ACCEPTANCE TEST PROCEDURE FOR TCAS 3000

Aviation Communication and Surveillance Systems

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Record of Revisions

Rev	Date	Authorization	Description of Change
-	6/01/05	ECR008688	Initial Release.
A	9/15/05	ECR008943	Added Tests
B	10/14/05	ECR009052	Added Tests
C	12/15/05	ECR009153	Added Tests
D	2/01/06	ECR009305	New RF FPGA

Table of Contents

1   <u>INTRODUCTION</u>

This document is the Acceptance Test Procedure for the TCAS 3000 Computer Unit.

1.1   **Purpose**

- ▪ To provide instruction on the loading of embedded Hardware Test Software (HTS).

- ▪ To provide instruction on the execution of a TCAS 3000 Final Acceptance Test utilizing automated test equipment with embedded test software (HTS).

- ▪ To provide instruction on the loading of Operational Flight Software and testing after Operational Flight Software has been loaded.

- ▪ To provide instruction on the downloading and clearing of the Maintenance (BITE) Fault Log.

1.2   **Scope**

This Acceptance Test Procedure specification (ATP) establishes the manufacturing and operational requirements that the TCAS 3000 Computer Unit, Part Numbers 9003000-55001, 9003000-65001, and 9003000-10001 must meet to ensure that the unit is in proper operating condition.

1.3   **References**

Document No.	Description	Revision
8002216-001	TCAS 3000 Test Requirements Document	C (or subsequent)
EB7517947	Using JCAIR TCAS Simulation Panel	F (or subsequent)
8005745-001	WebEDDIT Tool User Guide	- (or subsequent)

1.4   **Definitions**

1.4.1   **Acronyms and Abbreviations**

Acronym	**Definition**
ACSS	Aviation Communication and Surveillance Systems
AIU	Aircraft Interface Unit
CCP	Common Computing Platform
FPGA	Field Programmable Gate Array
HTS	Hardware Test Software
LRU	Line Replaceable Unit
MTS	Manufacturing Test Station
RFIU	RF Interface Unit
SDRAM	Synchronous Dynamic Random Access Memory
TCAS	Traffic Collision Avoidance System
TRD	Test Requirements Document
UUT	Unit Under Test

2   SYSTEM OVERVIEW

The TCAS 3000 Acceptance Test is a fully automated end item test that is performed using the ACSS TCAS MTS (Part No. T336255). At the MTS level of testing, there are two primary types of software utilized. The first type of software is the HTS program which is loaded into the FLASH memory of the UUT and then executes within the UUT's SDRAM. The second type of software is the MTS program that executes on the MTS PC.

The HTS program receives high level commands from the MTS program via an RS232 interface. It executes commands and returns a response. The responses returned from HTS may range from acknowledgement of receipt of a command to returning data and/or status of a test that was performed by the embedded software.

The MTS program is comprised of a Test Executive, Instrument Drivers, and Test Functions. The Test Executive, which provides an operator interface, directs test sequencing, determines pass/fail status and enables test report generation. The Instrument Drivers communicate with and control the MTS test equipment via an IEEE488 interface and PCI bus for the PC based instruments. The Test Functions perform the individual tests that comprise a TCAS 3000 Acceptance Test and are described in the TCAS 3000 Test Requirements Document (TRD).

3   GENERAL INFORMATION

3.1   General Requirements

The following conditions are recommended for performance of a TCAS 3000 Acceptance Test:

- Temperature = 25 ± 5 ⁰C

- Relative humidity = 95% maximum

- Pressure = between 20 and 32 in Hg

- Power to the UUT should be removed before attaching or removing any interconnecting systems.

3.2   General RF Test Requirements

- All antenna ports must be terminated in 50 ohms while power is applied to the UUT.

- Any additional test equipment that may be connected to the antenna ports must have a voltage standing wave ratio (VSWR) of less than 1.5:1.

- Any additional test equipment that may be connected to the antenna ports shall withstand peak power levels of at least 1000 W and average power levels of at least 2 W.

3.3   Power Requirements

- 115 Vac, 60 Hz, 20 A standard service power for test equipment operation. All power supplied to the UUT is provided by the test equipment via software controlled rack mounted power supplies.

