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ECN

2. ECN Category (mark one) Supplemental ☐ Direct Revision ☒ Change ECN ☐ Temporary ☐ Standby ☐ Supersede ☐ Cancel/Void ☐	3. Originator's Name, Organization, MSIN, and Telephone No. Joseph A. Glasscock, Systems Development & Integration/Scientific & Program Systems/CASS, TMACS, SACS, 07E62, R1-01, 373-4302 6. Project Title/No./Work Order No. Tank Monitor and Control System (TMACS) Software Project Acromag Driver Acceptance Test 9. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-WM-TRP-113, Rev. 5	4. USQ Required? ☐ Yes ☒ No 7. Bldg./Sys./Fac. No. 2750E/TMACS/200E 10. Related ECN No(s). N/A	5. Date June 17, 1998 8. Approval Designer Q 11. Related PO No. N/A
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Tank Monitor and Control System (TMACS) Software Project Acromag Driver Acceptance Test

Joseph A. Glasscock

Lockheed Martin Services, Inc., Richland, WA 99352
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WSD 8-6-98
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Test Procedure ID

UTP 07.04.00 -00

Revision 6

TEST DESIGN SPECIFICATION ID: 07.04.00 -00

TESTING PHASE: Acceptance Test

TITLE: Acromag Driver Test

PLATFORM: Windows NT

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TANK MONITOR AND CONTROL SYSTEM

(TMACS)

SOFTWARE PROJECT

ACROMAG DRIVER ACCEPTANCE TEST

Steven J. Washburn

Joe Glasscock

LMSI Software Development and Integration

SIGN OFF:

DA Barnes TMACS Cognizant Engineer	signature Date

Software QA	signature Date

J. A. Glasscock TMACS Project Manager	signature Date

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FEATURES TO BE TESTED:

This Procedure tests the functionality of the TMACS Acromag driver software for user acceptance.

TEST CASE DESCRIPTIONS:**Table 1. Test Cases**

UTP 07.04.00 -00 -1. Test Embedded Mode Communication without Code Operated Switch
UTP 07.04.00 -00 -2. Test Checksum Errors While in Embedded Mode
UTP 07.04.00 -00 -3. Test Acromag Reject Errors While in Embedded Mode
UTP 07.04.00 -00 -4. Test Non-responsive Acromag Stations While in Embedded Mode
UTP 07.04.00 -00 -5. Test Polling Rate Changes while in Embedded Mode
UTP 07.04.00 -00 -6. Test Normal Communication through Code Operated Switch While in Embedded Mode
UTP 07.04.00 -00 -7. Verify Log Messages from Driver

Table 2. Appendices

Appendix A: Acromag Emulator Program Display and Commands
Appendix B: Emulator Test Configuration for Normal Operation
Appendix C: Emulator Test Configuration for Single Checksum Errors
Appendix D: Emulator Test Configuration for Multiple Checksum Errors
Appendix E: Emulator Test Configuration for Single Reject Error

DEPENDENCIES:

The Acromag driver being tested must be installed as a service on the test computer.

REFERENCES:

The acceptance criteria for this Test Procedure are taken from HNF-2708, the Functional Requirements for the Acromag I/O Processor Interface to the Tank Monitoring and Control System (TMACS).

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The Acromag commands are detailed in the Acromag Programmer's Reference Manual, part number 8500-228-B10037 from Acromag Incorporated, Wixom, Michigan.

FEATURE PASS/FAIL CRITERIA:

- The actual result from each test case must match the expected result.
- All incident reports generated while executing the test procedure must be resolved or closed.

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 G2 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).

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The Acromag stations associated with an Acromag interface can be displayed in the G2 Inspector workspace. This is very useful in showing the sample frequency for each station and the stations available for an interface. The command needed is: "Display a table of the names, obj-index, polling-freq, and last-recorded-value of every acromag-station S such that the text of the gsi-interface_name of S = "acromag-04" (assuming that the gsi-interface is acromag-04).

Acromag communications

The starting channel number for Acromag communications depends on the type of station.

- An analog station starts with channel 01 and goes through channel 16.
- A digital station starts with channel 17 and goes through channel 32.
- A reference station starts with channel 33 and goes through channel 34.

