# **MDTest User Manual**

Testing Automation and Reporting for IBM i

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# 1. MDTest

# 1.1 Welcome to MDTest

This is the reference manual for MDTest - the Midrange Dynamics Automated Testing Tool.

This manual is comprised of these sections:

- Installation.
- Overview
- Defining Tests
- MDTest Functions
- Example Test Programs
- Automating Tests
- Quality Gates
- Reporting

You can download a PDF version of this guide here.



# **1.2 MDTest Installation**

## **1.2.1 Pre-Requisites**

- MDCMS 8.6.1 or newer
- MDOpen extension for VSCode 8.6+ (available now) or the MDOpen plugin for Eclipse/RDI 8.7+ (under construction)
- License Key for MDTest
- Minimum OS/400 V7R2M0 TR9
- DevTools QDEVTOOLS library
- License Program 5770-SS1 39 International Components for Unicode (only required for RegEx testing functions)

## 1.2.2 Where to Install

MDTest is only necessary to license and install on IBM i partitions where unit testing will occur. This is typically performed on development and functional testing partitions.

## 1.2.3 Install MDTest Library

A separate download for MDTest isn't necessary, as the installation package for the MDTEST product is included in the MDSEC product library.

A library named MDTEST (+ suffix of the MDCMS instance, when not default) contains all service programs and copybooks necessary for utilizing the MDTest functionality. This library must be installed once before MDTest can be used. Once the library exists, any future MDCMS upgrades run using MDINSSAVF will automatically update the MDTEST library as well.

Command to install the MDTEST library: MDINSTEST The command should be run from a command line from within an MDCMS green-screen session. There are no parameters for this command.

## 1.2.4 Cross-Reference MDTEST

For ease of use for the developers, it is highly recommended to add the MDTEST library to an application and level in MDXREF and then build the cross-referencing for this library. Steps (for an authorized MDXREF administrator):

- 1. from green screen, enter command MDXREF and press enter
- 2. press F9=Build Database
- 3. select an application/level pair and use option L to list the libraries for the level.
- 4. position to a blank row and add a sequence number and MDTEST to the library list and press enter.
- 5. use option X to cross-reference MDTEST

## 1.2.5 Add MDTEST to Promotion Level Job Descriptions

The job description for each Promotion Level that will utilize MDTest for the compile-time and run-time of test programs will need to have the MDTEST library added to its library list. Steps (for an authorized MDCMS administrator):

- 1. from green screen, enter command MDCMS and press enter
- 2. select option 1=MDCMS Setup Menu
- 3. select option 2=Promotion Levels
- 4. for each applicable level, use option J=JOBD to edit the job description

# **1.3 MDTest Overview**

MDTest is a Unit testing tool integrated with MDChange.

MDTest provides for the on-demand and automated execution of a sequenced list of commands and SQL statements.

The results of the executed items are reported with several layers of granularity and MDTest can block the further deployment of the applicable programs via a quality gate.

Aside from being a runtime engine for testing, MDTest also provides a large set of testing related functions that can be easily imbedded into testing programs written by your development staff (every ILE language is supported). The categories of functions include: - Code Coverage Functions - Performance Measurement Functions - Informational Functions - Execution Functions -Numeric condition Functions - Character condition Functions - RegEx condition Functions - Array condition Functions

Specifications of all Functions

MDTest functions only need to be embedded in custom test programs - your application objects themselves do not require any special coding.

## 1.3.1 Other Key Deliverables

#### Powerful Automation

- Trigger Tests by object, attribute, RFP, period, manually
- · Associate with modify, recompile, delete operations
- Invoke any command or SQL statement
- Control Quality Gates with pass/fail results

## Drill Down Reporting

- Custom Filters
- Summary Results
- Drill down to individual unit test results
- Custom Reporting Categories
- Tagging, Isolation & Extraction of relevant Job Log data.
- Reusable Templates
- Define sequences of Commands or SQL Statements
- Include any pre and post test operations
- Link to MDCMS Attributes
- Generic program inclusion & exclusion filtering
- Use MDCMS Wildcards for runtime variables
- Group granular test definitions
- Pass/Fail Condition Control

## 1.3.2 Overall Steps to use MDTest

- Define Test Steps
- Write Test Programs
- Define Automated Testing Templates
- Reporting
- Handle Quality Gates

# 1.4 Defining Test Steps

A testing pipeline is made up of individual steps. In MDTest, a step is represented by a Test Definition.

## 1.4.1 Manage Test Definition Categories

In MDOpen, navigate to MDTest->MDTest Definition Categories Maintenance of Categories requires authority to MDSEC Code 93

A category is a 10-character identifier of your choosing to help in organizing and filter the list of Test Definitions. Click Add to add a new MDTest Definition Category or click on the category name to edit it.

Field	Description	
Category	A 10 character ID of your choice to better organize the list of Definitions A suitable description of the category	
Description		
Row Option	Description	
Сору	Add a new Test Definition Category based on values of an existing element	

Delete	Delete a Category - only permitted if not used on any definitions	
Rename	Rename a Category	
MDTest Definitions	List all definitions for a Category	

## 1.4.2 Manage Test Definitions

In MDOpen, navigate to MDTest->MDTest Definitions Maintenance of Definitions requires authority to MDSEC Code 93

A Test Definition is a single, executable step that is submitted to batch and processed by the MDTest framework. Each execution of a Definition will be tracked and reported as a Job. A sequence of one or more MDTest Definitions combined into an Automated Testing Template make up a MDTest Pipeline. Click Add to add a new MDTest Definition or click on the Description to edit it.

Field	Description
Description	A suitable description of the definition
Category	A 10 character ID for organizing the Definitions. Use content-assist to select from list of Categories
Step Type	Command, Manual or SQL Statement. More information below
Timeout in Seconds	Define a maximum wait time (in seconds) for the step to complete before considered failed and to abort the step
Step ActionThe command string or SQL Statement. Use content-assist to append an MDCMS or Level Wildcard string. Step Action is not applicable for manual steps. Use Content-Assist to append a wildcard (MD Level or Custom Field wildcard) to the Action string. At run-time, MDTest will replace the wildcard w value based on the target level for level wildcards or the first object request in the RFP that trigger 	

Row Option	Description	
Сору	Add a new Test Definition based on values of an existing definition	
Delete	Delete a Test Definition - the definition will also be deleted from any Automated Testing Templates	
MDTest Jobs	List all executions of this definition	
Manually Run MDTest Definition	Execute the definition manually. Requires MDSEC Code 94. More Details below	
Templates using Definition	List the Automated Testing Templates that use the MDTest Definition	

#### **Command Step Type**

A Command Step Type expects a command in the Step Action parameter. Generally, commands do not need to be qualified with a library name, unless they do not reside in the library list for the job description of the target promotion level. The command will run from within a batch job that exists only for the duration of this command.

Example of using the MDTransform Data copy command to refresh test data:

MDCPYDATA TEMP(TESTSETUP) SBM(\*NO) JOBS(3)

Example of calling a test program with custom wildcard values:

CALL PGM(MYTSTPGM) PARM(('##MINCOD##' (\*CHAR 5)) ('##MAXCOD##' (\*CHAR 5)))

#### Manual Step Type

A manual step is a process that will occur outside of MDTest, such as an interactive process. Once the manual process is complete, a user can click the thumbs-up icon if it passed or thumbs-down icon if it failed. The user and decision will be logged to the step's job as well as the Automated Template batch. The thumb icons will appear in the Test Batches or MDTest Jobs lists for an entry that is waiting for a decision. If a decision isn't granted before the timeout for the step is reached, it will be considered to have failed.

