2

ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN 608598

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.	4. Date
Supplemental [ ] Direct Revision [X] Change ECN [ ] Temporary [ ] Standby [ ] Supersedure [ ] Cancel/Void [ ]	DG Spurling, IRM/ISS/C&WMSS, R1-01, 3-2969	8/29/94
	5. Project Title/No./Work Order No. TMACS/N46G1	6. Bldg./Sys./Fac. No. 2750E/TMACS/200E
	7. Impact Level Q	
	8. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-WM-TRP-105, Rev 65 WHC-SD-WM-TRP-106, Rev 65 WHC-SD-WM-TRP-107, Rev 65 WHC-SD-WM-TRP-109, Rev 54 WHC-SD-WM-TRP-113, Rev 54 WHC-SD-WM-TRP-114, Rev 65	9. Related ECN No(s). ECN 196863 EDT 159986 EDT 600611 EDT 196862
		10. Related PO No.

11a. Modification Work	11b. Work Package No.	11c. Modification Work Complete	11d. Restored to Original Condition (Temp. or Standby ECN only)
[ ] Yes (fill out Blk. 11b) [X] No (NA Blks. 11b, 11c, 11d)	N46G1	N/A Cog. Engineer Signature & Date	N/A Cog. Engineer Signature & Date

12. Description of Change

Four Tank Farm Surveillance System (TFSS) Change Requests were incorporated into TMACS Software Release 4.1. These include AN Farm sensor addition (temperature, pressure), C-106 instrument install (Enraf, pressure), Enraf installs (C-103,BX-106,T-102,T-107) and enhancements to the Acromag software driver.

The results of this software test are documented in each Test Report, and summarized in Test Procedure 10 (WHC-SD-WM-TRP-114).

13a. Justification (mark one)							
Criteria Change	[X]	Design Improvement	[ ]	Environmental	[ ]		
As-Found	[ ]	Facilitate Const.	[ ]	Const. Error/Omission	[ ]	Design Error/Omission	[ ]

13b. Justification Details

TMACS software development and release guidelines are governed under WHC-IP-0842, Section 12.2, Tank Farm Surveillance System Configuration Control Board, and WHC-SD-WM-CSCM-019, TMACS Software Configuration Management Plan

14. Distribution (include name, MSIN, and no. of copies)

See Distribution Sheet

RELEASE STAMP

OFFICIAL RELEASE BY WHC DATE SEP 01 1994

A-6000-135 (01/93) WEF067

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A-7900-013-1 (06/92)

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ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1): 608598

15. Design Verification Required	16. Cost Impact				17. Schedule Impact (days)	
	ENGINEERING		CONSTRUCTION			
[] Yes	Additional	[] $	Additional	[] $	Improvement	[]
[X] No	Savings	[] $	Savings	[] $	Delay	[]

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[X]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]		[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request	[]		[]

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision

20. Approvals

Signature	Date	Signature	Date
OPERATIONS AND ENGINEERING		ARCHITECT-ENGINEER	
Cog Engineer [DA Barnes]	8/31/94	PE	
Cog. Mgr. [JS Schofield]	8/31/94	QA	
QA [JA Warren]	08/31/94	Safety	
Safety	N/A	Design	
Security	N/A	Environ.	
Environ.	N/A	Other	
Projects/Programs	N/A		
Tank Waste Remediation System	N/A		
Facilities Operations [TW Bohan]	8/31/94	DEPARTMENT OF ENERGY N/A	
Restoration & Remediation	N/A	Signature or Letter No.	
Operations & Support Services	N/A		
IRM/ISS/C&WMSS [RB Bass]	8/31/94	ADDITIONAL N/A	
IRM/ISS/C&WMSS [DG Spurling]	8/30/94		
Other	N/A		
	N/A		

RELEASE AUTHORIZATION

Document Number:	WHC-SD-WM-TRP-109, REV 5
Document Title:	TMACS TEST PROCEDURE TP005: SENSOR CONFIGURATION, LOGGING, AND DATA CONVERSION
Release Date:	9/1/94

* * * * * * * * * * * * * *

This document was reviewed following the procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

