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Year 2000 SDPS Test Plan for the ECS Project

Technical Paper

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Abstract

This technical paper presents the plan for SDPS Year 2000 compliance testing for the ECS Project. It addresses issues related to Y2K compliance and ECS requirements, design, and test activities intended to support this goal. It includes test cases that will be used, defines the manner in which the tests are conducted, and describes the controlled environment in which the tests will be performed.

Keywords: Y2K, Year 2000, requirements, Level 4, CSS Time Service, DCE Time Service, test, system

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1. Introduction

1.1 Identification

The Year 2000 SDPS Test Plan for the ECS Project serves as the detailed test plan for ECS year 2000 compliance testing as specified in the *Year 2000 Plan for the ECS Project 212-WP-001-002*. This document provides a summary of the system level approach to Y2K compliance verification that led to the development of this test plan. The plan also outlines the test procedures and environment that will be used to verify Y2K compliance of the ECS System. Y2K testing will occur concurrently with Drop 5A testing. Technical Direction Number 28, Year 2000 Requirements, and updates to the ECS Statement of Work in accordance with Contract Modification 82, directed ECS to develop and document this plan.

1.2 Scope

This test plan applies to verification of Year 2000 compliance of the ECS Project at the subsystem and system levels by the System Verification and Acceptance Test Organization. For more information on ECS Year 2000 compliance, consult *Year 2000 Plan for the ECS Project 212-WP-001-002*.

1.3 Purpose

The purpose of Year 2000 testing is to verify Year 2000 compliance of the ECS system at the subsystem and end to end level. Executing functional test cases will carry this out. Some of these test cases have been developed from existing System Verification (SV) and Acceptance Test (AT) test cases and some new test cases have been developed.

1.4 Schedule and status

This Year 2000 SDPS Test Plan for the ECS Project is due on September 30, 1998. As an approval code 1 document, it requires government approval prior to acceptance and use. This submittal represents the test objectives/descriptions, test configuration, and success criteria for each test case. Test databases, data, and tools needed for each test are identified.

1.5 Document Organization

This document is organized into 13 sections and 3 appendices.

Section 1. This section serves as an introduction to the document. It includes information on the scope, purpose, plan, schedule, and organization of the test plan.

Section 2.	This section contains information on other documents that are referenced by or related to this document.
Section 3.	This section summarizes the overall ECS Y2K test philosophy. It contains background information on the planning of the test and descriptions of the test environment, the roles and responsibilities of the participants, and test tools that will be used.
Section 4.	This section contains information on Y2K requirement mapping to test cases.
Sections 5-13.	These sections contain the actual test cases. Each test case includes a description, configuration, and objective for the test.
Appendix A.	This Appendix contains a list of acronyms used in the test plan.
Appendix B	This appendix contains an ECS Y2k requirement to test case traceability matrix.
Appendix C	This appendix contains a table of time shift test dates for Y2K time shift testing.

Any questions should be addressed to:

Data Management Office
The ECS Project Office
Raytheon Systems Company
1616 McCormick Dr.
Upper Marlboro, MD 20774-5372

2. Related Documentation

2.1 Parent Documents

The following documents are the parents from which the scope and content of this document derives:

107-CD-001	Level 1 Master Schedule for the ECS Project
212-WP-001	Year 2000 Plan for the ECS Project

2.2 Applicable Documents

The following documents are directly applicable to this plan.

Y2KPMO-TG1	Raytheon General Technical Guidance for Year 2000 Compliance, Revision 1.21
194-102-MG1	Configuration Management Plan for the ECS Project
None	NASA Year 2000 Agency Test and Certification Guidelines and Requirements, Volume 1

2.3 Information Documents

The following documents, although not directly applicable, amplify or clarify the information presented in this document, but are not binding:

210-TP-001	Technical Baseline for the ECS Project
222-TP-003	Release Plan Content Description for the ECS Project
LIBO2310	Goddard Space Flight Center, EOSDIS Backbone Network (Ebnet) Interface Requirements Document, Draft
EOSVV-1004	EOSDIS Integration and Certification Presentation
LIBO2462	NASA, EOS Reference Handbook
None	Goddard Space Flight Center, EOSDIS Backbone Network (Ebnet) Interface Requirements Document, Draft
None	EOSDIS Integration and Certification Presentation
None	NASA, EOS Reference Handbook

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3. Year 2000 Test Overview

This section defines the process used for verifying Year 2000 (Y2K) compliance of the ECS project. The first subsection describes the Y2K problem (Section 3.1). The second contains information on the various ECS activities that address Y2K compliance and how the test scenarios were developed (Section 3.2). Other subsections define the environment in which the tests will be conducted (Section 3.3), the roles and responsibilities of participating organizations (Section 3.4), and the test tools that will be used (Section 3.5).

A more detailed description of ECS Y2K issues and the Y2K problem is available in the Year 2000 Plan for the ECS Project, 212-WP-001-002.

3.1 Year 2000 Problem

Throughout a typical day, computer systems facilitate an extraordinary number of transactions initiated by each individual and business. We are accustomed to occasional, isolated malfunctions of these systems and have become resigned to the ensuing disruptions.

However, because of various shortcuts that computer programmers have taken over the past few decades, a large number of disruptions may occur simultaneously with the approaching turn of the century. As explained below, many of these errors will occur because dates in which the year ends in "00" will be processed incorrectly. Additional disruptions will occur because the microprocessors that control some machinery and equipment will not work after the date changes -- even though from casual observation one would not suspect that dates are used in the machinery or equipment's operation. The range of associated problems has therefore been referred to as "the Year 2000 problem". If the situation is not corrected in advance, some of these disruptions may be serious indeed. However, because the number of systems and applications in which the problems could emerge is so large, finding and correcting all of them in time is a daunting task.

3.1.1 Background

Early computer programmers worked around a variety of constraints imposed by the emerging technology. Two of the biggest constraints were the usable memory of the machines, and the costs of storing data. One technique used to circumvent these limitations was to represent dates with an implied century. For example, a date field holding the value "01/01/56" meant "January 1,1956" not "1856" or "2056." Use of this convention reduced the amount of storage required and improved processing speeds (with fewer pieces of data per record being held in the computers memory, manipulations could be performed more efficiently). For the few applications in which valid dates could span a century (for example, birth dates for the general population in which some people are 1 year old and others may be 101 years old) the specific date fields would be expanded accordingly. A mortgage system might have four-digit years for "maturity date" but two-digit years for "opening date, "last payment date," "next mailing date," and so forth.

The technique of representing years with two digits was also used when the microchips that are embedded in many kinds of machinery and equipment were hard-coded. Other programming shortcuts, as well, were applied to dates in ways that can create problems by the end of the century.

Computer systems use dates for a large number of functions. One example is the determination of how long something has existed. The computer makes this determination by subtracting an earlier date from the current date. A system that orders replacements for a particular part every five years might record that a part was last installed on June 1, 1992; on June 1 1997, the system would calculate that "97/06/01" - "92/06/01" represented a five-year period and that the part needed replacing. In the year 2000 however, the system might conclude that the part was -97 years old ("00/01/01" - "97/06/01" equals -97 years). How the computer would then proceed would depend on how the programming instructions had been written. Some systems might recognize the calculated age as invalid, and generate a report listing such occurrences for further investigation. Other systems might leave the replacement parts unordered, since they would never have reached a calculated age of five years. In the second case, the part would eventually wear out and fail. Depending on the function of the part and the machinery it belonged to, this failure could result in:

- The production of defective merchandise,
- Significant down time while the defective part was identified and a replacement was ordered and installed,
- Or serious injury or loss of life if the part was essential to the safe operation of the equipment.

To the extent that the eventual consequences of using date shortcuts were contemplated during the 1960s and 1970s, it was believed that the underlying programs would be replaced well before the century changed and that if they were not, there would be plenty of time to correct the problem. Unfortunately, this attitude endured long enough so that some software written even as late as the 1990s contains the same date problems, and some equipment being sold today will malfunction in the next couple of years. The century is now drawing to a close, and the time left in which to correct this problem is rapidly shrinking.

The actual amount of time required to modify a system that has a century date problem can vary significantly. The relevant factors include:

- The age of the systems in operation;
- The number of systems in operation;
- The number of programs and lines of code in a system;
- The number of computer languages in which programs are written (and -the availability of programmers with skills in those languages);
- The quality of the system maintenance that has been performed (in particular, the extent to which documentation explain the purposes of each computer instruction);

- The extent to which electronic data are exchanged with other entities;
- And the extent to which the organization depends on equipment with embedded microchips that may not function properly in the next century.

In most cases, modifying any part of a program that has date problems is not especially difficult. What is difficult and what makes Year 2000 remediation programs especially challenging and time-consuming is the need to:

- Find all of the places where data problems might lead a program to miscalculate or terminate;
- Coordinate the repair of each part of the overall system so that no one repair interferes with the operations of other parts of the system;
- test the repair by using data that accurately mimics the processing that will occur in the next decade;
- and complete the project without granting any time extensions.

3.1.2 Critical Dates

January 1, 2000, is not the only date in the near future that may disrupt data-processing systems. Other dates and the ensuing roll-overs that could cause disruptions are the following:

January 1, 1999 One-Year Look-Ahead Date into Next Century.

Many computer programs process data by looking forward one year and counting dates back from that point. If such systems have two digit date problems that are not corrected in time, they may begin to malfunction or fail at the start of 1999.

September 9, 1999 (9/9/99)

A common programming device was to enter 9999 as a signal that a stack of data had reached its end. This signal may have occasionally been programmed on date fields, with the result that the date 9/9/99 will have a special and unintended meaning in a program. Although the incidence of 1/1/2000 problems appears to be much greater than that of 9/9/99 problems, systems should be checked for each.

February 29, 2000 Uncommon Leap Year

Another significant event that arises coincidentally in the year 2000 is the exercise of a relatively seldom-used part of the rule for identifying leap years. The rules for determining whether a given year is a leap year are:

1) If the year is evenly divisible by 4 it is a leap year,
2) If the year is evenly divisible by 100 it is not a leap year.
3) If a year evenly divisible by 100 is also evenly divisible by 400, it is a leap year.

The first part of the rule given above is the commonly understood definition of a leap year. But the much less frequently used second and third parts of the rule are less commonly understood. These rules produce the result that although 1900 and 2100 are not leap years, 2000 is a leap year. Some programmers did not know about the second rule when they wrote their original codes, and those programs will run successfully in 2000. Some programmers knew about the second rule, but not about the third rule, and their programs are likely to fail.

December 31, 2000 (366th Day of Uncommon Leap Year)

Some programs operate by counting the days in the year. If the writers of these programs were unaware of the uncommon-leap-year situation, their systems may not fail until December 31, 2000, the (unexpected) 366th day of the year.

3.2 ECS Approach to Year 2000 Compliance Verification

ECS has two conditions requiring Y2K compliance checks. The first is when the local on-site clock (e.g., GSFC, LaRC, etc.) transitions a critical date (see Section 3.1.2). The second is when Universal Time Code (UTC) time tags of the received spacecraft information transition a critical date. It is important to test that both transitions happen successfully. The first (on-site) transition has minimal occurrences whose impact could possibly be minimized by powering down the system at the time of the transition. The second (UTC) transition can occur multiple times (e.g., processing and then reprocessing data sets that span midnight on Dec 31, 1999 and processing queries that have temporal coverage that spans the critical transitions). Any system anomalies in handling the second transition must be found and corrected. ECS Y2K compliance testing will be conducted concurrently with Drop 5A testing.

3.2.1 Requirements

ECS Level 4 requirements addressing various date issues that include Y2K (New Century and Leap Year) have been defined and baselined in the requirements database (RTM). These requirements are included in this document in Appendix B. Each CSMS/SDPS software CI/service and FOS have a requirement of the following form, where xxxx is the component:

The xxxx shall ensure that the following calendar transitions are handled completely and accurately:

a. New Year

b. New Decade

c. New Century

d. Leap Year.

Both COTS hardware and software will be evaluated for procurement based on their ability to support the software Cis/services for which they are allocated. Their Y2K compliance will be tested as part of the component they support. Thus, these COTS products, including the operating systems of hardware platforms, will be tested for support of these requirements. See Section 3.2.3 for more information.

ECS Technical Direction Number 28, "*Year 2000 Requirements*", states that "*ECS shall include the Y2K requirements in all external interfaces, as appropriate.*" Under the assumption that ECS External Interfaces were thought to be Y2K compliant. And after considering the resources required to coordinate and update each of approximately 30 ECS IRD documents, the ECS Chief Engineer (Raytheon) and the ECS COTR (ESDIS) verbally agreed that, instead of generating external interface requirements, an audit of these interfaces was more appropriate at this time. Therefore, ECS conducted an extensive audit of its external interfaces to verify Y2K compliance. This audit began with IRD and ICD reviews. Further investigative discussions were held with external organization representatives where review revealed potential problems. A Technical Paper (212-TP-001-001) documenting the results of the audit has been published and is available on the EDHS Server (http://edhs1.gsfc.nasa.gov). Currently, there are a small number of open action items resulting from the audit. Open resolution issues will be completed by 20 December 1998.

3.2.2 Design

The ECS Communications Subsystem (CSS) Time Service provides a common set of time access services. These services provide centralized control for time retrieval, comparison, and calculation methods in support of all ECS custom software. No ECS custom software will use any other time methods, except for the Rogue Wave Time widget, which handles date/time entry. This directive is enforced during design and code review activities.

All ECS designed user GUIs require year parameters to be submitted for processing as four digits. Web based user and operator GUIs require year information to be entered by users as four digits. X/Motif GUIs require either four digit years to be entered or, if using the Rogue Wave object RWTime, allow two digits to be entered with Rogue Wave automatically adding the prefix "19". Although it is unclear when the Rogue Wave libraries will be updated to add the prefix "20" for user interoperability in the next century, whatever prefix Rogue Wave adds to the year is apparent to the user on the screen before the parameter is submitted for processing. If it is incorrect, the user can enter the full four-digit year.

All ECS external interface dates used for time reference are currently defined to include four digit years which will avoid any Y2K rollover confusion. There are a limited number of instances where two digit years are embedded in file names, but no time calculations are performed by ECS based upon these filenames. This is documented in the ICDs and will continue to be the standard for future ICDs.

3.2.3 COTS Software

ECS is heavily dependent on the integration of COTS, both hardware and software. As part of the procurement process, COTS Y2K compliance is a major evaluation and selection criterion. Further, ECS obtains written assurances from vendors that their products are or will be Y2K compliant.

Most modern COTS appear to have adopted four-digit year formats, thus avoiding typical Y2K rollover problems. But, if any are identified as non-Y2K compliant, a clear upgrade path to a Y2K compliant version of that COTS product, or a different Y2K compliant COTS product, will be

identified. This upgrade must occur at or before April of 1999, since NASA is required to be Y2K compliant by that time.

In actuality, many COTS products only support date/times through the year 2037. This is typically a hardware limitation stemming from the use of 32 bit words. This problem will resolve itself as computing platforms migrate to 64 bit word hardware architectures over the next few years.

ECS has conducted extensive surveys of the COTS software vendors regarding Y2K compliance for the software products. With the exception of one product, all commercial software products integrated into the ECS solution are currently shipping product versions that are advertised as meeting Year 2000 compliance criteria. The exception is HP Multi-threaded debugger. ECS procures maintenance support for the COTS software products that include version upgrades and patches. Therefore, no additional COTS software product cost is anticipated. Appendix A of the Year 2000 Plan for the ECS Project, 212-WP-001-002 lists all COTS software products, current version in use by ECS, and the Y2K-compliant version.

The Systems Engineering Department conducts a weekly Configuration Control Board (CCB) devoted strictly to changes with respect to COTS software within the ECS project. This CCB monitors and approves the progress of COTS installations, upgrades, and rollout through the ECS system.