#### **SQL Statement Step Type**

An SQL Statement Step Type expects a Db2 SQL statement in the Step Action parameter. This is typically used to insert, update or delete records in a table. The statement will run from within a batch job that exists only for the duration of this statement execution. Generally, SQL statements do not need to be qualified with a library name, unless the target entity doesn't reside in the library list for the job description of the target promotion level.

Example of SQL Statement with a custom wildcard:

UPDATE MDACUR SET VALCHF = ++BASRAT++

## 1.4.3 Manually Run MDTest Definition

If a Test Definition should be run manually, to test the definition or to test a target process before/after installing, use option Manually Run MDTest Definition for the selected definition. If the option doesn't appear, then you don't have authority to MDSEC Code 94.

Field	Description
Appl	The application code of a Promotion Level for determining the job description to use for the library list, job queue, etc. Use content-assist to select from a list
Level	The Promotion Level number for determining the job description to use for the library list, job queue, etc. Use content-assist to select from a list
Additional Library for top of Libl	The name of a library that should be positioned above all other libraries in the library list. Useful when unit testing a program currently checked out to a developer library
Use Additional Library	True = the library will be added to the library list. False = the library will be not be added to the library list
Delay Job Start in Seconds	The number of seconds the submitted job should wait before beginning processing. This can be useful for starting a service job in order to debug. The job info is visible from the MDTest Jobs view which is automatically displayed once the Confirm button is pressed.

After selecting the option, you will be prompted with a confirmation panel.

# **1.5 Automated Testing Templates**

An Automated Testing Template defines a sequence of Test Definitions that should be executed in order to automatically test an application process. A Template Test is triggered when one or more programs of a given MDCMS attribute have completed installation into a target environment.

## **1.5.1 Manage Automated Testing Templates**

In MDOpen, navigate to MDTest->Automated Testing Templates Maintenance of Testing Templates is permitted if you have authority to either MDSEC Code 7 or 93.

Click Add to add a new Template or click on the template name to edit it.

Field	Description
Template	A 10 character ID of your choice
Testing Product	MDTest - the MDTest unit testing product from Midrange Dynamics TestBench - the QA Testing product from Original Software
Product Library	If the product is TestBench, the library containing the TestBench product should be entered here
Description	A suitable description of the template
Quality Gate	When true, any programs that triggered the template will not be allowed to continue beyond the installed level (migration to next level or send to another target), unless the test jobs return a PASS status. The Quality Gate can be overridden by authorized users, when necessary.
Test Frequency	The number of candidates found for a template before a batch test run is triggered. The programs will be collected and placed in Test Pending status until the Test Frequency threshold has been reached. The Frequency value is used in conjunction with the Unit of Frequency
Unit of Frequency	<ul> <li>RFP (recommended, unless test case runs for a long period of time) - A Test Batch will be executed each n (Test Frequency) times an RFP containing one or more candidates is installed</li> <li>Object - A Test Batch will be executed after n object candidates have been installed. If the number of candidates in an RFP exceed the threshold, they will still be in the same batch.</li> <li>Day - A Test Batch will be executed after n days since the first candidate was installed.</li> <li>Manual Only - candidates will be placed in pending status until such time that an authorized user (MDSEC Code 94) manually starts the Test</li> </ul>
Test Counter	The current number of candidates in pending status
Counting from Date	The date of the first currently pending candidate
Include Recompiles	By default, only programs checked out for modification are considered candidates. Set to True if Recompiled programs should also trigger a test
Include Deletions	Set to True if Deleted programs should trigger a test
lnclude By Default	False - programs installed with an MDCMS attribute assigned to the Template will only be considered a candidate if the are included in the Object Exceptions. True - programs installed with an MDCMS attribute assigned to the Template will always be considered a candidate unless they are omitted in the Object Exceptions.

Row Option	Description	
Сору	Add a new Template based on values of an existing element	
Delete	Delete a Template	
Rename	Rename a Template	
Object Exceptions	Since many programs tend to share the same attribute, but may need a different (or no) set of test definitions, individual program handling can be controlled using Object Exceptions. More information below	
Batches	The list of pending, active or completed executions of the set of Test Definitions used by the Template. More information below.	
Attributes assigned to Template	The program or service program MDCMS attributes to consider as candidates for testing using this template.	
MDTest Execution Steps	The sequence of Test Definitions to be executed for the template. More information below.	

## **1.5.2 MDTest Execution Steps**

Viewed/Managed by selecting option MDTest Execution Steps for an Automated Testing Template. Maintenance of Execution Steps requires authority to MDSEC Code 7

An execution step is a sequenced step for the testing pipeline. Each step is executed for a MDTest Template Batch as its own batch job and controlled by the MDTest pipeline manager.

Click Add to add a new Step or click on the sequence number to edit it.

Field	Description
Sequence	A number to order the steps. The lower the number, the earlier the step will be executed.
Definition ID	The ID of a Test Definition. Use content-assist to select from a list
Ignore Errors	false - if the step fails, the entire MDTest batch run will be considered to have failed. true - if the step fails, the batch will be flagged as having warnings but not be set to failed.
Run if Prior Step Failed	false - if any prior step failed, don't execute this step true - execute this step even if a prior step failed (often used for data cleanup steps)

Row Option	Description	
Сору	Add a new step based on values of an existing element	
Delete	Delete a step	
Manually Run MDTest Definition	Run the Definition for the step manually. A confirmation panel will be displayed be execution occurs.	

## 1.5.3 Assign MDCMS Attributes to Template

Viewed/Managed by selecting option Attributes assigned to Template for an Automated Testing Template. Maintenance of Attributes requires authority to MDSEC Code 5 for the target level of the attribute.

Header Option	Description
Only Assigned to This	Only attributes currently assigned to the template will be listed
Not Assigned to This	Only attributes not currently assigned to the template will be listed
Assigned to Any	All attributes will be listed

Row Option	Description
Сору	Add a new step based on values of an existing element
Delete	Delete a step
Manually Run MDTest Definition	Run the Definition for the step manually. A confirmation panel will be displayed before execution occurs.

## 1.5.4 Object Exceptions

Viewed/Managed by selecting option Object Exceptions for an Automated Testing Template. Maintenance of Object Exceptions is permitted if you have authority to either MDSEC Code 7 or 93.

An Object Exception provides a way to granularly determine how specific programs are tested, as programs for many different purposes will use the same MD attribute.

Click Add to add a new Object Exception or click on the Object Name to edit it.

Field	Description
Object Name	A specific object name or a generic naming pattern for all objects matching the pattern. When MDTest checks the list of Object Exceptions for a program, the specific name will be checked first and then the first matching naming pattern will be used if the specific name isn't found. If a match isn't found in the exception list, then the usage will be determined by the Include by Default parameter on the Automated Testing Template.
Alternative Template	*NONE - do not perform Automated Testing for a matching program *SAME - use the Template that the Object Exception belongs to Alternative Template - use the execution steps defined for a different Template. Use content-assist to select from a list.