An Acromag will return a 4-hex-digit number for every value requested.

Emulator Operation

The emulator to use is **acro.exe**.

Refer to **Appendix A** for emulator operation.

PRE-TEST INSPECTION AND SETUP REQUIREMENTS

This Test Procedure is run using the software developed for production.

The hardware required is:

- The TMACS development computer(s).
- At least an 8-port serial multiplexer is attached to the workstation where the driver is to be tested.
- The Acromag emulator (currently on a separate computer). The emulator can function through each port on the driver test machine.
- (Optional if the emulator can support the Interactive Mode commands.) An Acromag unit that can be plugged in to a serial port.
- (Optional if the emulator can support the code-operated switch.) A code-operated switch that can be plugged between the Acromag emulator and the driver test machine.
- A serial analyzer used to monitor the communication between TMACS and the external devices (used to view the code-operated switch commands).

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To set this test up the Test Administrator must perform the following steps:

1. Verify that there are Acromag Station Objects in the knowledge base are using the tested GSI interface and have unique station addresses. Preferably there will be an analog, a digital, and a reference station for testing.
2. Verify that the gsi-interface is configured to point to the socket for the driver to be tested (e.g., socket 22214, 22215...) and that the driver being tested will listen on that socket.
3. Make sure the computer which will run the Acromag bridge software is connected to the Acromag emulator program through a port on the serial multiplexer on the computer. They need to be running the same baud rate.
4. If used make sure a serial analyzer is tied into the connection between the Acromag bridge and the code-operated switch. (This is necessary to observe the data coming across the communication line for the code-operated switch).
5. Verify that the gsi-interface will configure the driver to use the serial port where the emulator/Acromag is connected.
6. Start the Acromag bridge. On Windows NT™ the driver is started as a service and configured by G2 including which serial port to use.

TEST CASES:

UTP 07.04.00 -00 -1. Test Embedded Mode Communication without Code Operated Switch

Step	Perform	Expected Result	Initial
1.	Have the Test Administrator set up the emulator for <u>Acromag emulation mode without the code-operated switch</u> . Configuration for the Acromag Emulator is given in Appendix B . Start the Acromag emulator. Start the Acromag driver. Disable/enable the gsi-interface for the serial port.	Verify that <u>commands received</u> by the Acromag emulator from the Acromag bridge are in the form of ASCII hexadecimal digits and ASCII characters: [SS][CC]RH[MMMM]#XX] where [SS] is a 2 hexadecimal digit station number, [CC] is a 2 hex digit starting channel number, "RH" is the Acromag command "Read Hex", [MMMM] is the 4 hex digit channel mask, # is the checksum delimiter, [XX] is the two hex digit checksum value of the command.	RB.

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Step	Perform	Expected Result	Initial
2.	G2 is running.	<p>Verify that <u>command responses</u> from the Acromag emulators to the Acromag bridge is in the form of ASCII hexadecimal digits and ASCII characters given below:</p> <p style="text-align: center;">[A/R][SS][CC].[NNNN]...#[XX]</p> <p>where [A/R] is the character "A" or "R" for accept or reject of command received, [SS] is the Station [CC] is the channel [NNNN]... is a string of four hexadecimal ASCII digits representing the value for each channel selected by the channel mask [XX] is the two digit hexadecimal checksum value of the command response.</p>	ab

UTP 07.04.00 -00 -2. Test Checksum Errors While in Embedded Mode

Step	Perform	Expected Result	Initial
1.	Pause G2. Have the Test Administrator set up the Acromag Emulator Configuration Parameters as given in Appendix C . Resume G2.	Verify that TMACS is running.	ab
2.	Start the Acromag Emulator with display of received and transmitted messages to the screen enabled. (In some cases this will not be possible because of added timing problems caused by message display).	For the Acromag station specified, Verify that a sequence similar to that shown in Appendix C is displayed by the emulator after a checksum error.	ab
3.	G2 is running.	Verify that you <u>do not</u> see a white alarm stating a Checksum error has occurred displayed on the G2 MOST RECENT ALARM window. This is because a retry is attempted before a checksum error will be reported.	ab

