	
1	08 12	M	IP3	3	27990	LK2	TM,TC,TR,PB
1	08 12	M	IP3	3	27990	BLE	TM,TC
1	08 12	M	IP3	3	27990	MAU	TM,TC
1	08 12	M	IP3	4	27991	BR1	TM
1	08 12	M	IP3	4	27991	LK2	
1	08 12	M	IP3	4	27991	BLW	TM,TC,TR
1	08 12	M	IP3	4	27991	MAU	TM,TC,TR,PB
1	08 12	M	IP3	5	27992	BR1	TM,TC,PB
1	08 12	N	IP3	10	27997	BLE	TM,TC
1	08 12	N	IP3	10	27997	SN3	
1	08 12	N	IP3	10	27997	LK2	TM,TC,TR
1	08 12	N	IP3	10	27997	BR2	TM,TC,PB
1	08 12	N	IP3	11	27997	MAU	
1	08 12	N	IP3	11	27997	BLE	TM,TC,TR
1	08 12	N	IP3	11	27997	SN3	
1	08 12	N	IP3	11	27997	LK2	
1	08 12	N	IP3	11	27998	BR1	TM,TC,PB
1	08 12	N	IP3	12	27998	MAU	
1	08 12	N	IP3	12	27999	BR1	TM,TC,TR,PB
1	08 12	N	IP3	13	27999	MAU	
1	08 12	N	IP3	13	28000	BR2	TM,TC,PB

VAL STATUS FILE OF IRS-P3

mm-dd		SHIFT	S/C	PASS no	ORBIT	STN	OPERATIONS
08	12	M	IP3	1	27988	BIK	TC
08	12	M	IP3	2	27989	BIK	
08	12	M	IP3	3	27990	LK2	TR,PB
08	12	M	IP3	3	27990	BLE	
08	12	M	IP3	3	27990	MAU	
08	12	M	IP3	4	27991	BR1	
08	12	M	IP3	4	27991	LK2	
08	12	M	IP3	4	27991	BLW	
08	12	M	IP3	4	27991	MAU	
08	12	M	IP3	5	27992	BR1	
08	12	N	IP3	10	27997	BLE	TM,TR
08	12	N	IP3	10	27997	SN3	
08	12	N	IP3	10	27997	LK2	TR
08	12	N	IP3	10	27997	BR2	TM
08	12	N	IP3	11	27997	MAU	
08	12	N	IP3	11	27997	BLE	TM,TR
08	12	N	IP3	11	27997	SN3	
08	12	N	IP3	11	27997	LK2	
08	12	N	IP3	11	27998	BR1	TM
08	12	N	IP3	12	27998	MAU	
08	12	N	IP3	12	27999	BR1	TM,TR
08	12	N	IP3	13	27999	MAU	
08	12	N	IP3	13	28000	BR2	

AD OPERATIONS FILE FOR IRS-P3 FOR SHIFTS

mm-dd	SHIFT	S/C	ORBIT NO	PATH NO	PAYLOAD STATIONS
08 12	M	IP3	27990	112	SN3
08 12	M	IP3	27991	88	SN3
08 12	M	IP3	27992	64	NSG
08 12	N	IP3	27997	285	WAL

ANOMALY OBSERVATIONS FILE FOR IRS-P3

DATE YYYY-mm-dd	SHIFT	S/C id	ANAMOLY observations
2001 08 12	M	IP3	Nil
2001 08 12	N	IP3	Nil

Special operations file of IRS-P3

DATE YYYY-mm-dd	SHIFT	S/C id	SPECIAL operations
2001 08 12	M	IP3	Nil
2001 08 12	N	IP3	Nil

ANOMOLY OBSERVATION REPORT FOR IRS-P3 SAT. ON 18th MARCH 2002 FOR ORBIT NO. 27181

Date	S/c Id	Shift	PassNo.	OrbitNo.	Anomoly	Time of Occ. hh mm sec	Recovery Operation	CMDIssued	Remark
18 Mar 2002	IRS-P3	E	08	27181	MOS_POW	16 45 13	MOS(R)_ON	FDH(R)_ON	NORMAL