* * * * * * * * * * * * * *

WHC Information Release Administration Specialist:

Kara Brøz — 9/1/94

(Signature) **(Date)**

SUPPORTING DOCUMENT

1. Total Pages 18

2. Title	3. Number	4. Rev No.
TMACS Test Procedure TP005: Sensor Configuration, Logging, and Data Conversion	WHC-SD-WM-TRP-109	5

5. Key Words

Software, Test Procedure, Tank Monitor and Control System, TMACS Software Project

APPROVED FOR PUBLIC RELEASE

KMB 9/1/94

6. Author

Name: SJ Washburn

Steven J Washburn
Signature

Organization/Charge Code 62610/N46G1

7. Abstract

The TMACS Software Project Test Procedures translate the project's acceptance criteria into test steps. Software releases are certified when the affected Test Procedures are successfully performed and the customers authorize installation of these changes.

This Test Procedure tests the TMACS Point Configuration (to the published Tag List), Logging functions, and conversion of field data to engineering units.

8. PURPOSE AND USE OF DOCUMENT - This document was prepared for use within the U.S. Department of Energy and its contractors. It is to be used only to perform, direct, or integrate work under U.S. Department of Energy contracts. This document is not approved for public release until reviewed.

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9. Impact Level Q

10. RELEASE STAMP

OFFICIAL RELEASE BY WHC
DATE SEP 01 1994
STA 4

RECORD OF REVISION	(1) Document Number WHC-SD-WM-TRP-109	Page 1

(2) Title

Tank Monitor And Control System (TMACS) Software Project, Release 4.1
Test Procedure TP005, Sensor Configuration, Logging and Data Conversion

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release	
		(5) Cog. Engr.	(6) Cog. Mgr. Date
0	(7) Software Release 0.0 Release Testing Released under EDT 159986, 10/15/92		
1	Software Release 1.0 Release Testing Released under ECN 196866, 1/31/93		
2	Software Release 2.0 Release Testing Released under ECN 196864, 10/1/93		
3	Software Release 3.0 Release Testing Released under ECN 196863, 1/15/94		
4	Software Release 4.0 Release Testing Released under ECN 196862, 5/31/94		
5 RS	Software Release 4.1 Release Testing Released under ECN 608598, 8/29/94	D. Barnes. 8/31/94	John Kelly 8/31/94

TANK MONITOR AND CONTROL SYSTEM

(TMACS)

SOFTWARE PROJECT

TEST PROCEDURE TP005:

SENSOR CONFIGURATION, LOGGING and DATA CONVERSION

Steven J. Washburn

IRM Chemical & Waste Management
Software Support

SIGN OFF:

DAVID BARNES	David Barnes	8/24/94
DA Barnes TMACS Cognizant Engineer	signature	Date
TW BOHAN	TW Bohan	8/23/94
T Bohan TMACS User Manager	signature	Date
J. A. Warren	J A Warren	8/24/94
Software QA/V&V	signature	Date
	Dave Spurling	8/24/94
DG Spurling TMACS Project Manager	signature	Date

1.0 TEST ITEMS

This Test Procedure addresses the sensor configuration, conversion and logging requirements of the TMACS. The features to be tested are as follows:

Table 1. Test Cases

2.0 ACCEPTANCE CRITERIA AND REQUIREMENTS

The following acceptance criteria are from Section 5.0 of the TMACS Software Upgrade Project: Acceptance Criteria. The Test Steps that satisfy these criteria are given after each criteria item.

2.1 The system shall have the capability to log any sensor value. **See Test Steps 15 through 25, 26, 27.**

2.2 A sensor logging shall include the time stamp and the sensor's value. **See Test Steps 15 through 25, 26, 27.**

2.3 Logging shall occur at the sensor's scan frequency.

Note: Logging shall be made within the run-time software, and not necessarily to disk (file) at the sensor's scan frequency. Users of the logging data may request disk logging frequencies down to a 10 minute interval. **See Test Steps 15 through 25, 26, 27.**

2.4 Logged values shall be retained on-line (in G2) for up to 31 days, selected on a per-sensor basis.

Note: The minimum retention period for these data shall be 14 days. **See Test Procedure #2, Trending.**