4   TEST EQUIPMENT REQUIREMENTS

4.1   Test Equipment Hardware

The test equipment hardware that is required to perform a TCAS 3000 End Item Acceptance Test is as follows:

- TCAS MTS, Part No. T336255 (Mod D or subsequent)

    T336255 contains the following assemblies which may be referenced in this document:

    - Aircraft interface unit (AIU) : Part No. T336253
    - RF interface unit (RIU) : Part No. T336254
    - PDL panel : Part No. T336259
    - Tray assembly : Part No. T336255-26

4.2   Test Equipment Software

- TCAS 3000 PC Test Software - P/N 9000469-001. This program executes on the MTS test PC and automates the tests that are defined in the TCAS 3000 TRD.

- Hardware Test Software (HTS) - This program executes within UUT memory and responds to commands sent by the TCAS 3000 PC Test Software. Refer to the *"Initial Test Configuration Software Loading"* section in Appendix A of this document for the Master Media Part Number.

4.3   Test Equipment / UUT Interconnect

Figure 1 shows a general interconnect between the MTS test equipment and the UUT for performing an Acceptance test. Not shown in this figure are the Data Acquisition Unit DMM and switching matrices. Refer to drawing no. T336255 for detailed interconnections between the test equipment.

Note: This setup shows power connections to a UUT that can accept both AC and DC input power.
For a DC only UUT, only DC is provided.

Figure 1. General MTS / UUT Setup
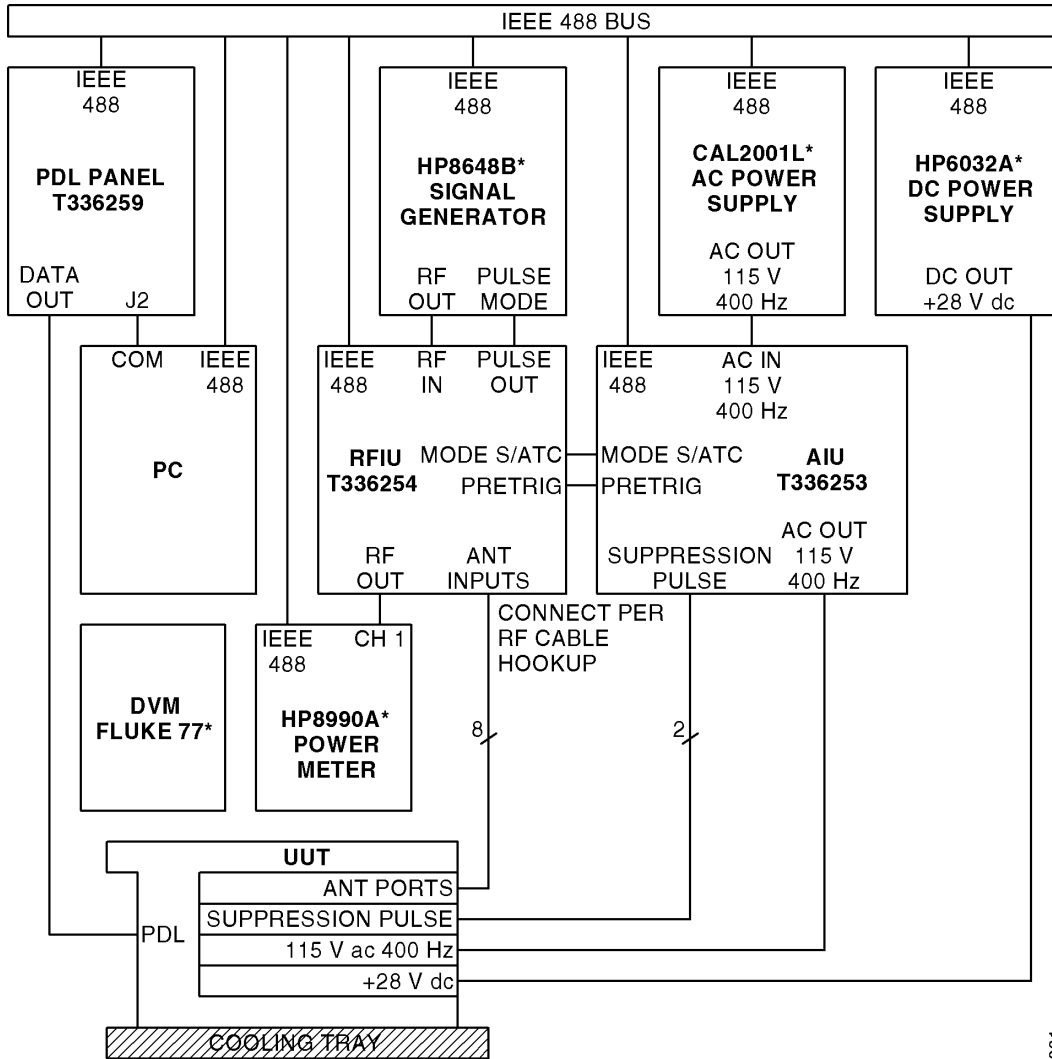
* Or equivalent

NOTE:
DVM used for troubleshooting only.