In addition, the COTS CCB works closely with Development to ensure that plans and schedules are developed and adhered to with respect to the ECS program. The CCB also monitors the ability of COTS package versions to meet internal ECS program requirements, as well as any other external requirement.

One of the most visible internal as well as external requirements that the COTS CCB is currently tracking is the Version upgrades of COTS packages in the ECS program such that the Y2K problem is resolved in time for the year 2000. This monitoring is active, and a game plan is in place to make sure that all COTS software is Y2K compliant.

3.2.4 COTS Hardware

ECS has also surveyed project hardware vendors regarding Year 2000 compliance. With the exceptions noted below, all of the vendors indicated that compliant versions of the product are currently available at no additional cost to ECS when covered by the appropriate maintenance support contracts.

Cisco Systems FDDI network interface adapter cards for HP workstations. The vendor no longer manufactures this product and there are no vendor plans for Year 2000 test or certification. No upgrades or enhancements are available from the vendor. ECS has purchased 30 each and will procure replacements.

Network General Sniffer LAN protocol analyzer. ECS has procured 8 each. The Network General product is integrated into a portable unit that is the non-compliance component. ECS will procure replacements.

3.2.5 SDPS/CSMS Custom Code Assessment

The SDPS/CSMS software baseline consists of custom code developed in C, C++, Fortran, and Java. Additionally, the baseline consists of a large number of scripts developed for the purpose of configuration control, setup, and monitoring. In order to comply with Y2K Requirements as previously discussed, the following software development roadmap is planned:

1. Plan the assessment (detection) and resolution/test (correction),
2. Assess using the DISCOVER Tool (C/C++),
3. Assess the Fortran, Java, and script baseline,
4. Resolve identified problems and deliver the updated Custom Software baseline to Development Integration,
5. Formally Integrate and regression test prior to turnover to the System Verification and Acceptance Test Organization, and
6. Work-off NCR's.

It is important to note the assumption that all Y2K Development-related activities will be completed in accordance with the currently baselined ECS Drop 5A schedule. All efforts will be completed in accordance with current processes required for baseline delivery to the System Verification and Acceptance Test Organization.

The Development Organization will support the overall ECS Y2K. Development will define the software baseline inventory, and identify established methods for systematic assessment for C, C++, Fortran, Java, and Scripts. Actual assessment (and resolution) activities will be in accordance with the Drop 5A schedule. Because of this schedule constraint, Development will identify support above and beyond currently scheduled activities. In addition, Development will interact with the System Verification and Acceptance Test Organization to ensure that complete regression testing is performed against current functionality, while identifying Y2K-specific tests which must be developed and performed in accordance with the Drop 5A schedule.

3.3 ECS Year 2000 Test Planning

The ECS Y2K verification will be applied to two general elements of the ECS: Those provided by COTS products and the custom code that instantiates functionality provided by ECS. The Y2K compliance of ECS COTS products shall be accomplished by conducting an inventory of all of the COTS products used in the ECS, and contacting the vendors to obtain written certification from each vendor that their COTS package is compliant. In the event that a vendor does not certify their COTS product as Y2K compliant, special arrangements will be made concerning its disposition and use.

Assessment of ECS custom code will be performed at two levels: the functional or subsystem level and the overall system level. Functional testing techniques ensure the system and end user requirements and specifications are met at the subsystem level. These tests focus on the results of

processing instead of how processing is implemented. System level tests ensure that ECS performs in accordance with requirements from a user standpoint at the overall ECS system level.

Functional level testing will make use of the existing System Verification Test procedures wherever possible. System level testing will make use of modified or new Acceptance Test procedures wherever possible.

Planning the ECS Year 2000 Compliance Test consisted of defining possible scenarios, developing test cases, and defining the test execution process.

3.3.1 Test Scenarios

Compliance testing is expected to be a significant effort in Y2K. After all of the requirements analysis, design and code reviews, and vendor certifications are obtained, what still remains is to verify that the ECS system is Y2K compliant by actually testing the entire ECS with simulated dates and times. Y2K compliance testing will be conducted at two ECS system levels: at the subsystem level, where basic Y2K compliance at the functional level will be demonstrated; and at the total ECS system level, where overall Y2K compliance at the user interface level will be demonstrated. These simulated time frames will cover at least three general simulation cases (AM-1 MODIS & AM-1 ASTER, and Landsat-7), where approximately 20 Scenarios will be generated at the subsystem level and 10 scenarios will be developed at the system level to cover the following tests listed below:

1) Operations during 1999 which

   Prepare projections of activities that will occur in 2000 (production plans, resource schedules, etc.)

   Rollover at midnight of December 31, 1999 to the year 2000 (data ingest, production, distribution, activity logs, etc).

2) Operations that test the following leap year conditions:

   Beginning before midnight of Feb. 28, 2000 and going into Feb. 29, 2000

   Beginning before midnight of Feb. 29, 2000 and going into March 2000

   Operations during 2001 or some non 2000 year

   Operations in the 21st century to include pre-year 2000 date use (e.g., search and order for 1999 data)

   Julian Day Roll-over - year 2000 - Day 365 to year 2000 - Day 366

   Julian Day Roll-over - year 2000 Day 366 to year 2001 - Day 001

   Arithmetic operations recognize Year 2000 has 366 days

   Ensure that the system properly processes data going over leap year for ingest of EDOS, Aster and Landsat data.

3) Other test cases

Both metadata and data generated in 2000 are properly time-tagged.

Messages and any other data items generated in 2000 are properly time-tagged

Production and resource plans that span midnight of December 31, 1999 have properly time-tagged the events in the plan

Queries performed in 2000 obtain the correct results when the query parameters span 1999 to 2000

Subscriptions submitted in and/or beginning in 1999 still apply and are satisfied in 2000

Production Requests and their corresponding PGE information which are entered in 1999 will continue to generate Data Processing Requests without requiring changes in this information in 2000.

Reprocessing Test using data that spans over 2000.

4) Date & Time Stamps

Part of the processing associated with dates deals with transactions between two systems that normally utilize "date/time stamped" information. It is essential that both the sending and receiving systems use a common time reference

5) Data Migration

Ensure that Data Migration efforts result in ECS metadata that is Y2K compliant.

6) Graphical User Interface (GUI) Testing

Test that all system GUIs will correctly accept various pre-2000 and 2000+ dates

Ensure that pre-2000 data is accessible when the system clocks are set to 2000+dates.

7) Business dates for planning/scheduling

Fiscal Year Roll-over (9/30/1999 to 10/01/1999 to assure that the fiscal year changes to 2000)

Quarterly Dates

Year-end Dates

8) System Level Tests

Acceptance Tests - testing the entire information system, including simulated interfaces

End-to-End Tests - verifies that a defined set of interrelated systems, which collectively support a key mission or business function or thread, inter-operate as intended in an operational environment.

9) Operations during 2001 or some "non-2000" year in the 21st century to include "pre-year 2000" data use (e.g., search and order for 1999 data.)

3.3.2 Test Cases

In order to develop test cases and procedures, the subsystem test leads compared the test scenarios defined in Section 3.2.1 with existing SV and AT test cases. Then each test lead developed new test cases based on that comparison. All of the test leads compared test cases to eliminate any overlap The test cases were augmented to provide for the Y2K specific data inputs as described above and incorporate detailed steps to validate overall ECS system integrity under the conditions imposed by calendar roll-over to the year-2000 and beyond. These broad test conditions include those directed at testing for general system integrity, interface integrity, data integrity, input integrity, output integrity, and processing integrity as enumerated in Table 3-1. A more specific list of test categories as they relate to individual subsystems and overall ECS system test scenarios are addressed in Section 4, Y2K Requirements Mapping to Test Cases. Detailed descriptions of the Y2K Test Cases follow in Section 5 of this document. Step by step test procedures for these test cases will be available on the web at a later date.

Table 3-1 Typical Y2K Validation Criteria

	GENERAL INTEGRITY
1	The system operates as expected when processing the operating system's "current date."
2	The system operates as expected when the "current date" rolls over from 1999 to 2000.
3	The system operates as expected when processing dates from two different centuries during the same step.
4	The system operates as expected when retrieving information from a previous century.
5	The system maintains the integrity of the data when it processes dates.
6	The system displays clear and understandable dates on its outputs and displays.
7	The system provides dates in a format that can be read by other systems.
8	The system identifies the correct "calendar date" when providing the formal system function.
9	The system identifies the "correct day of the week" when providing the formal system function.
10	The system identifies the "correct day of the month" when providing the formal system function.
11	The system operates as expected when processing known interfaces that contain date values or character representations of date values
	INTERFACE INTEGRITY
1	The system operates as expected after processing data from an interface that includes date information.
2	The system operates as expected after processing data from an interface that includes date-based character representations

3	The system operates as expected after processing data from an interface that includes date-based numeric representations.
	DATA INTEGRITY
1	The system operates as expected when indexes containing date-based representations are used.
2	Queries and data record retrievals return the correct record sets and records for dates.
3	Default dates are correct and appropriate for the system domain.
4	The system's use of explicit century dates is correct for the range of dates the system is expected to process.
5	The system's use of implicit century dates is correct for the range of date conditions and uses of that system.
	INPUT INTEGRITY
1	The system accepts, processes, and stores all valid dates.
2	The system operates as expected for the parameter dates starting on January 1, 2000 and including February 29, 2000.
3	The system operates as expected when an implicit century-based date is accepted as a valid date.
4	The system operates as expected when an explicit century-based date is accepted as a valid date.
	OUTPUT INTEGRITY
1	The system produces consistent date outputs in accordance with its interface, display, or report specifications for dates starting January 1, 2000 and including February 29, 2000.
2	The business rules and intended use specifications remain consistent after the "current date" rolls over from1999 to 2000
3	The explicit and implicit dates do not cause overwriting or truncation of displays and report lines.
	PROCESSING INTEGRITY
1	System logic using date comparisons returns the expected outcome for dates starting with January 1, 2000 and including February 29, 2000.

3.3.3 Test Conduct

The goal of test conduct is the verification of requirements through successful execution of the test. During this time, portions of test procedures may be executed out of sequence to concentrate on particular parts of the system. Test conduct continues until all parts of all test procedures have been successfully executed. Test conduct culminates with the formal execution of the test procedures before appropriate witnesses

3.4 Toolkit Testing

The Toolkit time (TD), geolocation (CSC), Spacecraft ephemeris (EPH), and Celestial body (CBP) tools are the only ones likely to be sensitive to Y2K problems. To test these tools requires running

the existing drivers for each tool with the following input data (which can be on special files that can be archived):

1 Times on a close grid crossing 12/31/1999 to 1/1/2000 with substitute “leapsec.dat” and “utcpole.dat” files NOT having a leap second at 1/1/2000.

2 Times on a close grid crossing 12/31/1999 to 1/1/2000 with substitute “leapsec.dat” and “utcpole.dat” files HAVING a leap second at 1/1/2000.

Two tests, “with” and “without,” will be used, because the leap second will not be announced until July of 1999.

The driver input files will be constructed by modifying existing ones. For some obscure formats like PB5 and spacecraft specific ones, this will be a difficult job and will depend on how suppliers provide the data. The tools are easily tested for widely supported formats like UTC, TAI, GPS, and Julian Date formats. For TRMM it is uncertain if the UTCF data will behave correctly.

For the EPH tools, spacecraft data files will be used spanning the desired time range. These will be made with “orbsim”, a toolkit utility. When “orbsim” is run, its PCF should point to the same “leapsec.dat” and “utcpole.dat” files that are used when running the drivers.

Expected Results

All the functions tested should behave smoothly right through the leap second, except the group listed in Table 3-2. These require special test data. The pair of functions, PGS_TD_UTCtoUTCjd.c and PGS_TD_UTCjdtoUTC.c, are detailed below as an example.

Table 3-2 Toolkit Functions Requiring Special Test Data

PGS_TD_ISOinttoUTCjd.c	PGS_TD_TAItoUTCjd.c	PGS_TD_UTCjdtoPB5.c
PGS_TD_UTCjdtoUT1jd.c	PGS_TD_PB5ctoUTCjd.c	PGS_TD_UDTFtoUTCjd.c
PGS_TD_UTCjdtoPB5C.c	PGS_TD_UTCjdtoUTC.c	PGS_TD_PB5toUTCjd.c
PGS_TD_UT1jdtoUTCjd.c	PGS_TD_UTCjdtoTAIjd.c	PGS_TD_UTCtoUTCjd.c
PGS_TD_TAIjdtoUTCjd.c	PGS_TD_UTCjdtoISOint.c	PGS_TD_UTCjdtoUDTF.c

The function PGS_TD_UTCtoUTCjd.c in either C or FORTRAN, will give correct and uniformly increasing values, with a PGS_S_SUCCESS return up through 1999-12-31T23:59:59.9999999 whether there is a leap second or not. In fact all the results below for this function should be the same whether there is a leap second or not. This is because UTC as a real number has no way to encode or capture a leap second. It jumps backwards. There will be a gap in the output Julian dates because, in the new year, after the leap second, it is essential to capture the correct whole day Julian Date value according to standards.

When this function receives a time in the range 1999-12-31T23:59:60.0000000 through 1999-12-31T23:59:60.9999999 it should give the return status: PGSTD_M_LEAP_SEC_IGNORED: the input time string seconds field has been reduced from 60 to 59.

On and after 2000-01-01T00Z it should again give normally increasing values.

The values will jump backwards by one second at the transition from 1999-12-31T23:59:59.9999999 to 1999-12-31T23:59:60.0000000 because the leap second is ignored. In fact, the answer for 1999-12-31T23:59:60.0000000 should be the same as for 1999-12-31T23:59:59.0000000.

The function PGS_TD_UTCjdtoUTC.c, will be tested using the outputs from the previous function. It is noted that the outputs jump backwards as soon as one passes 1999-12-31T23:59:59.9999999 and proceeds to 1999-12-31T23:59:60.0000000. The backwards jump place must be recorded. The next full second after it, which is expressed a 1/86400 day or 0.000011574 day, must be used in testing this function. When there is no leap second, the outputs from PGS_TD_UTCtoUTCjd.c can be entered into PGS_TD_UTCjdtoUTC.c along with the leap second flag PGSd_FALSE. The original times in ASCII should be recovered with the exception that within the leap second (seconds field equal 60,) you will get back seconds field equal 59. When there is no leap second in the leap second data file, if you entered a PGSd_TRUE for the leap second flag, you should get back:

PGSTD_ETIME_VALUE_ERROR: error in UTC Julian date: invalid date for leap second.

This must be tested with times in the gap region mentioned above. When there is a leap second, then entering times is the gap region with the flag PGSd_TRUE will lead to recovering UTC times within the leap second (second field equal 60.)

3.5 Planning & Scheduling

Subsystem and System level test procedure development for Y2K will commence on 10/1/98 and finish on 12/15/98. During the development of procedures cycle they will be internal reviews conducted by the peers and subsystems leads to verify that the procedures met their Y2K objective.

On completion of this internal review cycle all procedures will be placed on the web . The expected posting date for the web will be 12/15/98. ESDIS is expected to review the procedures and make comments to all procedures by 1/2/99. The procedure authors will meet with ESDIS reviewers to discuss and discrepancies. The agreed upon comments will then be incorporated and updated procedures will be on the web by 1/15/99. Y2k software drop will be delivered as part of 5A drop. The expected turnover date for this drop to the VATC is 1/25/99. An installation and checkout of this S/W build in the VATC, TS2 and OPS MODE , will begin on 1/26/99 and complete on 2/8/99.

