

Previs Inc.

Users Manual

Bailey DCS Simulator

HMI Test Addendum

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Prepared by:



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HMI Test Addendum

1 Introduction

This manual is an addendum to the Previs Bailey DCS Simulator Users Manual, and provides a manual for HMI Test, most specifically a manual for the *HMI_Test.EXE* Client to the Bailey DCS Simulator.

Bailey DCS Simulator version

The *HMI_Test.EXE* client (herein also called *HMI Test Client*) is included within the following Bailey DCS Simulator versions:

Version	HMI Test Client Included
<i>HMI</i> (HMI Test)	Yes
<i>CC</i> (Composer Companion)	Yes
<i>OTS</i> (Operator Training Simulator)	Yes

The HMI Test Client is part of all versions of the Bailey DCS Simulator.

2 Functions and Features

Key Functions and Features for the HMI_Test.EXE application are:

- Bailey DCS Simulator must be working and must be in Loopback mode to use this client. (See Bailey DCS Simulator Users Manual).
- Primary purpose is to support HMI Test via stepping one record at a time through the test specifications in an MDB file, and performing each test (for one L:P:M:B address and tag name at a time), and then logging the HMI Test result into an MDB file
- Detailed tests is supported for all exception generating console blocks. For example, for an FC30 – Analog block, the tester may
 - Set an analog value just above & below the ZERO value, or the ZERO + SPAN value, or set any other specific value.
 - Force any of the valid alarm states or no alarm
 - Force a bad quality state or red tag state
- Provides view of all recent Bailey DCS Simulator event messages and supports simulator start/stop.

3 Install and Configure HMI Test Client

Installation

The HMI Test application is always installed with the Bailey DCS Simulator. Refer to the Bailey DCS Simulator Users Manual.

Before Attempting to Run the HMI Test Client

Before attempting to run this application, you must first ensure that:

- The Bailey DCS Simulator is correctly installed, and the USB license key for the Bailey DCS Simulator is installed.
- The default.INI file for the Bailey DCS Simulator is correctly configured to start the simulator, and that the Bailey DCS Simulator correctly loads all of your CFG files.
- The Bailey DCS Simulator must be executing in Loopback mode.
- There are no installation or configuration issues clearly evident at the Message Tab of the BaileySim client.
- The simulator starts & stops via the services control menu correctly each time, with all CFG files loaded.

For help, please refer to the Users Manual – Bailey DCS Simulator.

Loopback Mode

The Loopback Mode of the Bailey DCS Simulator is specifically designed for HMI Test. In the Loopback Mode, the exception generating blocks are disconnected from the upstream and downstream logic in your CFG files, and their normal REAL function is substituted with a function specifically designed to help test connected HMI applications.

HMI Test (HMI) Version of Bailey DCS Simulator

The HMI version of the Bailey DCS Simulator is specifically licensed to ONLY execute in Loopback mode. If you are using this version, it will not operate in other modes.

Other Bailey DCS Simulator Versions

In the Composer Companion (CC) or Operator Training Simulator (OTS) versions of the Bailey DCS Simulator the Loopback Mode is accessed using the Loopback line within the default.INI file as follows:

e.g. LOOPBACK,300,600,0,1,1

Has to be present in the default.ini file to enable Loopback Mode for HMI Test (Refer to the Bailey DCS Simulator Users Manual).

4 Your HMI Tests

Microsoft Access (MDB) Test File

The HMI Test client application uses a Microsoft Access database file (.mdb format) to manage all tests. This file can be arbitrarily named but **MUST (!)** have the same table and record structure as the sample file provided.

This sample file, called HMITEST.mdb, is installed into the Bailey DCS Simulator\Program Files directory.

Recommendation *It is recommended that you copy the sample HMITEST.MDB file that we provide to you and use it as a way to create the right table and records structure for your tests.*

Table: TestSpecification

The TestSpecification Table is used as input to specify all HMI tests. This table defines:

- **Specification Number**
- **Tagname** - This is your tag name
- **Loop** address for exception generating block
- **PCU** address for exception generating block
- **Module** address for exception generating block
- **Block** address for exception generating block
- **Expected Block Type** (i.e. what FC type is expected at this address)
- **Graphic names** (note that you do not need to populate all of these graphic name fields if you do not wish to)
- **User Text Field** – Free form test to help at test time

When actually executing the tests defined in your MDB file, the HMI Test application will vector to start at the first record, and then the second, and third and so on. For this reason, you will wish to sort your MDB file into the best sequence for your tests.