ID-8002029-001

5   MTS END ITEM TEST

At the MTS test phase, the TCAS 3000 Computer Unit shall be tested using product test software (HTS) that is specified in Appendix A of this document.

5.1   ATP / MTS Test Software Synchronization

Note: If this is the first time that the current revision of this document is used at the MTS, the test software must be synchronized with this revision of ATP.

Step 1. Refer to the *"Synchronization Between ATP / Test Software"* section in Appendix A of this document if needed.

5.2   UUT Alignment / Calibration

Note: This does not apply to units that have been tested previously (unless new alignment or calibration is desired).

Step 1. For units in initial manufacturing build and test only, perform the *"TCAS 3000 Manual Alignment Procedure"* described in Appendix B of the TCAS 3000 TRD (8002216-001).

Step 2. Refer to the *"Initial Test Configuration Software Loading"* section in Appendix A of this document prior to performing an Auto Calibration on the MTS.

Step 3. For units in initial manufacturing build and test only, perform the *"TCAS 3000 Automatic Calibration Procedure"* described in Appendix C of the TCAS 3000 TRD (8002216-001).

5.3   Loading of Embedded Test Software

Note: This does not apply to units that have already been loaded with the correct test software prior to performing an Auto Calibration on the MTS.

Loading of all images except for HTS must be performed using an emulator. Loading of HTS may be performed using an emulator or compact flash after all other images are present.

5.3.1   Emulator Loading

Step 1. Refer to the *"Initial Test Configuration Software Loading"* section in Appendix A of this document if needed.

5.4   MTS End Item Test Initialization

5.4.1   Test Setup

Step 1. Verify that the MTS test equipment is connected per Dwg No. T336255 and that it is calibrated.

Step 2. Power up the ACSS TCAS MTS and allow it to warm up for at least 30 minutes. Verify that all IEEE488 test equipment has the correct addresses per Dwg No. T336255 and that all of the test equipment is functioning properly.

Step 3. Insert the UUT into MTS UUT mount.

Step 4. Connect the MTS W1 PDL cable (P/N T336259) to the UUT PDL front panel connector.

Step 5.   Launch the Test Software by double clicking on the Desk-Top Icon labeled "9000469"

Step 6.   Log in with employee number and password.

Step 7.   Go to File, Select, Open.

Step 8.   Select one of the following sequence files:

Sequence	Description
9000469_Pre.squ	Sequence that utilizes Pre Test Limits
9000469_Mfg.squ	Sequence that utilizes Manufacturing Limits
9000469_Opr.squ	Sequence that utilizes Operational Limits

5.4.2 Compact Flash Loading Of HTS

Step 1.   If HTS has already been loaded into the UUT, then proceed to the "MTS End Item Test Execution" section.

Step 2.   Refer to the *"Initial Test Configuration Software Loading"* section in Appendix A of this document to obtain the latest version of the HTS software on compact flash. Insert the HTS compact flash card into the UUT's compact flash receiver.

Step 3.   Apply power to the UUT by clicking on the "DC Pwr" LED on the operator interface so that it illuminates.

Step 4.   The HTS program will automatically be loaded. This process should take approximately 1-3 minutes. The "XFER IN PROCESS" LED on the UUT front panel should begin flashing as data is being read from the compact flash card.

Step 5.   Wait until the "C/F LOAD STATUS" LED becomes illuminated a static (non-flashing) green. This is an indication that HTS has been successfully programmed into UUT flash.

Step 6.   Remove the HTS compact flash card from the UUT.

Step 7.   Remove power from the UUT by again clicking on the "DC Pwr" LED on the operator interface so that it is no longer illuminated.

5.5   MTS End Item Test Execution

 Note: If Operational Flight Software is to be loaded at the end of testing, refer to the *"Final Configuration Software Loading And Verification"* section of Appendix A of this document to obtain the correct Master Media copy.