System and subsystem level testing will begin on February 9th in the modes mentioned above and continue until 3/3/99. During this period Y2K testing and compliance verification culminates with the formal execution of the test procedures before appropriate witnesses. Mandatory witnesses include representatives of the quality office, ECS project management and ESDIS integration office. Testing will be performed at two levels: test demonstrations at the functional or subsystem level and at the overall system level. Functional testing techniques ensure the system and end user requirements and specifications are met at the subsystem level and focus on results of processing instead of how processing is implemented. The System level tests ensure that ECS performs in accordance to requirements from a user standpoint at the overall ECS system level.

Primavera Project Planner(P3) was used to schedule the various Y2K. P3 will enable us to identify activity progress and made corrections if needed to stay on schedule as we monitor the project on a daily basis.

3.6 Test Environment

Functional and system Y2K testing will be conducted on the existing Verification and Test Center (VATC) string, located at the Landover facility in room 1030. This string is fully operational and emulates all the ECS general and site-unique hardware configurations found at the DAACs and the SMC. A figure of the EDF hardware systems is shown in Figure 3.3-1.

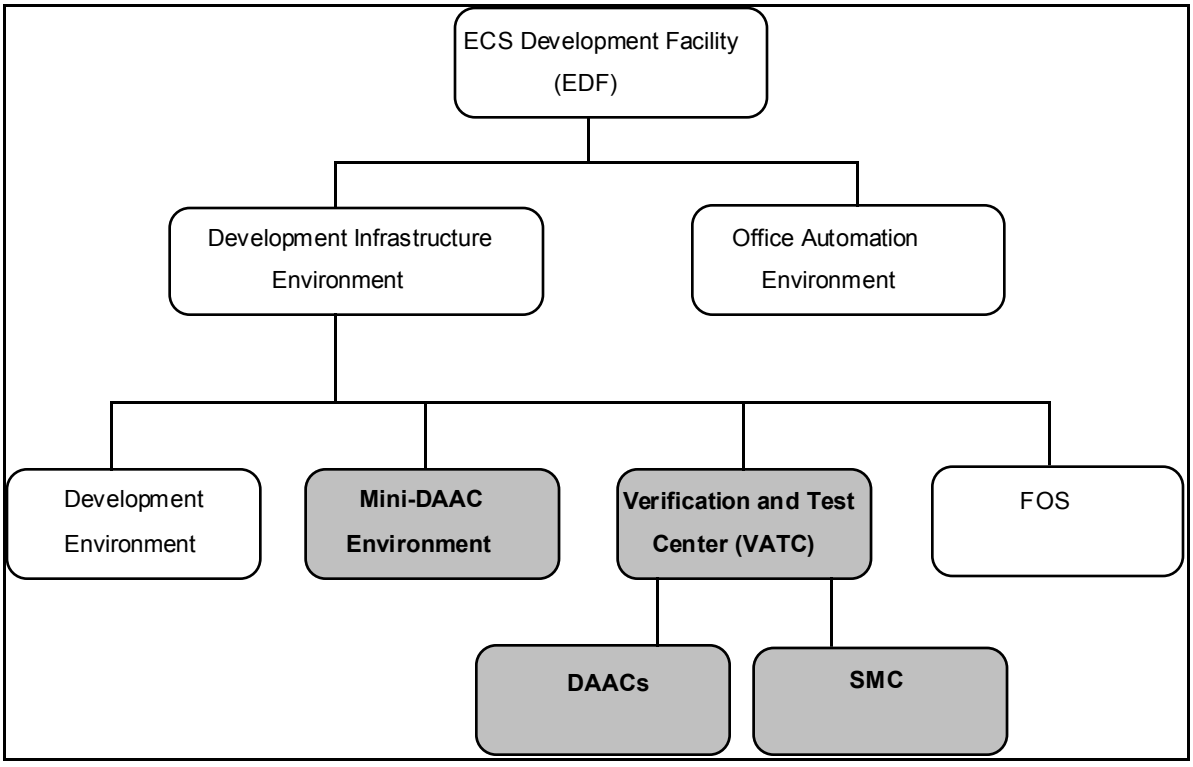

Figure 3.3-1. ECS Development Facility (EDF)

3.7 Roles and Responsibilities

Y2K Compliance testing is a formal process that requires well defined roles and responsibilities for each of the participating organizations. This section provides an outline of these roles and responsibilities

System Verification and Acceptance Test Organization (SVAT): The SVAT assigns a test manager to coordinate and run acceptance testing. The SVAT also provides test conductors to execute the step-by-step procedures that are defined in the ATPR. Test conductors also write, collect, and

track non conformance reports (NCR's) and determine the impact of these reports on test plans, scenarios, test cases, and procedures.

ECS Quality Office (QO): The QO provides a representative to witness the execution of Y2K Compliance testing. The QO also tracks the status of non-conformance reports and reviews them prior to closure to ensure that the required actions have been completed.

Configuration and Data Management Organization: Configuration Management (CM) coordinates with the SVAT to capture the test configuration of software, hardware, test data, test tools, and documentation prior to test execution to ensure repeatability. They also capture and retain test outputs (e.g., test logs, data, and modified procedures) and distribute copies for test analysis

ESDIS Contractor: The ESDIS Contractor and the Independent Verification and Validation (IV&V) Contractor witness and monitor Y2K compliance testing, as directed by the ESDIS and the IV&V Contractor.

3.8 Test Data

Data sets will be developed to provide sources for three general subsystem levels and ECS system level Y2K test scenarios: AM-1 MODIS, AM-1 ASTER, and Landsat-7. This will include the development of a series of Level 0 EDOS input files:

Level 0 data from EDOS

When processing EDOS Level 0 data, three critical times are of importance: the range begin time (start time), the range end time (stop time), and the create time of the data set, which is embedded in the file names of the data set. Three test data sets are needed to test Y2K compliance. The first set should contain a range begin time in the late minutes of year 1999 and the range end time in the early minutes of year 2000. In addition, this set should have a creation time with a year 2000 date embedded in the file names. The second set should contain a start time in the late minutes of day of year 59 (Feb. 28) and the stop time set to early in day 60 (Feb. 29) in the year 2000. The create time should be a time in day 60 of year 2000. The third set should contain a start time in the late minutes of day of year 365 (Dec. 30) and the stop time set to early in day 366 (Dec. 31) in the year 2000. The create time should be a time in day 366 of year 2000.

Level 1A MODIS HDF File

This time data is part of the embedded core metadata of the file. Three MOD01 (MODIS L1A HDF file) are needed to check out Y2K compliance. The first file should contain a range with the begin time in the late minutes of year 1999 and an end time in the early minutes of year 2000. The second file should have a range beginning time of Feb. 28, 2000 and a range ending time of Feb. 29, 2000. The third file should have a range beginning time of Dec. 30, 2000 and a range ending time of Dec. 31, 2000. These time data values are part of the embedded core metadata of the files.

Level 1B ASTER HDF File

Two critical times for AST_L1B (ASTER L1B HDF File) are needed to check out Y2K compliance. The first file should contain a single date/time field with a Feb. 29, 2000 time value. The second should contain a single date/time field with a Dec. 31, 2000 time value . As in the MOD01, the time data is part of the embedded core metadata of the file.

Landsat7 Data Set

Two Landsat 7 data sets containing three scenes is needed to check the times associated with Y2K compliance. The inventory metadata has three critical times associated with it: a sub-interval start time, a sub-interval end time and a point (single) time. For the purposes of Y2K testing the first sub-interval will begin in 1999 and end in 2000. The second sub-interval will begin on Feb 28 and end on Feb. 29, 2000 Lastly, the production time embedded in the data set file names, will contain a Dec. 31, 2000 date for check out.

4. Y2K Requirement Mapping to Test Cases

4.1 Y2K Test Hierarchy

Tests are categorized into four classes as follows:

1. **Character, Field, or Data Point Level:** Tests that involve date and time information at its most basic level within a data set. This would include time and date stamps at the Packet level, or at the basic measurement level within larger units of data such as files, satellite contacts or passes, and data granules.

2. **File, Contact, Pass, Granule and Metadata Level:** Tests that involve date and time information at a higher level than above that may contain a collection of time related information. This would include time and date stamps at the file, contact, pass, granule or metadata level.

3. **Interface Level:** Tests that involve dates in one system requiring corresponding changes in another system, will interface correctly when executed across both systems. This would include data received from EDOS, NOAA or other organizations outside ECS.

4. **Operations Level:** Tests that the system behaves properly with no real-time failures or adverse affects based on date manipulations.

Subsystem tests will fully test all of Classes 1 and 2 and some of the Class 3. The ECS system level tests will test some of the Class 1 and all of the Classes 2, 3 & 4 within the context of the MODIS, ASTER and Landsat-7 test scenarios. A mapping of these tests to subsystems and application scenarios for each class are shown in Table 4.1 through Table 4.4.

Table 4.1 Y2K Requirements Mapping to Test Cases for Character, Field, or Data Point Level Date & Time Data

	Description:	Activities:	Expectations:	CLS	DMS	DSS	IDG	ING	IOS	MSS	PDPS	MODIS	ASTER	LS7
1.1	**Date Transitions 1999/12/31 to 2000/1/1** Date transitions test that the test component can correctly recognize and handle century dates greater than 1999. This test specifies the date ranges to be used in the test data.	Test data should include the following dates: 1999-12-31 -> 2000-01-01 Exercise test component by entering dates in the required range Inspect internal and external data structures for correct date Verify behavior against expected results	Test component behaves normally (no catastrophic failure at date transition) Data fields contain correct date Component functions occur as predicted based on date Ambiguous date fields are determined to have no impact	X	X	X	X	X	X	X	X	X	X	X
1.2	**Leap Year 2000/02/29, Non-Leap Year** 1900/02/29Test the proper handling of leap year.	Test data should include the following dates: 1900/02/29, 2000/02/28, 2000/02/29, 2000/03/01 & 2004/02/29 Exercise test component by entering dates in the required range. Inspect internal and external data structures for correct date. Verify behavior against expected results	The test component recognizes that 2000 is a leap year and that 1900 is not 2000/02/29 is valid. 1900/02/29 is invalid.	X	X	X	X	X	X	X	X	X	X	X
1.3	**Day of Week, Month, Year** Day of the week tests for correct weekday based on a numeric date. Day of month tests for correct day given a month and a numeric day. Day of the year tests for correct weekday given a numeric day.	Test data should include the following dates: 1900/01/01 2000/01/01 2000/02/29 2000/12/31 Exercise test component by entering dates in the required range Inspect internal and external data structures for correct date Verify behavior against expected results	Date functions return correct day of week. Day 1 of the week is Sunday Months have correct number of days: 1900/01/01 is Monday. 2000/01/01 is Saturday. 2000/02/29 is a Tuesday. 2000/12/31 is Sunday. Note: The years 1972 and 2028 begin on the same day as 2000 and should return the same day.	X			X				X			
1.4	**Julian Date** This scenario tests for the correct Julian date.	Test data should include the following Julian dates: 00060 00366 Exercise test component by entering dates in the required range Inspect internal and external data structures for correct date Verify behavior against expected results	Julian date 00060 is 2000/02/29. Julian date 00366 is 2000/12/31. Note: The years 1972 and 2028 begin on the same day as 2000 and should return the same Julian values.	X	X	X	X	X	X	X	X	X	X	X

	Description:	Activities:	Expectations:	CLS	DMS	DSS	IDG	ING	IOS	MSS	PDPS	MODIS	ASTER	LS7
1.5	**Other Date Formats** Other data formats tests for the correct data in non-standard date formats.	Test data should include all dates and date ranges described in tests 1.1 through 1.5. Exercise test component by entering dates in the required range. Inspect internal and external data structures for correct date. Verify behavior against expected results.	Test component behaves normally (no catastrophic failure at date transition). Data fields contain correct date. Component functions occur as predicted based on date. Ambiguous date fields are determined to have no impact. Date conversions from one format are correct, Julian to Gregorian and the reverse.				X	X			X			
1.6	**Date Spans** Data spans test for the correct determination of the number of days between two or more dates. Date span testing covers any processing that is not based on one date but depends on a date range.	Test date should include a ranges of dates that cross both century (1900, and 2000) boundaries. Exercise test component by entering dates in the required range. Inspect internal and external data structures for correct date. Verify behavior against expected results.	Test component behaves normally (no catastrophic failure at date transition). Data fields contain correct date Component functions occur as predicted based on date. Test component returns correct number of days between test dates.	X			X	X		X	X			

Table 4.2 Y2K Requirements Mapping to Test Cases for File, Contact, Pass, Granule and Metadata Level Date & Time Data

	Description:	Activities:	Expectations:	CLS	DMS	DSS	IDG	ING	IOS	MSS	PDPS	MODIS	ASTER	LS7
2.1	**File Integrity and Date Storage** Tests that dates entered into the system and stored in external databases or files will be returned as entered or will be interpreted in a consistent, documented, and understood manner.	Exercise test component to write and retrieve date data from and to external files Inspect internal and external data structures for correct date Verify that stored and retrieved date data is interpreted correctly for the range of years encompassed by the test component Verify behavior against expected results	Test component behaves normally (no catastrophic failure at date transition) Data fields contain correct date Component functions occur as predicted based on date Date data or date dependent data stored in external files is not subject to misinterpretation when retrieved in the future		X	X	X	X	X	X	X	X	X	X
2.2	**Database / File Access** Database / File access test that data retrieval based on dates function correctly and that data stored in the database is correctly organized and consistent with dates both prior to the year 2000 and after. Also that date fields are not used for non-date indicators.	Exercise test component to access the database using date dependent access keys that cross century boundaries Inspect and verify that correct data has been retrieved Verify behavior against expected results Exercise test component to perform sequential database access using date dependent keys Inspect and verify that correct data has been retrieved in the correct chronological order	Database access is correct for all range of dates Data output is in correct chronological order Component functions occur as predicted based on date Test component behaves normally (no catastrophic failure at date transition)	X	X	X		X	X	X	X	X	X	X

Table 4.3 Y2K Requirements Mapping to Test Cases for Interface Level Related Date & Time Data

	Description:	Activities:	Expectations:	CLS	DMS	DSS	IDG	ING	IOS	MSS	PDPS	MODIS	ASTER	LS7
3.1	**User Interface, Display & /Reports** User interface/display tests that user interface panels or display screens show the correct data and that the date displayed is unambiguous in the context of the screen. Reports show correct date.	Exercise test component to generate screen or report output Inspect and verify output date fields	Test component behaves normally (no catastrophic failure at date transition) Data fields contain correct date									X	X	X
3.2	**Date Input (Screens)** Data input tests that all input avenues to the test component will accept dates as specified in Level 1 tests.	Test data should include all dates and date ranges specified in tests 1.1 thru 1.5 Exercise test component by entering dates in test data Observe each date entry and note results	Test component behaves normally (no catastrophic failure at date transition) Data fields contain correct date Component functions occur as predicted based on date Date editing and validation is correct									X	X	X
3.3	**Simulated Interfaces (or stubs modules)** Simulated interfaces refer to a set of tests that use specially coded program interfaces to affect a processing sequence. These programs are stand-ins for components that are unavailable or irrelevant to Year 2000 testing. The tests simulate data received or passed to the test component being tested.	Exercise test component utilizing simulated interfaces Observe behavior and inspect external and internal data structures Validate that date data passed in and out of the test component across the interfaces is correct and unambiguous Exercise test component with test data using dates prior to 2000 Exercise test component with test data using dates after 2000 Compare before and after results	Test component behaves normally (no catastrophic failure at date transition) Component functions occur as predicted based on date Before and after results are consistent									X	X	X
3.4	**Interface Integrity / Information Exchange** This scenario tests date data that is passed between one or more test components. Date information exchanged between systems or subsystems should be able to be interpreted correctly with regard to century.	Exercise the system components suing test data as described in tests 1.1 – 1.5 Identify and verify data interfaces Observe and inspect data transferred at the interface boundary Validate that dates or date related data can be interpreted correctly Run before and after year 2000 test cases	Test component behaves normally (no catastrophic failure at transition) Component functions occur as predicted based on date Date data passed across the interface is interpreted correctly and consistently by the sender and the recipient Before and after results are consistent									X	X	X