Row Option	Description
Сору	Add a new exception based on values of an existing element
Delete	Delete an exception

## 1.5.5 Batches

Viewed/Managed by selecting option Batches for an Automated Testing Template.

The view lists all batch runs for a specific Testing Template in descending order.

Row Option	Description
Start/Rerun Batch	Start the run for a Batch in Pending status or Rerun a Batch that previously completed or abnormally ended. An initial run or a rerun will both update the quality gate for the batch
Manual Step Passed	If the batch run is waiting for a decision for a manual step, this option is provided to state that the manual step has completed successfully. The batch will then proceed to the next Execution Step.
Manual Step Failed	If the batch run is waiting for a decision for a manual step, this option is provided to state that the manual step has failed. The batch will be flagged as failed (if ignore errors = false) and proceed to the next Execution Step.
Set Batch Status to System Error	If the batch run ended abnormally, this option is used to mark as completed with system errors. Afterwards, the quality gate is set to failedand a subsequent rerun of the batch is possible.
MDTest Jobs	List all of the job information for the batch
Manual Results	List all of the results for the batch
Objects	List all of the installed programs that were included for the batch

# **1.6 MDTest Functions**

## **1.6.1 Pre-Requisites**

Ensure the prerequisites below are met before adding MDTest Test Functions described below to your test programs.

## COBOL

- In Working Storage Section COPY MDTCBLWSC OF QLBLSRC.
- In Procedure Division COPY MDTCBLPRC OF QLBLSRC.
- Bind in MDTEST/MDRTEST Service Program (Use any preferred method)
- Ensure MDTEST is in the library list when compiling the program.

#### RPG

- Include the follwing copy book: /Copy QRPGLESRC, MDRTESTP
- Bind in MDTEST/MDRTEST Service Program (Use any preferred method)
- Ensure MDTEST is in the library list when compiling the program.

## 1.6.2 MDTest Procedures

#### **Help Functions**

MDTEST\_ADDINFO

writes an Information Entry to Result

## ILE Procedure Interface

Direction	Field	Туре	Options	Comment
In	Message	VarChar(128)	Value	
In	Report Group	Char(10)	Const, NoPass, Omit	

COBOL SECTION

## **MDTEST-ADDINFO** USING

Direction	Field	Туре	Optional	Initialized	Comment
In	MDTEST-MSG	PIC X(128)	No	each Call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	

#### **RPG Example**

```
Dcl-S h_Message VarChar(128);
//Version 1
h_Message = 'This is my';
MDTest_addInfo(h_Message + ' first message');
//Version 2
MDTest_addInfo('This is my second message':'FINANCE');
```

#### MDTEST\_ADDPASSRESULT

writes a Pass Result

Direction	Field	Туре	Options	Comment
In	Message	VarChar(128)	Value	
In	Expected Value	VarChar(4096)	Const, NoPass, Omit	
In	Actual Value	VarChar(4096)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

COBOL SECTION

## MDTEST-ADDPASSRESULT USING

Direction	Field	Туре	Optional	Initialized	Comment
In	MDTEST-MSG	PIC X(128)	No	each Call	
In	MDTEST-EXP-NUM	PIC X(4096)	Yes	each Call	
In	MDTEST-ACT-NUM	PIC X(4096)	Yes	each Call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	

## RPG Example

```
Chain 16 CUSTOMER;
If %found(CUSTOMER);
MDTest_addPassResult('Customer record found.':'Customer':'exists');
EndIf;
```

MDTEST\_ADDLOGENTRY

## writes a Log Entry

ILE Procedure Interface

Direction	Field	Туре	Options	Comment
Out	Log Entry Id	Int(10)		Input Parameter for MDTest_addLogDetailEntry
In	Message	VarChar(2048)	Value	

COBOL SECTION

## **MDTEST-ADDLOGENTRY** USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST- LOG-ID	PIC S9(9) COMP-5			Output Parameter of MDTest_addLogEntry
In	MDTEST- LOG-MSG	PIC X(2048)	No	each Call	

#### RPG Example

Dcl-S h\_LogEntryId Like(MDTest\_addLogEntry);

h\_LogEntryId = MDTest\_addLogEntry('Check of Procedure getCustomer finished.');

#### MDTEST\_ADDLOGDETAILENTRY

## writes a Log Detail Entry

## ILE Procedure Interface

Direction	Field	Туре	Options	Comment
In	Log Entry Id	Int(10)	Value	Output Parameter of MDTest_addLogEntry
In	Message	VarChar(2048)	Value	

COBOL SECTION

## MDTEST-ADDLOGDETAILENTRY USING

Direction	Field	Туре	Optional	Initialized	Comment
In	MDTEST- LOG-ID	PIC S9(9) COMP-5	No	first only	Output Parameter of MDTest_addLogEntry
In	MDTEST- LOG-MSG	PIC X(2048)	No	each Call	

## RPG Example

Dcl-S h\_LogEntryId Like(MDTest\_addLogEntry);

MDTest\_addLogDetailEntry(h\_LogEntryId:'Paremter used for calling getCustomer: 16');

#### MDTEST\_GETJOBSTATUS

## returns the current Job status

## ILE Procedure Interface

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL, MDTest_PASS or MDTEST_UNKNOWN

COBOL SECTION

## MDTEST-GETJOBSTATUS USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST- STATUS	PIC X(10)			MDTEST-FAIL, MDTEST-PASS or MDTEST-UNKNOWN

#### RPG Example

Dcl-S h\_JobStatus Like(MDTest\_getJobStatus);

h\_JobStatus = MDTest\_getJobStatus();

## MDTEST\_FORCEFAIL

writes a Fail Result

Direction	Field	Туре	Options	Comment
In	Message	VarChar(128)	Value	
In	Report Group	Char(10)	Const, NoPass, Omit	

COBOL SECTION

## MDTEST-FORCEFAIL USING

Direction	Field	Туре	Optional	Initialized	Comment
In	MDTEST-MSG	PIC X(128)	No	each Call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	

## RPG Example

MDTest\_addInfo('Customer not found.':'FINANCE');

#### MDTEST\_ABORTBATCH

#### writes a Fail Result

ILE Procedure Interface

Direction	Field	Туре	Options	Comment
In	Message	VarChar(128)	Value	
In	Report Group	Char(10)	Const, NoPass, Omit	

COBOL SECTION

## MDTEST-ABORTBATCH USING

Direction	Field	Туре	Optional	Initialized	Comment
In	MDTEST-MSG	PIC X(128)	No	each Call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	

RPG Example

MDTest\_abortBatch('Customer file not found.':'FINANCE');

#### MDTEST\_WAITMANUALSTEP

Wait for manual actions - Allows for test steps, such as interactive processes, to occur outside of the MDTest framework and then log the test status decision provided by a user from within MDOpen.

Direction	Field	Туре	Options	Comment
In	Timeout	Int(10)	Const, NoPass, Omit	Maximum wait time in seconds
In	Report Group	Char(10)	Const, NoPass, Omit	

## MDTEST-WAIT-MANUAL-STEP USING

Direction	Field	Туре	Optional	Initialized	Comment
In	MDTEST-TIMEOUT	PIC S9(9) COMP-5	Yes	each call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	

RPG Example

MDTest\_waitManualStep(600:'FINANCE');

#### **Execute Functions**

## MDTEST\_START\_TIMER

Start the timer for performance measurement and set the start-point for any job log messages to be reported.