2.5 Logged values for selected sensors shall be transferred to the SACS computer for permanent storage. **See Test Procedure #8, SACS Interface.**

The following Change Request has been incorporated into a previous release:

93-047 Add SY Farm sensors to TMACS, including hydrogen, pressure, vent flow, discrete alarms, and temperatures: structural and in-tank. **See Test Cases 5.1, 5.3 and 5.4.**

93-067 Provide TMACS software connection for instrument sensors in C, BX, and T Farms. **See Test Case 5.5, validating sensor configuration.**

The following Change Requests have been incorporated into this release:

94-027 Provide software connection to Acromag stations at AN Tank Farm. **See Test Case 5.5, validating sensor configuration.**

94-031 Add automatic Enraf Levels in BX-106, C-103, T-102, T-107. **See Test Case 5.5, validating sensor configuration.**

94-034 Add Enraf level sensor, two pressure sensors to C-106. **See Test Case 5.5, validating sensor configuration.**

3.0 TESTER INFORMATION

The TMACS system is an application built using the G2 Real-Time Expert System. The instructions for using the mouse, mouse buttons, and keyboard are given below.

The majority of user control of the system involves pointing at objects on the computer screen using the POINTER. The pointer is an arrow that is pointing to the upper left of the screen. When a user moves the mouse, the pointer moves on the screen.

The G2 system treats the left and right mouse buttons as if they were a single button. Whenever the use of a mouse button is required the user is free to use either of these buttons.

The following terms are used to describe actions performed with the mouse:

- To MOVE the pointer, slide the mouse with no buttons pressed.
- To POINT to a push-button or object, move the pointer to the appropriate place on the screen.
- To CLICK on an object, first move your mouse so that the screen pointer rests on the object. Then, press the mouse button and release immediately without moving the mouse.
- To DRAG an object with the mouse, first move the mouse so that the screen pointer rests on the object. Then, press the mouse button and move the mouse without releasing the button. The object moves along with the screen pointer as you move the mouse. Release the button when the object is in the desired place. To drag a window in TMACS place the

mouse in a blank area around the margin of the window and drag. (Note: the drag function is not provided for all windows.)

If the screen becomes unreadable or objects overwrite each other the screen can be redrawn by typing Control-C. (Hold down the "Control" key while typing the letter C).

4.0 PRE-TEST INSPECTION AND SETUP REQUIREMENTS

This Test Procedure uses the software developed for production use, although not necessarily configured to communicate with field data. This should be running when the formal test begins, and can be identified in three parts as "/home/G2/TMACS/prod/TMACS_Release_x_x.KB" (where x_x refers to the current revision number, with only one file in the directory matching the template), "/home/G2/BRIDGE/acromag_brg" which is the Acromag I/O driver, "/home/G2/BRIDGE/panalm_brg" which is the Panalarm I/O driver and "/home/G2/BRIDGE/printer_brg" which is the Alarm printer driver. The TMACS Software Engineer participating in the test shall demonstrate this.

Since this test procedure demonstrates the logging of data, G2 must be operational and running continuously 1 hour before performing this test.

It is also prudent if the test administrator would verify the configuration of the actual Panalarm and Acromag I/O units to make sure they are configured properly.

In addition the test administrator should make sure the UNIX cron table for TMACS has been edited to **NOT** move the "continuous_sensor_history..." and "discrete_sensor_history..." prefixed data files from the current to history data directory on a more frequent basis. Also these two directories should be emptied of all data files with time stamps in their file names.

The test administrator must also generate a Sensor Configuration Report from the TMACS system to be tested to be used in verification steps below. This can be done from the "Procedures" subworkspace under the GFI-MODULE.

This test operates in two modes (1) local Acromag I/O unit mode and (2) G2 Simulator mode. For local Acromag mode the test administrator will have to start the Acromag Bridge on Port 6 (acromag_brg 22206) and verify that the proper Acromag I/O unit is connected to Port 6 of the multiplexor and communicating properly. For Simulation mode the bridge will have to be terminated and G2 restarted.