Table 4.4 Y2K Requirements Mapping to Test Cases for Operations Level Related Date & Time Data

	Description:	Activities:	Expectations:	CLS	DMS	DSS	IDG	ING	IOS	MSS	PDPS	MODIS	ASTER	LS7
4.1	**Date Ambiguity** This scenario tests for the correct interpretation of a date field or date related data in the context of where and how it is used. In general date fields are unambiguous, if there are four digits and contain the century designator and the year, however, some dates may be correctly interpreted in the context of their use without these attributes, i.e. today's date, report run date etc.	Inspect the date field and verify that it can be interpreted correctly in the context Verify that no other tests (for example, date computations) are required for this test component	**Expectations:** Date information is unambiguous in the context Any computations, manipulations or processing based on an interpreted data require explicit date handling functions to determine the correct century									X	X	X
4.2	**Date Comparison** Date comparisons test that two dates are equal or that one date lies before or after another date. This test that output from a date comparison is correct and that the functionality of the test component is correct based on the date comparison.	Exercise test component to perform data comparisons Use test data for pre-year 2000 Exercise again with Year 2000 test data Mix before and after year 2000 data and perform compares Compare before and after results	Test component behaves normally (no catastrophic failure at date transition) Component functions occur as predicted based on date Before and after results are consistent									X	X	X
4.3	**Forward Date Horizon** Date horizon tests the test components time interval of interest. Forward date horizon tests predictive or date based processing into the future.	Test data should include dates that cause the relevant horizons to cross the selected critical dates: Dates spans across the century boundary "time now" crosses each end of horizon range Exercise test component and observe behavior Use test data for pre-year 2000 Exercise again with Year 2000 test data Compare before and after results	Test component behaves normally (no catastrophic failure at date transition) Component functions occur as predicted based on date Before and after results are consistent									X	X	X
4.4	**Past Date Horizon** Date horizon tests the test components time interval of interest. Past date horizon tests predictive or date based processing into the past.	Test data should include dates that cause the relevant horizons to cross the selected critical dates: Dates spans across the century boundary "time now" crosses each end of horizon range Exercise test component and observe behavior Use test data for pre-year 2000 Exercise again with Year 2000 test data Compare before and after results	Test component behaves normally (no catastrophic failure at date transition) Component functions occur as predicted based on date Before and after results are consistent									X	X	X

	Description:	Activities:	Expectations:	CLS	DMS	DSS	IDG	ING	IOS	MSS	PDPS	MODIS	ASTER	LS7
4.5	**Expiration Processing** Expiration processing tests that events occur correctly that are to take place based on a future date, in particular, events that are timed to expire, that is, cease to function or are no longer valid (for example, passwords or file access privileges), and that events that should not happen are not triggered by transition to year 2000. Note: This scenario requires an isolated test environment	Test data should include dates and date ranges specified in tests 1.1 thru 1.5 Exercise test component using trigger dates and observe behavior Use test data for pre-year 2000 Exercise again with Year 2000 test data Compare before and after results	Test component behaves normally (no catastrophic failure at date transition) Component functions occur as predicted based on date Before and after results are consistent System elements do not expire on 1999/09/09, files archived with a "never purge" designation are not date dependent									X	X	X
4.6	**Aging and Archiving** Aging and archiving tests that events occur correctly that are to take place based on a future date, in particular, events that are timed to rollover or move from one phase to another (for example, invoices that move from 30 days to 60 days past due, or files that are automatically moved to archive data sets). Note: This scenario requires an isolated test environment	Exercise the test components through an aging cycle; aging cycle should cross the Year 2000 boundaries as described in tests 1.1 thru 1 Exercise test component with pre-year 2000 and again with Year 2000 data Observe system behavior and note before and after results	Test component behaves normally (no catastrophic failure at date transition) Component functions occur as predicted based on date Before and after results are consistent									X	X	X
4.7	**Date Used in Naming Conventions** This scenario tests that entity names (for example file names) containing date information can be interpreted correctly using dates that cross the century boundary. *Note: Special consideration might be needed for systems that restrict the length of a name to 8 characters of which the first must be alpha.*	Test data should include dates and date ranges specified in tests 1.1 thru 1.5 Identify and inspect all system elements containing date data in their names Exercise test component to create output element (e.g. file) using date data in the name Exercise test component to read, archive, or delete system element using date data in the name	All named system elements are unambiguous and function as predicted Test component behaves normally (no catastrophic failure at date transition) Component functions occur as predicted based on date									X	X	X
4.8	**Date Logic Calculations** Date logic calculations tests that any and all calculations using date fields, based on date fields, or are the outcome of date fields are correct using dates that cross the century boundary.	Test data should include dates and date ranges specified in tests 1.1 thru 1.5 Exercise test component to perform calculations and logic functions based on date or date related information Observe system behavior and inspect internal and external data structures	Test component behaves normally (no catastrophic failure at date transition) Date fields contain correct date Component functions occur as predicted based on date Branch processing based on date data is correct									X	X	X

	Description:	Activities:	Expectations:	CLS	DMS	DSS	IDG	ING	IOS	MSS	PDPS	MODIS	ASTER	LS7
4.9	**Sort** This sort tests that data and/or files sorts based on dates are executed correctly. Sort operations are not generally in question, only that the outcome should be proper date sort sequence.	Test data should include dates and date ranges specified in tests 1.1 thru 1.5 Exercise test component Inspect sorted data for correct chronological order	Sorted data is in correct chronological order									X	X	X
4.10	**Test with Date Simulator** Date simulation is a technique to apparently change the system date without actually changing the system clock. Actually changing the system clock could have irreparable effects on the OS and third party software. A data simulator sits between the system clock and the accessing applications and returns a date based on set parameters.	Most if not all Level 4 tests should run with a date simulator in order to protect internal system resources from any adverse affects of advancing the system date In addition, all test components should be exercised in an isolated and restorable test environment	Date simulator returns date based on configuration parameters									X	X	X
4.11	**Process Cycle-automated processing on certain dates** Full process cycle tests are required for mission critical or safety related operations. These are a complete set of tests that exercise the integrated system fully from the beginning to the end for a complete cycle.	Configure system as a production environment Configure date simulator Test data should include dates and date ranges specified in tests 1.1 thru 1.5 Exercise test system through a full processing cycle with the date simulator set to the current date Exercise test system through a full processing cycle with the date simulator set to begin with 2000/01/01 Observe and note results	All named system elements are unambiguous and function as predicted Test component behaves normally (no catastrophic failure at date transition) Component functions occur as predicted based on date									X	X	X
4.12	**Boundary Test (Maximum Capacity)** This scenario tests the boundaries or maximum capacity of a system component. This test requires production size test data sets and "stress" situations. In general, this scenario is intended to test such boundaries as tables, files, and output areas that are date dependent.	Test data should include dates and date ranges specified in tests 1.1 thru 1.5 Exercise test component to fill all internal tables and data structures Exercise test component to fill all external data structures Observe results	Test component behaves normally (no catastrophic failure at date transition) Component functions occur as predicted based on date									X	X	X
4.13	**Regression Test** Regression testing is intended to verify that all changes made to a system as part of Year 2000 renovations have not corrupted or otherwise impacted the functionality of the system. *Note: This scenario requires an isolated test environment*	Exercise complete system and all test cases Observe results	All system functions occur as predicted									X	X	X

5. CLS/PULL Tests

5.1 Client Functionality

5.1.1 ECS Desktop

The ECS Desktop provides ECS science users with a custom GUI to help launch and use the workbench tools. These tools provide access to the ECS, the capability to learn about the system and find and use the data products. The tools include

Desktop Administration structure - organize and save data

Advertising Services - obtain information about and access to the ECS system on the web

B0SOT - search of ECS directory and inventory and the order data products

DAR Tool - create and submit ASTER requests

EOSView - graphically view ECS data products

User Registration Tool - request an ECS account and provide a profile definition via the web

5.1.2 User Registration and Administration

Release 2.0 User Registration and Administration capability provides the means for users to register with ECS in order to access and use the system. The User Registration Tool works with MSS's Accountability Management Service to provide three generic classes of users: guest users, registered users and DAAC users. Guest users are users that have not submitted requests to become registered users. Registered users are those guest users that have submitted requests for a registered user account, and have account created for them based on an approval process. DAAC Users are registered users that have additional security provided by a DCE account and password. Only DAAC users can submit a DAR.

The MSS Account Management Service provides the means to create and maintain accounts and user profile information. The user profile data is also made available to the various subsystems, such as Data Server and Client. Information such as the user's electronic mail address and the shipping address are used for the distribution of ordered data products.

5.1.3 Data Search and Order

Release 2.0 uses the capabilities provided by the B0SOT (B.0 Search and Order Tool) Client, which is the equivalent of the former Release A Search and Order Tool. The B0SOT provides ECS users with the capability to search, examine and order V0 and ECS data. Through the use of dependent valids, the user is helped in his selection of meaningful data. This tool will be replaced, beginning in Drop 5a, with web based search and order tool: JEST.

5.1.4 ASTER DAR Creation and Submission

The Release 2.0 Data Acquisition Request (DAR) capability allows selected ECS users to submit ASTER DARs through a custom Client GUI. The Dar submission process enables users to specify an array of parameters that pertain to the acquisition. An identification number returned from ASTER is stored with the DAR in the user's directory. (Note: The DARs are submitted to the ASTER GDS system through the DAR Gateway.)

5.2 Client Test Cases

5.2.1 Client DAR Functionality (B100250.070)

5.2.1.1 Test Description

This test exercises the Data Acquisition Request Tool functionality by conducting the test in five time periods. The Client Desktop is not specifically tested, but is implicitly exercised as the launch and support platform for tested Workbench tools. The test will be conducted in the EDF VATC environment where the times can be controlled. The system administrator will set the system times as required to simulate the five time periods.

Midnight of Dec 31, 1999 into Jan. 2000

Midnight of Feb 28, 2000 into Feb. 29, 2000

Midnight of Feb 29, 2000 into March 2000

Midnight of Dec 30, 2000 into Dec. 31, 2000

Midnight of Dec 31, 2000 into 2001.

This test case includes the creation, submittal and modification of requests for data acquisition at a future date by ASTER. During the 1999 period, events for post 2000 will be requested. DAR submits will be made during 19xx, with modifications submitted after 20xx. DARs saved during 19xx will be used to create new DARs in the new period. The test input consists of DAR requests and modifications. The test output consists of Dar files, DAR ID replies

Success Criteria:

Responses from the ASTER simulator for new and modified DAR submittals

L3/L4 Requirements: S-CLS-01800 , S-CLS-18105 (for DAR)

5.2.2 Client /MSS ECS System Access Functionality (B100110.010)

5.2.2.1 Test Description

This test exercises the User Registration Tool and MSS User Account Management GUI functionality by conducting the test in five time periods. The Client Desktop is not specifically tested, but is implicitly exercised as the launch and support platform for the User Registration

Tool. The test will be conducted in the EDF VATC environment where the times can be controlled. The system administrator will set the system times as required to simulate the five time periods.

Midnight of Dec 31, 1999 into Jan. 2000

Midnight of Feb 28, 2000 into Feb. 29, 2000

Midnight of Feb 29, 2000 into March 2000

Midnight of Dec 30, 2000 into Dec. 31, 2000

Midnight of Dec 31, 2000 into 2001.

This test case includes the creation, submittal and approval of requests for access to the ECS system as ECS registered and DAAC users, approval and creation of ECS accounts by the ECS User Account GUI, and subsequent login to the ECS system with the new accounts. Creation, modification and deletions of accounts will be done on both sides of the time periods. The test input consists of requests for ECS system accounts. The test output consists of ECS Registered user and DAAC user login to ECS System.

Success Criteria:

Access to ECS data and functions for registered users across the critical time periods.

L4 Requirements: S-CLS-01800, S-CLS-18105 (for URT)

5.2.3Client B0 Search and Order (B0SOT) Functionality (B100170.120)

5.2.3.1 Test Description

This test exercises the B0SOT functionality by conducting the test in five time periods and also uses 19xx and post 2000 dated data. The test will be conducted in the EDF VATC environment where the times can be controlled. The system administrator will set the system times as required to simulate the five time periods.

Midnight of Dec 31, 1999 into Jan. 2000

Midnight of Feb 28, 2000 into Feb. 29, 2000

Midnight of Feb 29, 2000 into March 2000

Midnight of Dec 30, 2000 into Dec. 31, 2000

Midnight of Dec 31, 2000 into 2001.

During the post 2000 time periods, data from the 19xx periods will be requested. Searches and orders will be submitted for the following data types, which will have a post 2000 time, stamp.

ASTER

MODIS

LANDSAT 7

The test input will consists of searches and orders. The test output will be search results, mail notification of orders and error messages.

Success Criteria:

Search results and placement of orders with correct date-time-stamps

L4 Requirements: S-CLS-01800, S-CLS-18105 (for B0SOT)

5.2.4 Client JEST Search and Order Functionality (B100120.120)

5.2.4.1 Test Description

This test exercises the Drop 5 JEST functionality by conducting the test in five time periods and also uses 19xx and post 2000 dated data. The test will be conducted in the EDF VATC environment where the times can be controlled. The system administrator will set the system times as required to simulate the five time periods.

Midnight of Dec 31, 1999 into Jan. 2000

Midnight of Feb 28, 2000 into Feb. 29, 2000

Midnight of Feb 29, 2000 into March 2000

Midnight of Dec 30, 2000 into Dec. 31, 2000

Midnight of Dec 31, 2000 into 2001.

During the post 2000 time periods, data from the 19xx periods will be requested. Searches and orders will be submitted for the following data types, which will have a post 2000 time, stamp.

ASTER

MODIS

LANDSAT 7

The test input will consists of searches and orders. The test output will be search results, mail notification of orders and error messages.

Success Criteria:

Search results and placement of orders with correct date-time-stamps

L4 Requirements: S-CLS-18105 (for JEST)

5.2.5 DAAC Quality Assurance Functionality (B100250.020)

5.2.5.1 Test Description

This test exercises the DAAC QA process by conducting the test in five time periods and also uses 19xx and post 2000 dated data. The test will be conducted in the EDF VATC environment where the times can be controlled. The system administrator will set the system times as required to simulate the five time periods.

Midnight of Dec 31, 1999 into Jan. 2000

Midnight of Feb 28, 2000 into Feb. 29, 2000

Midnight of Feb 29, 2000 into March 2000

Midnight of Dec 30, 2000 into Dec. 31, 2000

Midnight of Dec 31, 2000 into 2001.

Mail requests by science users, creation of subscriptions and quality checks of production data will be done over the critical time periods to ensure all can be handled properly.

The test input will consists of user mail requests and data subscriptions. The test output will be Z-Mail correspondence, notification of filled subscriptions, quality evaluation of data products

Success Criteria:

Successful quality check of data ordered by an ECS science user.

L4 Requirements:

C-CSS-40430

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6. DMS TESTS

6.1 DMS Functionality

The Data Management Subsystem provides services, which search for, locate and access data on behalf of a user or another program. Data management services decouple users and programs from the methods used by a site to access the data, and the manner in which the data have been named. The Data Management Subsystem is composed of the following Servers:

- Data Dictionary Service (DDICT) is a server that manages the definitions of data objects, attributes, domains (valid values), and access operations available via Science Data Servers (SDSRV), LIMGRs, GTWAYs, and DIMGRs. The DDICT information will be stored in a relational Database Management System (DBMS). The database will be replicated at each DAAC using the COTS DBMS software to perform the replication.