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Step	Perform	Expected Result	Initial
4.	Pause G2. Set up the Acromag Emulator Configuration Parameters as given in Appendix D . Resume G2.	Verify that TMACS is running. Verify that the emulator is running.	AB-
5.	G2 is running.	For the Acromag station specified: Verify that a sequence similar to that shown in Appendix D is displayed by the emulator after a checksum error.	AB
6.	G2 is running.	Verify that a white alarm stating a Checksum error has occurred is displayed by G2. Note: Because of G2 internal data verification an internal alarm message will be generated which will supersede the checksum error message on the "MOST RECENT ALARM" window. Therefore, to see the white alarm you will need to get into the alarm summary paging mode by clicking on the "CURRENT ALARMS" button on the CONTROL PANEL. You will need to page through the alarms until you see the specified checksum error message.	AB-

UTP 07.04.00 -00 -3. Test Acromag Reject Errors While in Embedded Mode

Step	Perform	Expected Result	Initial
1.	Pause G2. Set up the Acromag Emulator Configuration Parameters as given in Appendix D, section 1.0, for testing a single Acromag command reject error. Resume G2 again when this is completed.	Verify that the emulator is communicating with TMACS.	AB
2.	G2 is running.	For the Acromag station specified: Verify that the sequence similar to that shown in Appendix D, section 2.0, is displayed after an Acromag reject error.	AB

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Step	Perform	Expected Result	Initial
3.	G2 is running.	Verify that a white alarm stating an Acromag reject error has occurred is displayed by G2 with the Acromag error code you specified in the emulator configuration. Note: Because of G2 internal data verification an internal alarm message will be generated which will supersede the reject alarm message on the "MOST RECENT ALARM" window. Therefore, to see the white alarm you will need to get into the alarm summary paging mode by clicking on the "CURRENT ALARMS" button on the CONTROL PANEL. You will need to page through the alarms until you see the specified reject alarm message.

UTP 07.04.00 -00 -4. Test Non-responsive Acromag Stations While in Embedded Mode

In this section we will test the situation when an Acromag station stops communicating with the Acromag bridge that the bridge will not attempt to re-send a command to that station. We will also verify that when communication is restored that the Acromag bridge will only send a retry when a checksum error is received from the station. The serial analyzer is needed to verify the operation of TMACS for these tests.

Step	Perform	Expected Result	Initial
1.	Pause G2. Unplug the cable to the Acromag emulator from the serial multiplexer. If not already present, plug the serial analyzer in to the port. Resume G2 again when this is completed.	Verify that the G2 and emulator are running.
2.	G2 is running.	Verify that the Acromag stations on this Serial Port no longer respond to commands from the TMACS Acromag Bridge and that the bridge does not resend commands to which no response is received. This can be observed by the use of a Serial Analyzer between the Unix workstation and Acromag emulator computers.

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Step	Perform	Expected Result	Initial
3.		Verify that white alarm messages appear on the G2 message workspace notifying you that communication has been lost with these stations. E.g., "The link between TMACS and its I/O driver has been broken" with the port number identified.	AB
4.	Pause G2. Plug the cable from the Acromag emulator back into the serial multiplexer. Resume G2.	Verify that the G2 and emulator are running.	AB
5.	G2 is running.	Verify that the Acromag stations on this Serial Port now respond to commands from the TMACS Acromag Bridge and that the bridge resends commands to the Acromag station which is sending out checksum errors.	AB
6.	G2 is running.	Verify that white alarm messages appear on the G2 message workspace notifying you that communication has been established with these stations	AB
7.	Stop the driver service.	Verify that there is a white alarm message on the G2 message workspace stating, "The link between TMACS and its I/O driver has been broken" with the port number identified."	AB
8.	Start the driver service.	Verify that G2 does not communicate with the service.	AB
9.	Disable and enable the gsi-interface object for the channel.	Verify that G2 communicates with the service and presents a white alarm message on the G2 alarm workspace stating, "The link between TMACS and its I/O driver has been established" with the port number identified.	AB

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UTP 07.04.00 -00 -5. Test Polling Rate Changes while in Embedded Mode