Step 1.   From the test program's operator interface, Click on one of the following:

[Single Pass] : (Automatically power down after executing sequence)
[Test UUT]   : (Prompt operator for power down after executing sequence)

Step 2.   Enter all UUT information when prompted.

Step 3.   Select the UUT Part number from Menu selection.

Step 4.   Select one of the following Test Type: Pre Test or Final Test

Step 5.   Enter Employee number.

Step 6.   Upon Clicking on OK, automatic testing will commence.

Step 7.   Respond to all prompts and instructions that the test program may display during test execution.

Step 8.   At the completion of all tests, the operator will be asked if the UUT should be loaded with Operational Flight Software. If the Response is "YES", the operator will be

prompted to insert the correct compact flash card and loading will commence. At the completion of loading, the Software part numbers and CRCs will automatically be verified with the information that appears in Appendix A of this document.

Step 9. A test report text file will be generated at the end of test. The test report may be viewed and/or printed out at the end of the test sequence.

Step 10. Verify that all tests have passed.

Step 11. Remove the UUT from the MTS UUT mount after the UUT has been powered down.

Note: For test methodology and pass/fail criteria, refer to Appendix B of this document for the cross reference between the Final Test Report and TRD (Doc. No. 8002216-001).

6   BITE LOG FAULT CLEARING

This procedure describes the general steps required to dump and clear the UUT's BITE Fault log from any accumulated errors.

Note: The actual screen names and buttons that appear in the WebEDDIT application may not exactly match the text in the following procedure due to later revisions of the application. Therefore, this procedure is to be utilized as a guide in conjunction with the latest revision of the WebEDDIT Tool User Guide (8005745-001).

Step 1. At this stage, the UUT should contain Operational Flight Software. If it does not contain Operational Flight Software, load all of the correct images before proceeding.

Step 2. Attach the UUT to the SIMPAN (TCAS Simulation Panel) station holding fixture and connect the SIMPAN PDL cable to the UUT PDL connector for RS232 communications.

Step 3. Refer to EB7517947 and setup the SIMPAN as described in the *TCAS Simulation Front Panel Initial Setup* section.

Step 4. On the SIMPAN panel, set the 'Gear' switch to 'down' and the three 'Air' switches to 'Gnd'.

Step 5. Switch the MODE S control panel to 'STBY'.

Step 6. The required TCAS 3000 input power is +28 (±1 VDC), 10A. Perform the power up sequence per the *Test Setup* section in EB7517947.

Step 7. From the PC Desk Top, launch the WebEDDIT application by double clicking on the WebEDDIT.exe icon.

Step 8. When prompted to connect to CCP, select 'YES'. The 'active' LED at the bottom of the screen will become illuminated when an RS232 connection has been established.

Step 9. From the WebEDDIT GUI menu bar, select Target➔CCP Maintenance Interface. This will bring up the 'Common Computing Platform Maintenance Interface Function' screen.

Step 10. From the 'Common Computing Platform Maintenance Interface Function' screen, select 'Fault Logs and Event Logs'. This will bring up the 'CCP Logs' screen.

Step 11. From the 'CCP Logs' screen, select 'Dump BITE FAULT LOG' to dump all stored faults. Follow instructions when prompted and refer to the WebEDDIT Tool User Guide (8005745-001) for option details.

Step 12. Open the 'ccp_mifa_dump_fault_log_xxx.htm' file (where xxx is variable that changes for each dump). Make note of any faults that may have been logged.

Step 13.   After dumping the BITE Fault Log, return to the 'CCP Logs' screen and then select 'Clear BITE FAULT LOG'. The UUT will be reset and RS232 communications will be disconnected when this occurs.

Step 14.   Allow the tool to automatically re-establish an RS232 connection or refer to WebEDDIT Tool User Guide if the tool is unable to re-connect.

Step 15.   When RS232 communication has been re-established, return to the 'CCP Logs' screen.

Step 16.   Select 'Dump BITE FAULT LOG' and verify that any stored faults that should have been cleared are no longer present.

> **Note:** Several faults may be logged due to **known** missing stimuli. Make note of any faults that should **not** be present.

Step 17.   Exit the WebEDDIT application and power off the UUT. Disconnect the PDL cable from the UUT

7   SIMPAN END ITEM TEST

In this phase, the TCAS 3000 Computer Unit shall be tested at the SIMPAN (TCAS Simulation Panel) using Operational Flight Software that is specified in Appendix A of this document. The Operational Flight Software should have been loaded into the UUT at the completion of an MTS End Item Test prior to performing this test.