- Local Information Manager (LIMGR) is a server that provides access to data and services at a site to the extent the underlying data servers make their data available via the LIMGR. The LIMGR accepts requests, such as a search, and produces and executes the corresponding requests that must occur at the data servers for that site.

- Distributed Information Manager (DIMGR) is a server that provides access to data and services across sites. The DIMGR accepts requests, such as a search, and produces and executes the corresponding requests that must occur at the LIMGRs and/or data servers.

- V0 Gateway (GTWAY) is a server that provides interoperability services between ECS data server and V0 client.

6.2 DMS Test Cases

6.2.1 DMS Year 2000 Test (TS0387)

6.2.1.1 Test Description

This test will concentrate on trying to verify that the DMS servers are year 2000 compliant by running several test scenarios to ensure that the DMS servers such as LIM, DDICT, V0 to ECS Gateway and ECS to V0Gateway can handle date transitions, leap years and non leap years. This test will cover the following:

Date transition from 1999/12/31 to 2000/01/01

Date transition from 2000/12/31 to 2001/01/01

Date Transition from 2009/12/31 to 2010/01/01

Leap Year 2000/02/29 to 2000/03/01

Non Leap Year 2001/02/28 to 2001/03/01

Date transition from 1999/12/31 to 2000/01/01: Date transition test that will verify the following servers can receive and process a search and order correctly by recognizing and handling century dates greater than 1999.

Date transition from 2000/12/31 to 2001/01/01: Date transition test that will verify the following servers can receive and process a search and order correctly by recognizing and handling the day greater than 365.

Date transition from 2009/12/31 to 2010/01/01: Date transition test that will verify the following servers can receive and process a search and order correctly by recognizing and handling decade dates greater than 2009.

Leap year from 2000/02/29 to 2000/03/01: Leap year test that will verify the following servers can receive and process a search and order correctly by recognizing and handling leap year dates greater than 02/29.

Non Leap year from 2001/02/28 to 2001/03/01: Non Leap year test that will verify the following servers can receive and process a search and order correctly by recognizing and handling non leap year dates greater than 02/28.

Inputs to this test case include user profile option and selection criteria for data product to be ordered. This test specifies the date ranges to be used in the test data. The selected data product searched is returned and ordered. The servers behave normally (no catastrophic failure at date transition). Data fields contain correct date. Order is received.

Success Criteria:

This test is considered successful if the user is able to successfully place the search and order the data and receives the specified product successfully with no abnormal catastrophe.

L4 Requirements:

S-DMS-02010, S-DMS-11100, , S-DMS-23940, , S-DMS-33140,

7. DSS TESTS

7.1 DSS Functionality

This section tests the Data Server Subsystem (DSS) for year change, decade change, century change and leap year compliance. The DSS is comprised of four software components: Science Data Server (SDSRV), Storage Management (STMGT), Distribution (DDIST) and Document Data Server (DDSRV - not yet delivered). Only SDSRV, STMGT and DDIST will be tested in the following series of tests. Each DSS software component consists of it's own data base and it's own GUI, all of which will be exercised while performing ingest, search and acquire requests in the following tests. SDSRV receives insert and acquire requests from other subsystems within ECS, processes the requests, and forwards them to other DSS software component (STMGT and/or DDIST) when appropriate. These tests can be run either with the external subsystems (such as Ingest, PDPS, B0SOT), or they can be run with a DSS Request Driver. They will be run with data that reflects the times being tested, and, in the case if the third test, they will be run with the system time changed on the various servers to reflect the times being tested.

7.2 DSS Test Cases

7.2.1 Pre-2000 Tests (TS0815.1)

7.2.1.1 Test Description

This test demonstrates the ability for DSS to process requests where the associated data reflects dates and times before the century change. In addition, it verifies special crossover times as specified in the requirements or in the Y2K plan, and including:

- 12/30/1998 - 12/31/1998
- 12/31/1998 - 1/1/1999 (end of year/non leap year)
- 9/8/1999 - 9/9/1999
- 2/28/1999 - 3/1/1999 (end of February/non leap year)
- 9/30/1999 - 10/1/1999 (fiscal year century change)
- Processing data during 1999

This test includes inserting data via electronic or hard media means. Acquiring that data via electronic and hard media distribution requests. Searching on the data inserted. Inspecting all DSS GUIs for possible date problems after the century change, and performing queries on the data base to verify all dates were converted and stored as expected. Data to be used includes MODIS, ASTER, Landsat-7, NOAA, EOC, FDF. Inputs to this test include data/metadata that represents

the dates/times listed above, including at least one granule of data on D3 tape. Test inputs also include search and acquire requests. Outputs to this test include data/metadata stored in the deep archive/inventory data base, successful searches, and data being pushed to the appropriate places, including at least one granule on 8MM tape. Outputs also include GUI displays.

Success Criteria:

This test is considered successful if DSS can successfully process and store data representing dates in the pre-2000 time frame. This will be verified by demonstrating that the ingested data is successfully stored in the archive, the metadata has been stored in the inventory data base (and dates are correctly converted/stored as expected), queries return results representing the data in the inventory database, and data is successfully pushed, pulled or written to 8MM tape.

L4 Requirements: S-DSS-05865, S-DSS-22120, S-DSS-30720

7.2.2 Year 2000 and Post-2000 Tests (TS0815.2)

7.2.2.1 Test Description

This test demonstrates the ability for DSS to process requests where the associated data reflects dates and times crossing into the new century and after the century change. In addition, it verifies special crossover times as specified in the requirements or in the Y2K plan, and including:

- 12/31/1999 - 1/1/2000 (century change)
- 2/28/2000 - 2/29/2000
- 2/29/2000 - 3/1/2000 (end of Feb/leap year)
- 12/30/2000 - 12/31/2000
- 12/31/2000 - 1/1/2001 (end of year/leap year)
- 12/31/2009 - 1/1/2010 (end of decade)
- Processing data during 2003

This test includes inserting data via electronic or hard media means. Acquiring that data via electronic and hard media distribution requests. Searching on the data inserted. Inspecting all DSS GUIs for possible date problems after the century change, and performing queries on the database to verify all dates were converted and stored as expected. This test includes performing special queries, such as queries of data with dates/times before the century change (1999), queries that end at 1/1/2000:00:00:00, queries that begin at 1/1/2000:00:00:00 and queries that span the century change. Data to be used includes MODIS, ASTER, Landsat-7, NOAA, EOC, FDF.

Inputs to this test include data/metadata that represents the dates/times listed above, including at least one granule of data on D3 tape. Test inputs also include search and acquire requests. Outputs to this test include data/metadata stored in the deep archive/inventory data base, successful

searches, and data being pushed to the appropriate places, including at least one granule on 8MM tape. Outputs also include GUI displays.

Success Criteria:

This test is considered successful if DSS can successfully process and store data representing dates crossing into the new century and in the post-2000 time frame. This will be verified by demonstrating that the ingested data is successfully stored in the archive. The metadata has been stored in the inventory data base (and dates are correctly converted/stored as expected). Queries return results representing the data in the inventory database, and data is successfully pushed, pulled or written to 8MM tape.

L4 Requirements: S-DSS-05865, S-DSS-22120, S-DSS-30720

7.2.3 System Time Change Tests (TS0815.3)

7.2.3.1 Test Description

This test demonstrates the ability for ingest, archive, search and acquire requests to process to successful completion when the system time is changed to cross special boundaries. Boundaries to be tested include:

- 12/31/1999 - 1/1/2000
- 2/28/2000 - 2/29/2000
- 12/30/2000 - 12/31/2000
- 12/31/2000 - 1/1/2001

Preparation activities for this test include having RTSC synchronize the system times on each of the servers used to represent the specific times being tested. The system time will be changed four times, each time it will be changed to at least 1 hour before the crossover being tested, to allow for servers to be initialized, GUIs to be brought up, and processing to begin. This test includes inserting data via electronic or hard media means. Acquiring that data via electronic and hard media distribution requests. Searching on the data inserted. Inspecting all DSS GUIs for any date problems that occurred in association with the change in system time, particularly in association with the century change. And performing queries on the data base to verify all dates were converted and stored as expected. This test includes performing special queries, such as queries of data with dates/times before the century change (1999), queries that end at 1/1/2000:00:00:00, queries that begin at 1/1/2000:00:00:00 and queries that span the century change. Servers will be brought up and down to verify they can be, and to verify files with dates in their names are created properly. Logs will be thoroughly inspected for any abnormal messages pertaining to the dates being tested. Data to be used includes MODIS, ASTER, Landsat-7, NOAA, EOC, FDF.

Inputs to this test include data/metadata that represents the dates/times listed above, including at least one granule of data on D3 tape. Test inputs also include search and acquire requests, and system time changes. Outputs to this test include data/metadata stored in the deep

archive/inventory data base, successful searches, and data being pushed to the appropriate places, including at least one granule on 8MM tape. Outputs also include GUI displays.

Success Criteria:

This test is considered successful if DSS can successfully process and store data in the time spans being tested. This will be verified by demonstrating that the ingested data is successfully stored in the archive. The metadata has been stored in the inventory data base (and dates are correctly converted/stored as expected). Queries return results representing the data in the inventory database, and data is successfully pushed, pulled or written to 8MM tape. The test is also considered successful if servers can be terminated and restarted and files are created as expected when the system time is changed.

L4 Requirements: S-DSS-05865, S-DSS-22120, S-DSS-30720

8. IDG TESTS

8.1 IDG Functionality

8.1.1 Subscription Server Functionality

The role of the Subscription Server is to support the detection of previously defined events and to perform specified actions (registering, updating, and canceling) on behalf of clients who have previously registered to those events. In order to actually perform its role in the ECS, the Subscription Server Process requires that its clients be active and have previously registered events with it. Examples of events include science granule insertion; metadata update, new advertisement, and new schema export to DDICT. The Subscription Server addresses the need for a common mechanism across subsystems, which support a generic event-action model based on a event producer/consumer paradigm.

8.1.2 Time Service Functionality

The CSS Time Service will utilize the DCE (Distributed Computing Environment) DTS (Distributed Time Service) to keep system clocks in the ECS network approximately in sync by adjusting the time kept by the operating system at every node. Timestamps are used by many applications when recording event occurrences to a log. The implementation detail of the CSS Time Service and DCE DTS are invisible to the software developer.

The CSS Time Service will advantage of the DCE DTS, which has a Time Provider Interface (TPI). The TPI will allow an external time source to connect to the Time Service. A Time Provider provides access to standardize or government controlled time devices such as radios, satellites. Or telephone lines. The servers with a Time Service query the Time Providers for the current time and can pass the standard Coordinated Universal Time (UTC) time values to a DTS server and propagate them through the network. The Time Providers are considered the most accurate source of time information.

The Distributed Time Service (DTS) synchronizes the system clock on each host by directly adjusting the time kept by the operating system. Under ordinary circumstances, this is done gradually so that there are no sudden jumps in the time. It is also done in such a way that the time never goes backward. If a system clock is too far ahead, it is slowed down until the time is correct by modifying the tick increment.

8.2 IDG Test Cases

8.2.1 Basic Subscription Service Functions (TC0256)

8.2.1.1 Test Description

The following test cases verify the ability of the Subscription server to support the detection of previously defined events and to perform specified actions on behalf of clients who have registered to those events

This test verifies the basic functionality of the Subscription Service. These functionalities deal with event requests (registering, updating, and canceling) and subscription requests (submitting, updating, and canceling) including acknowledgment messages for these requests.

The Subscription Server and client software processes all requests. The client software is a command line interface application (runTest) that sends the requests to the Subscription Server (the Subscription Server can also receive/send request messages to other servers). These requests are done with the assistance of the Server Request Framework (SRF) (which also assists with sending acknowledgment messages back to the client software) and Universal Reference (UR) to access objects.

In addition to the SRF, the Subscription Server uses the Process Framework (PF) to interface with the underlying distributed architecture. This test is verifying that the Subscription Server does update the database properly based on the requests sent along with the specific infrastructure capabilities provided by the PF, the SRF, and the Universal Reference mechanism (which provides a unique identifier to object instances). This test case will test for Y2K compliance by verifying that a subscription request for a time period that spans the rollover to year 2000 can successfully processed.

The test input consists of the subscriber and event producer sends requests to Subscription Server. This request producer is a command line interface that receives input from the user. The actual input is contained in the test procedures and consists of commands and information to create an event or subscription. The test output consists of messages to the user indicating the completion of a task and reviewing of the database tables to verify that the tasks where performed successfully.

Success Criteria:

Messages to the user indicating the successful completion of a task and the correct/expected updates to the database tables

L4 Requirements:

C-CSS-40430

8.2.2 Processing Subscription Actions (TC0291)

8.2.2.1 Test Description

The Subscription Service should be able to perform actions on behalf of the client. The action is specified during a subscription request and executed when the specified event is triggered. At this time these actions are limited to data acquires. The data acquire action can either ftp push the event data to a chosen destination or place the data onto an 8mm tape. The search and data production request actions will be delivered in Release B1.

This test case will perform checks on how the subscription server handles request involving the following critical events/dates:

- date calculations that span 1999 to 2000.
- last calendar day in 1999.
- the first calendar day in 2000.
- the first business day in 2000.
- an invalid date.
- leap year for 2000.
- invalid leap year for 1999.
- day after leap year for 2000.

The input to this test case consists of the following.

Subscriber and event producers (run_Test,runOpGui.csh) send requests to Subscription Server.

The entry input (event registration and subscription submission) is contained in the test procedures and consists of commands and information to create an event or subscription.

Event data.

The output of this test case consists of the following.

Messages to the user indicating the completion of a task, reviewing of the database tables to verify that the tasks were performed successfully.

Email notification messages.

Transmitted data (email, ftp'ed files, 8mm tape).

Success Criteria:

Event data received by email and placed on 8mm tape or pushed to specified location via FTP. Also Email notification messages sent to the subscriber that the requested data has been archived as well as acknowledgment messages to the user indicating the successful completion of a task and the correct/expected updates to the database tables.

L4 Requirements:

C-CSS-23010, C-CSS-28100, C-CSS-40430, C-ISS-21210

8.2.3 Qualifying Subscribeable Events (TC0294)

8.2.3.1 Test Description

The Subscription Service should allow subscribers to subscribe to an event based on a set of attributes specified by the event producer. For this test a set of events are created with these attributes and subscriptions are made for these events using the specified attributes. After which events are triggered and request processing performed cumulating in Email notification to the subscriber of the qualified subscription request.

This test case will perform checks on how the subscription server handles request involving the following critical events/dates:

- date calculations that span 1999 to 2000.
- last calendar day in 1999.
- the first calendar day in 2000.
- the first business day in 2000.
- an invalid date.
- leap year for 2000.
- invalid leap year for 1999.
- day after leap year for 2000.

The input to this test case consists of the following.

Subscriber and event producers (run_Test) send requests to Subscription Server.

Request producers are on-line command interfaces that receive input from the user.

The actual input is contained in the test procedures and consists of commands and information to create an event or subscription.

The output of this test case consists of the following.

Messages to the user indicating the completion of a task, reviewing of the database tables to verify that the tasks where performed successfully.

Email notification messages.

Success Criteria:

Email notification messages sent to the subscriber that the requested data has been archived as well as acknowledgment messages to the user indicating the successful completion of a task and the correct/expected updates to the database tables.

L4 Requirements:

C-CSS-23010, C-CSS-28100, C-CSS-40430, C-ISS-21210

8.2.4 Time Value Manipulation (TC0207)

8.2.4.1 Test Description

The purpose of the Absolute Time test is to demonstrate the Time Service's ability to calculate and maintain a simulated time given an absolute time value. It will then make the following time conversions utilizing the calculated delta time where appropriate:

Convert a binary time to a timespec_t format of GMT time.

Convert a binary time to a tm format of GMT time.

Convert a binary time to an ASCII format of GMT time.

Convert a binary time to a tm format of local time.