Step	Perform	Expected Result	Initial
1.	Have the Test Administrator set up the test for <u>Acromag emulation mode without using the code-operated switch</u> . Configuration for the Acromag Emulator is given in Appendix A . When the Acromag emulator and Acromag driver software are running, enable the display of send and received commands on the emulator.	Verify that the emulator is communicating with G2.	BB
2.	Login in the administrator mode and bring up the display of an Acromag object that is connected to the test port. Observe the sample frequency of the Acromag object.	Write the value here <u>1 10</u> . A value of 1 = sampled every 1 seconds. A value of 2 = sampled every 10 seconds. A value of 3 = sampled every 60 seconds. A value of 4 = sampled every 600 seconds. Verify that the object does poll at the expected rate by looking for the polling message on the serial analyzer or emulator.	BB
3.	Change the sample frequency of the Acromag object. Valid values as of 1/1/98 are 1,2,3 and 4.	Write the new value here <u>60</u> . Verify that the object is polled only at the new rate by looking for the polling message on the serial analyzer.	BB
4.	Change the sample frequency of the Acromag object to 0.	Verify that the object is no longer polled at any rate. (This will require observing for > 10 minutes.)	BB
5.	Change the sample frequency of the Acromag object to the original value.	Verify that the object is polled only at the new rate by looking for the polling message on the serial analyzer or emulator.	BB

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UTP 07.04.00 -00 -6. Test Normal Communication through Code Operated Switch While in Embedded Mode

As of May, 1998, the Acromag emulator does not support emulation of the code-operated switch. To run this section a code-operated switch must be connected between the Acromag driver serial port and the Acromag emulator or test unit.

A serial analyzer is needed to see the arming character and channel selection character for the code-operated switch. This analyzer should be connected between the driver serial port and the code-operated switch since the code-operated switch does not pass on the arming and port selection characters.

Step	Perform	Expected Result	Initial
1.	Have the Test Administrator set up the test for <u>Acromag emulation mode using the code-operated switch</u> . Configuration for the Acromag Emulator is given in Appendix A . When the Acromag emulator, code-operated switch, and Acromag driver software are running, enable the display of send and received commands on the emulator.	<p>Verify that <u>commands sent from the port on the slave</u> are in the form of ASCII hexadecimal digits and ASCII characters:</p> <p style="text-align: center;">[A][P][SS][CC]RH[MMMM]#[XX]</p> <p>where</p> <p>[A] is the code-operated switch arming character, [P] is the port number character. [SS] is a 2 hexadecimal digit station number, [CC] is a 2 hex digit starting channel number, "RH" is the Acromag command "Read Hex", [MMMM] is the 4 hex digit channel mask, # is the checksum delimiter, [XX] is the two hex digit checksum value of the command.</p>

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Step	Perform	Expected Result	Initial
2.	G2 is running.	<p>Verify that <u>command responses</u> from the Acromag emulators to the Acromag bridge is in the form of ASCII hexadecimal digits and ASCII characters given below:</p> <p style="text-align: center;">[A/R][SS][CC]:[NNNN]...#[XX]</p> <p>where [A/R] is the character "A" or "R" for accept or reject of command received, [SS] is a 2 hexadecimal digit station number, [CC] is a 2 hex digit starting channel number, [NNNN]... is a string of four hexadecimal ASCII digits representing the value for each channel selected by the channel mask, [XX] is the two digit hexadecimal checksum value of the command response.</p>	AB.
3.	Once communication has been verified between the Acromag emulator software and TMACS bridge interface bring up the ACROMAG-ROOT workspace. Then click on the development ports button followed by any one of the four test Port buttons. You should then see the subworkspace for that test port. On this workspace select the analog Acromag station to observe. Observe one of the stations for several minutes.	Verify that it does not expire for more than a second.	AB.

UTP 07.04.00 -00 -7. Verify Log Messages from Driver

Step	Perform	Expected Result	Initial
1.	On the computer running the driver, use the Event Viewer to check the Event Log for messages from the Acromag Driver.	Verify that there is a startup message dated when the Acromag driver was started for this testing.	AB.
2.		Verify that there is a shutdown message from step UTP 07.04.00 -00 -4.	AB.