After the timer is started, perform one or more program calls, procedure calls, etc. and then use MDTest\_End\_Timer to stop the timer and collect the results.

When using MDTest\_Execute\_CMD or MDTest\_Execute\_SQL, the timer start/stop procedures should be omitted as they are integrated with those 2 execution functions.

#### ILE Procedure Interface

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Severity	Packed(2:0)	Value	Severity of Messages to log
In	Duration	Int(10)	Const, NoPass, Omit	Allowed duration in milliseconds between start and end of timer
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

COBOL SECTION

## **MDTEST-START-TIMER** USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-SEV	PIC S9(2) COMP-3	No	first only	Severity of Messages to log
In	MDTEST-MAX- DURATION	PIC S9(9) COMP-5	Yes	each Call	Allowed duration in milliseconds
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	

#### **RPG Example**

```
If MDTest_Start_Timer(10:360:'application process':'EXAMPLE') = MDTest_FAIL;
    // system error
EndIf;
```

## MDTEST\_END\_TIMER

End the timer that was started using MDTest\_Start\_Timer and collect any reporting data.

If the duration between the start and end of the timer exceeds the max duration provided to the start procedure, this procedure will return MDTest\_FAIL.

#### ILE Procedure Interface

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

COBOL SECTION

## MDTEST-END-TIMER USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	

#### **RPG Example**

If MDTest\_End\_Timer('finished calling my program') = MDTest\_FAIL;
 // process took too long
EndIf;

#### MDTEST\_EXECUTE\_CMD

#### executes an IBM i Command

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Command	VarChar(2048)	Value	
In	Severity	Packed(2:0)	Value	Severity of Messages to log
In	Duration	Int(10)	Const, NoPass, Omit	Allowed duration in milliseconds
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

## MDTEST-EXECUTE-CMD USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-CMD	PIC X(2048)	No	each Call	
In	MDTEST-SEV	PIC S9(2) COMP-3	No	first only	Severity of Messages to log
In	MDTEST-MAX- DURATION	PIC S9(9) COMP-5	Yes	each Call	Allowed duration in milliseconds
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	

## RPG Example

If MDTest\_Execute\_CMD('ADDLIBLE CUSTDATA':10:360) = MDTest\_FAIL; //couldnt add CUSTDATA to Library List EndIf;

## MDTEST\_EXECUTE\_SQL

## executes an SQL Statement

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Statement	VarChar(2048)	Value	
In	Severity	Packed(2:0)	Value	Severity of Messages to log
In	Duration	Int(10)	Const, NoPass, Omit	Allowed duration in milliseconds
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

## MDTEST-EXECUTE-SQL USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-CMD	PIC X(2048)	No	each Call	
In	MDTEST-SEV	PIC S9(2) COMP-3	No	first only	Severity of Messages to log
In	MDTEST-MAX- DURATION	PIC S9(9) COMP-5	Yes	each Call	Allowed duration in milliseconds
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	

## RPG Example

If MDTest\_Execute\_SQL('UPDATE CUST set CUSTNAME = '' WHERE CUSTNBR = 16':10:360) = MDTest\_FAIL;
//couldnt update field CUSTNAME in file CUST

EndIf;

#### **Numeric Functions**

MDTEST\_NUM\_EQUAL

checks if "Expected Value" & "Actual Value" contain the same value

#### **ILE Procedure Interface**

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Expected Value	Packed(63:23)	Value	
In	Actual Value	Packed(63:23)	Value	
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

COBOL SECTION

## MDTEST-NUM-EQUAL USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-EXP- NUM	PIC S9(40)V9(23)	No	each Call	
In	MDTEST-ACT- NUM	PIC S9(40)V9(23)	No	each Call	
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST- REPORT-GROUP	PIC X(10)	Yes	first only	

#### **RPG Example**

Dcl-S h\_Result Like(MDTest\_Num\_Equal);

h\_Result = MDTest\_Num\_Equal(CUSTNBR:16:'Customer Nbr should be 16.':'FINANCE');

## MDTEST\_NUM\_NOTEQUAL

checks if "Expected Value" & "Actual Value" contain different values

#### ILE Procedure Interface

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Expected Value	Packed(63:23)	Value	
In	Actual Value	Packed(63:23)	Value	
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

COBOL SECTION

## MDTEST-NUM-NOTEQUAL USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-EXP- NUM	PIC S9(40)V9(23)	No	each Call	
In	MDTEST-ACT- NUM	PIC S9(40)V9(23)	No	each Call	
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST- REPORT-GROUP	PIC X(10)	Yes	first only	

#### RPG Example

Dcl-S h\_Result Like(MDTest\_Num\_NotEqual);

h\_Result = MDTest\_Num\_NotEqual(CUSTNBR:16:'Customer Nbr should NOT be 16.':'FINANCE');

## MDTEST\_NUM\_ZERO

## checks if "Actual Value" is zero

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Actual Value	Packed(63:23)	Value	
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

## MDTEST-NUM-ZERO USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-ACT- NUM	PIC S9(40)V9(23)	No	each Call	
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST- REPORT-GROUP	PIC X(10)	Yes	first only	

RPG Example

Dcl-S h\_Result Like(MDTest\_Num\_Zero);

h\_Result = MDTest\_Num\_Zero(CUSTNBR);

## MDTEST\_NUM\_NOTZERO

## checks if "Actual Value" is not zero

**ILE Procedure Interface** 

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Actual Value	Packed(63:23)	Value	
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

COBOL SECTION

## MDTEST-NUM-NOTZERO USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-ACT- NUM	PIC S9(40)V9(23)	No	each Call	
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST- REPORT-GROUP	PIC X(10)	Yes	first only	

#### RPG Example

Dcl-S h\_Result Like(MDTest\_Num\_NotZero);

h\_Result = MDTest\_Num\_NotZero(CUSTNBR);

MDTEST\_NUM\_LOWERTHAN

checks if "Actual Value" is lower than "Expected Value"

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Expected Value	Packed(63:23)	Value	
In	Actual Value	Packed(63:23)	Value	
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

COBOL SECTION

## MDTEST-NUM-LOWERTHAN USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-EXP- NUM	PIC S9(40)V9(23)	No	each Call	
In	MDTEST-ACT- NUM	PIC S9(40)V9(23)	No	each Call	
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST- REPORT-GROUP	PIC X(10)	Yes	first only	

RPG Example

Dcl-S h\_Result Like(MDTest\_Num\_LowerThan);

h\_Result = MDTest\_Num\_LowerThan(CUSTNBR:16);

## MDTEST\_NUM\_LOWEREQUALTHAN

checks if "Actual Value" is lower than or equal "Expected Value"

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Expected Value	Packed(63:23)	Value	
In	Actual Value	Packed(63:23)	Value	
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

## MDTEST-NUM-LOWEREQUALTHAN USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-EXP- NUM	PIC S9(40)V9(23)	No	each Call	
In	MDTEST-ACT- NUM	PIC S9(40)V9(23)	No	each Call	
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST- REPORT-GROUP	PIC X(10)	Yes	first only	

## RPG Example

Dcl-S h\_Result Like(MDTest\_Num\_LowerEqualThan);

h\_Result = MDTest\_Num\_LowerEqualThan(CUSTNBR:16);