Convert a timespec_t format to a binary format.

Convert a relative timespec_t format to a relative binary format.

Compute the sum of two binary times.

Compute the difference between two binary times.

Obtain the local time zone label and offset from GMT, given the UTC.

Convert a tm structure that expresses GMT or UTC to a binary timestamp.

Compare two binary timestamps or two relative binary timestamps and return the relationship.

Converts a character string to a binary timestamp.

This test will also demonstrate the Time Service's Y2K compliance by handling data transitions, invalid dates, and leap years System error messages will be generated for any non-Y2K compliant dates used as inputs during this test.

Actions are performed to verify that the CSS Time Service provides APIs to compute time from current time plus/subtract the delta time parameter. Inputs to this test case include calls to the API from the test tool demonstrating the convert time functionality provided by the CSS Time Service and multiple date inputs that verify Y2K compliance. Outputs to this test case include responses from the API calls to calculate the delta value and convert, manipulate and retrieve various formats of time stamps. System error messages will be generated for any non-Y2K compliant dates used as inputs during this test.

Success Criteria:

This test is successful when the format and accuracy of the convert time for each API are verified, the correct time values returned include the delta time offset, and Y2K compliance is verified.

L4 Requirements: C-CSS-25185

8.2.5 Relative Time (TC0208)

8.2.5.1 Test Description

The purpose of the Relative Time test is to demonstrate the ability to obtain and validate a simulated time given a relative time offset. It will then make the following time conversions utilizing the delta time where appropriate:

Convert a binary time to a timespec_t format of GMT time.

Convert a binary time to a tm format of GMT time.

Convert a binary time to an ASCII format of GMT time.

Convert a binary time to a tm format of local time.

Convert a timespec_t format to a binary format.

Convert a relative timespec_t format to a relative binary format.

Compute the sum of two binary times.

Compute the difference between two binary times.

Obtain the local time zone label and offset from GMT, given the UTC.

Convert a tm structure that expresses GMT or UTC to a binary timestamp.

Compare two binary timestamps or two relative binary timestamps and return the relationship.

Converts a character string to a binary timestamp.

This test case verifies Y2K compliance by performing various time and date conversions using various critical times/dates. Actions are performed to verify that the CSS Time Service provides APIs to compute time from current time plus/subtract the delta time parameter. Inputs to this test case include calls to the API from the test tool demonstrating the convert time functionality provided by the CSS Time Service. Outputs to this test case include responses from the API calls to calculate the delta value and convert, manipulate and retrieve various formats of time stamps.

Success Criteria:

This test is successful when the format and accuracy of the convert time for each API are verified and the correct time values returned include the delta time offset.

L3/L4Requirements: C-CSS-25185

8.2.6 Synchronize System Time (TC0209)

8.2.6.1 Test Description

The test is to demonstrate that the CSS Time service provides the utilities required to synchronize system time across all components, it's time to one or more external time sources and maintain an accuracy of 500 milliseconds within all ECS distributed components. The utility DTSCP is used to query and verify the system time data. This test case verifies that the system can accept and synchronize to various Y2K critical time/dates. The critical time is entered in to the system and then a time check is requested from the system to verify that the time was accepted as entered. Actions are performed to verify that the CSS Time Service provide the utilities required to synchronize system time. Inputs to this test case include calls to the API from the test tool demonstrating the synchronize system time functionality provided by the CSS Time Service. Outputs to this test case include responses from the API calls to give the time across all components, one or more external time sources and maintain an accuracy of milliseconds within all distributed components.

Success Criteria:

This test is successful when the format and accuracy of the synchronize system time for each API are verified.

L4 Requirements: C-CSS-25185

8.2.7 Directory Agents Operations (TC0204)

8.2.7.1 Test Description

This test case inspects that the Directory Service can maintain multiple copies of the namespace in different DCE clients. The directory can be retrieved and updated from the remote DCE clients. Y2K compliance will be checked by verifying that the Directory Service correctly operates on Y2K critical dates. DCE utility commands to list the DCE directories are the test inputs. DCE clients display the directories copied from the server, which serve as test output.

Success Criteria:

The DCE client successfully maintains an identical copy of the master server namespace.

L4 Requirements: C-CSS-20160

8.2.8 E-mail Access (TC0231)

8.2.8.1 Test Description

The Multi-purpose E-Mail messaging test demonstrates the capability of the electronic mail messaging function to send, receive, and reply to the Multi-purpose Internet Mail Extension (MIME) messages based on SMTP/X.400 protocols existing at GSFC and other test sites. MIME supports pre-defined types of non-textual message contents and user defined message contents, which allows interchange text in languages with different character sets. The MIME extensions actually handle the capability to read attachments to electronic messages. In addition, the MIME

extensions help users identify what data type messages they are receiving and produce indications of incompatibilities for readability. Also, demonstrates the capability of the messaging service to manage and interact with user email via graphical user interface (GUI). Y2K compliance will be checked by verifying that the E-Mail Mailtool correctly operates on Y2K critical dates.

Test input consists of test mail messages which include message body and attached files. Attachment types include text, ASCII text, binary, postscript, images, and other message types. The expected outputs of this test include message transfers with readable attachments

Success Criteria:

This test case is successful if the messages with attachments are sent, received, and a reply is successfully sent back to the sender. Also, MIME message types are decoded correctly and can be saved to a designated location.

L4 Requirements: C-CSS-22220

8.2.9 General BBS Test (TC0235)

8.2.9.1 Test Description

The General BBS test demonstrates the capability of the BBS Service to provide a forum for sharing ECS related information. The BBS must have the capability to collect and maintain historical data, copy files to BB, support the download ECS toolkits, and provide the "WHAT's NEW" feature which informs the user of new updates as they become available on the bulletin board. Y2K compliance will be checked by verifying that the BBS Service correctly operates on Y2K critical dates.

Test inputs include commands to view, copy, and download information contained within and on the Bulletin Boards. Selectable information includes the destination news groups, subject, sender, and message summaries within the user interface. And ECS toolkit packages to perform operations on software files (i.e. copy or download). Test outputs include copied and downloaded files/toolkits from the Bulletin Board., statistical/Historical information about the Bulletin Board Service, and viewing entries contained within the Bulletin Boards.

Success Criteria:

The copying and downloading of files/toolkits contained within the Bulletin Boards. Viewing of historical and statistical information maintained on Bulletin Boards. Viewing and selecting from the "What's New" feature on new information available on the Bulletin Boards.

L4 Requirements: C-CSS-62850

8.2.10 File Access and Transfer (TC0240)

8.2.10.1 Test Description

The purpose of this test is to verify the remote files can be accessed via file transfer protocol (ftp) and kerberized file transfer protocol (kftp) during Y2K critical dates. Test inputs include login

commands to a local DAAC remotely from ECS site and data files. Test outputs include remote access to files from a local host and files transferred via ftp and kftp.

Success Criteria:

Remote access to files obtained.

Files transferred successfully via ftp and kftp can be opened (ASCII) and/or run (binary).

L4 Requirements: **C-CSS-60950**

8.2.11 Security Features (TC0276)

8.2.11.1 Test Description

The objective of this test case is to verify that CSS Security service handles the Y2K critical dates. OSF's Distributed Computer Environment (DCE) provides the capabilities necessary to successfully satisfy the given requirements. OSF's DCE is implemented as a major part of the ECS infrastructure functionality. The test input is the Y2K requirements. The test output is the satisfaction of the given requirements by the inspection verification method.

Success Criteria:

Successfully satisfy the given requirements by referencing the appropriate approved documentation.

L4 Requirements: C-CSS-21235

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9. ING TESTS

9.1 ING Functionality

This section tests the Ingest Subsystem for Year 2000, Leap Day and Leap Year compliance. The Ingest Subsystem is comprised of 4 front ends (Auto, Polling, HTML and Media), 2 main servers (Request Manager and Granule Server), a database and a GUI. The Ingest Subsystem will be tested to verify that it can ingest data (multiple date formats) with the above dates as well as function correctly as the System Time crosses the above boundaries.

9.2 ING Test Cases

9.2.1 Year 2000 Data Ingest and Archive Test (TS0655.1)

9.2.1.1 Test Description

This test demonstrates the ability to ingest and archive Year 2000 data. Year 2000 data has start and/or stop dates or a single date in the year 2000. These dates will be in the following formats: YYYYDDD, YYYYMMDD, YYMMDD and continuous time from Jan. 1, 1958 00:00:00.0000000Z. The following data types will be tested:

L70RF1 (L70RWRS1) - format: YYYYDDD

L70RF2 (L70RWRS2) - format: YYYYDDD

L7CPF - format: YYYYMMDD

MOD00 - format: Continuous time from Jan. 1, 1958 00:00:00.0000000Z

AST_L1B - format: YYYYMMDD

AM1ATTF - format: YYYYDDD

GDAS_0ZF (GDAS0ZFH) - format: YYMMDD (note: 2 digit Year of Century)

The objective of this test is to successfully ingest and archive data to verify that the Ingest Subsystem and the ingest portion of the Data Server Subsystem are year 2000 compliant. This involves preprocessing, archiving and storing metadata in the Inventory database for data containing a year 2000 date.

Inputs to this test consist of the following. A D3 tape containing a granule ASTER L1B data. A PDR containing a granule of MOD00 data and its corresponding XFR file. A DAN containing a granule of L70RF1 data with 3 L70RWRS1 scenes. A DAN containing a granule of L70RF2 data with 3 L70RWRS2 scenes. A PDR containing a granule of L7CPF data. An AM1ATTF data file and a PDR containing a granule of GDAS_0ZF data. Additional inputs will be keyed and selected at the Ingest GUI interface to request data ingest from D3 tape.

Test outputs consist of Monitor/Control Display,Archive Storage directory content, and SDSRV Inventory Database queries.

Success Criteria:

This test is considered successful if all Year 2000 data is ingested and archived successfully. Specifically the following criteria must be met:

Monitor/Control Display indicates a successful final status,

Data is reflected in the Archive Storage directory,

SDSRV Inventory Database queries indicate that metadata is stored and contains the correct Year 2000 dates.

L4 Requirements: S-INS-03370

9.2.2 Year 2K, Leap Day/Year System Time Ingest and Archive Test (TS0655.2)

9.2.2.1 Test Description

This test demonstrates the ability for the System Time to cross the following boundaries without causing any adverse affects on the data ingest and archive process: Year 1999 to 2000, Leap Day in year 2000 and Leap Year 2000 to 2001. Data will be ingested using the ingest front ends, Auto, Polling with Delivery Record, Polling without Delivery Record, and Media, while the System Time crosses the boundaries identified above.

The objective of this test is to successfully ingest and archive data using the 5 different ingest front ends to verify that the Ingest Subsystem and the ingest portion of the Data Server Subsystem are not adversely affected when the System Time crosses the previously identified boundaries.

Inputs to this test consist of the following. A D3 tape containing a granule ASTER L1B data. PDR containing a granule of MOD00 data and it corresponding XFR file. A DAN containing a granule of L70RF1 data with 3 L70RWRS1 scenes. A PDR containing a granule of L7CPF data. An AM1ATTF data file and a DAN containing a granule of DAP data.

Test outputs consist of Monitor/Control Display, Archive Storage directory content, SDSRV Inventory Database queries, and Monitor of all Ingest Processes.

Success Criteria:

This test is considered successful if all data is ingested and archived successfully ast the System Time crosses over the Year 2000, Leap Day and Leap Year boundaries. Specifically the following criteria must be met:

Monitor/Control Display indicates a successful final status,

Data is reflected in the Archive Storage directory,

SDSRV Inventory Database queries indicate that metadata is stored and contains the correct dates,

None of the Ingest Processes core dumps or encounter inadvertant errors.

L4 Requirements: S-INS-03370

9.2.3 Leap Day/Year Data Ingest and Archive Test (TS0655.3)

9.2.3.1 Test Description

This test demonstrates the ability to ingest and archive Leap Day and Leap Year data. Leap Day data has start and/or stop dates or a single date on Feb 29/DOY 60, in a Leap Year such as the year 2000. Leap Year data is data which has start and/or stop dates or a single date on Dec. 31/DOY 366, in a Leap Year such as the year 2000. These dates will be in the following formats: YYYYDDD, YYYYMMDD, YYMMDD and continuous time from Jan. 1, 1958 00:00:00.0000000Z. The following data types will be tested:

L70RF1 (L70RWRS1) - format: YYYYDDD

L70RF2 (L70RWRS2) - format: YYYYDDD

L7CPF - format: YYYYMMDD

MOD00 - format: Continuous time from Jan. 1, 1958 00:00:00.0000000Z

AST_L1B - format: YYYYMMDD

AM1ATTF - format: YYYYDDD

GDAS_0ZF (GDAS0ZFH) - format: YYMMDD (note: 2 digit Year of Century)

Also some error conditions will be tested. Ingest of data that has Feb. 29 as a start and/or stop date or a single date, for a year that is not a leap year, such as year 2100. Ingest of data that has DOY 366 as a start and/or stop date or a single date, for a year that is not a leap year, such as 2100.

The objective of this test is to successfully ingest and archive data to verify that the Ingest Subsystem and the ingest portion of the Data Server Subsystem are Leap Day and Leap Year compliant. This involves preprocessing, archiving and storing metadata in the Inventory database for data containing a Feb. 29/DOY 60 or Dec. 31/DOY 366, year 2000 date.

Inputs to this test consist of a D3 tape containing a granule ASTER L1B data. A PDR containing a granule of MOD00 data and it corresponding XFR file. A DAN containing a granule of L70RF1 data with 3 L70RWRS1 scenes. A DAN containing a granule of L70RF2 data with 3 L70RWRS2 scenes. A PDR containing a granule of L7CPF data. An AM1ATTF data file and a PDR containing a granule of GDAS_0ZF data. Additional inputs will be keyed and selected at the Ingest GUI interface to request data ingest from D3 tape.

Test outputs consist of Monitor/Control Display, Archive Storage directory content, and SDSRV Inventory Database queries.

Success Criteria:

This test is considered successful if all Leap Day and Leap Year data is ingested and archived successfully. Specifically the following criteria must be met:

Monitor/Control Display indicates a successful final status,

Data is reflected in the Archive Storage directory,

SDSRV Inventory Database queries indicate that metadata is stored and contains the correct Leap Day or Leap Year dates.

L4 Requirements:

S-INS-03370

10. IOS TESTS

10.1 IOS Functionality

The Advertising Service provides the interfaces needed to support Client defined interactive submission, browsing, searching, and retrieving of advertisements. Although there will be a single format for submitting advertisements to the service, advertisements should be accessible via several different interfaces to support database searching, text searching, and hyper linked access and retrieval according to several different viewing styles (e.g., plain ASCII text, interactive form, or HTML document). A data server or other provider will advertise its data collections and services with the Advertising Service. The advertisement will include a listing of all products (and other Earth Science Data Types) available in the collection and a set of product attributes. The Advertising Service database is replicated across the DAACs for easy access to the information. The COTS DBMS provides the replication functions. Advertisements include directory level metadata, therefore, the attributes reflected in the advertising service include the ECS Core Metadata Directory-Level attributes that apply to collections. The client will send user queries which access only directory level metadata directly to the advertising service (rather than sending it as a distributed query to the various sites which provided the advertising information).

10.2 IOS Test Cases

10.2.1 IOS Year 2000 Test (TS0388)

10.2.2.1 Test Description

This test will concentrate on trying to verify that the IOS servers are year 2000 compliant by running several test scenarios to ensure that the IOS servers such as Advertising can handle date transitions, leap years and non leap years. This test will cover the following:

Date transition from 1999/12/31 to 2000/01/01

Date transition from 2000/12/31 to 2001/01/01

Date Transition from 2009/12/31 to 2010/01/01

Leap Year 2000/02/29 to 2000/03/01

Non Leap Year 2001/02/28 to 2001/03/01

Date transition from 1999/12/31 to 2000/01/01: Date transition test that will verify the following servers can receive and process a search and order correctly by recognizing and handling century dates greater than 1999.