Table: TestRecord

The TestRecord table is Output from all HMI Tests and includes:

- **Specification Number** – Same as TestSpecification
- **Tagname** – Same as TestSpecification
- **Loop** address for exception generating block
- **PCU** address for exception generating block
- **Module** address for exception generating block
- **Block** address for exception generating block
- **FCType** – Does the FC at address above actually match with expected FC type

- **Result** – Test PASS or FAIL
- **User** – Identify the tester
- **Date** – Identify the date of the test
- **Time** – Identify the time of the test
- **Issues** – Location for tester to include any test comments or issues.

Run HMI Test Client.

Run HMI Test Client from the directory where Bailey DCS Simulator has been installed and:

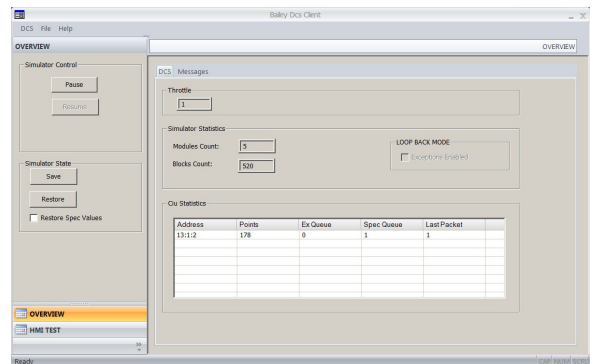
- Select DCS/Connect to connect to the Bailey DCS Simulator.
- Select HMI TEST mode at the left bottom corner to begin the test sequence.
- Verify that the HMI is connected to the simulator by ensuring that the correct CIU address is populated with a points table and that it is generating exceptions. You should also see that HMI behavior at that console appears generally normal.
- Select File/Load submenu to load your mdb test file (be sure this file has the correct Table and Record format as above.
- First record would be displayed in the left pane and the ANALOG or DIGITAL tab in the HMI TEST view.
- Execute the test you need using the radio buttons, check boxes and push buttons.
- After finishing your test the type your comments into the “Issues” edit box.
- Press “Test Ok”, ”Test Not Ok” or “SKIP” button at the left pane to go to the next test record.
- At any time press “STOP” button to cancel test.
- Any time user can do to “INPUT FILE” tab or “OUTPUT FILE” tab to review input and output data.
- After the last record the “Output File” tab is displayed.
- Go to File/Save submenu to save the test result.
- The test result is saved in the “TestRecord” table of your MDB file.
- To exit, go to DCS/Disconnect submenu and then to DCS/Exit.

5. The User Interface

Three Sections

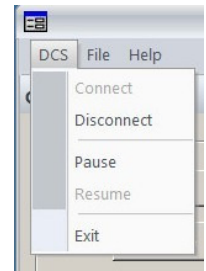
The user interface for the HMI Test Application has four sections:

- Menu
- Selector
- Right Panel
- Left Panel



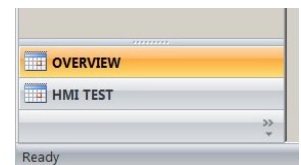
Menu

- **Menu** – along the top of the screen, with the following choices:
 - **DCS** – Commands to the simulated DCS including:
 - **Connect** – Connect this client to simulated DCS
 - **Disconnect** – Disconnect this client from simulated DCS
 - **Pause** – Pause simulator
 - **Resume** – Resume simulator
 - **File** – Provides three file options:
 - **Open - Open Test MDB file**
 - **Save** – Save test MDB file
 - **Load CFG Files** – Causes CFG files to be released from disk
 - **Help** – Gives details re this application. Refer to manuals for operating instructions.



Selector

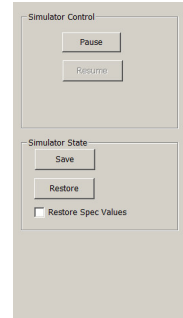
- **Selector** - In bottom Left selects the mode for this client
 - Overview
 - HMI Test.



When Overview Mode is selected

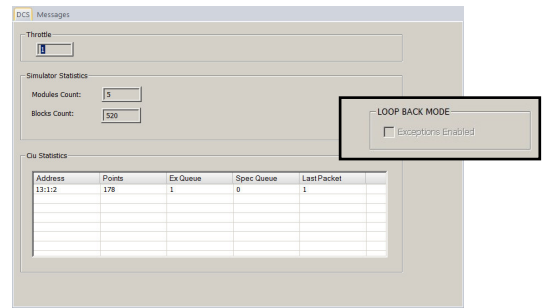
Left Panel

- **Pause** – Pause simulator execution.
- **Resume** – Resume simulator execution
- **Save** – save DCS state file
- **Restore** – Restore DCS State File
- **Restore Spec Values** - Restore specifications when restoring DCS state file.