## MDTEST\_NUM\_GREATERTHAN

## checks if "Actual Value" is greater than "Expected Value"

**ILE Procedure Interface** 

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Expected Value	Packed(63:23)	Value	
In	Actual Value	Packed(63:23)	Value	
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

COBOL SECTION

## MDTEST-NUM-GREATERTHAN USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-EXP- NUM	PIC S9(40)V9(23)	No	each Call	
In	MDTEST-ACT- NUM	PIC S9(40)V9(23)	No	each Call	
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST- REPORT-GROUP	PIC X(10)	Yes	first only	

#### **RPG Example**

Dcl-S h\_Result Like(MDTest\_Num\_GreaterThan);

h\_Result = MDTest\_Num\_GreaterThan(CUSTNBR:16);

## MDTEST\_NUM\_GREATEREQUALTHAN

checks if "Actual Value" is greater than or equal "Expected Value"

#### ILE Procedure Interface

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Expected Value	Packed(63:23)	Value	
In	Actual Value	Packed(63:23)	Value	
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

COBOL SECTION

## MDTEST-NUM-GREATEREQUALTHAN USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-EXP- NUM	PIC S9(40)V9(23)	No	each Call	
In	MDTEST-ACT- NUM	PIC S9(40)V9(23)	No	each Call	
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST- REPORT-GROUP	PIC X(10)	Yes	first only	

#### RPG Example

Dcl-S h\_Result Like(MDTest\_Num\_GreaterEqualThan);

h\_Result = MDTest\_Num\_GreaterEqualThan(CUSTNBR:16);

#### MDTEST\_NUM\_INRANGE

checks if "Actual Value" is between "Range Start" and "Range End"

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Actual Value	Packed(63:23)	Value	
In	Range Start	Packed(63:23)	Value	
In	Range End	Packed(63:23)	Value	
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

COBOL SECTION

## MDTEST-NUM-INRANGE USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-ACT- NUM	PIC S9(40)V9(23)	No	each Call	
In	MDTEST-RANGE- START	PIC S9(40)V9(23)	No	each Call	
In	MDTEST-RANGE- END	PIC S9(40)V9(23)	No	each Call	
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST- REPORT-GROUP	PIC X(10)	Yes	first only	

## RPG Example

Dcl-S h\_Result Like(MDTest\_Num\_InRange);

h\_Result = MDTest\_Num\_InRange(CUSTNBR:1:229);

## MDTEST\_NUM\_OUTSIDERANGE

checks if "Actual Value" is not between "Range Start" and "Range End"

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Actual Value	Packed(63:23)	Value	
In	Range Start	Packed(63:23)	Value	
In	Range End	Packed(63:23)	Value	
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

## MDTEST-NUM-OUTSIDERANGE USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-ACT- NUM	PIC S9(40)V9(23)	No	each Call	
In	MDTEST-RANGE- START	PIC S9(40)V9(23)	No	each Call	
In	MDTEST-RANGE- END	PIC S9(40)V9(23)	No	each Call	
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST- REPORT-GROUP	PIC X(10)	Yes	first only	

## RPG Example

Dcl-S h\_Result Like(MDTest\_Num\_OutsideRange);

h\_Result = MDTest\_Num\_OutsideRange(CUSTNBR:1:229);

#### **Character Functions**

MDTEST\_CHAR\_EQUAL

## checks if "Expected Value" & "Actual Value" contain the same value

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Expected Value	VarChar(4096)	Value	
In	Actual Value	VarChar(4096)	Value	
In	Ignore Case	Ind	Const, NoPass, Omit	Case Insensitive On/Off
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

## MDTEST-CHAR-EQUAL USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-EXP- CHAR	PIC X(4096)	No	each Call	
In	MDTEST-ACT- CHAR	PIC X(4096)	No	each Call	
In	MDTEST-IGNORE- CASE	PIC 1	Yes	first only	
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	

## RPG Example

Dcl-S h\_Result Like(MDTest\_Char\_Equal);

h\_Result = MDTest\_Char\_Equal('MDTest':'MDTEST':\*On);

## MDTEST\_CHAR\_NOTEQUAL

checks if "Expected Value" & "Actual Value" contain different values

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Expected Value	VarChar(4096)	Value	
In	Actual Value	VarChar(4096)	Value	
In	Ignore Case	Ind	Const, NoPass, Omit	Case Insensitive On/Off
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

## MDTEST-CHAR-NOTEQUAL USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-EXP- CHAR	PIC X(4096)	No	each Call	
In	MDTEST-ACT- CHAR	PIC X(4096)	No	each Call	
In	MDTEST-IGNORE- CASE	PIC 1	Yes	first only	
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	

## RPG Example

Dcl-S h\_Result Like(MDTest\_Char\_NotEqual);

h\_Result = MDTest\_Char\_NotEqual('MDTest':'MDTEST':\*On);

## MDTEST\_CHAR\_CONTAINS

## checks if "Actual Value" contains "Expected Value"

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Expected Value	VarChar(4096)	Value	
In	Actual Value	VarChar(4096)	Value	
In	Ignore Case	Ind	Const, NoPass, Omit	Case Insensitive On/Off
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

## MDTEST-CHAR-CONTAINS USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-EXP- CHAR	PIC X(4096)	No	each Call	
In	MDTEST-ACT- CHAR	PIC X(4096)	No	each Call	
In	MDTEST-IGNORE- CASE	PIC 1	Yes	first only	
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	

## RPG Example

Dcl-S h\_Result Like(MDTest\_Char\_Contains);

h\_Result = MDTest\_Char\_Contains('test':'MDTest':\*On);

## MDTEST\_CHAR\_NOTCONTAINS

checks if "Actual Value" does not contain "Expected Value"

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Expected Value	VarChar(4096)	Value	
In	Actual Value	VarChar(4096)	Value	
In	Ignore Case	Ind	Const, NoPass, Omit	Case Insensitive On/Off
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

## MDTEST-CHAR-NOTCONTAINS USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-EXP- CHAR	PIC X(4096)	No	each Call	
In	MDTEST-ACT- CHAR	PIC X(4096)	No	each Call	
In	MDTEST-IGNORE- CASE	PIC 1	Yes	first only	
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	

## RPG Example

Dcl-S h\_Result Like(MDTest\_Char\_NotContains);

h\_Result = MDTest\_Char\_NotContains('test':'MDTest':\*On);

## MDTEST\_CHAR\_STARTSWITH

checks if "Actual Value" starts with value of "Expected Value"

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Expected Value	VarChar(4096)	Value	
In	Actual Value	VarChar(4096)	Value	
In	Ignore Case	Ind	Const, NoPass, Omit	Case Insensitive On/Off
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

## MDTEST-CHAR-STARTSWITH USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-EXP- CHAR	PIC X(4096)	No	each Call	
In	MDTEST-ACT- CHAR	PIC X(4096)	No	each Call	
In	MDTEST-IGNORE- CASE	PIC 1	Yes	first only	
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	

## RPG Example

Dcl-S h\_Result Like(MDTest\_Char\_StartsWith);

h\_Result = MDTest\_Char\_StartsWith('MD':'MDTest');

## MDTEST\_CHAR\_ENDSWITH

checks if "Actual Value" ends with value of "Expected Value"