Step 1.   The *BITE LOG FAULT CLEARING* procedure (previous section) must be performed prior to performing a SIMPAN End Item Test. This will clear any faults that were logged at the MTS during loading and verification of Operational Flight Software.

Step 2.   Perform the procedure specified in *Using JCAIR TCAS Simulation Panel Test Fixture* (Doc. No. EB7517947).

APPENDIX A

Software / Firmware Configuration

1 INTRODUCTION

This Appendix provides the TCAS 3000 Production End Item Test and Operational Software/Firmware Configuration Tables.

1.1 Purpose

- To provide instruction on the loading of images prior to End Item Testing.

- To provide instruction on the loading of Operational Flight Software prior to shipment of the product.

2 SOFTWARE / FIRMWARE CONFIGURATION AND VERIFICATION

2.1 Initial Test Configuration Software Loading

Prior to performing an MTS Auto Calibration or an MTS End Item Test, the following images must be loaded into the UUT.

Step 1.   Obtain the Master Media (CD) for the images listed in the tables below.

Step 2.   Perform the emulator loading procedure described in Appendix A of the TCAS 3000 TRD (8002216-001).

End Item Part Numbers	Software Master Media Part Number			
9003000-55001 9003000-65001 9003000-10001	**TCAS 3000 Initial Configuration SW P/N 9300003-002D** This Master Media Contains The Following Files			
	Description	**P/N**	**File Name**	**CRC**
	Boot	9000356-001	T3000_FL_BP1.BIN	B9E02DB2
	Data Loader	9000355-001	T3000_FL_DL1.BIN	162CBA5E
	I/O FPGA	9003025-001	IO_001.BIN	65E4D78D
	RF FPGA	9003026-002	RF_002.BIN	A2260964
	HW Config	9000654-001	t3000_hardware_info.BIN	653FE076

Note: HTS may be compact flash loaded at the MTS after the other images have been loaded by the emulator.

End Item Part Numbers	Software Master Media Part Numbers	
9003000-55001 9003000-65001 9003000-10001	**Hardware Test Software (HTS)**	**9300002-002F** (If loading using Compact Flash at MTS)
		9300002-002D (If loading using emulator and CD)

2.2 Final Configuration Software Loading And Verification

Prior to shipping the End Item, the following images must be loaded into the UUT.

Step 1.   Obtain the Master Media for the images listed in the table below.

Note: These images will be compact flash loaded at the MTS.

End Item Part Numbers	Software Master Media Part Number			
9003000-55001 9003000-65001 9003000-10001	**Master Media For OP Software P/N 9300001-002F** This Master Media Contains The Following Files			
	Description	**P/N**	**File Name**	**CRC**
	Application (OP SW)	9000354-001	T3000_FL.OP1	D233397C
	Data Loader	9000355-001	T3000_FL.DL1	162CBA5E
	I/O FPGA	9003025-001	IO_001.FGA	65E4D78D
	RF FPGA	9003026-002	RF_002.FGB	A2260964
	Config File	N/A	HEADER.CFG	N/A

2.3   Synchronization Between ATP / Test Software

The loading and verification of operational software part numbers and CRC's is an automated process. For this process to work correctly, TCAS 3000 PC Test Software - P/N 9000469-001 requires the presence of the configuration file 9000469Config.txt in order to select a UUT and for Loading/Verification of Operational Software.

Step 1.   If the PC Test Software (9000469) is currently executing, terminate execution.

Step 2.   Obtain the latest 9000469Config.txt file from the designated controlled source.

Step 3.   Place the file in the following path: **D:\9000469\9000469Config.txt**

Note: Any changes or additions of UUT part numbers, software part numbers or CRC's, or revision letter changes of this document must also be reflected in the 9000469Config.txt file.