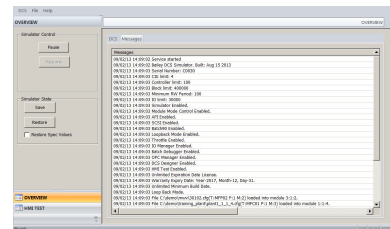


Right Panel

- **DCS Tab** – Provides various statistics re Bailey DCs Simulator operation:
 - **Throttle** – Current throttle setting
 - **Simulator Statistics** – includes:
 - **Modules Count** – How many controller module CFG files are loaded.
 - **Blocks Count** – How many function blocks, in total, are loaded.
 - **CIU Statistics** – current CIU's in operation (see details)
 - **Loopback mode** - When in loopback mode the indicator is visible.



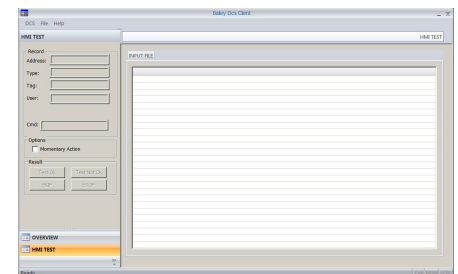
- **Messages Tab** – Recent event log messages for Bailey DCs Simulator. For details of the different messages, refer to Users Manual, Bailey DCS Simulator.



When HMI Test Is Selected

This section describes screen operations when HMI Text is selected.

If all the fields on the screen are empty, then open the test MDB file first, via the menu.



Left Panel

Once the Test MDB file is loaded, the left panel provides the following:

- Record
 - **Address** – L:P:M:B address for this test record
 - **Type** – Using the L:P:M:B address above the function code type is auto-determined from the CFG file.
 - **Tag** – Tag name for this test record
 - **User** – User name (from MDB)
 - **Cmd** – For all block types, while addressing a specific block address, the Bailey DCS Simulator presents the data received in response to operator command from any console, as context sensitive decoded information (SET/RESET, VALUE <value>, OUTPUT SIN VALUE <value>, OUTPUT STATUS <value>, MANUAL/AUTO, STOP/START, TEXT <text id>) for the Function Code type in view. This data persists in the “Cmd” box on the left part of the screen until dismissed by the next record.
- Options
 - **Momentary Action** – check this if you wish each test action to be momentary. Leave it unchecked if you wish each test action to be of a toggle nature.
- Result
 - **Test OK Button** – Click this button if the test was OK (PASS). This will record the PASS test result in the TestRecord Table, and will increment to the next test record in the TestSpecification Table.
 - **Test Not OK Button** - Click this button if the test was NOT OK (FAIL). This will record the FAIL test result in the TestRecord Table, and will increment to the next test record in the TestSpecification Table.
 - **SKIP** – Click this button to SKIP the currently showing record, and record nothing in the TestRecord Table for this test record, and increment to the next test record in the TestSpecification Table.
 - **STOP** - Click this button to record nothing in the TestRecord Table for this test record, and STOP test execution.

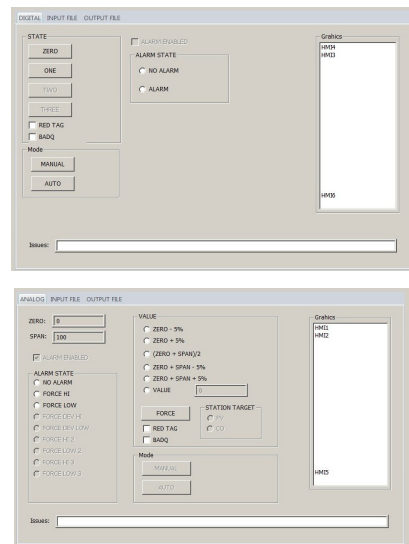
The screenshot shows a software interface for recording test data. It features several input fields: 'Address' (containing '1:1:4:405'), 'Type' (containing 'ANALOG'), 'Tag' (containing 'TAG1'), and 'User' (containing 'DAVE'). Below these is a 'Cmd' field. An 'Options' section contains a checkbox for 'Momentary Action'. At the bottom, a 'Result' section contains four buttons: 'Test Ok', 'Test Not Ok', 'SKIP', and 'STOP'.