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Expected Value	VarChar(4096)	Value	
In	Actual Value	VarChar(4096)	Value	
In	Ignore Case	Ind	Const, NoPass, Omit	Case Insensitive On/Off
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

## MDTEST-CHAR-ENDSWITH USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-EXP- CHAR	PIC X(4096)	No	each Call	
In	MDTEST-ACT- CHAR	PIC X(4096)	No	each Call	
In	MDTEST-IGNORE- CASE	PIC 1	Yes	first only	
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	

## RPG Example

Dcl-S h\_Result Like(MDTest\_Char\_EndsWith);

h\_Result = MDTest\_Char\_EndsWith('est':'MDTest');

## MDTEST\_CHAR\_BLANK

## checks if "Actual Value" is empty

#### ILE Procedure Interface

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Actual Value	VarChar(4096)	Value	
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

COBOL SECTION

## MDTEST-CHAR-BLANK USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-ACT- CHAR	PIC X(4096)	No	each Call	
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	

#### RPG Example

Dcl-S h\_Result Like(MDTest\_Char\_Blank); Dcl-S h\_Name Char(10) Inz('Sam');

h\_Result = MDTest\_Char\_Blank(h\_Name);

MDTEST\_CHAR\_NOTBLANK

## checks if "Actual Value" is not empty

ILE Procedure Interface

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Actual Value	VarChar(4096)	Value	
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

COBOL SECTION

## MDTEST-CHAR-NOTBLANK USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-ACT- CHAR	PIC X(4096)	No	each Call	
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	

RPG Example

Dcl-S h\_Result Like(MDTest\_Char\_NotBlank); Dcl-S h\_Name Char(10) Inz('Sam');

h\_Result = MDTest\_Char\_NotBlank(h\_Name);

## MDTEST\_CHAR\_IN

checks if "Actual Value" is found in "Elements"

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Actual Value	VarChar(256)	Value	
In	Number of Elements	Int(10)	Value	
In	Elements	VarChar(256)	Dim(50), Value	
In	Ignore Case	Ind	Const, NoPass, Omit	Case Insensitive On/Off
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

COBOL SECTION

## MDTEST-CHAR-IN USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-CHAR- ELEM	PIC X(256)	No	each Call	
In	MDTEST-CARRAY- COUNT	PIC S9(9) COMP-4	No	first only	
In	MDTEST-CHAR- ARRAY	PIC X(256)	No	first only	
In	MDTEST-IGNORE- CASE	PIC 1	Yes	first only	
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	

RPG Example

Dcl-S h\_Result Like(MDTest\_Char\_In); Dcl-S h\_Elements VarChar(256) Dim(50);

h\_Elements(1) = 'ABC'; h\_Elements(2) = 'DEF';

h\_Result = MDTest\_Char\_In('def':2:h\_Elements:\*On);

#### MDTEST\_CHAR\_NOTIN

checks if "Actual Value" is not found in "Elements"

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Actual Value	VarChar(256)	Value	
In	Number of Elements	Int(10)	Value	
In	Elements	VarChar(256)	Dim(50), Value	
In	Ignore Case	Ind	Const, NoPass, Omit	Case Insensitive On/Off
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

COBOL SECTION

## MDTEST-CHAR-NOTIN USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-CHAR- ELEM	PIC X(256)	No	each Call	
In	MDTEST-CARRAY- COUNT	PIC S9(9) COMP-4	No	first only	
In	MDTEST-CHAR- ARRAY	PIC X(256)	No	first only	
In	MDTEST-IGNORE- CASE	PIC 1	Yes	first only	
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	

RPG Exampleregex

Dcl-S h\_Result Like(MDTest\_Char\_NotIn); Dcl-S h\_Elements VarChar(256) Dim(50);

h\_Elements(1) = 'ABC'; h\_Elements(2) = 'DEF';

h\_Result = MDTest\_Char\_NotIn('def':2:h\_Elements:\*On);

#### MDTEST\_CHAR\_REGEX

checks if Regular Expression in "Expected Values" is found in "Actual Value"

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Expected Value	VarChar(4096)	Value	
In	Actual Value	VarChar(4096)	Value	
In	Ignore Case	Ind	Const, NoPass, Omit	Case Insensitive On/Off
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

COBOL SECTION

## MDTEST-CHAR-REGEX USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-EXP- CHAR	PIC X(4096)	No	each Call	
In	MDTEST-ACT- CHAR	PIC X(4096)	No	each Call	
In	MDTEST-IGNORE- CASE	PIC 1	Yes	first only	
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	

## RPG Example

h\_Status = MDTest\_Char\_Regex('^(?:\w+\.?)\*\w+@(?:\w+\.)\*\w+\$':'Saman.Neinawaie@MidrangeDynamics.com');

## MDTEST\_CHAR\_NOTREGEX

checks if Regular Expression in "Expected Values" is not found in "Actual Value"

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Expected Value	VarChar(4096)	Value	
In	Actual Value	VarChar(4096)	Value	
In	Ignore Case	Ind	Const, NoPass, Omit	Case Insensitive On/Off
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

## MDTEST-CHAR-NOTREGEX USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-EXP- CHAR	PIC X(4096)	No	each Call	
In	MDTEST-ACT- CHAR	PIC X(4096)	No	each Call	
In	MDTEST-IGNORE- CASE	PIC 1	Yes	first only	
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	

## RPG Example

h\_Status = MDTest\_Char\_NoRegex('^(?:\w+\.?)\*\w+@(?:\w+\.)\*\w+\$':'Saman.Neinawaie@MidrangeDynamics.com');

## **Code Coverage Functions**

MDTEST\_REG\_CODECOV\_MOD

## register code coverage for a module

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Program Library	Char(10)	Value	Library Name, *LIBL, *CURLIB
In	Program Name	Char(10)	Value	
In	Module	Char(10)	Value	
In	Program Type	Char(10)	Value	*PGM, *SRVPGM
In	min. %	Int(10)	Const, NoPass, Omit	
In	max. %	Int(10)	Const, NoPass, Omit	
In	min. Hit Lines	Int(10)	Const, NoPass, Omit	
In	max. Hit Lines	Int(10)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

## MDTEST-REG-CODECOV-MOD USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-PGM-LIB	PIC X(10)	No	first only	
In	MDTEST-PGM- NAME	PIC X(10)	No	first only	
In	MDTEST-PGM- MODULE	PIC X(10)	No	first only	
In	MDTEST-PGM-TYPE	PIC X(10)	No	first only	*PGM, *SRVPGM
In	MDTEST-MIN- PERCENTAGE	PIC S9(9) COMP-5	Yes	each Call	
In	MDTEST-MAX- PERCENTAGE	PIC S9(9) COMP-5	Yes	each Call	
In	MDTEST-MIN- LINES-HIT	PIC S9(9) COMP-5	Yes	each Call	
In	MDTEST-MAX- LINES-HIT	PIC S9(9) COMP-5	Yes	each Call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	
##### RPG Example					

h\_Status = MDTest\_reg\_CodeCov\_Mod('MYLIB':'MYPGM':'\*ALL':'\*PGM':85:-1:1961:-1:'FINANCE');

MDTEST\_RPT\_CODECOV

## generate code coverage report

#### ILE Procedure Interface

Direction	Field	Туре	Options	Comment
Out	Status	Char(10)		MDTest_FAIL or MDTest_PASS
In	Message	VarChar(128)	Const, NoPass, Omit	
In	Report Group	Char(10)	Const, NoPass, Omit	