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Step	Perform	Expected Result	Initial
3.		Verify that there is a startup message from step UTP 07.04.00 -00 -4.	AS
4.		Verify that there are no other driver messages produced as a result of this testing.	AS

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Appendix A: Acromag Emulator Program Display and Commands

Main Screen for Acromag Emulator Program

COMMUNICATION TEST PROGRAM
TMACS
VERSION 1.00

MAIN MENU

- "1" Test #1 - Generate checksum errors
- "C" Change configuration parameter values
- "D" Display configuration parameter values
- "S" Save configuration parameter values
- "T" Terminate program and return to DOS

Enter desired command:

When the emulator is operating it recognizes the following commands:

- ? – display commands
- S – display the strings sent by the emulator.
- R – display the strings received by the emulator.
- C – configure the emulator
- + - Raise TC temperature
- -- Lower TC temperature

If the bell is used it will upset the timing of the emulator and cause time-out failures in TMACS. Do not use the bell for normal operation.

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Appendix B: Emulator Test Configuration for Normal Operation**Configuration Parameter Values****RS-232 PARAMETERS**

Port Number: 1

Baud Rate: 9600

Parity: N

Data Bits: 8

Stop Bits: 1

ACROMAG PARAMETERS

Acromag Address: 0

(The Acromag address is set at testing time; range is 1-254.)

TC Temperature: 70.0

Temperature Station Offset: -1.0

Temperature Channel Offset: 0.1

Digital Data (Hex): 00008000

Selected Address: 0

Selected channel: 5

Selected TC Temperature: 70.0

Response Delay Time (sec.): 0.0

ERROR PARAMETERS

Error Rate (%): 30.0

Multiple Rate: 0

Checksum Mask (Hex): 01

Channel Error Mask (Hex): A000

Reject Value: 12

Audible Bell: OFF

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Appendix C: Emulator Test Configuration for Single Checksum Errors

Configuration Parameter Values

RS-232 PARAMETERS

Port Number: 1 Baud Rate: 9600 Parity: N
 Data Bits: 8 Stop Bits: 1

ACROMAG PARAMETERS

Acromag Address: 5 *182116* (The Acromag address is set at testing time; range is 1-254.)
 TC Temperature: 70.0
 Temperature Station Offset: -1.0
 Temperature Channel Offset: 0.1
 Digital Data (Hex): 00008000
 Selected Address: 0
 Selected channel: 0
 Selected TC Temperature: 70.0
 Response Delay Time (sec.): 0.000

ERROR PARAMETERS

Error Rate (%): 30.0
 Multiple Rate: 0
 Checksum Mask (Hex): 80
 Channel Error Mask (Hex): A000
 Reject Value: 00
 Audible Bell: OFF

Sample Output From Acromag Emulator for Single Checksum Error

This example is for an Acromag on port 5, station 1. The actual port and Acromag station number may be different in testing.

0501RH2051#28

Command from Driver to Emulator for Station 5 requesting ASCII Hex data for all channels specified by mask value (between the "RH" and "#" characters).

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A0501:00B800BC00BD00BF#4E

Response from Emulator to Driver Accepting Read Hex Command for station 5 and returning the data for 4 channels along with a **bad** checksum (preceded by the "#" character).

0501RH2051#28

Driver has detected bad checksum and resends the command to the Emulator.

A0501:00B800BC00BD00BF#CE

Response from Emulator to Driver Accepting Read Hex Command for station 5 and returning the data for 4 channels along with a **good** checksum.

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Appendix D: Emulator Test Configuration for Multiple Checksum Errors

Configuration Parameter Values

RS-232 PARAMETERS

Port Number: 1 Baud Rate: 9600 Parity: N
Data Bits: 8 Stop Bits: 1

ACROMAG PARAMETERS

Acromag Address: 5 (The Acromag address is set at testing time; range is 1-254.)
TC Temperature: 70.0
Temperature Station Offset: -1.0
Temperature Channel Offset: 0.1
Digital Data (Hex): 00008000
Selected Address: 0
Selected channel: 0
Selected TC Temperature: 70.0
Response Delay Time (sec.): 0.000

ERROR PARAMETERS

Error Rate (%): 30.0
Multiple Rate: 1
Checksum Mask (Hex): 80
Channel Error Mask (Hex): A000
Reject Value: 00
Audible Bell: OFF

Sample Output From Acromag Emulator for Multiple Checksum Errors

This example is for an Acromag on port 5, station 1. The actual port and Acromag station number may be different in testing.