Right Panel

In the HMI Test Mode, when stepping through the test file, the right panel provides specific test controls for testing of each supported Function Code type.

Issues – If the test FAILS, type a note here and it will be recorded to the test output file.

Graphics – Each RECORD of Test Input file supports multiple graphic screen names (to 20 graphic names, to 20 characters per graphic name maximum) for each test record.



Supported FC Types

The following exception generating function code types are supported for HMI test:

- FC30 – Analog Exception Report
- FC45 – Digital Exception Report
- FC62 – Remote Control Memory
- FC68 – Remote Manual Set Constant
- FC80 – Station
- FC123 – Device Driver
- FC129 – Multi-State Device Driver
- FC136 – Remote Motor Control
- FC151 – Text Selector
- FC177 – Data Acquisition Analog
- FC194 – User Defined Data Export
- FC222 – Analog In/Channel
- FC223 – Digital In/Channel
- FC224 – Analog Out/Channel
- FC225 – Digital Out/Channel

Each of these function codes is supported by a specific loopback function (see Bailey DCS Users Manual – Appendix G for loop back functions)

Tests for each Function Code (FC) Type

This section describes the tests available for each Function Code type.

Analog FC Types - FC30, FC68, FC177, FC222, FC223

For all analog FC types (FC30, FC68, FC177, FC222, FC223) tests include:

- Auto-sense the ZERO/SPAN range from the block (i.e. from CFG content)
- Provide Single Click selection of data value (for data exception to console) which is:
 - 5% below ZERO
 - 5% above ZERO
 - at mid point between ZERO and ZERO + SPAN
 - 5% below ZERO + SPAN
 - 5% above ZERO + SPAN
- Provide data entry function to support specific value entry
- Set, via mutually exclusive radio button control, the alarm state to any of the alarm states supported by the block under test (e.g. LOLO, LO, DEV, HI, HIII etc), or to no alarm
- Set, via check box control, the bad quality state
- Set, via check box control, the red tag state

STATION – FC80

For STATION FC type (FC80) tests include:

- Auto-sense the ZERO/SPAN PV range from the block (i.e. from CFG content)
- Provide Single Click selection of PV data value which is:
 - 5% below ZERO
 - 5% above ZERO
 - at mid point between ZERO and ZERO + SPAN
 - 5% below ZERO + SPAN
 - 5% above ZERO + SPAN
- Provide data entry function to support specific value entry for PV
- Provide Single Click selection of CO data value which is:
 - -5% , 5%, 50%, 95%, or 105%
- Provide data entry function to support specific value entry for CO
- Set, via mutually exclusive, non-momentary, radio button control, the alarm state to any of the alarm states supported by the block under test (e.g. LO, DEV, HI, HIII etc), or to no alarm.
- Set, via check box control, the bad quality state
- Set, via check box control, the red tag state
- Set, via button controls, the mode state (AUTO,MANUAL)

Digital Tag Types - FC30, FC68, FC177, FC222, FC223

For all digital tag types except the MSDD (i.e. FC45, FC62, FC123, FC136, FC224, FC225) tests include:

- Set, via button controls the state (ONE,ZERO)
- Set, via mutually exclusive, non-momentary, radio button control, the alarm state to any of the alarm states supported by the block under test (e.g. ALM, RTN), or to no alarm
- Set, via check box control, the bad quality state
- Set, via check box control, the red tag state

MSDD – FC129

For all MSDD block (i.e. FC129) tests include:

- Set, via button controls the state(ONE,ZERO,TWO,THREE)
- Set, via mutually exclusive, non-momentary, radio button control, the alarm state to any of the alarm states supported by the block under test (e.g. ALM, RTN), or to no alarm
- Set, via check box control, the bad quality state
- Set, via check box control, the red tag state
- Set, via button controls, the mode state (AUTO,MANUAL)

Text Selector – FC151

For Text Selector block (i.e. FC151) tests include:

- Set, via mutually exclusive, non-momentary, radio button control, the target of the index value (MSG,COLOR).
- Provide data entry of text selector index.
- Set, via check box control, the bad quality state

User Defined data Export – FC194

For User Defined Data Export (FC194) it is possible to:

- Provide data entry of text string
- Set, via check box control, the bad quality state
- Set, via button controls, the mode state (AUTO,MANUAL)