COBOL SECTION

## MDTEST-RPT-CODECOV USING

Direction	Field	Туре	Optional	Initialized	Comment
Out	MDTEST-STATUS	PIC X(10)			MDTEST-FAIL or MDTEST-PASS
In	MDTEST-MSG	PIC X(128)	Yes	each Call	
In	MDTEST-REPORT- GROUP	PIC X(10)	Yes	first only	

## RPG Example

h\_Status = MDTest\_rpt\_CodeCov();

# 1.7 Example Test Programs

## 1.7.1 RPG

Below is an example RPG free-format program utilizing the various MDTest Helper Functions

```
**Free
Ctl-Opt Alloc(*Teraspace) Option(*SrcStmt:*NoDebugIO:*NoUnRef)
     Main(mainProc);
//Copybooks *
/Copy QRPGLESRC, MDRTESTP
//Main Procedure - *ENTRY *
Dcl-Proc mainProc;
 Dcl-Pi mainProc;
  CmdDur Zoned(6);
  SQLDur Zoned(6);
 End-Pi;
 Dcl-DS d_SQLRow Qualified Dim(100);
  CurCod Char(3);
  Act_FX Packed(8:3);
Exp_FX Packed(8:3);
 End-DS;
 Dcl-S Cnt Packed(3);
 Dcl-S Date Char(8);
 Dcl-S Status Like(MDTest_reg_CodeCov_Mod);
 Dcl-S Cmd VarChar(2048);
 Dcl-S Elem VarChar(256) Dim(50);
 Dcl-S Row Int(10);
 Dcl-S i Int(10);
 Dcl-C c_Quote Const('''');
 //register application program for code coverage
 '*ALL':
                          '*PGM':
                          50:
                          *Omit:
                          15.
                          *Omit:
                          'FINANCE');
 If Status = MDTest_FAIL;
  Return;
 EndIf;
 //invoke currency update process
Date = %char(%date():*IS00);
 Cmd = 'CALL PGM(MDACURUPD) PARM(' + c_Quote +
                     Date + c_Quote + ')';
 Status = MDTest_Execute_CMD(Cmd:
                       10:
                       CmdDur:
                       'Currency update process');
 If Status = MDTest_FAIL;
  Return;
 EndIf;
 //generate code coverage report
 MDTest_rpt_CodeCov('code coverage for currency update pgm');
 Cmd = 'UPDATE MDTEST_COMPARE_RATES A ' +
 'SET A.CHF_FX = (RRN(A) / 10) + 1';
Status = MDTest_Execute_SQL(Cmd:
                       10:
                       SOLDUR:
                       'Generate Test Values');
 If Status = MDTest_FAIL;
  Return:
 EndIf;
```

```
MDTest_addInfo('various tests using the test table');
Exec SOL
  DECLARE C1 CURSOR FOR
  SELECT A.CURCOD, A.VALCHF, E.CHF_FX
FROM MDACUR A, MDTEST_COMPARE_RATES E
WHERE A.CURCOD = E.CURCOD
  ORDER BY A.CURCOD:
Exec SQL
  Open C1;
DoW 1 = 1;
  Exec SQL
    Fetch C1 for 100 Rows into :d_SQLRow;
  If SQLCode <> 0;
    Leave;
  EndIf;
  For i = 1 to SQLER3;
    Elem(i) = d_SQLRow(i).CurCod;
    Row += 1;
    MDTest_Char_NotRegex('/':d_SQLRow(i).CurCod);
    MDTest Num Equal(d SOLRow(i).Exp FX:
                         d_SQLRow(i).Act_FX:
                         d_SQLRow(i).CurCod);
    MDTest_Num_InRange(d_SQLRow(i).Act_FX:
                          d_SQLRow(i).Exp_FX - 0,1:
d_SQLRow(i).Exp_FX + 0,1:
                           d_SQLRow(i).CurCod);
  EndFor:
EndDo;
Exec SQL
  Close C1:
MDTest_Char_In('EUR':Row:Elem);
MDTest_Char_In('GBP':Row:Elem);
```

End-Proc;

## 1.7.2 COBOL

2 Copy books are included in the MDTest library that must be included in the source code, in order to take advantage of the MDTest Functions

- 1. MDTCBLWSC, to be placed in the WORKING-STORAGE SECTION. Contains all variables used by MDTest. The variables all begin with MDTEST-
- 2. MDTCBLPRC, to be placed at the end of the PROCEDURE DIVISION. Contains helper section to invoke the MDTest procedures.

```
PROCESS APOST NOMONOPRC
IDENTIFICATION DIVISION.
PROGRAM-ID. CBLEXP1.
AUTHOR.
            Midrange Dynamics.
DATE-WRITTEN. 20.11.2023.
ENVIRONMENT DIVISION.
CONFIGURATION SECTION
SOURCE-COMPUTER. IBMi.
OBJECT-COMPUTER. IBMi.
INPUT-OUTPUT SECTION.
FILE-CONTROL.
*****
DATA DIVISION.
FILE SECTION
****
WORKING-STORAGE SECTION
*** MDTest working storage variables
COPY MDTCBLWSC OF QLBLSRC
   EXEC SQL
     INCLUDE SOLCA
   END-EXEC.
   EXEC SQL
      BEGIN DECLARE SECTION
   END-EXEC.
01 SQLTABLE.
```

```
05 SOLROW OCCURS 100.

10 SQLCURCOD PIC X(3).
10 SQLACT-FX PIC S9(5)V9(3) PACKED-DECIMAL.
10 SQLEXP-FX PIC S9(5)V9(3) PACKED-DECIMAL.

      EXEC SQL
         END DECLARE SECTION
      END-EXEC.
 01 WS-CNT
                             PIC S9(3) COMP-3.
 01 WS-DATE PIC X(
01 WS-RETURN-CODE PIC X.
                            PIC X(8).
                            PIC S9(3) COMP-3.
 01 WS-ROW
LINKAGE SECTION.
 01 LS-CMDDURX.
      05 LS-CMDDUR
                         PIC 9(6).
 01 LS-SQLDURX.
      05 LS-SQLDUR
                            PIC 9(6).
 PROCEDURE DIVISION USING LS-CMDDURX, LS-SQLDURX.
000-MAIN-CONTROL SECTION.
 BEG.
*** register application program for code coverage
      MOVE '*LIBL' TO MDTEST-PGM-LIB
MOVE 'MDACURUPD' TO MDTEST-PGM-NAME
                     TO MDTEST-PGM-MODULE
      MOVE '*ALL'
      MOVE '*PGM'
                          TO MDTEST-PGM-TYPE
TO MDTEST-MIN-PERCENTAGE
      MOVE 50
      MOVE 50 IO MDIESI-MIN-PERCENIAG
MOVE 15 TO MDTEST-MIN-LINES-HIT
MOVE 'FINANCE' TO MDTEST-REPORT-GROUP
      PERFORM MDTEST-REG-CODECOV-MOD
*** skip test suite if unable to register code coverage
IF MDTEST-STATUS = 'FAIL'
         GO TO XIT
      END-IF
*** start timer/logging of currency update process
MOVE 10 TO MDTEST-SEV
      MOVE LS-CMDDUR TO MDTEST-MAX-DURATION
      MOVE 'Currency update process' TO MDTEST-MSG
      PERFORM MDTEST-START-TIMER
*** Call application program to perform currency update
      ACCEPT WS-DATE FROM DATE YYYYMMDD
      CALL 'MYAPPLPGM' USING WS-DATE
                                 WS-RETURN-CODE
*** end timer/logging of currency update process
PERFORM MDTEST-END-TIMER
*** generate code coverage report
      MOVE 'code coverage for currency update pgm' TO MDTEST-MSG
      PERFORM MDTEST-RPT-CODECOV
*** report that process failed if appl program returns E IF WS-RETURN-CODE = 'E'
          MOVE 'MYAPPLPGM returned value E' TO MDTEST-MSG
          PERFORM MDTEST-FORCEFAIL
         GO TO XIT
      END-IF
*** set record values in a hypothetical test table
*** for demonstrating the MDTEST-EXECUTE-SQL
      STRING 'UPDATE MDTEST_COMPARE_RATES A '
    'SET A.CHF_FX = (RRN(A) / 10) + 1'
              DELIMITED BY SIZE INTO MDTEST-CMD
      MOVE LS-SQLDUR TO MDTEST-MAX-DURATION
MOVE 'Generate Test Values' TO MDTEST-MSG
      PERFORM MDTEST-EXECUTE-SQL
*** skip test suite if record update failed
IF MDTEST-STATUS = 'FAIL'
GO TO XIT
      END-IF
*** information message about tests
      MOVE 'various tests using the test table'
TO MDTEST-MSG
      PERFORM MDTEST-ADDINFO
*** loop through test table
      EXEC SQL
         DECLARE C1 CURSOR FOR
         SELECT A.CURCOD, A.VALCHF, E.CHF_FX
FROM MDACUR A, MDTEST_COMPARE_RATES E
WHERE A.CURCOD = E.CURCOD
           ORDER BY A.CURCOD
      END-EXEC
      EXEC SQL
```