9000469Config.txt

Note: The current 9000469Config.txt file must contain the following information and format:

[ATP]
Dwg Number 8002217 Rev: **D**

[9003000-55001]
Application Software P/N: 9000354-001
Application Software CRC: 0xD233397C
Boot Software P/N: 9000356-001
Boot Software CRC: 0xB9E02DB2
DataLoader Software Copy 1 P/N: 9000355-001
DataLoader Software Copy 1 CRC: 0x162CBA5E
DataLoader Software Copy 2 P/N: 9000355-001
DataLoader Software Copy 2 CRC: 0x162CBA5E
Hardware Config Software P/N: 9000654-001
I/O FPGA Copy 1 P/N: 9003025-001
I/O FPGA Copy 1 CRC: 0x65E4D78D
I/O FPGA Copy 2 P/N: 9003025-001
I/O FPGA Copy 2 CRC: 0x65E4D78D
RF FPGA P/N: 9003026-002
RF FPGA CRC: 0xA2260964

[9003000-65001]
Application Software P/N: 9000354-001
Application Software CRC: 0xD233397C
Boot Software P/N: 9000356-001
Boot Software CRC: 0xB9E02DB2
DataLoader Software Copy 1 P/N: 9000355-001
DataLoader Software Copy 1 CRC: 0x162CBA5E

DataLoader Software Copy 2 P/N: 9000355-001
DataLoader Software Copy 2 CRC: 0x162CBA5E
Hardware Config Software P/N: 9000654-001
I/O FPGA Copy 1 P/N: 9003025-001
I/O FPGA Copy 1 CRC: 0x65E4D78D
I/O FPGA Copy 2 P/N: 9003025-001
I/O FPGA Copy 2 CRC: 0x65E4D78D
RF FPGA P/N: 9003026-002
RF FPGA CRC: 0xA2260964

[9003000-10001]
Application Software P/N: 9000354-001
Application Software CRC: 0xD233397C
Boot Software P/N: 9000356-001
Boot Software CRC: 0xB9E02DB2
DataLoader Software Copy 1 P/N: 9000355-001
DataLoader Software Copy 1 CRC: 0x162CBA5E
DataLoader Software Copy 2 P/N: 9000355-001
DataLoader Software Copy 2 CRC: 0x162CBA5E
Hardware Config Software P/N: 9000654-001
I/O FPGA Copy 1 P/N: 9003025-001
I/O FPGA Copy 1 CRC: 0x65E4D78D
I/O FPGA Copy 2 P/N: 9003025-001
I/O FPGA Copy 2 CRC: 0x65E4D78D
RF FPGA P/N: 9003026-002
RF FPGA CRC: 0xA2260964

APPENDIX B

Test Report / TRD Cross Reference

The following tables contain the cross reference between the tests executed during the Acceptance Test and the corresponding paragraph in the TRD that describes the test method and the PASS/FAIL criteria.