0501RH2051#28

Command from Driver to Emulator for Station 5 requesting ASCII Hex data for all channels specified by mask value (between the "RH" and "#" characters).

Test Procedure ID UTP 07.04.00 -00 Revision 6	TEST DESIGN SPECIFICATION ID: 07.04.00 -00 TESTING PHASE: Acceptance Test	TITLE: Acromag Driver Test PLATFORM: Windows NT	Page 19 of 21
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A0501:
00B800BC00BD00BF#4E Response from Emulator to Driver Accepting Read Hex
Command for station 5 and returning the data for 4 channels along with a **bad** checksum (preceded by the "#" character).

0501RH2051#28 Driver has detected bad checksum and resends the command to the Emulator.

A0501:
00B800BC00BD00BF#4E Response from Emulator to Driver Accepting Read Hex
Command for station 5 and returning the data for 4 channels along with a second **bad** checksum.

No more retries should appear

Test Procedure ID

UTP 07.04.00 -00

Revision 6

TEST DESIGN SPECIFICATION ID: 07.04.00 -00

TESTING PHASE: Acceptance Test

TITLE: Acromag Driver Test

PLATFORM: Windows NT

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Appendix E: Emulator Test Configuration for Single Reject Error**Configuration Parameter Values****RS-232 PARAMETERS**

Port Number: 1

Baud Rate: 9600

Parity: N

Data Bits: 8

Stop Bits: 1

ACROMAG PARAMETERSAcromag Address: 819 06

(The Acromag address is set at testing time; range is 1-254.)

TC Temperature: 70.0

Temperature Station Offset: -1.0

Temperature Channel Offset: 0.1

Digital Data (Hex): 00008000

Selected Address: 0

Selected channel: 0

Selected TC Temperature: 70.0

Response Delay Time (sec.): 0.000

ERROR PARAMETERSError Rate (%): 30.0Multiple Rate: 0Checksum Mask (Hex): 00Channel Error Mask (Hex): A000Reject Value: 12

(This reject value maps to an error in the Acromag manual. Other values may be used.)

Audible Bell: OFF**Sample Output From Acromag Emulator for Single Reject Error**0501RH2051#28

Command from Driver to Emulator for Station 5 requesting ASCII Hex data for all channels specified by mask value (between the "RH" and "#" characters).

R0501:12#B5Response from Emulator to Driver **Rejecting** Read Hex Command for station 5 and returning an Acromag error code of 12 along with a checksum (preceded by the "#" character).

USER TEST PROCEDURE COVER SHEET

Test Procedure Number: 07.04.00-00
 Execution Number: 1

Version: 6
 Execution Test Date/Time: 6/4/98 11:45

Tester: JA Glasscock

Witness: DA BARNES

INCIDENT SHEETS FOR THIS TEST PROCEDURE

Incident Number	Procedure Step	Date Closed
<u>NONE</u>		

COMMENTS ACROMAG DRIVER SOFTWARE VERSION 3.0.0
TESTED. (6/4/98, 10:14 AM)

APPROVAL OF TEST PROCEDURE

Test Designer: JA Blank

Date: 6/1/98

Technical Project Lead: JA Blank

Date: 6/1/98

TEST was (circle one) " Successful " Unsuccessful " Re-test

CERTIFICATION OF SATISFACTORY EXECUTION

All of the test cases for this test procedure have been tested and all exception sheets for this test case have been resolved.

Testing Focal Point: JA Blank

Date: 6/4/98

Technical Project Lead: JA Blank

Date: 6/4/98

DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	Process Control	Date June 17, 1998
Project Title/Work Order		EDT No. N/A
Tank Monitor and Control System (TMACS) Software Project Acromag Driver Acceptance Test		ECN No. 648892

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
D. A. Barnes	R2-11	X			
V. L. Benson	R1-01	X			
S. C. Cantrell	R1-01	X			
J. A. Glasscock	R1-01	X			
M. J. Holm	R2-11	X			
R. R. Wandling	R1-01	X			