OPEN C1 END-EXEC EXEC SOL FETCH C1 FOR 100 ROWS INTO :SQLROW END-EXEC IF SQLCODE = 0 PERFORM MDTEST-CLEAR-CHAR-ARRAY MOVE SQLERRD (3) TO WS-CNT MOVE 1 TO WS-ROW PERFORM 100-COMPARE UNTIL WS-ROW > WS-CNT END-IF EXEC SQL CLOSE C1 END-EXEC \*\*\* check if EUR in array MOVE 'EUR' TO MDTEST-CHAR-ELEM PERFORM MDTEST-CHAR-IN \*\*\* check if GBP in array MOVE 'GBP' TO MDTEST-CHAR-ELEM PERFORM MDTEST-CHAR-IN XIT. GOBACK. 100-COMPARE SECTION. 100. \*\*\* add currency code to array MOVE SQLCURCOD (WS-ROW) TO MDTEST-CHAR-ELEM PERFORM MDTEST-ADD-CHAR-ELEM \*\*\* check if currency code contains folder symbol using regex MOVE '/' TO MDTEST-EXP-CHAR MOVE SQLCURCOD (WS-ROW) TO MDTEST-ACT-CHAR PERFORM MDTEST-CHAR-NOTREGEX \*\*\* numeric exact test MOVE SQLCURCOD (WS-ROW) TO MDTEST-MSG MOVE SQLEXP-FX (WS-ROW) TO MDTEST-EXP-NUM MOVE SQLACT-FX (WS-ROW) TO MDTEST-ACT-NUM PERFORM MDTEST-NUM-EQUAL \*\*\* numeric range test

MOVE SQLCURCOD (WS-ROW) TO MDTEST-MSG COMPUTE MDTEST-RANGE-START = SQLEXP-FX (WS-ROW) - .1 COMPUTE MDTEST-RANGE-END = SQLEXP-FX (WS-ROW) + .1 MOVE SQLACT-FX (WS-ROW) TO MDTEST-ACT-NUM PERFORM MDTEST-NUM-INRANGE

ADD 1 TO WS-ROW

\*\*\* MDTest procedure division sections COPY MDTCBLPRC OF QLBLSRC.

# 1.8 Reporting

There are several layers of reporting information that is stored in MDCMS tables when a Test Batch is run.

## 1.8.1 Objects

View - option Objects for an Automated Testing Batches row

Lists every program object that triggered an automated test run, along with RFP it was in and if a Quality Gate was enabled.

## Table - MDCMS.MDDTLUT

Кеу	Description
MDTEMP	Template Name
MDBCHN	Batch Number
MDRFP	Installed RFP Number
MDOBJN	Object Name
MDOBJL	Object Library
MDOBJT	Object Type

## 1.8.2 MDTest Jobs

View - option MDTest Jobs for an Automated Testing Batches row

Lists every job (1 per Execution Step) that is running or has run for a batch. When a job is still active, the active job status is displayed and can be clicked on to see the job log for that job.

Table - MDCMS.MDDTJOB

Кеу	Description
MDTEMP	Template Name
MDBCHN	Batch Number
MDSEQ	Sequence of Template Execution Step (parent = MDCMS.MDDTMDT)
MDTDEF	Definition ID (parent = MDCMS.MDDTDEF)

## 1.8.3 MDTest Results

View - option MDTest Results for an MDTest Job or Batch row

Lists each result record injected by either your test program or the MDTest program (MDTWRAP). For comparison test results, the actual value and expected value will also be displayed.

## Table - MDCMS.MDDTRES

Кеу	Description
MDJID	The MDTest Job ID (parent = MDCMS.MDDTJOB)
MDTRES	The MDTest Job Result

## 1.8.4 MDTest Result Log

View - option MDTest Result Log for an MDTest Result row

Lists any upper-level log entries for an injected result record. This will include all options passed to an MDTest procedure as well as result values up to 128 characters.

Table - MDCMS.MDDTLOG

Кеу	Description
MDTRES	The MDTest Job Result ID (parent = MDCMS.MDDTRES)
MDTLID	The MDTest Job Result Log ID

## 1.8.5 MDTest Result Log Details

View - option MDTest Result Log Details for an MDTest Result Log row

Lists any lower-level log entries for an injected result record. This will include any included job log entries as well as result values larger than 128 characters.

## Table - MDCMS.MDDTLOGD

Кеу	Description
MDTLID	The MDTest Job Result Log ID (parent = MDCMS.MDDTLOG)
MDTLSEQ	The MDTest Job Result Log Detail sequence number

# **1.9 Quality Gates**

After an RFP is installed into a target level, MDCMS checks if any programs that were installed require Automated Testing based on the Automated Testing Templates.

If any programs are included that require testing, then a batch is prepared for each Template that is required.

If the Quality Gate field for one or more of the Automated Testing Templates is set to true, then MDCMS will not allow the submit or send of an RFP containing the programs from the target level until the Test Batch has completed and passed.

Methods to check state of Quality Gate:

- · Use option Automated Testing Results for the Installed RFP
- Select function MDTest/All Test Batches from the MDOpen menu

## 1.9.1 Override Quality Gate

If you have authority to MDSEC Code 59 (Override Automated Testing Quality Gate) for the Level of the installed RFP, you can override the quality gate when the test failed. This is done directly from the RFP pre-submit warning dialog or as an option in the Automated Testing Results view for a Test Batch.