Test_01_1A_Through_Test_09_13

Test Number	TRD Para.		Test Number	TRD Para.		Test Number	TRD Para.		Test Number	TRD Para.
01_1A	4.1.1		05_03	4.6.3		07_34	4.9.5		08_02	4.10.1
01_2A	4.1.2		05_04	4.6.4		07_35	4.9.5		08_03	4.10.1
01_3A	4.1.3		06_01	4.7.1		07_36	4.9.6		08_04	4.10.1
01_4A	4.1.4		06_02	4.7.2		07_37	4.9.6		08_05	4.10.1
01_1D	4.2.1		06_03	4.8.1		07_38	4.9.6		08_06	4.10.1
01_2D	4.2.2		06_04	4.8.1		07_39	4.9.6		08_07	4.10.1
01_3D	4.2.3		06_05	4.8.2		07_40	4.9.6		08_08	4.10.1
01_4D	4.2.4		07_01	4.9.1		07_41	4.9.6		08_09	4.10.1
02_01	4.3.1		07_02	4.9.1		07_42	4.9.6		08_10	4.10.1
02_02	4.3.2		07_03	4.9.1		07_43	4.9.7		08_11	4.10.1
03_01	4.4.1		07_04	4.9.1		07_44	4.9.7		08_12	4.10.1
03_02	4.4.2		07_05	4.9.1		07_45	4.9.7		08_13	4.10.1
03_03	4.4.3		07_06	4.9.1		07_46	4.9.7		08_14	4.10.1
03_04	4.4.4		07_07	4.9.1		07_47	4.9.7		08_15	4.10.1
03_05	4.4.5		07_08	4.9.2		07_48	4.9.7		08_16	4.10.1
03_06	4.4.6		07_09	4.9.2		07_49	4.9.7		08_17	4.10.1
03_07	4.4.7		07_10	4.9.2		07_50	4.9.8		08_18	4.10.1
03_08	4.4.8		07_11	4.9.2		07_51	4.9.8		08_19	4.10.1
03_09	4.4.9		07_12	4.9.2		07_52	4.9.8		08_20	4.10.1
03_10	4.4.10		07_13	4.9.2		07_53	4.9.8		08_21	4.10.1
03_11	4.4.11		07_14	4.9.2		07_54	4.9.8		08_22	4.10.1
03_12	4.4.12		07_15	4.9.3		07_55	4.9.8		08_23	4.10.1
03_13	4.4.13		07_16	4.9.3		07_56	4.9.8		08_24	4.10.1
03_14	4.4.14		07_17	4.9.3		07_57	4.9.9		08_25	4.10.2
03_15	4.4.15		07_18	4.9.3		07_58	4.9.9		08_26	4.10.3
03_16	4.4.16		07_19	4.9.3		07_59	4.9.9		08_27	4.10.4
03_17	4.4.17		07_20	4.9.3		07_60	4.9.9		08_28	4.10.5
03_18	4.4.18		07_21	4.9.3		07_61	4.9.9		09_01	4.11.1
03_19	4.4.19		07_22	4.9.4		07_62	4.9.9		09_02	4.11.2
03_20	4.4.20		07_23	4.9.4		07_63	4.9.9		09_03	4.11.3
03_21	4.4.21		07_24	4.9.4		07_64	4.9.10		09_04	4.11.4
04_01	4.5.1		07_25	4.9.4		07_65	4.9.10		09_05	4.11.5
04_02	4.5.2		07_26	4.9.4		07_66	4.9.10		09_06	4.11.6
04_03	4.5.3		07_27	4.9.4		07_67	4.9.10		09_07	4.11.7
04_04	4.5.4		07_28	4.9.4		07_68	4.9.10		09_08	4.11.8
04_05	4.5.5		07_29	4.9.5		07_69	4.9.10		09_09	4.11.9
04_06	4.5.6		07_30	4.9.5		07_70	4.9.10		09_10	4.11.10
04_07	4.5.7		07_31	4.9.5		07_71	4.9.11		09_11	4.11.11
05_01	4.6.1		07_32	4.9.5		07_72	4.9.12		09_12	4.11.12
05_02	4.6.2		07_33	4.9.5		08_01	4.10.1		09_13	4.11.13