The test administrator must also make sure that the SY Acromag stations (both production and development) are enabled and that the SY Tank Icons are enabled.

5.0 TEST STEPS WITH EXPECTED RESULTS

STEP	DESCRIPTION	VERIFY
	5.1 Sensor Configuration Data	
1	The Test Administrator should provide a **Sensor Configuration Report** generated from the system being tested. This is done from the "Procedures" subworkspace of the GFI-MODULE workspace.	JCB 8/24/94
2	Using WHC-SD-WM-TI-594, Rev 1 (draft) TMACS Tag List, verify that all the new sensors for this release appear on the Sensor Configuration Report. Also verify that the sensor tag names, riser numbers (where applicable) and vertical offsets match. Record verification on the Sensor Configuration Report and attach to this Test Procedure.	JCB 8/24/94
	5.2 Conversion of Continuous Sensor Data to Engineering Units	
3	Have the Test Administrator bring up the **ACROMAG-ROOT** workspace, the **Conversion Formulas** subworkspace and the readout display subworkspace for this test procedure.	7:45 JCB 8/25/94
4	Begin testing all of the engineering conversion formulas (on the raw Acromag data) for Flow, Hydrogen, Pressure and Level data. On the left side of the readout display window under the text "Flow, Hydrogen, Pressure, Level Conversions" you should see output for these conversion formulas as well as the Acromag data in raw form and percent. You should also see the channel status for the Acromag channel this test works with. The channel status should be "**GOOD**". If the status is "BAD" check the polarity on the current source and reverse it if necessary to get a "**GOOD**" status.	JCB 8/25/94
5	Set the Current Source to approximately 8.8 mA so that the "Acromag Output" readout display is exactly 30 percent and verify, (after an appropriate delay), that readings for each formula are the same as given in Table 1 and that the channel status is "**GOOD**".	JCB 8/25/94
6	Set the Current Source to approximately 13.6 mA so that the "Acromag Output" readout display is exactly 60 percent and verify that readings for each formula are the same as given in Table 1 and that the channel status is "**GOOD**".	JCB 8/25/94

STEP	DESCRIPTION	VERIFY
7	Set the Current Source to approximately 18.4 mA so that the "Acromag Output" readout display is exactly 90 percent and verify that readings for each formula are the same as given in Table 1 and that the channel status is "**GOOD**".	JEB 8/25/94
8	Set the Current Source to approximately 30.0 mA (well over range that can be handled by the Acromag module). Verify that the Raw Data Reading goes to "32767" and that the channel status changes to "**BAD**".	JEB 8/25/94
9	Set the Current Source to approximately 4.0 mA and verify that the Raw Data Reading goes to approximately "0.0" and that the channel status changes to "**GOOD**".	STOP 8:05 START 8:17 JEB 8/25/94
10	Set the Current Source to approximately -4.0 mA by reversing polarity (which is under the range that can be handled by the Acromag Analog Input module). Verify that the Raw Data Reading goes to "-32768" and that the channel status changes to "**BAD**".	JEB 8/25/94
11	We will now begin testing of the engineering conversion formula (on the raw Acromag data) for Temperature data. On the right side of the readout display window under the text "Temperature Conversion" you should see output for this conversion formula as well as the Acromag data in raw form. You should also see the channel status for the Acromag channel this test works with. The channel status should be "**GOOD**".	JEB 8/25/94
12	The Acromag raw data value should be in the range 240 (75 degrees Fahrenheit) to 300 (86 degrees Fahrenheit). The average reading is about 287 (83.66 degrees Fahrenheit). Verify that the raw and converted data falls within these limits.	JEB 8/25/94

5.3 Conversion of Digital Data to Discrete States

13	Have the Test Administrator bring up the attribute table for two discrete sensors. Record the discrete sensor Identifier and "alarm state index" attribute for each sensor below: Tag Id: _____ Index: _____ Tag Id: _____ Index: _____	

STEP	DESCRIPTION	VERIFY
14	Using Table 2, Discrete Alarm States, supplied in the Attachments, verify that the above alarm state indices match the logic states specified in the TMACS Tag List. For example, for an index of 1, the sensor would be in alarm on value 0, normal for value 1, and unknown for all other values (or no value). When finished you can hide the sensor tables and tank status window.	