ANOMOLY OBSERVATION REPORT FOR IRS-P3 SAT. ON 19th MARCH 2002 FOR ORBIT NO. 27194

Date	S/c Id	Shift	PassNo.	OrbitNo.	Anomoly	Time of Occ. hh mm sec	Recovery Operation	CMDIssued	Remark
19 Mar 2002	IRS-P3	E	09	27194	MOS_POW	17 12 45	MOS(R)_ON	FDH(R)_ON	NORMAL

ANOMOLY OBSERVATION REPORT FOR IRS-P3 SAT. ON 20th MARCH 2002 FOR ORBIT NO. 27208

Date	S/c Id	Shift	PassNo.	OrbitNo.	Anomoly	Time of Occ. hh mm sec	Recovery Operation	CMDIssued	Remark
20 Mar 2002	IRS-P3	M	04	27208	WIFS_POW	11 32 10	FDX(R)_ON	HDH(R)_ON	NORMAL

Remarks file of IRS-P3

DATE yyyy-mm-dd	SHIFT	S/C id	REMARKS
2001 08 12	M	IP3	Nil
2001 08 12	N	IP3	Nil

SPECIAL OPERATION REPORT FOR IRS-P3 SAT. ON 12th MARCH 2002 FOR ORBIT NO. 27123

Date	S/c Id	Shift	PassNo.	OrbitNo.	Title	CMDIssued	Configuration Change	Remark
12 Mar 2002	IRS-P3	N	12	27123	WIFS_POW	DTX(R)_ON	NO CHANGE	NORMAL

SPECIAL OPERATION REPORT FOR IRS-P3 SAT. ON 13th MARCH 2002 FOR ORBIT NO. 27131

Date	S/c Id	Shift	PassNo.	OrbitNo.	Title	CMDIssued	Configuration Change	Remark
13 Mar 2002	IRS-P3	N	10	27131	WIFS_POW	FDX(R)_ON	NO CHANGE	NORMAL

SPECIAL OPERATION REPORT FOR IRS-P3 SAT. ON 15th MARCH 2002 FOR ORBIT NO. 27155

Date	S/c Id	Shift	PassNo.	OrbitNo.	Title	CMDIssued	Configuration Change	Remark
15 Mar 2002	IRS-P3	M	5	27155	MOS_POW	MOS(R)_ON	NO CHANGE	NORMAL

SPECIAL OPERATION REPORT FOR IRS-P3 SAT. ON 16th MARCH 2002 FOR ORBIT NO. 27172

Date	S/c Id	Shift	PassNo.	OrbitNo.	Title	CMDIssued	Configuration Change	Remark
16 Mar 2002	IRS-P3	N	11	27172	WIFS_POW	FDX(R)_ON	NO CHANGE	NORMAL

ECIAL OPERATION REPORT FOR IRS-P3 SAT. ON 18th MARCH 2002 FOR ORBIT NO. 27181

te	S/c Id	Shift	PassNo.	OrbitNo.	Title	CMDIssued	Configuration Change	Remark
Mar 2002	IRS-P3	E	08	27181	MOS_POW	MOS(R)_ON	NO CHANGE	NORMAL

PECIAL OPERATION REPORT FOR IRS-P3 SAT. ON 19th MARCH 2002 FOR ORBIT NO. 27194

ate	S/c Id	Shift	PassNo.	OrbitNo.	Title	CMDIssued	Configuration Change	Remark
9 Mar 2002	IRS-P3	E	09	27194	MOS_POW	MOS(R)_ON	NO CHANGE	NORMAL

PECIAL OPERATION REPORT FOR IRS-P3 SAT. ON 20th MARCH 2002 FOR ORBIT NO. 27208

ate	S/c Id	Shift	PassNo.	OrbitNo.	Title	CMDIssued	Configuration Change	Remark
0 Mar 2002	IRS-P3	M	04	27208	WIFS_POW	FDX(R)_ON	NO CHANGE	NORMAL