Date transition from 2000/12/31 to 2001/01/01: Date transition test that will verify the following servers can receive and process a search and order correctly by recognizing and handling the day greater than 365.

Date transition from 2009/12/31 to 2010/01/01: Date transition test that will verify the following servers can receive and process a search and order correctly by recognizing and handling decade dates greater than 2009.

Leap year from 2000/02/29 to 2000/03/01: Leap year test that will verify the following servers can receive and process a search and order correctly by recognizing and handling leap year dates greater than 02/29.

Non Leap year from 2001/02/28 to 2001/03/01: Non Leap year test that will verify the following servers can receive and process a search and order correctly by recognizing and handling non leap year dates greater than 02/28. The test input consists of Product Name, Provider ID, Version ID, Northern Latitude, Western Longitude, Southern Latitude, Eastern Longitude, Beginning Date, Ending Date, Instrument Name, Platform Name, Product URL, Product Revision Date, Valid For Another, Archive Center, Description, Related Services, and Comments to Moderator The test output consists of the listing of a data advertisement or service entry created. The servers behave normally (no catastrophic failure at date transition).

Success Criteria:

This test is considered successful if the tester is able to submit a request for the creation of an advertisement. The ESOD must accept the ACL and the password of the tester when attempting to perform the request. If an unauthorized user submits the request to delete an entry, an authorization error message is displayed.

L4 Requirements: S-IOS-00980

11. MSS TESTS

11.1 MSS Functionality

The System Management Subsystem (MSS) provides the management framework and enterprise management (network and system management) for all ECS resources: commercial hardware (including computers, peripherals, and network routing devices), commercial software, and custom applications. Enterprise management reduces overall development and equipment costs, improves operational robustness, and promotes compatibility with evolving industry and government standards. Consistent with current trends in industry, the MSS thus manages both ECS's network resources per ESN requirements and ECS's host/application resources per SMC requirements. Additionally MSS also supports many requirements allocated to SDPS and FOS for management data collection and analysis/distribution. The MSS allocates services to both the system-wide and local levels. With few exceptions, the management services are fully decentralized; no single point of failure exists which would preclude user access. In principle every service is distributed unless there is an overriding reason for it to be centralized. MSS has two key specializations: Enterprise Monitor and Coordination Services and Local System Management Services. The distribution of these services provides maximum flexibility and policy neutrality in the design and implementation of MSS services.

11.2 MSS Test Cases

11.2.1 User Account Registration (TC0069)

11.2.1.1 Test Description

The objective of this test is to successfully create, track, retrieve, update, and delete, User Registration Accounts under Year 2000 compliance scenarios. Tracking, retrieval, updating, and deletion of the user account profile is monitored for Date/Time/Day/Date performance under the various Y2K standard test scenarios.

Y2K test date input scenarios are:

December 31, 1999 – Date Transition scenario – from 1999/12/31 to 2000/01/01.

January 1, 2000 – Date Transition scenario – from 2000/12/31 to 2001/01/01.

February 29, 2000 – Leap Year scenario – from 2000/02/29 to 2000/03/01,

December 31, 2000 – Date transition scenario – from 2000/12/31 to 2001/01/01.

For output, the EOSDIS User Registration Submission Status Page is displayed with a successful confirmation message after each request entry.

Sequential verification of ECS user account data is displayed.

Success Criteria:

This test is considered successful if all user accounts are created, tracked, updated, retrieved and deleted successfully under theY2K compliance test scenarios. No abnormal system failures occur due to the use of Y2K dates throughout

L4 Requirements:

C-MSS-18500, C-MSS-36820, C-MSS-45330

11.2.2 Request Order Tracking (TC0070)

11.2.2.1 Test Description

This test verifies that the User Order Tracking services are in compliance with year 2000 standards. This test demonstrates tracking of user orders through the ECS Order Tracking system using the following Y2K date scenarios.

December 31, 1999 - Date transition scenario - from 1999/12/31 to 2000/01/01.
January 1, 2000 - Date transition scenario - from 2000/12/31 to 2001/01/01.
February 29, 2000 - Leap Year scenario - from 2000/02/29 to 2000/03/01,
December 31, 2000 - Date transition scenario - from 2000/12/31 to 2001/01/01.

Operator entries for orders in the Y2K compliant environment are the input to the test. The output consists of the following.

Displays a list of order IDs and associated information, such as home (location), DAAC, order date, order source, status and order size for orders that are queried and updated.

Deletes order IDs in the list that was deleted by request.

Displays a list of request IDs for an order and associated information, such as request ID, home (location), DAAC, # files, size, media, format, and status for order request IDs that are queried and updated.

Deletes order request IDs that were deleted by request..

Success Criteria:

This test is successful when orders and request IDs of orders are successfully queried, deleted, and updated in the Y2K environment.

No abnormal system failures are observed using the Y2K compliance standards.

L3/L4Requirements: C-MSS-18500, C-MSS-36820, C-MSS-45330

12. PDPS TESTS

12.1 PDPS Functionality

The Planning subsystem is responsible for supporting operation staff in managing the data production activities at a site. The Planning subsystem assists the operations staff in performing two major functions:

- Defining the data processing tasks to be performed at a site; and
- Generating efficient plans for the scheduling of those tasks.

In addition, the Planning subsystem is responsible for coordinating the production with the Data Server and Data Processing subsystems to achieve a highly automated production system.

The Data Processing Subsystem is the collection of hardware and software components that are responsible for the management of the data processing resources at a provider site. These management responsibilities can be divided into the following general functional areas:

- Managing the generation of Data Products and the operational environment used to produce these products.
- Providing an Algorithm Integration and Test Environment for the introduction of science software into the EOSDIS environment.
- Providing a Quality Assurance (QA) environment for testing the quality of data products.

12.2 PDPS Test Cases

12.2.1 Inspect PDPS Database and GUI's for Y2K Compliance (TS0491)

12.2.1.1 Test Description

This procedure inspects each PDPS GUI and the PDPS database to verify that a four-digit year field is used. The goal of this test procedure is to verify that all the PDPS GUIs that have date entry fields utilize a 4-digit field. The database fields that store dates will also be inspected for 4-digit year entries. Date entries to the GUI are the test input. Error messages and inspection of GUI date fields are the output. There may be an output file from the script that is being developed to help us verify the database date fields.

Success Criteria:

This test is considered successful if all the date fields in the GUIs require the user to enter a 4 digit year. The database date fields are all Y2K compliant (4 digit year at minimum).

L4 Requirements: S-DPS-26040, S-DPS-45010, S-PLS-03100

12.2.2 Pre-2000 Y2K Data Processing – ASTER Processing / QA Monitor (TS0492)

12.2.2.1 Test Description

This test case can be performed at any point in time. This tests the capability of the PDPS subsystems to create production requests, activate a plan, and process data over the special times. Inputs to the test include: insert data with special times. Create Production Requests for special times. Create and activate a plan processing data for special times. Process data and create output products for special times.

Production Requests will be created. Plans will be created and activated. Output products will be generated.

Success Criteria:

Production Requests can be created for data that starts on or spans special times. Plans can be activated for Production Requests that start on or span special times. PGEs can be executed that take in data that starts on or spans special times and can produce output for the same timeframe.

L4 Requirements: S-DPS-26040, S-DPS-45010, S-PLS-03100

12.2.3 Pre-2000 Y2K Data Processing – DPREP (TS0493)

12.2.3.1 Test Description

This test case can be performed at any point in time. This tests the capability of the PDPS subsystems to create production requests, activate a plan, and process data over the special times for the DPREP PGEs Test inputs include insert L0 data for special times. Create DPREP Production Requests for special times. Create and activate a plan processing data via DPREP for special times. Process data and create output products for special times.

Production Requests will be created. Plans will be created and activated. Output products will be generated.

Success Criteria:

Production Requests can be created for data that starts on or spans special times. Plans can be activated for Production Requests that start on or span special times. DPREP PGEs can be executed that take in data that starts on or spans special times and can produce output for the same timeframe.

L4 Requirements: S-DPS-26040, S-DPS-45010, S-PLS-03100

12.2.4 Pre-2000 Y2K Data Processing – Deletion Server / Ground Events (TS0494)

12.2.4.1 Test Description

This test case can be performed at any point in time. This tests the capability of the PDPS subsystems to create production requests, activate a plan, and process data over the special times. Ground Event creation for special times will also be tested. NOTE: These ground events will remain in the system for the subsequent test (TS0495).

Test inputs include Insert data for special times, Create ground events over special times. Create Production Requests for special times. Create and activate a plan processing data for special times. Process data and create output products for special times. Delete data for special times via Deletion Server.

Production Requests will be created. Plans will be created and activated. Output products will be generated.

Success Criteria:

Ground events can be created for special times. Deletion Server functions correctly for data granules which start on or span special times.

L4 Requirements: S-DPS-26040, S-DPS-45010, S-PLS-03100

12.2.5 2000+ Y2K Data Processing (TS0495)

11.2.5.1 Test Description

This test is designed to be run for each of the simulated time settings where we actually change the machine clocks to the special times.

This tests the capability of the PDPS subsystems to create production requests, activate a plan, and process data over the special times. Ground Events that have been previously created for special times will be verified.

Test inputs include Insert data. Create Production Requests for special times. Create and activate a plan. Process data and create output products.

Production Requests will be created. Plans will be created and activated. Output products will be generated and inserted to DSS. Ground Events will occur (created from a previous test case).

Success Criteria:

Ground events can occur for special times. PDPS can produce output products during special times. These output products will be archived in DSS.

L4 Requirements: S-DPS-26040, S-DPS-45010, S-PLS-03100

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13. ECS Applications Used to Demonstrate Y2K Compliance

The ECS system will be used to support the AM-1 and Landsat-7 missions in the Year 2000 time-frame. Y2K compliance will be tested using test procedures obtained from AM-1 MODIS, AM-1 ASTER, and Landsat-7 acceptance test scenarios.

13.1 AM-1 Support

Drop 4 of the ECS system provides an end-to-end system that incorporates features specified in the ECS F&PRS needed to meet AM-1 mission requirements. The AM-1 mission requirements, whose implementation are verified during acceptance testing, relate in a significant way to flight operations at the EOC and instrument data operations at the DAACs.

Drop 4 support includes the processing and distribution of instrument data from a complement of five AM-1 instruments. These instruments are Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER); Clouds and Earth's Radiant Energy System (CERES); Multi-Imaging SpectroRadiometer (MISR); Moderate-Resolution Imaging SpectroRadiometer (MODIS); and Measurements Of Pollution In The Troposphere (MOPITT). ASTER and MODIS test scenarios will be used to verify Y2K compliance.

13.2 ASTER Test Scenarios

The ASTER test scenario includes the verification of data and information management interfaces to support the processing of ASTER instrument data. This includes the receipt of ASTER level-1 data on magnetic tape at EDC, the production and distribution of level-2 products by EDC, and the receipt of level-2&3 data via communication lines at other DAACs from the ASTER GDS.

The following test procedures will make use of five ASTER data sets to verify that the ECS system is year 2000 compliant. This will be done by exercising the test scenarios to demonstrate proper operation during certain date transitions, leap years and non leap years. The test procedures within each scenario will verify proper system operation under date transition from: 1999/12/31 to 2000/01/01; 2000/12/31 to 2001/01/01; 2009/12/31 to 2010/01/01; leap year 2000/02/29 to 2000/03/01; and non leap year 2001/02/28 to 2001/03/01.

13.2.1 ASTER DAR Production Planning (B120330-010$E)

13.2.1.1 Test Description

The ASTER DAR Production Planning test case verifies that the EDC DAAC develops the plans and schedules and coordinates input data needs for generating the AST09 product specified in the DAR. Routine processing is periodic and dependent upon the arrival of data. The production plan will be created so that processing takes place only when new data arrives.

Success Criteria:

Test success criteria are defined in Tables 4-1 through 4-4 of this document.

L3/L4 Requirements: List requirement numbers

13.2.2 ASTER DAR Data Ingest and Archiving (B120330-020$E)

13.2.2.1 Test Description

The ASTER DAR Data Ingest and Archiving test case verifies that the EDC ECS DAAC ingests and archives ASTER Level 1 data that includes the DAR observation, browse data, and associated metadata. This test case also verifies that the EDC ECS DAAC ingests and archives ancillary data.

This test procedure will also show that the system can: support expedited data access to AM-1 data types (feature 100); ingest ASTER L1A and L1B data from D3 tape (feature 240); ingest ASTER DEM data (feature 330); ingest EDC produced 100M DEM data from D3 tape (feature 340); and that ingested data are catalogued and archived so that they can be located and retrieved from production and distribution (feature 850)

Success Criteria:

Test success criteria are defined in Tables 4-1 through 4-4 of this document.

L3/L4 Requirements: List requirement numbers

13.2.3 ASTER DAR Product Generation and Archiving(B120330∞ 040$E)

13.2.3.1 Test Description

The ASTER DAR Product Generation and Archiving test case verifies that the EDC DAAC generates and archives ASTER products, including the AST09 product requested by the DAR originator. The Production Request Editor periodically looks for any new data that is ingested within the time range specified in the Prodution Plan (B120330.010$E).

This test will demonstrate that the system can use the runtime parameter flag production rule (feature 600) and that the output of one PGE can be used as the input of another PGE (feature 450).

Success Criteria:

Test success criteria are defined in Tables 4-1 through 4-4 of this document.

L3/L4 Requirements: List requirement numbers

13.2.4 ASTER Ad-hoc Reprocessing(B120330-060$E)

13.2.4.1 Test Description

The ASTER Ad-hoc Reprocessing test case verifies that the EDC ECS DAAC reprocesses and archives the ASTER products that were produced in the ASTER Production Generation and Archiving test case (B120330.040$E). This test assumes that an interruption in production occurred. The objective is to reprocess one DPR from each PGE and ensure that the results are the same. The Production Plan will be updated to reflect the reprocessing status of the DPRs that were previously been activated for processing.

This test procedure will also show that the system can: support ad-hoc reprocessing (feature 730); replanning and plan reactivation (feature 740); and data versioning (feature 810).

Success Criteria:

Test success criteria are defined in Tables 4-1 through 4-4 of this document.

L3/L4 Requirements: List requirement numbers

13.3 MODIS Test Scenarios

The MODIS test scenario includes the verification of data and information management interfaces to support the processing of MODIS instrument data. This includes the receipt of MODIS level-0 data; production, archive and distribution of levels 1A, 1B & 2 data; and production and distribution of level 1 & 4 data by GSFC. It includes the ingest of levels 2-4; and the production, archive, and distribution of level 3 data by EDC.

The following test procedures will make use of five MODIS data sets to verify that the ECS system is year 2000 compliant. This will be done by exercising the test scenarios to demonstrate proper operation during certain date transitions, leap years and non leap years. The test procedures within each scenario will verify proper system operation under date transition from: 1999/12/31 to 2000/01/01; 2000/12/31 to 2001/01/01; 2009/12/31 to 2010/01/01; leap year 2000/02/29 to 2000/03/01; and non leap year 2001/02/28 to 2001/03/01.

13.3.1 MODIS Production Planning (B120440-010$G)

13.3.1.1 Test Description

The MODIS Production Planning test procedure verifies that the ECS develops the plans and schedules and coordinates input data needs for generating MODIS Cloud Mask products at the GSFC ECS DAAC. This test procedure schedules a full days worth of input Level 0 data from EDOS, which will be used to create the MODIS Cloud Mask products.

This test procedure will also show that: the insertion of data into the archive can cause the automatic scheduling of a PGE (feature 430). The system can support the Advanced Temporal production rule (feature 470). The system can support the Alternate inputs (including timers and

use of ancillary data) production rule (feature 500) The system can support accessing 0 to 233 orbit number (feature 630); and show the capability to generate plans that contain ground event jobs (feature 820)

Success Criteria:

Test success criteria are defined in Tables 4-1 through 4-4 of this document.

L3/L4 Requirements: List requirement numbers

13.3.2 MODIS Daily Product Generation and Archiving at the GSFC DAAC (B120440-040$G)

13.3.2.1 Test Description

The MODIS Daily Product Generation and Archiving at the GSFC DAAC test case verifies that the GSFC ECS DAAC generates and archives MODIS Cloud Mask products. Chaining PGE01, PGE02 and PGE03 creates the Cloud Mask products.

This test procedure processes the Level 0 data that is received from EDOS and creates Level 1A MODIS products (PGE01). This Level 1A data is then used as input to the production of Level 1B MODIS products (PGE02). These products, in addition to several static and ancillary files are used as input for generating MODIS Cloud Mask products (PGE03) at the GSFC ECS DAAC.

Success Criteria:

Test success criteria are defined in Tables 4-1 through 4-4 of this document.

L3/L4 Requirements: List requirement numbers

13.3.3 MODIS Product Distribution(B120440-070$G)

13.3.3.1 Test Description

The MODIS Product Distribution test case verifies that the ECS processes user requests for MODIS products and distributes the products requested. In this test case, the user already knows which products he/she desires to receive.

This test procedure will also show that the system can: support SCF interfaces (feature 200); distribute data in response to a subscription order electronically via FTP (feature 960); distribute data in response to a client order electronically via FTP (feature 970); and recover queued and in progress orders after failures in DDIST, SDSRV, and STMGT (feature 1530).

Success Criteria:

Test success criteria are defined in Tables 4-1 through 4-4 of this document.

L3/L4 Requirements: List requirement numbers

13.3.4 MODIS Ad-hoc Reprocessing (B120440-080$G)

13.3.4.1 Test Description

The MODIS Ad-hoc Reprocessing test case verifies that the GSFC ECS DAAC reprocesses and archives the MODIS products that were produced in the MODIS Production Generation and Archiving test case (B120440.040$G). The purpose of this test is to reprocess a DPR without affecting previously processed jobs. This test assumes that an interruption in production occurred. The objective is to reprocess one DPR from each PGE and ensure that the results are the same. The Production Plan will be updated to reflect the reprocessing status of the DPRs that were previously been activated for processing.

This test procedure will also show that the system can support: ad-hoc reprocessing (feature 730); replanning and plan reactivation (feature 740); and data versioning (feature 810)

Success Criteria:

Test success criteria are defined in Tables 4-1 through 4-4 of this document.

L3/L4 Requirements: List requirement numbers

13.3.5. High Data Rate Ingest and Archiving at GSFC DAAC (B120810-010$G)

13.3.5.1 Test Description

The High Data Rate Ingest and Archiving at GSFC DAAC test case verifies ECS ingest, archiving and performance requirements. This test will show the capability to concurrently ingest MODIS L0 data from EDOS, Attitude data from FDD and NOAA ancillary data from the GDAAC Data Link Server.

This test procedure will also show that the system can support: expedited data access to AM-1 data types (feature 100); ingest of AM-1 Level 0 data from EDOS (feature 230); ingest AM-1 ephemeris data (feature 280); ingest FDD Orbit/Attitude data (feature 290); concurrently ingest data from multiple sources (feature 360); and concurrent ingest of multiple granules from a single source (feature 370).

Success Criteria:

Test success criteria are defined in Tables 4-1 through 4-4 of this document.

L3/L4 Requirements: List requirement numbers

13.4 Landsat-7 Support

Landsat-7 scenario testing includes the verification of ECS interfaces with elements of the Landsat-7 ground support system needed for data operations. The ECS interfaces with the Landsat-7 system elements include the Mission Management Office (MMO), International Ground Stations

(IGS), and the Ground Data Processing System (GDPS). The GDPS, in turn, is composed of the Landsat-7 Processing System (LPS) and the Image Assessment System (IAS). The ECS interfaces are those needed for: the receipt of product cost information and exchange of registration service and system management status from the MMO; the receipt of inventory and browse data from the IGS; the receipt and storage of Landsat-7 level-0R data (view-able image data with radiometric and geometric information appended but not applied), and metadata and browse data from the LPS; and the receipt of calibration data and metadata from the IAS. Interfaces needed for data search, order and distribution services to Landsat-7 data users are tested as part of Drop 4.

13.5 Landsat-7 Test Scenarios

The following test procedures will make use of five Landsat-7 data sets to verify that the ECS system is year 2000 compliant. This will be done by exercising the test scenarios to demonstrate proper operation during certain date transitions, leap years and non leap years.

The test procedures within each scenario will verify proper system operation under date transitions from: 1999/12/31 to 2000/01/01; 2000/12/31 to 2001/01/01; 2009/12/31 to 2010/01/01; leap year 2000/02/29 to 2000/03/01; and non leap year 2001/02/28 to 2001/03/01.

13.5.1 LPS and IGS Data Ingest and Archiving (B120650-010$E)

13.5.1.1 Test Description

The LPS and IGS Data Ingest and Archiving test case verifies that the EDC ESC DAAC ingests and archives Landsat 7 Level 0R data and associated metadata and browse data received from the LPS as well as inventory information and browse data received from IGSs. This test procedure will also show that the system can: support the LPS interface protocol (feature 60); ingest Landsat-7 L0R data (feature 250); and show that ingested data are catalogued and archived so that they can be retrieved for production and distribution (feature 850).

Success Criteria:

Test success criteria are defined in Tables 4-1 through 4-4 of this document.

L3/L4 Requirements: List requirement numbers

13.5.2 ECS Interfaces with MOC and IAS (B120650-020$E)

13.5.2.1 Test Description

The ECS Interfaces with MOC and IAS test case verifies that the ECS provides the IAS with Level 0R data, and ingests and archives calibration information received from the IAS. This test procedure will also show that the system can: support the IAS interface protocols (feature 70); support the Landsat 7 MOC interface protocols for cloud cover data (feature 80); ingest data following EOSDIS data standards using polling with delivery record (feature 220); ingest IAS calibration parameter files (feature 260); and show that ingested data are catalogued and archived so that they can be located and retrieved for production and distribution (feature 850).

Success Criteria:

Test success criteria are defined in Tables 4-1 through 4-4 of this document.

L3/L4 Requirements: List requirement numbers

13.5.3 ECS User Access to Landsat 7 Information and Products (B120650-030$E)

13.5.3.1 Test Description

The ECS User Access to Landsat 7 Information and Products test case verifies that the ECS processes user requests for Landsat 7 products and information and distributes the products and information requested.

This test procedure will also show that the system can: distribute data in response to subscription order via 8mm and 4mm tape (feature980); distribute CPF data with L7 scene orders (feature 1040); reformat L7 data for distribution (feature 1050); support distribution of cloud cover data to the L7 MOC (feature 1060); support scheduling and management of physical media devices used by ingest and data distribution (feature 1450); and show that the system supports user orders for Landsat-7 scene data, which is generated on-the-fly using subsetting services, including mirror-scan correction data, calibration data, and CPF data (feature 1030).

Success Criteria: Test success criteria are defined in Tables 4-1 through 4-4 of this document.

L3/L4 Requirements: List requirement numbers

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Appendix A. Acronyms≠

ASF	University of Alaska Synthetic Aperture Radar (SAR) Facility
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
AT	Acceptance Test
CCB	Configuration Control Board
CERES	Clouds and Earth's Radiant Energy
CI	Configuration Item
CLS	Client System
CM	Configuration Management
COTR	Contract Officer Technical Representative
COTS	Commercial Off-the-Shelf
CSMS	Communications and Systems Management Segment
CSS	Communications subsystem
DAACs	Distributed Active Archive Centers
DCN	Document Change Notice
DMS	Data Management System
DSS	Data Storage System
EBNet	EOSDIS Backbone Network
ECS	EOSDIS Core System
EDC	Earth Resources Observation Systems (EROS) Data Center
EDF	ECS Development Facility
EDHS	ECS Data Handling System
EDOS	EOS Data and Operations System
EOC	EOS Operations Center
EOS	Earth Observing System
EOSDIS	Earth Observing System (EOS) Data and Information System (DIS)

EROS	Earth Resources Observation Systems
ESDIS	Earth Science Data and Information System
ESN	EOSDIS Science Network
FDDI	Fiber-optic Distributed Data Interface
FOS	Flight Operations Segment
GPS	Global Positioning System
GSFC	Goddard Space Flight Center
GUI	Graphical User Interface
HDF	Hierarchical Data Format
HP	Hewlett Packard
HTML	Hypertext Markup Language
HW	Hardware
ICD	Interface Control Document
ING	Ingest
IOS	Inter-operability System
IV&V	Independent Verification and Validation
JPL	Jet Propulsion Laboratory
LAN	Local Area Network
LaRC	Langley Research Center
M&O	Maintenance and Operations
MISR	Multi-Imaging SpectroRadiometer
MODIS	Moderate-Resolution Imaging SpectroRadiometer
MOPITT	Measurements Of Pollution In The Troposphere
MSS	Management Subsystem
NA	Network Administrator
NASA	National Aeronautics and Space Administration
NCR	Non-conformance Report

NSIDC	University of Colorado, National Snow and Ice Data Center
PDPS	Planning and Data Processing System
PGE	Product Generation Executable
QO	Quality Office
RAID	Redundant Array of Independent Disks
RTM	Requirements and Tracebility Management
SA	System Administrator
SI&T	System Integration and Test
SDPS	Science Data Processing Segment
SMC	System Monitoring and Coordination Center
SOW	Statement of Work
SV	System Verification
SVAT	System Verification and Acceptance Test Organization
SW	Software
UTC	Universal Time Code
VATC	Verification and Test Center
Y2K	Year 2000

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Appendix B. ECS Y2K Requirement Traceability

PARAGRAPH ID	VERIFICATION METHOD	TEXT	TEST ID
C-CSS-10900	test/demo	The CSS DCCI shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TC0235
C-CSS-20160	test/demo	The Directory Service shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TC0204
C-CSS-21235	test/demo	The Security Service shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TC0276
C-CSS-22220	test/demo	The Message Service shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TC0231
C-CSS-23010	test/demo	The Event Service shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TC0291 TC0294
C-CSS-25185	test/demo	The Time Service shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TC0207 TC0208 TC0209
C-CSS-26100	test/demo	The Thread Service shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TC0276

PARAGRAPH ID	VERIFICATION METHOD	TEXT	TEST ID
C-CSS-28100	test/demo	The Event Logger Service shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TC0291 TC0294
C-CSS-40430	test/demo	The Subscription Service shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	B100250.020 TC0256 TC0291 TC0294
C-CSS-60950	test/demo	The File Access Service shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TC0240
C-CSS-61860	test/demo	The Electronic Mail Service shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TC0231
C-CSS-62850	test/demo	The Bulletin Board Service shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TC0235
C-ISS-21210	test/demo	The ISS-INCI shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year..	TC0291 TC0294
C-MSS-18500	test/demo	The MSS-MCI shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TC0069 TC0070
C-MSS-36820	test/demo	The MSS-MACI shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TC0069 TC0070

PARAGRAPH ID	VERIFICATION METHOD	TEXT	TEST ID
C-MSS-45330	test/demo	The MSS-MLCI shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TC0069 TC0070
S-CLS-01800	test/demo	The DESKT CI shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	B100250.070 B100110.010 B100170.120
S-CLS-18105	test/demo	The WKBCH CI shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	B100250.070 B100110.010 B100170.120 B100120.120
S-DMS-02010	test/demo	The LIMGR CI shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TS0387
S-DMS-11100	test/demo	The DIMGR CI shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TS0387
S-DMS-23940	test/demo	The DDICT CI shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TS0387
S-DMS-33140	test/demo	The GTWAY CI shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TS0387
S-DPS-26040	test/demo	The PRONG CI shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TS0491 TS0492 TS0493 TS0494 TS0495

PARAGRAPH ID	VERIFICATION METHOD	TEXT	TEST ID
S-DPS-45010	test/demo	The AITTL CI shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TS0491 TS0492 TS0493 TS0494 TS0495
S-DSS-05865	test/demo	The SDSRV CI shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TS0815.1 TS0815.2 TS0815.3
S-DSS-22120	test/demo	The STMGT CI shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TS0815.1 TS0815.2 TS0815.3
S-DSS-30720	test/demo	The DDIST CI shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TS0815.1 TS0815.2 TS0815.3
S-INS-03370	test/demo	The INGST CI shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TS0655.1 TS0655.2 TS0655.3
S-IOS-00980	test/demo	The ADSRV CI shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TS0388
S-PLS-03100	test/demo	The PLANG CI shall ensure that the following calendar transitions are handled completely and accurately: a. New Year b. New Decade c. New Century d. Leap Year.	TS0491 TS0492 TS0493 TS0494 TS0495

Appendix C. Time shift test dates for Y2k time shift testing

Tests			RISK LEVEL		
Date(s)	Day of Week	Purpose	Low	Medium	High
01/01/1999	Friday	Tests "99" Character Strings	*	*	*
04/09/1999	Friday	Tests "99" Character Strings	*	*	*
09/09/1999	Thursday	Tests Programmers Default Date	*	*	*
12/31/1999	Friday	Tests "99" Character Strings	*	*	*
12/31/1999>01/01/2000	Friday>Saturday	Y2K rollover- note 01/01/1900 was a Monday	Required***	Required***	Required
01/01/2000>01/02/2000	Saturday>Sunday	Y2K – note 01/02/1900 was a Tuesday	Optional	Optional	Optional
02/28/2000>02/29/2000	Monday>Tuesday	Tests Leap Year	Required	Required	Required
02/29/2000>03/01/2000	Tuesday>Wednesday	Tests Leap Year	Optional	Optional	Recommended
Day 365 > 366 (Y2000)	Saturday>Sunday	Julian Day rollover - Leap Year Test	Required**	Required**	Required**
Year 2000, Day 366 > Year 2001, Day 001	Sunday>Monday	Julian Day rollover - Leap Year Test	Optional**	Optional**	Recommended**
02/28/2004>02/29/2004	Saturday>Sunday	Tests Leap Year	Optional	Optional	Optional
02/29/2004>03/01/2004	Sunday>Monday	Tests Leap Year	Optional	Optional	Optional
Critical Business Dates	System Dependant	Boundary testing around Date	Recommended	Recommended	Required
Window Dates	System Dependant	Tests Window Boundaries and Backward Time Test****	Recommended	Recommended	Required
Random Dates in Year 2000	Varies	Regression test to ensure system works for various dates in the year 2000	Required	Required	Required

Legend

The ">" represents a rollover of the system clock(s) from the first date to the second date.

Critical Business dates for accounting systems examples: Fiscal year rollover, quarterly dates, and year end dates. For non-business systems, dates are those which trigger periodic system processes such as backup or purge dates, or planning and scheduling processes. Fiscal year end processes need to tested using 09/10/1999>10/01/2000 to ensure that the fiscal year changes to 2000.

* Strongly recommended for business systems, e.g., payroll, human resources, financial tracking, and those using COBOL. Optional for other systems.

** Requirements apply to systems using Julian Dates only. Requirements do not apply to other systems.

*** Low and medium risk inventory items that opt to power down during the January 1, 2000 rollover and required to test the 12/31/1999>01/01/2000 date. These inventory items must, at a minimum, conduct time shift testing for random dates in the year 2000 to ensure general functionality is validated.

**** Backward Time Test (for window dates) ensures that the 20th century data is accessible when system clocks are set to the 21st century.

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