5.4 Discrete Sensor Data Logging

15	Discrete Sensor data is logged whenever a state change (0 to 1 or 1 to 0) is detected. Therefore you will need to generate some state changes with the G2 simulator. To successfully switch over to this mode the test administrator must perform the following steps in order: (1) Terminate the Acromag Bridge, (2) Restart G2 (3) Start the Simulator (4) Bring up the "Discrete-sensor Simulation Value Controls" workspace. Proceed to the next step after the simulator has been started successfully.	
16	Get the workspace named "ACROMAG-ROOT", then select the subworkspace named "Development Ports", then select the subworkspace "TEST PORT 06". From this workspace bring up the subworkspace containing the digital Acromag stations for the SY farm.	
17	Click on the Acromag Station for DIG-STA-06-048 to get the pop up menu. Select table from this menu to examine the Channel Data 17 through 32. Verify that channels 18 and 19 are set to 1 (Normal Alarm State) before the next step.	

STEP	DESCRIPTION	VERIFY
18	On the "Discrete-sensor Simulation Value Controls" workspace, discrete sensor controls section enter the name of a discrete sensor name, e.g., "SY103-HIGH-HYDROGEN". Click the "**Alarm**" button and verify that an alarm is generated for the specified sensor. Repeat this step for another discrete sensor, e.g., "SY103-CABINET-TROUBLE". Note the time of these alarms and their messages: Message 1: _____ Time: _____ Message 2: Time:	
19	On the "Discrete-sensor Simulation Value Controls" workspace, discrete sensor controls section enter the name of a discrete sensor, e.g., "SY103-HIGH-HYDROGEN". Click the "**Normal**" button and verify that an alarm reset is generated for the specified sensor. Repeat this step for another discrete sensor, e.g., "SY103-CABINET-TROUBLE". Note the time of these alarm resets and their messages: Message 1: _____ Time: _____ Message 2: Time:	
20	Have the test administrator go to the Unix command tool window and type the Unix command "cd /TMACS_disk/G2-SACS/CURRENT". Then type the Unix command "ls -l discrete*.ascii" to check for the existence of a file in the form "discrete_sensor_history_YYYY_MMDD.ascii" where YYYY is the current year, MM is the current month and DD is the current day.	

STEP	DESCRIPTION	VERIFY
21	Type the UNIX command "more discrete_sensor_history_YYYY_MMDD.ascii" to verify the file contains records matching the example given below (where the fields are separated by the special character "¦"): SY103-PTN-NI-R07A-10-01 ¦ 12-15-93 ¦ 13:39:7 ¦ 0 ¦ NONE ¦ GOOD ¦ ALARM ¦ 12-15-93 ¦ 13:39:9 ¦ SY103, SHMS-J, HIGH HYDROGEN ALARM The report record format is as follows: the sensor tag name, date and time alarm state changed, sensor value, sensor quality status (either GOOD or UNKNOWN), sensor alarm state (either NORMAL or ALARM), date/time record written to file and sensor description.	
22	Verify by examining the time stamps in the file that sensor data appears which corresponds to the sensor messages and times you recorded above in Steps 18 and 19.	

5.5 Continuous Sensor Data Logging

23	Have the test administrator go to the UNIX command tool window and type the UNIX command "cd /TMACS_disk/G2-SACS/CURRENT". Then type the command "ls -l continuous*" to check for the existence of the file in the form "continuous_sensor_history_YYYY_MMDD.ascii" where YYYY is the current year, MM is the current month and DD is the current day.	
24	Type the UNIX command "tail continuous_sensor_history_YYYY_MMDD" to verify that the file contains records matching the example given below (where the fields are separated by the special character "¦"): BY101-PTT-TI-R001-01 ¦ 8-14-1992 ¦ 15:7:20 ¦ 32.0 ¦ F ¦ GOOD ¦ NORMAL ¦ 8-14-1992 ¦ 15:07:35 The report fields should be as follows: the sensor tag name, the date and time of last GOOD reading, sensor value, unit of measure, sensor quality status (either GOOD or UNKNOWN), sensor alarm status (either NORMAL or ALARM), date/time record written to file. Record the time of the last entry in the file here: _____.	