Test_09_14 Through Test_15_11

Test Number	TRD Para.		Test Number	TRD Para.		Test Number	TRD Para.		Test Number	TRD Para.
09_14	4.11.14		11_14	4.13.14		12_06	4.14.6		12_50	4.14.50
09_15	4.11.15		11_15	4.13.15		12_07	4.14.7		12_51	4.14.51
09_16	4.11.16		11_16	4.13.16		12_08	4.14.8		12_52	4.14.52
09_17	4.11.17		11_17	4.13.17		12_09	4.14.9		13_01	4.15.1
09_18	4.11.18		11_18	4.13.18		12_10	4.14.10		13_02	4.15.2
09_19	4.11.19		11_19	4.13.19		12_11	4.14.11		13_03	4.15.3
09_20	4.11.20		11_20	4.13.20		12_12	4.14.12		13_04	4.15.4
09_21	4.11.21		11_21	4.13.21		12_13	4.14.13		13_05	4.15.5
09_22	4.11.22		11_22	4.13.22		12_14	4.14.14		13_06	4.15.6
09_23	4.11.23		11_23	4.13.23		12_15	4.14.15		13_07	4.15.7
09_24	4.11.24		11_24	4.13.24		12_16	4.14.16		13_08	4.15.8
09_25	4.11.25		11_25	4.13.25		12_17	4.14.17		13_09	4.15.9
09_26	4.11.26		11_26	4.13.26		12_18	4.14.18		13_10	4.15.10
09_27	4.11.27		11_27	4.13.27		12_19	4.14.19		13_11	4.15.11
09_28	4.11.28		11_28	4.13.28		12_20	4.14.20		13_12	4.15.12
09_29	4.11.29		11_29	4.13.29		12_21	4.14.21		13_13	4.15.13
09_30	4.11.30		11_30	4.13.30		12_22	4.14.22		13_14	4.15.14
09_31	4.11.31		11_31	4.13.31		12_23	4.14.23		13_15	4.15.15
09_32	4.11.32		11_32	4.13.32		12_24	4.14.24		13_16	4.15.16
10_01	4.12.1		11_33	4.13.33		12_25	4.14.25		13_17	4.15.17
10_02	4.12.2		11_34	4.13.34		12_26	4.14.26		13_18	4.15.18
10_03	4.12.3		11_35	4.13.35		12_27	4.14.27		14_01	4.16.1
10_04	4.12.4		11_36	4.13.36		12_28	4.14.28		14_02	4.16.2
10_05	4.12.5		11_37	4.13.37		12_29	4.14.29		14_03	4.16.3
10_06	4.12.6		11_38	4.13.38		12_30	4.14.30		14_04	4.16.4
10_07	4.12.7		11_39	4.13.39		12_31	4.14.31		14_05	4.16.5
10_08	4.12.8		11_40	4.13.40		12_32	4.14.32		14_06	4.16.6
10_09	4.12.9		11_41	4.13.41		12_33	4.14.33		14_07	4.17.1
10_10	4.12.10		11_42	4.13.42		12_34	4.14.34		14_08	4.17.2
10_11	4.12.11		11_43	4.13.43		12_35	4.14.35		14_09	4.17.3
10_12	4.12.12		11_44	4.13.44		12_36	4.14.36		14_10	4.17.4
11_01	4.13.1		11_45	4.13.45		12_37	4.14.37		14_11	4.17.5
11_02	4.13.2		11_46	4.13.46		12_38	4.14.38		14_12	4.17.6
11_03	4.13.3		11_47	4.13.47		12_39	4.14.39		15_01	4.18.1
11_04	4.13.4		11_48	4.13.48		12_40	4.14.40		15_02	4.18.2
11_05	4.13.5		11_49	4.13.49		12_41	4.14.41		15_03	4.18.3
11_06	4.13.6		11_50	4.13.50		12_42	4.14.42		15_04	4.18.4
11_07	4.13.7		11_51	4.13.51		12_43	4.14.43		15_05	4.18.5
11_08	4.13.8		11_52	4.13.52		12_44	4.14.44		15_06	4.18.6
11_09	4.13.9		12_01	4.14.1		12_45	4.14.45		15_07	4.18.7
11_10	4.13.10		12_02	4.14.2		12_46	4.14.46		15_08	4.18.8
11_11	4.13.11		12_03	4.14.3		12_47	4.14.47		15_09	4.18.9
11_12	4.13.12		12_04	4.14.4		12_48	4.14.48		15_10	4.18.10
11_13	4.13.13		12_05	4.14.5		12_49	4.14.49		15_11	4.18.11

Test_15_12 Through Test_20_20

15_12	4.18.12		16_30	4.20.12		20_01	4.24.1
16_01	4.19.1		16_31	4.20.13		20_02	4.24.2
16_02	4.19.2		16_32	4.20.14		20_03	4.25.1
16_03	4.19.3		16_33	4.20.15		20_04	4.25.2
16_04	4.19.4		16_34	4.20.16		20_05	4.25.3
16_05	4.19.5		16_35	4.20.17		20_06	4.25.4
16_06	4.19.6		16_36	4.20.18		20_07	4.25.5
16_07	4.19.7		17_01	4.21.1		20_08	4.25.6
16_08	4.19.8		17_02	4.21.2-5		20_09	4.25.7
16_09	4.19.9		17_03	4.21.6-9		20_10	4.25.8
16_10	4.19.10		17_04	4.21.10		20_11	4.25.9
16_11	4.19.11		17_05	4.21.11-14		20_12	4.25.10
16_12	4.19.12		17_06	4.21.15-18		20_13	4.25.11
16_13	4.19.13		18_01	4.22.1		20_14	4.25.12
16_14	4.19.14		18_02	4.22.2		20_15	4.25.13
16_15	4.19.15		18_03	4.22.3		20_16	4.25.14
16_16	4.19.16		18_04	4.22.4		20_17	4.25.15
16_17	4.19.17		18_05	4.22.5		20_18	4.25.16-18
16_18	4.19.18		18_06	4.22.6		20_19	4.25.19
16_19	4.20.1		18_07	4.22.7		20_20	4.25.20
16_20	4.20.2		18_08	4.22.8			
16_21	4.20.3		18_09	4.22.9			
16_22	4.20.4		18_10	4.22.10			
16_23	4.20.5		18_11	4.22.11			
16_24	4.20.6		18_12	4.22.12			
16_25	4.20.7		18_13	4.22.13			
16_26	4.20.8		18_14	4.22.14			
16_27	4.20.9		18_15	4.22.15			
16_28	4.20.10		18_16	4.22.16			
16_29	4.20.11		19_01	4.23.1			

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