STEP	DESCRIPTION	VERIFY
25	Return to the "Continuous-sensor Simulation Value Controls" workspace in G2. Choose the name of a continuous sensor you wish to verify by examining the **Sensor Configuration Report**. Enter the sensor name into the type-in box and record it here also: _____ Generate a high alarm for the sensor by using the slider to generate a value above the High Alarm Limit specified in the **Configuration Report** for that sensor. Record the value you generated here: _____ Also record the time that the high alarm occurs here: _____	
26	Generate an alarm reset by using the slider to generate a value below the High Alarm Limit specified in the **Configuration Report** for that sensor. Record the value you generated here: _____ Also record the time that the alarm reset occurs here: _____.	
27	Return to the Unix command tool which examined the "continuous_sensor_history" file above and enter the command "tail continuous_sensor_history". Verify that new sensor data entries appear for the high alarm and alarm reset values you just generated for the sensor you selected with timestamps after the one you recorded in step 24.	

REFERENCES:

TMACS Tag List, WHC-SD-WM-TI-594 Rev. 1 (draft), C. C. Scaief, Instruments and Control Engineering, August 11, 1994.

"TMACS Engineering Conversion Formulas", WHC Internal Memo, May 10, 1993.

ATTACHMENTS:

Table 1 - Engineering Conversion Formulas for Continuous Sensors
Table 2 - Discrete Alarm States
Acceptance Sheet
Exception Sheets
Data/Verification Sheet
Test Log

TABLE 1

Engineering Conversion Formulas for Continuous Sensors

Current Source	8.8 mA	13.6 mA	18.4 mA
Acromag Data (Raw Counts)	3000	6000	9000
Surface Level (Inches)	15.0	30.0	45.0
Surface Level-C103 (In)	56.1	71.1	86.1
Surface Level-C106 (In)	67.0	82.0	97.0
Surface Level-T107 (In)	51.4	66.4	81.4
Tank Press AN Low (InWG)	-2.5	-1.0	0.5
Tank Press AN High (InWG)	17.0	44.0	71.0
Tank Press C106 Low (InWG)	0.3	0.6	0.9
Tank Press C106 High (InWG)	-2.1	-1.2	-0.3

TABLE 2

Discrete Alarm States

Alarm State Index	Discrete Value = 0	Discrete Value = 1	Discrete Value = 2 thru 9 (or none)
0	Normal	Alarm	Unknown
1	Alarm	Normal	Unknown
2	Normal	Normal	Unknown

ACCEPTANCE SHEET

TEST PROCEDURE NUMBER: TP005 **DATE:** 8/25/94

ORGANIZATION NAME: Chem & Waste Mgmt Software Sppt. **ORG#:** 62610

EXCEPTION SHEETS FOR THIS TEST PROCEDURE:

TESTER	WITNESS	STEP	DATE	RESOLVED
No exceptions				

COMMENTS:
All of the test steps of this test procedure have been tested and exception sheets for this test procedure have been resolved.

APPROVAL:

James a Warren — 8/25/94
TMACS Software Test Procedure Tester — Date

John Z Brannan — 8/25/94
TMACS Software Test Procedure Witness — Date

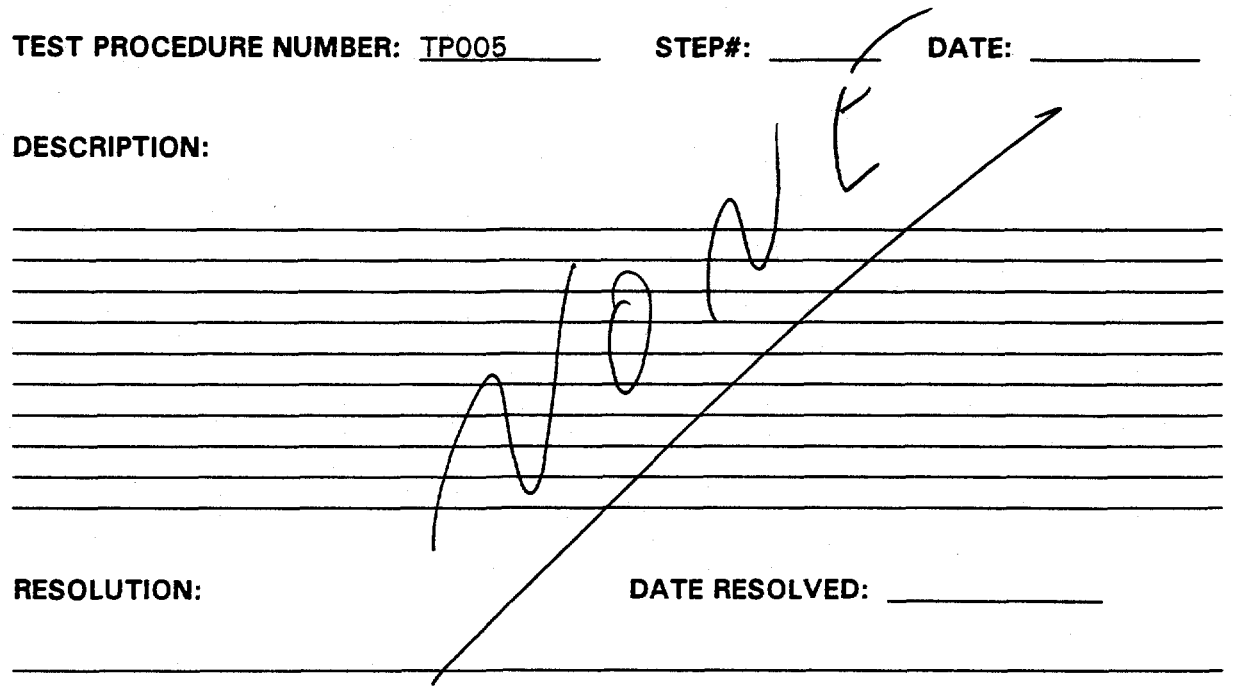
Steven J Washburn — 8/25/94
SJ Washburn, TMACS Test Procedure Software Engineer — Date

Dave Spurling — 8/25/94
DG Spurling, TMACS Software Project Manager — Date

EXCEPTION SHEET

TEST PROCEDURE NUMBER: TP005 **STEP#:** _____ **DATE:** _____

DESCRIPTION:



RESOLUTION: **DATE RESOLVED:** _____

APPROVAL:

_____
TMACS Software Test Procedure Tester Date

_____
TMACS Software Test Procedure Witness Date

_____
SJ Washburn, TMACS Test Procedure Software Engineer Date

_____
DG Spurling, TMACS Software Project Manager Date

DATA/VERIFICATION SHEET

This Sheet provides a record of Personnel who are involved in testing, data recording, verifying, and evaluating the Test Procedure. This form needs to be completed before a formal test is begun.

DIRECTIONS:

Print the name, sign, initial, and date the below lines of the participants.

TEST PROCEDURE NUMBER: TP005

J A Wam SQA		JAW	08/24/94
Tester / Organization		Initials	Date
John E Brannon / 62610		JEB	8/24/94
Witness / Organization		Initials	Date
Steven J Washburn		SJW	8/24/94
SJ Washburn, TMACS Test Procedure Software Engineer		Initials	Date
Dane Spurling		DS	8/24/94
DG Spurling, TMACS Software Project Manager		Initials	Date
Name / Organization		Initials	Date
Name / Organization		Initials	Date
Name / Organization		Initials	Date

TEST LOG

TEST PROCEDURE NUMBER: ~~TP005~~ TP005 **Date:** 8/25/91

WITNESS: John Brannon

TEST LOG NOTES:

8. TC 5.2 STEP 9 CHANGE 4.0 M/A TO APPROXIMATELY 4.0 M/A CURRENT SOURCE NEED TO GET A BETTER DEVICE IN THE FUTURE

COMMENTS: