



**Waygate
Technologies**

a Baker Hughes business

MDI Builder+

Menu Directed Inspection

Operating Manual

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Preface

MDI Builder+ 816308 Rev C (03/2024) refers to MDI v 4.00

MDI Builder+ 816308 Rev D (05/2024) refers to MDI v 4.00

An MDI (Menu Directed Inspection) is an inspection template which is built on a Windows PC and then installed on a Waygate Technologies VideoProbe. When the MDI is run on a Waygate VideoProbe during an inspection, it can streamline the capture, storage, reporting, and sharing of rich inspection data from a VideoProbe. An MDI-based inspection is performed by an inspector running an MDI on a Waygate Technologies VideoProbe whereby images captured during the inspection may contain automatic on-screen annotation, a smart descriptive file name, and a set of database tags which references the asset component being inspected as well as linkage to the overall inspection event details such as asset serial number, inspector, asset owner, location, and other inspection-specific details.

An MDI file contains a set of location descriptions of an asset where an inspector may want to capture an inspection image. An MDI may be created which defines inspection locations for an entire asset, or it may only define locations needed to log inspection details associated with a sub-section of an asset, or a service bulletin. The file is organized in a tree-type structure which supports on-screen navigation on a VideoProbe of up to (5) levels of details which will be used to identify a captured image.

An MDI file may also contain reference materials (image files or PDFs) which may be associated with defined sections of the MDI tree structure which an inspector can reference during an inspection. Additionally, the MDI allows for a standardized set of detect classifications or comments to be available on a drop-down menu such that an inspector can easily add Classifications to an image being captured using the company-standard terminology for the condition being observed.

An MDI file is created using the Windows PC based "MDI Builder" software tool. The MDI Builder tool creates an MDI file which in a Waygate-proprietary .mdz file format. In practice, organizations will generally centrally manage the creation and distribution of company-standard MDI files to be run by all inspectors in their organization. The distribution of MDI files to Waygate Technologies VideoProbes may be automated using the Waygate Technologies InspectionWorks cloud services which can download MDI files and receive uploaded inspection data directly to and from a Waygate VideoProbe using its Wi-Fi internet connectivity features.

Once an MDI is run by an inspector on a Waygate VideoProbe, at the end of the inspection the VideoProbe can create a Microsoft Word and/or a PDF detailed inspection report directly on the VideoProbe. In addition to the report, the full file of images and database tags created when the MDI was run may be uploaded to the Waygate InspectionWorks cloud server, or a customer file system, where the inspection data can be archived, or included in an asset life history database where the data can be searched, sorted, shared, and reports can be created.

1. Introduction

About this Manual

This manual and the related equipment is intended for visual inspection technicians with a basic understanding of inspection principles and practices, and who are familiar with basic computer operations, but who may not have experience with a video borescope system. The manual contains safety, compliance, and operating and maintenance instructions for the Waygate VideoProbe™ system. To ensure operator safety, please read and understand this manual prior to use.

Technical Support

For additional assistance, go to www.bakerhughesds.com/waygate-technologies for a complete listing of contact information.

Technical Support contact information follows:

Global Phone: 1-866-243-2638

Email: RemoteService@BakerHughes.com

2. Safety Information

In order to maintain and to ensure a safe operation, you should read the following safety information prior to loading the software. It is important that you understand and observe this information to avoid any operator errors that could lead to false test results.

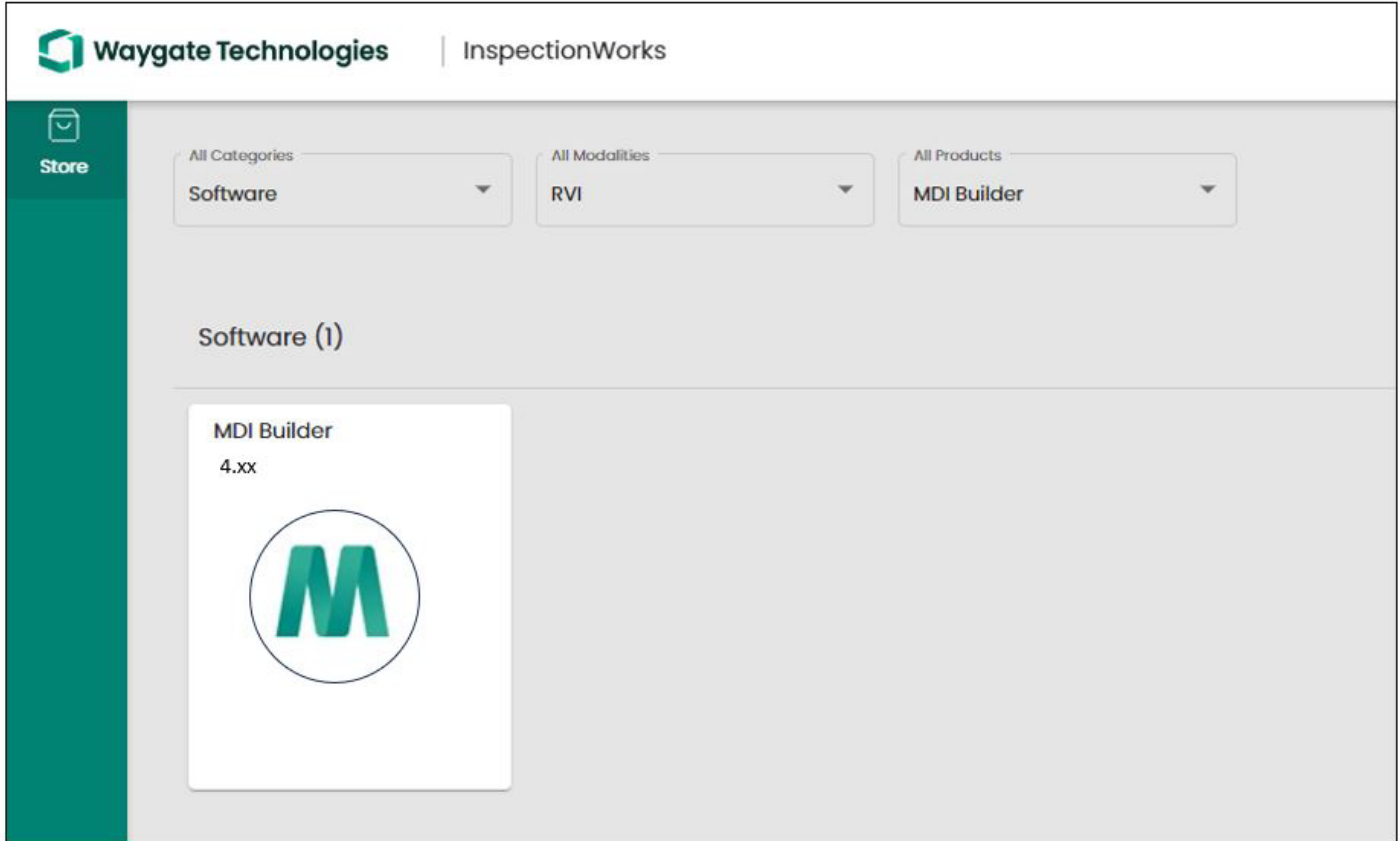
For detailed information on safety and regulatory issues, refer to the user's manual for your specific VideoProbe.

Attention:

If you have any questions about the use of your test equipment, software, or inspection results please contact your nearest representative of Waygate Technologies.

3. Getting Started

Download the MDI Builder software program from the Waygate Technologies InspectionWorks Store at www.inspectionworks.com. Use the search filter settings of " Software" , "RVI" and "MDI Builder" to locate the download file.



MDI Builder download site on InspectionWorks Store website

Once the file has been downloaded, install the MDI Builder software on a PC which is operating Windows 10 or later operating system.

Double-click on the MDI Builder desktop icon to start building an MDI.



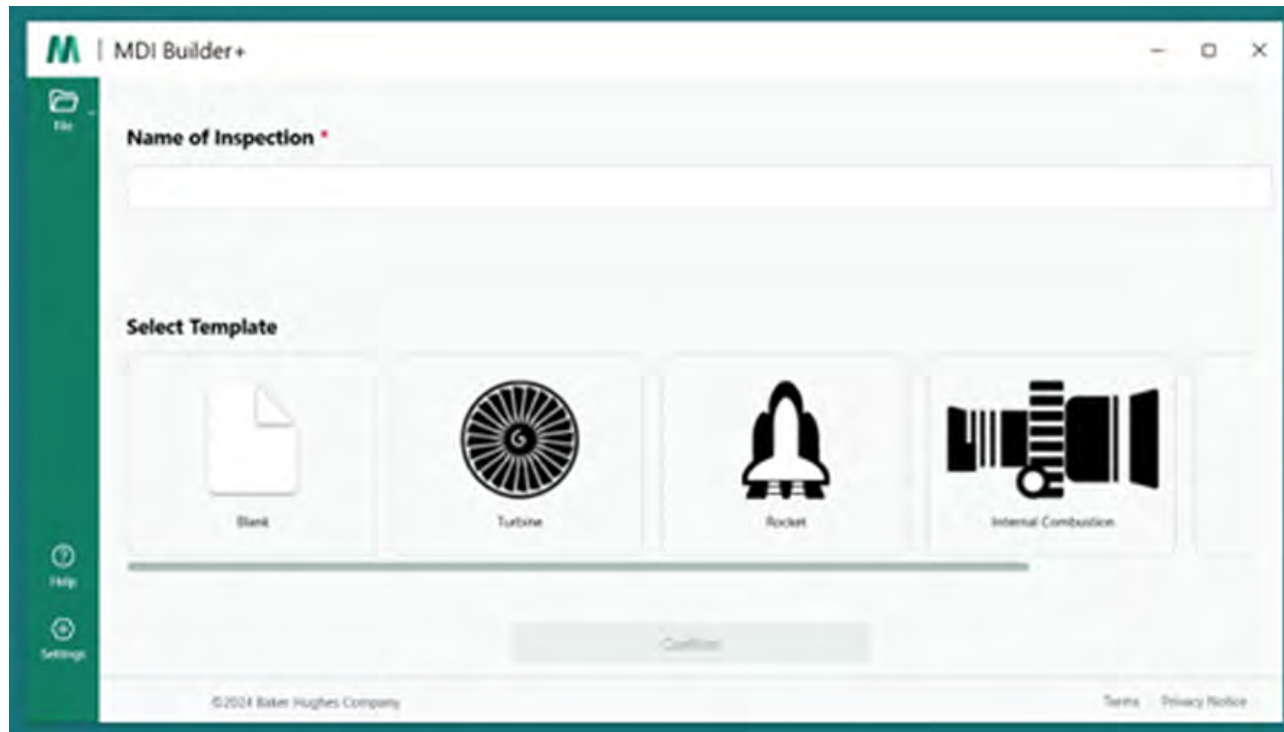
MDI Builder+

MDI Builder Desktop icon

4. Operation

Using MDI Builder+ Software

The start screen of the MDI Builder+ program will be displayed on PC as shown below:



MDI Builder+ start screen / Launch Page

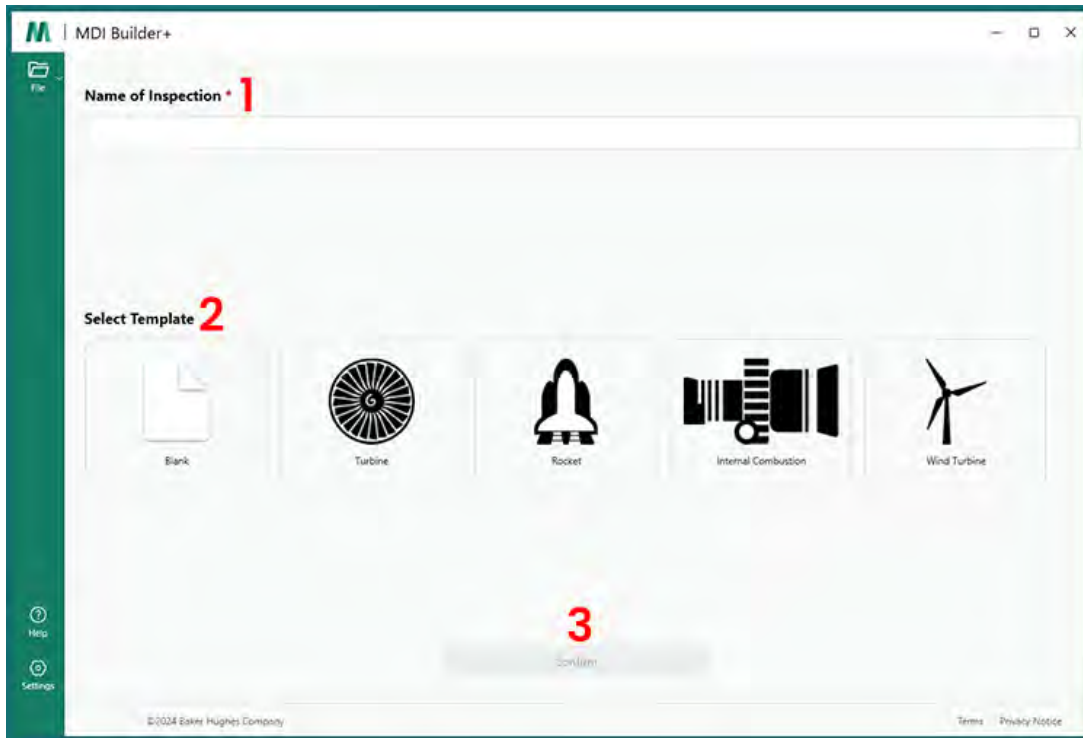
Building An MDI

An MDI will be created as the result of any one the following activities :

- Building an MDI based upon using one of the four MDI templates included in the MDI Builder+ application program.
- Importing an existing MDI, editing it, Editing and re-saving the MDI with a new file name.
- Building an MDI without using a prior MDI as a template - that is building the MDI "from scratch".

Building an MDI By Editing a Built-In Existing Template

In order to begin building an MDI from a built-in template, follow these three steps:



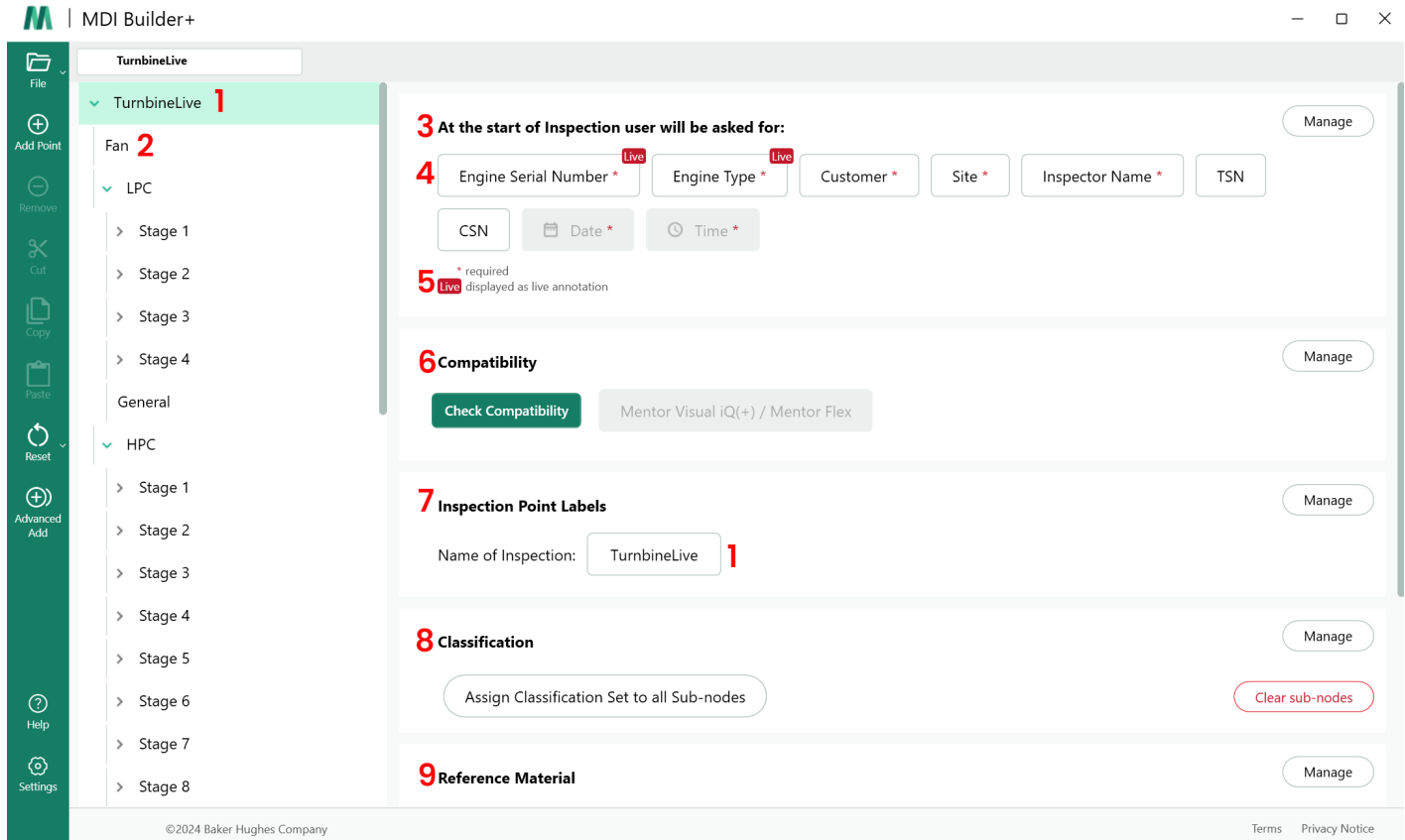
Building an MDI Using a Built-In Template

- 1** - Name the MDI Inspection: The inspection name may contain up to 50 characters containing upper or lower case alpha characters, numbers, and special keyboard characters such as " !, #, & *...". Spaces are not allowed. For this example, the name "NGT-1000" was chosen as the name of the MDI inspection.
- 2** - Select the desired template.
- 3** - Click the "Confirm" button.

A simple method to quickly build an MDI file is to use one of the four built-in MDI templates and modify it to meet your inspection requirements. The MDI Builder+ software tool contains sample MDI files which may be easily edited to create a finalized MDI based on a Turbine engine, Rocket, Internal Combustion engine, or Wind Turbine.

Editing an MDI Template

At this point, you may edit any of the attributes of the built-in MDIs which you have just selected. Refer to section [Building an MDI](#) for details of editing the details of the various attributes of the MDI you have just imported. In the illustration below, the Turbine MDI Template which has been named NGT-1000 has been selected to be edited.



Turbine MDI Template Available to Edit

The following sections of the MDI Template may now be edited. The sub-paragraph numbers refer to the numerical call-out values shown above "Turbine MDI Template Available to Edit":

1 - Name of Inspection: The name of the inspection which was initially entered on the MDI startup page has been carried over and is shown in the top of the MDI tree and in "Name of Inspection" box in the "Inspection Point Labels" section. Clicking this box allows the name of the inspection to be edited.

2 -MDI Tree Structure: The structure of the MDI itself may be edited to add or delete branches & nodes. The Tools of Cut, Copy and Paste, as well as the Advanced Add tool may be used in this editing process.

3 - Inspection Details:

- The Inspection details section allows you to define a set of titles of information which will be entered by an inspector at the start of an MDI (in this Template, the titles of Engine Serial Number, Engine Type, Customer.... have been pre-loaded).
- At the start of running an MDI on a VideoProbe, an on-screen keyboard will pop-up to allow free-form text entry.

- The data entered by the inspector will be captured and stored as meta data database tags associated with the inspection.
- The “Manage” button allows you to require the following actions from an inspector at the start-up of an MDI on a VideoProbe:
 - Display or do not display the data title
 - Require or don’t require the data to be entered by the inspector
 - Use the data entered by the inspector as automatic annotation on all still images and videos taken during the running of the MDI

4 - Live Annotation - When turned on, allows users to update annotation live.

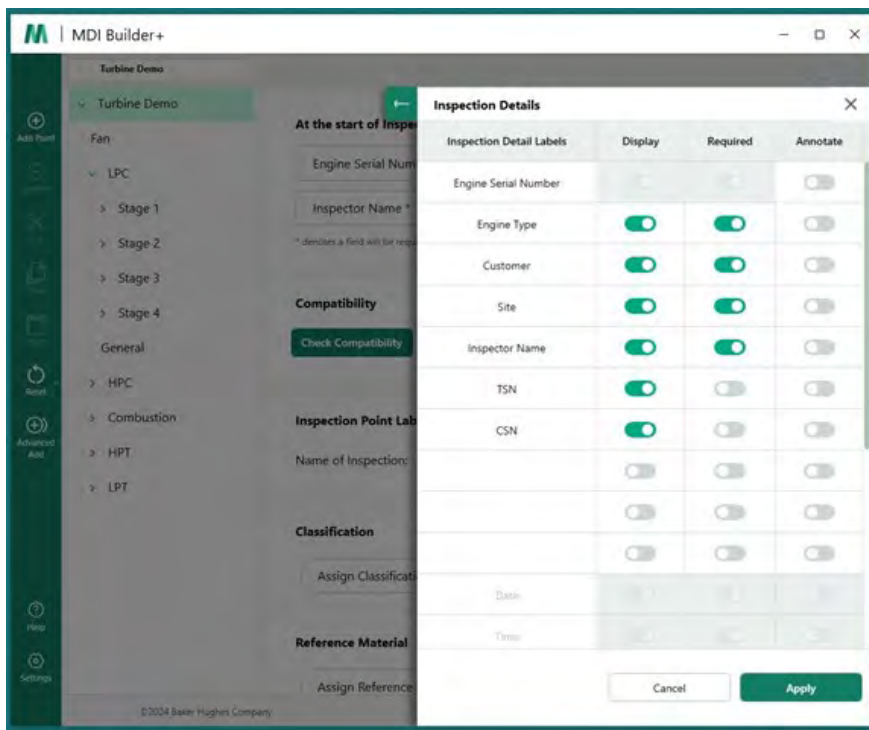
5 - Inspection Detail Field #1: Inspection Detail Field #1 is a mandatory field which must be entered by an inspector during the initial start-up of running an MDI on a VideoProbe. The contents of Detail Field #1 is concatenated with the Name of the Inspection field data and used to create the overall name of the File Folder of data created when an MDI is run on a VideoProbe

Inspection Details on MDI Report & Folder Creation

NOTE: The “Inspection Details” information entered on the VideoProbe at the beginning of an MDI inspection are also shown on the cover page of an MS Word or PDF MDI Report which may be generated on the VideoProbe. The figures below show the “Turbine ” MDI template’s MDI Builder+ Inspection Details screen, and how that data is shown on an MDI report generated by a VideoProbe.

For this example:

- The characters “123456” were entered in the “Engine Serial Number / Field #1” at the start of running the MDI on the VideoProbe.
- The MDI folder created by the VideoProbe which contains all images, videos, MDI Reports, xml database tags, and the MDI .mdz file are in a folder named “Turbine Demo-123456”.



MDI Builder+ Inspection Detail screen for MDI template “Turbine”

When the “Turbine” MDI template is loaded onto a VideoProbe, the startup screen on the VideoProbe

which allows for required and optional inspection details to be entered prior to beginning the inspection is shown in the figure below. Note that an asterisk (*) indicated a required field.



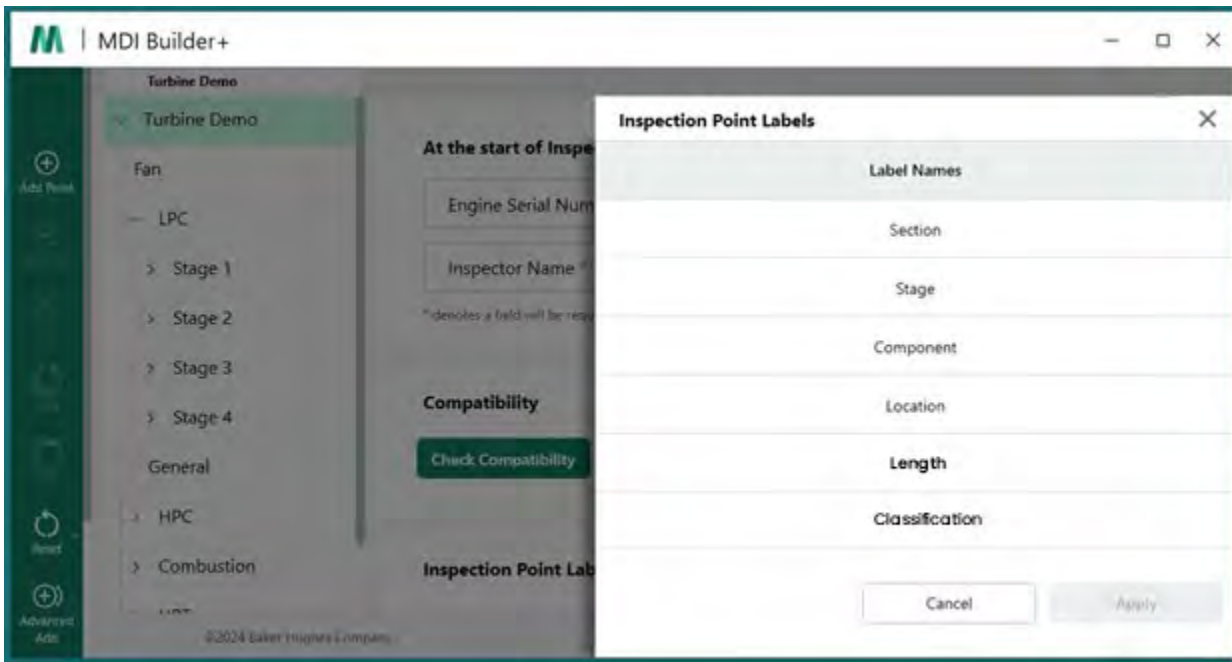
VideoProbe MDI inspection detail entry screen for Template "Turbine" MDI

Inspection Summary						
■	No Images/Approved Nodes					
■	No Flagged Images					
■	Flagged Images					
	Inspection Points	Approved Inspection Points	Images	Images with Analytic	Flagged Images	Recorded Videos
■ Fan	1	0	1	0	0	0
■ LPC	21	2	2	0	1	0
■ HPC	46	0	0	0	0	0
■ Combustion	5	5	5	0	0	0
■ HPT	25	0	0	0	0	0
■ LPT	73	0	0	0	0	0

Cover page table of VideoProbe MDI Report showing inspector entered information for MDI template

6 - Compatibility: This section is currently defaulted to allow MDI Builder+ + to only create MDIs compatible with the Mentor Visual iQ and Mentor Flex family of products.

7 - Inspection Point Labels: Inspection Point Labels create the descriptions of each branch of an MDI which are listed in the MDI Report's table created by a VideoProbe associated with each image report for MDI Template "Inspection".



Inspection Point Labels in the MDI Builder+ for the MDI Template



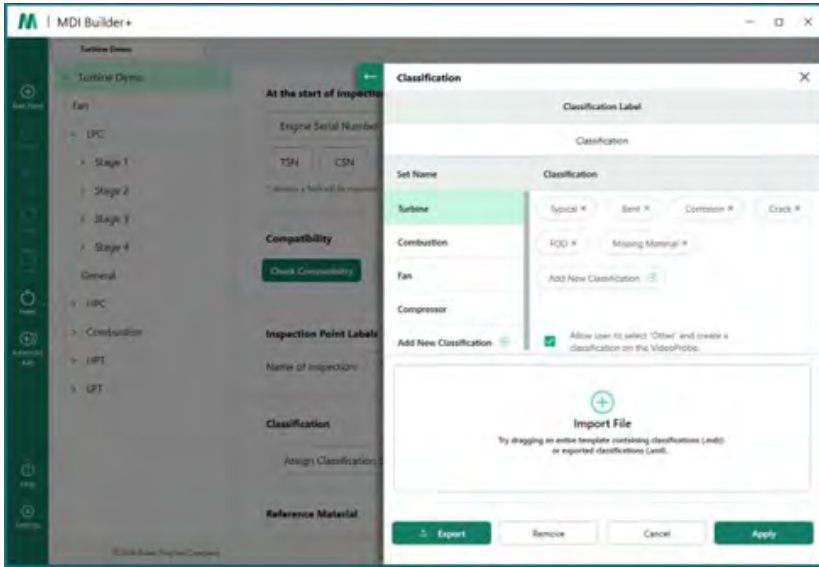
Example of image and location information table contained in an MDI

NOTE: The use of the Inspection Point Labels chosen in the MDI Builder+ are shown in the table above.

8 - Classification: The Classification section of MDI Builder+ allows you to create sets of descriptions which are available in a drop-down menu which can be associated with the image being saved.

The figures below show:

- The Classification set names which have been included in the “Turbine” MDI template in the MDI Builder+, as well as the specific classification descriptors available for the Set Name Turbine.
- A screen capture from a VideoProbe running the Turbine template MDI of the drop-down classifications available.

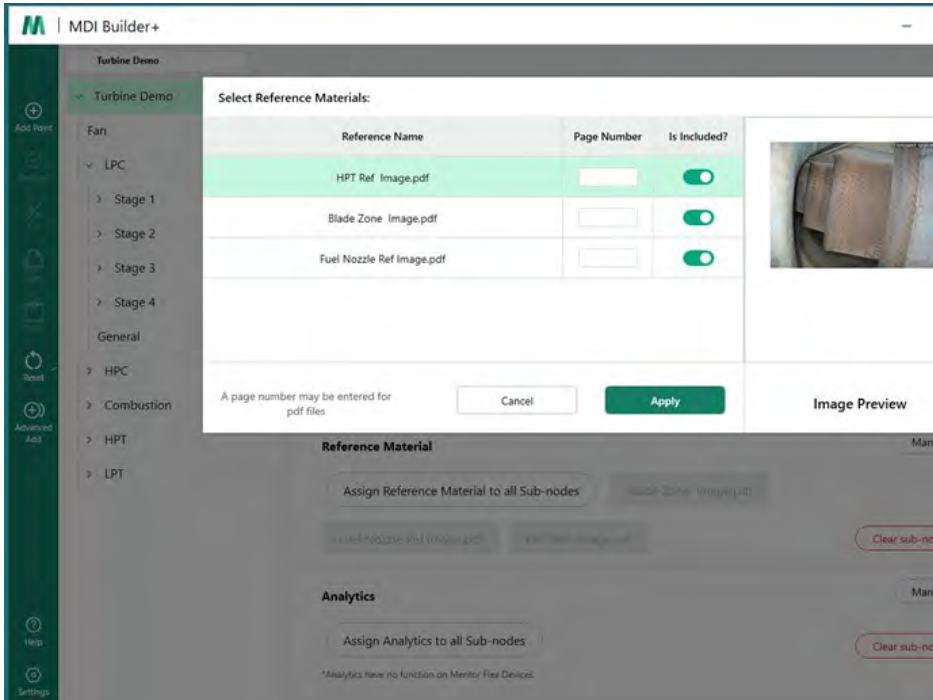


Classification screen on MDI Builder+ for MDI Template “Turbine”



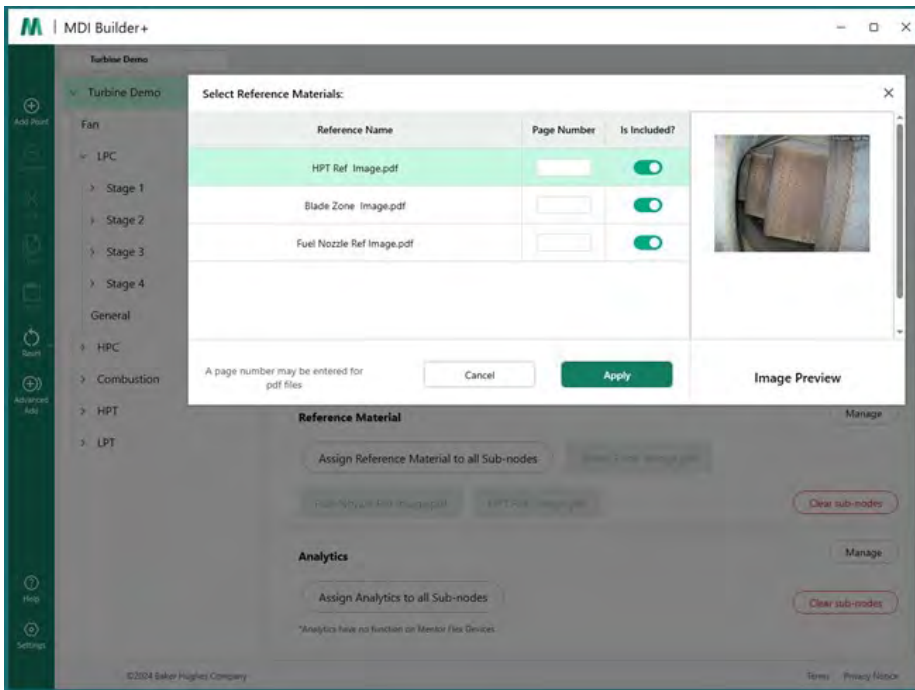
Drop-down classifications available on a VideoProbe running an MDI Template “Turbine”

9 - Reference Materials: (PDFs, JPEGs, or BMPs) may be added to any MDI branch or node and are available for viewing on the VideoProbe during an MDI inspection. The Reference Materials section of the MDI Builder+ tool allows for enabling the viewing of specific reference images on selected branches or nodes of an MDI. The reference materials may be viewed in full-screen or split screen mode on the VideoProbe.



Reference Material assignment screen in MDI Builder+

Analytics: The Analytics section of the MDI Builder+ tool directs the VideoProbe to automatically enable selected Analytics (such as specific Assisted Defect Recognition (ADR) types and the Blade Counter features) at chosen branches and nodes of an MDI.



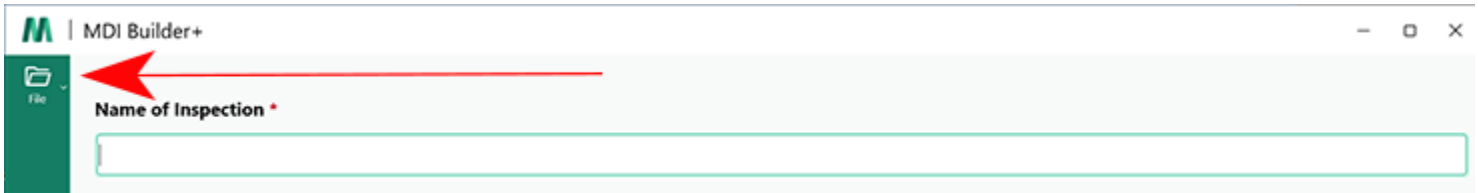
Analytics assignment screen in MDI Builder+

Refer to the detailed instructions included in "Option #3, Building an MDI with from a Blank Template"
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for information about how to edit specific features of the MDI Builder+ tool.

Import an Existing MDI

An existing MDI may be opened in the MDI Builder+ tool, changes may be made to the MDI, and the resulting MDI may be saved with the same name or with a new file name. In order to open an existing MDI, click on the drop-down icon next to the file folder icon in the MDI Builder+ application on an existing MDI.



Drop Down icon

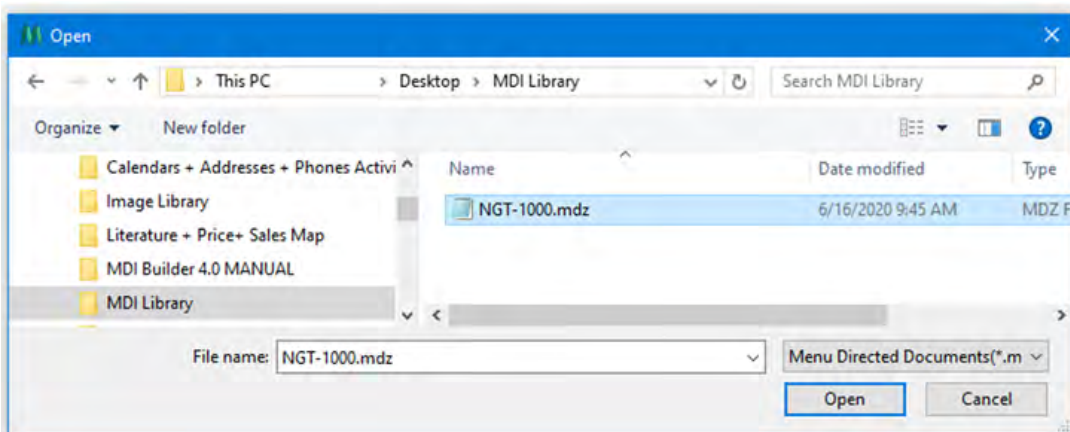
When the drop-down carrot is clicked, the screen shows an “Open” icon and text. Click this icon and navigate to the existing MDI you wish to open.



Open icon

Opening an existing MDI

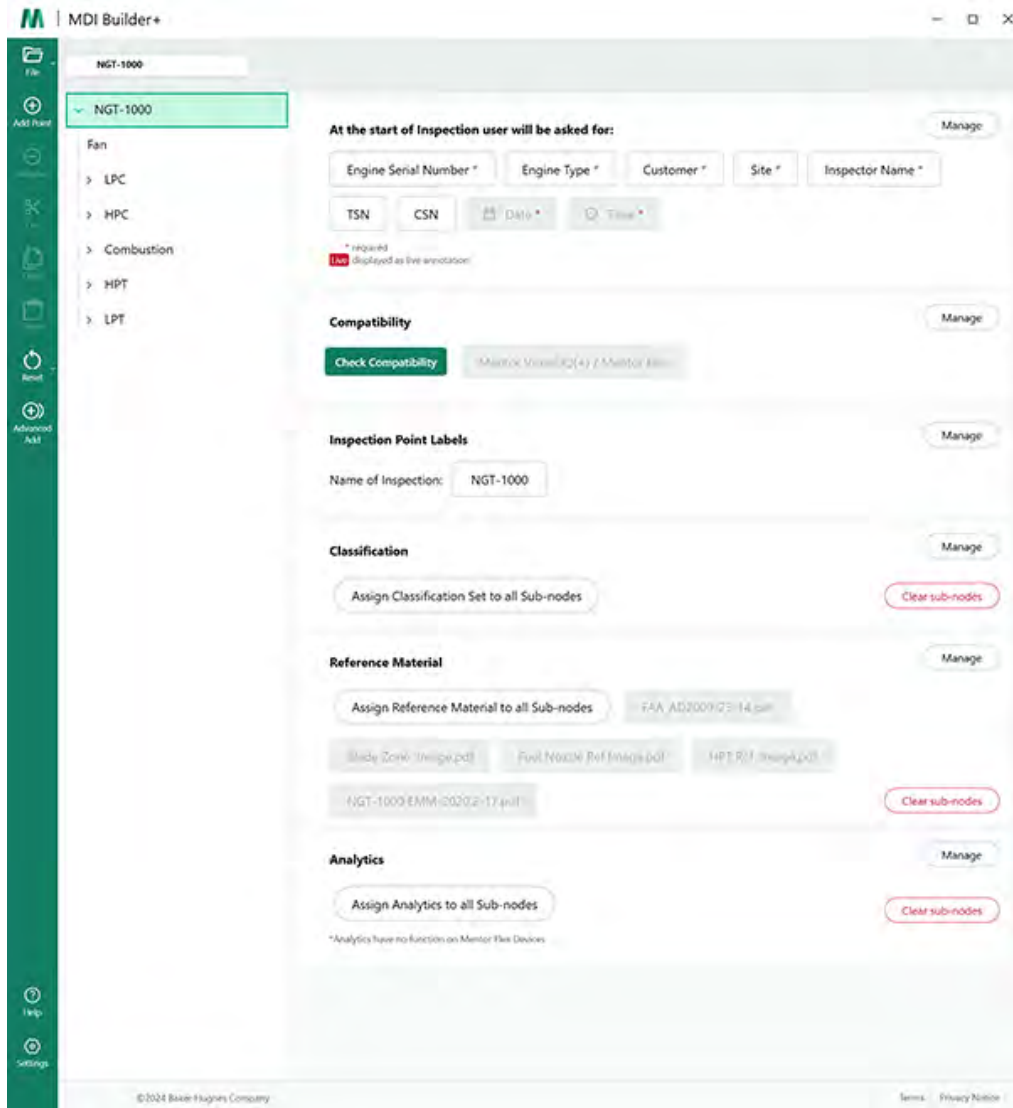
Once an existing MDI has been identified, select the MDI and click “Open”.



Browsing for an MDI to Open screen

Editing an Imported MDI

At this point, users may edit any of the attributes of the MDI that was imported.



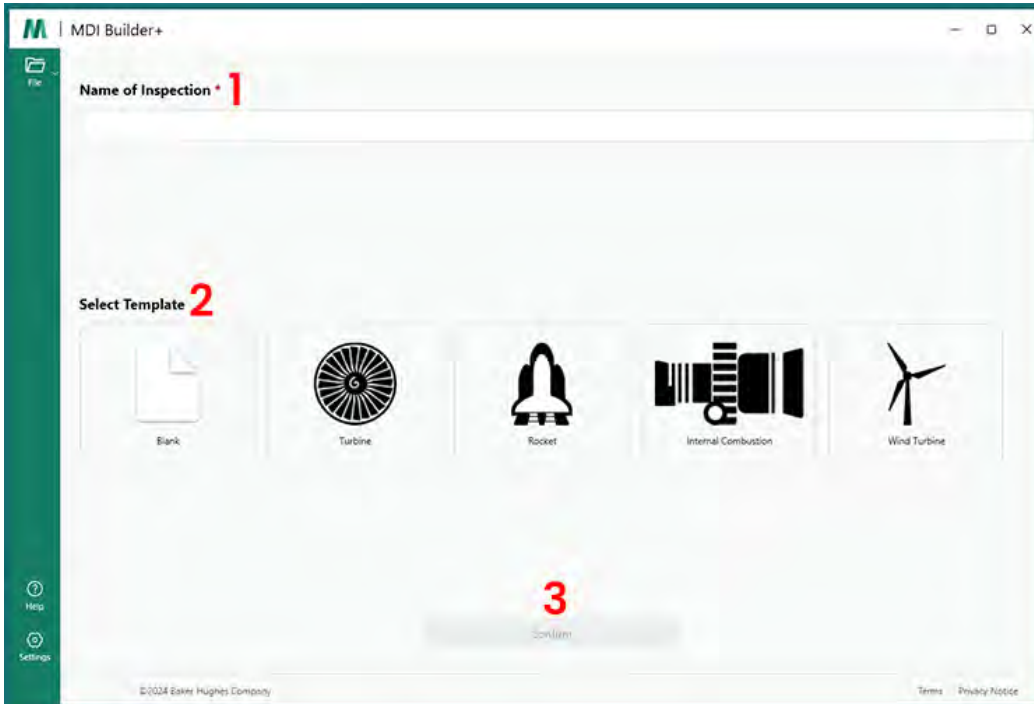
Imported MDI available to be edited

Refer to the detailed instructions included in “Option #3, Building an MDI with from a Blank Template” for information about how to edit specific features of the MDI Builder+ tool.

Building an MDI from a Blank Template

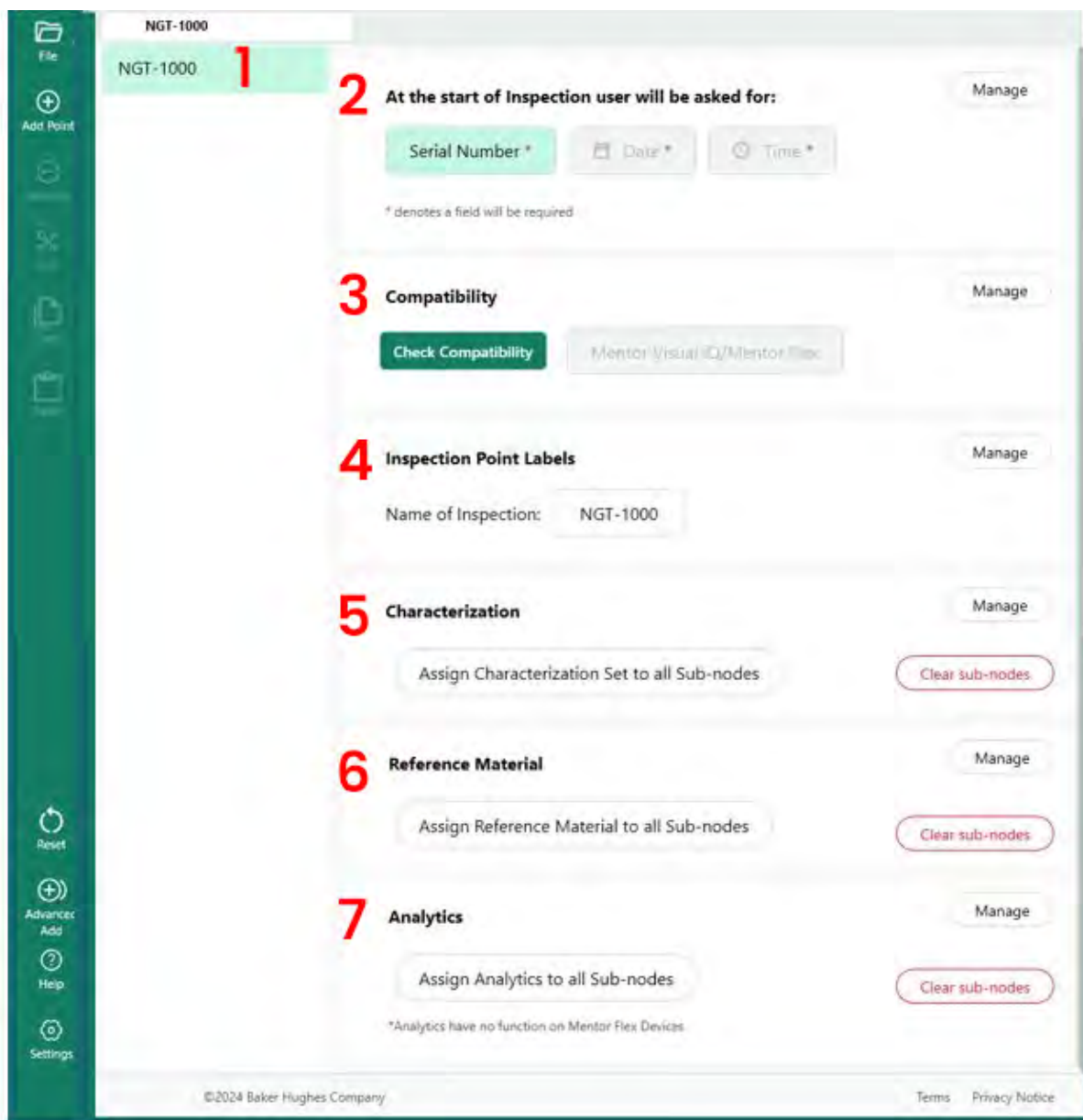
In order to begin building an MDI from a blank template, follow these three steps:

- 1** - Name the MDI Inspection: The inspection name may contain up to 50 characters containing upper or lower case alpha characters, numbers, and special keyboard characters such as " !, #, &, *...". Spaces are not allowed. For this example, the name "NGT-1000" was chosen as the name of the MDI inspection.
- 2** -Select the Blank Template
- 3** -Click the "Confirm" button



MDI Start Screen

Once selections are confirmed on the MDI start screen, the MDI Build Screen will be displayed.



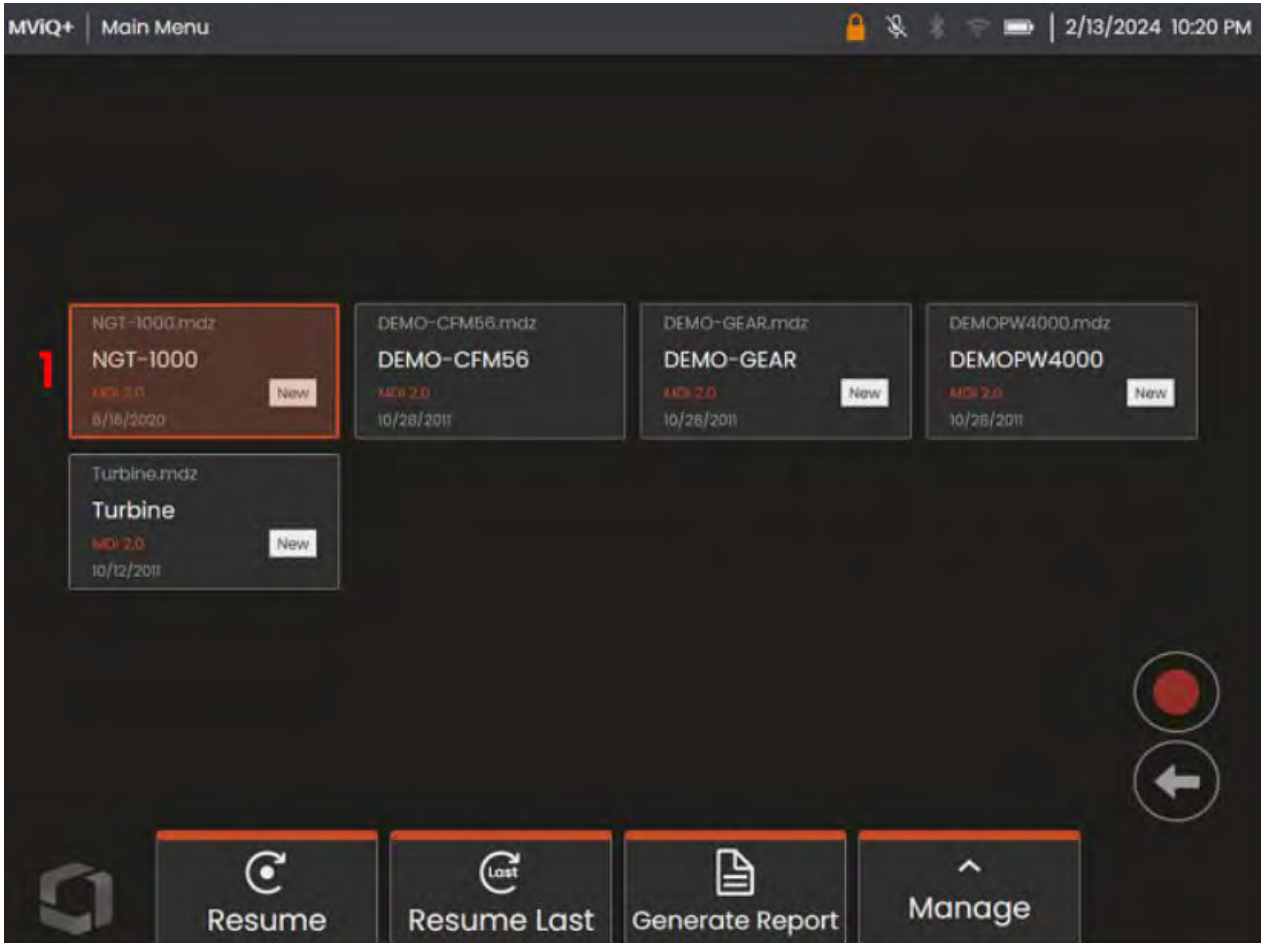
MDI Build Screen

- 1 - The name inputted previously is shown here. It will also appear on the VideoProbe
- 2 - When starting the application on the VideoProbe, the users will be required to enter these mandatory fields.
- 3 - The option to do a compatibility check is here.
- 4 - Inspection Point Labels can be managed prior to launching the MDI
- 5 - Classifications can be managed and cleared
- 6 - Reference materials related to the inspection can be uploaded and managed
- 7 - Analytics may be applied to specific Nodes or Branches

Creating a File Name

On the MDI Build screen, chose a file name for the MDI being built . It is the name which will show up on the MDI menu screen on the VideoProbe once the MDI is loaded on the VideoProbe as (name).mdz.

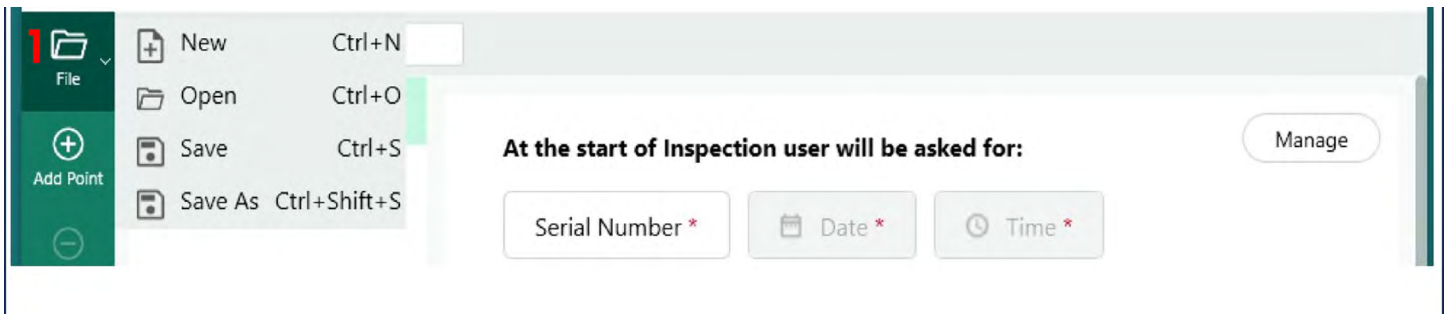
1 - For this example, the MDI name was chosen to be NGT-1000.



MDI Menu screen as shown on a MViQ+ VideoProbe

Saving the MDI File

Choose where on the PC to save the MDI file currently being built.



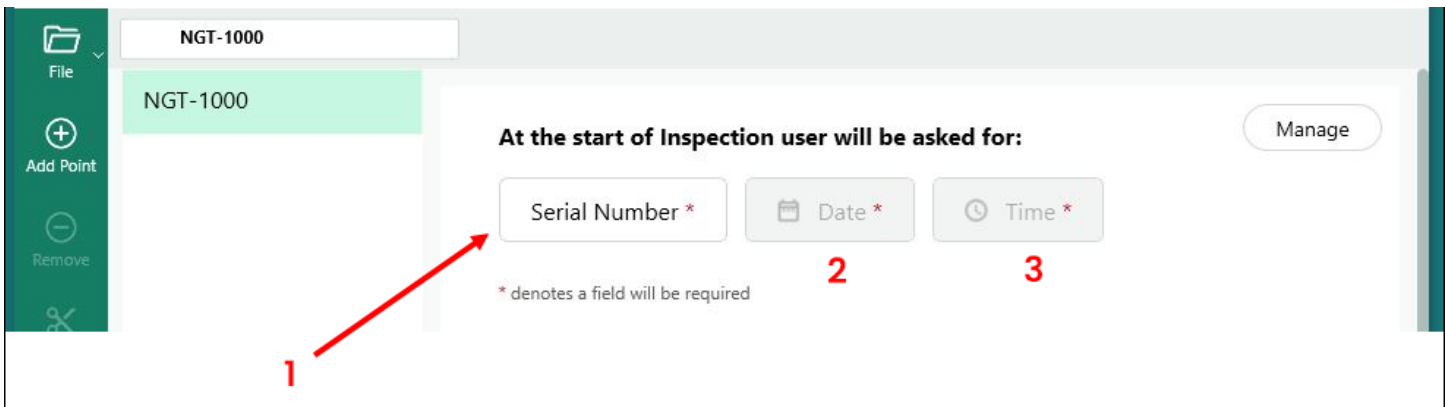
Save / Save-As screen

1 - Click the drop-down carrot next to “File” icon on the MDI Build screen and choose a location on the PC where the MDI being built will be stored.

NOTE: The first time saving the MDI users will be prompted to choose a full file path. On subsequent access the File icon – users can choose to “Save” in the previously selected location, or “Save As” and choose a new location.

Mandatory Inspection Level Fields

There are three mandatory fields which must be entered prior to the start of running an MDI on a VideoProbe:



Mandatory MDI Inspection Detail Labels

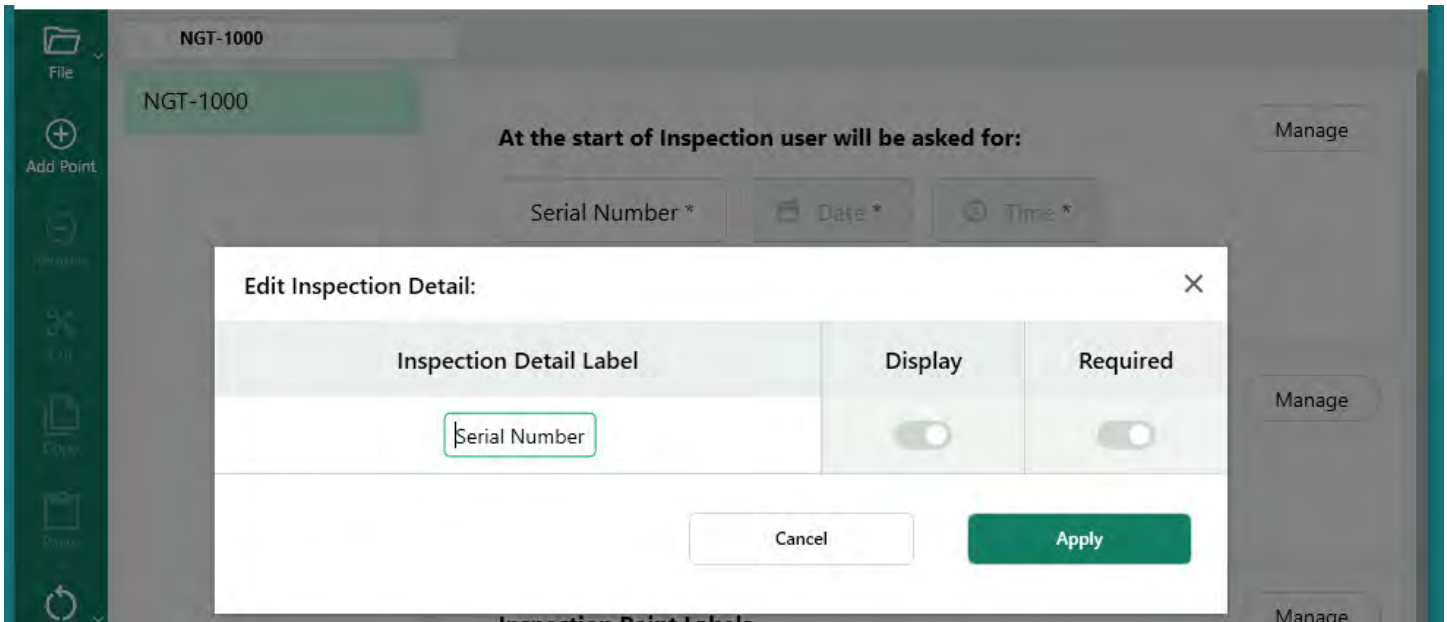
1 - Field #1 (named “Serial Number” by default – can be renamed)

2 - Date: This field will be entered automatically from the clock/calendar in the VideoProbe

3 - Time: This field will be entered automatically from the clock/calendar in the VideoProbe

Editing Field#1 – Serial Number Label

The MDI Builder+ has assigned the name “Serial Number” to Field #1. When running an MDI on a VideoProbe, information must be entered by an inspector associated with this field. Users may change the name of this field by clicking on the “Serial Number” button on the MDI Builder+ screen.



Editing name of Serial Number Field

Note MDI Folder Creation on VideoProbe: When an MDI is run on a VideoProbe, the VideoProbe will automatically create a Folder which will contain all inspection data including full resolution images, Database Tags, MDI Reports (if generated) and a copy of the MDI’s xxxxx.mdz file. The name of the MDI folder created on a VideoProbe when an MDI is run is formatted as “Name of the MDI – (data entered by inspector in mandatory field #1)”.

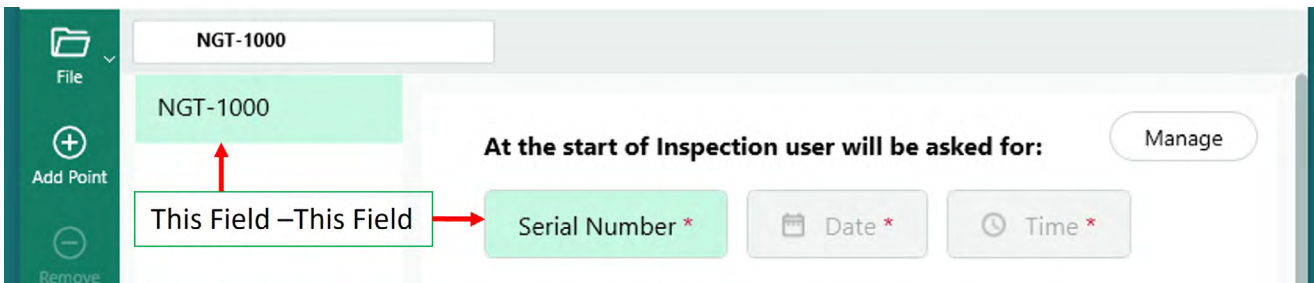
MDI FOLDER CREATION ON VIDEOPROBE EXAMPLE:

MDI Name: For this MDI, the MDI name is “NGT-1000”.

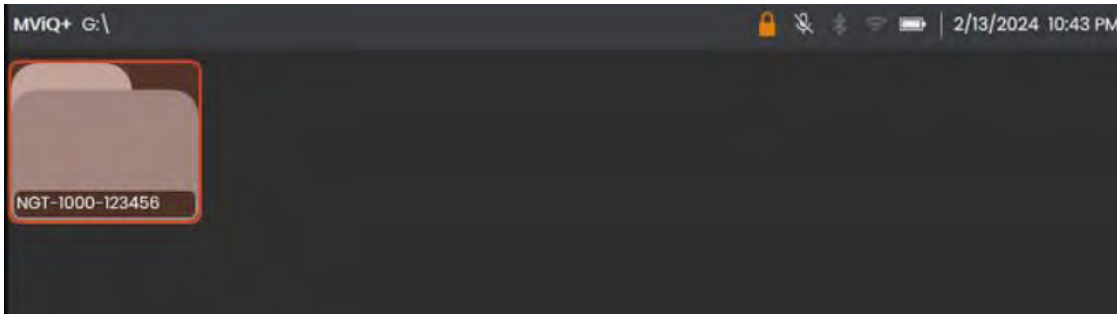
Field #1 Data For this example, the user kept Field #1 labeled as “Serial Number”.

At the start of the MDI, the inspector entered “123456” as the serial number in Field #1.

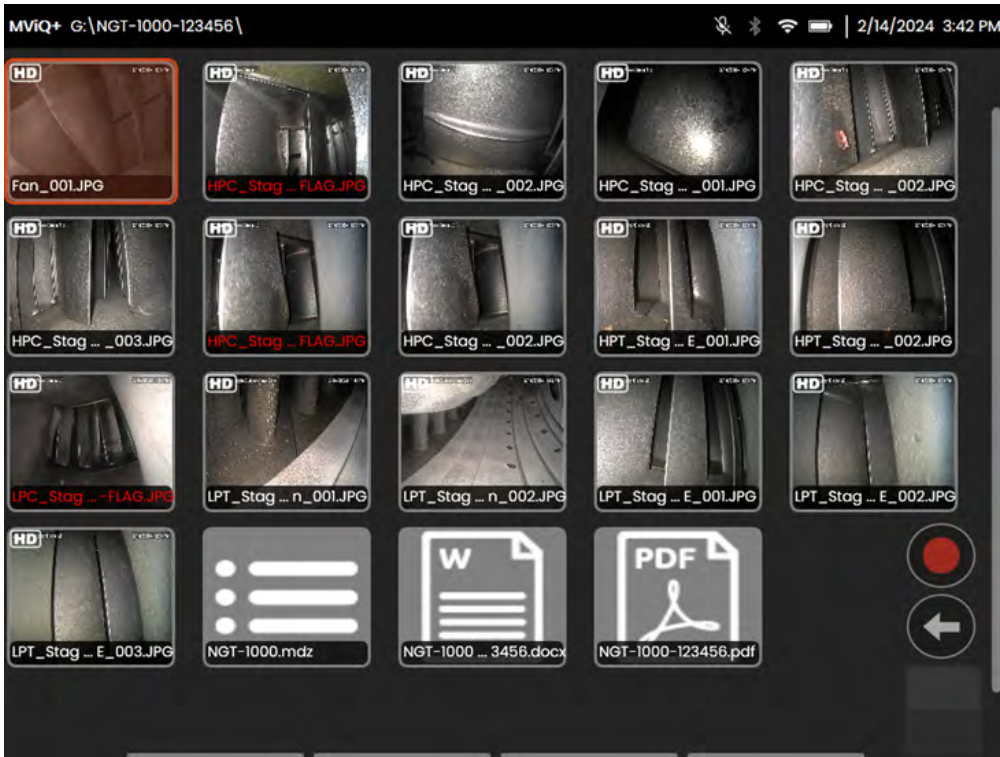
MDI Folder Name: The VideoProbe created “NGT-1000-123456” as the folder name which will contain all MDI data for the inspection.



MDI File Folder Automatically Created Name on VideoProbe



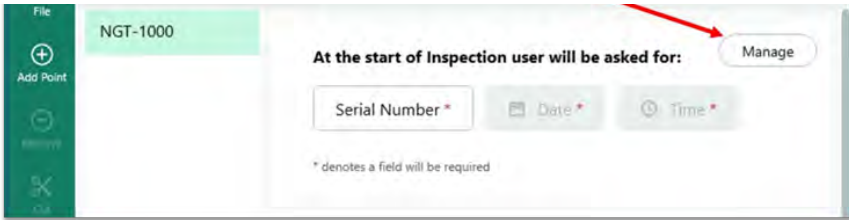
Example of MDI File Folder created by a VideoProbe running an MDI named NGT-1000



For reference: Example contents of an MDI File Folder created on a VideoProbe

Defining Inspection Detail Information (Assigned, Required or Optional)

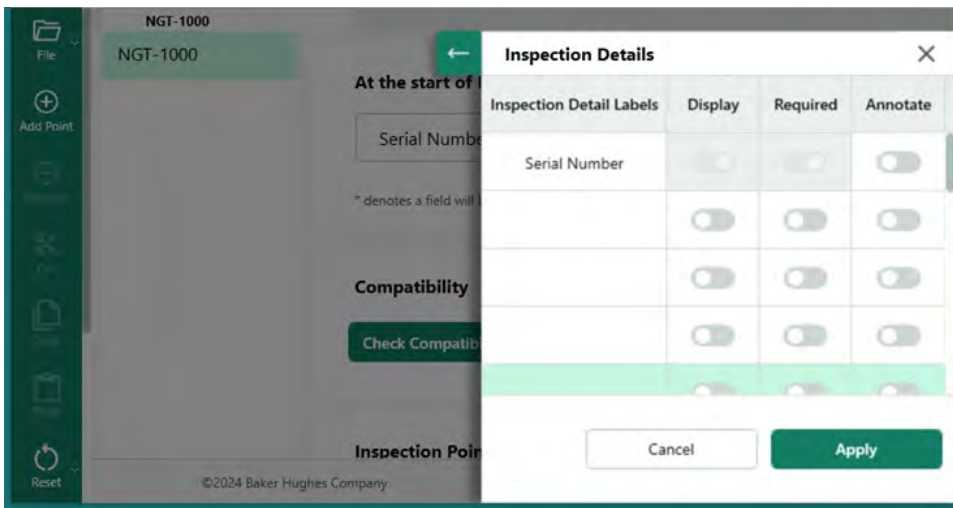
In addition to the three mandatory Inspection Details fields which must be filled in prior to running an MDI (#1- The field with a default name "Serial Number", #2-Date(auto-filled) and #3-Time (auto-filled), other inspection detail information may be built into the MDI which is intended to be captured on the VideoProbe prior to running the MDI on a VideoProbe. The author of the MDI who is building the MDI using the MDI Builder+ software tool may either require, or allow as optional, the entry of additional Inspection Details to be filled in prior to running the MDI on the VideoProbe.



Accessing Inspection Detail Labels

In order to include additional Inspection Label Details in an MDI , select the “Manage” button in the MDI Builder+ screen section containing the header script: “ At the start of Inspection user will be asked for”.

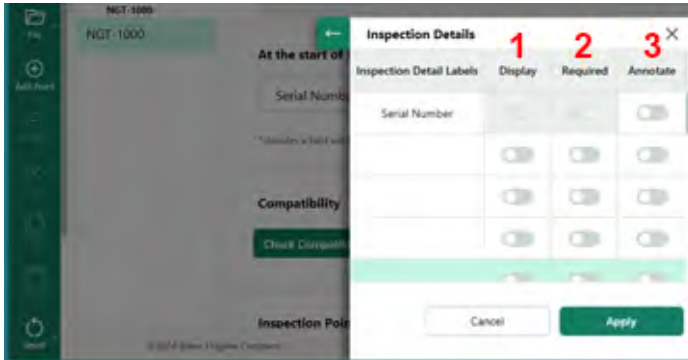
Seventeen (17) additional “Inspection Detail Labels” may be defined in the MDI Builder software tool which will facilitate the capture of information such as specific asset health and maintenance status, asset location, inspector name, customer name, and inspection requirement document number and revision, or other data unique to the inspection event.



Inspection Detail Label Entry Screen

Options Associated with Inspection Detail Labels in MDI Builder

The inspection Detail Labels entered into the MDI builder tool are used by a VideoProbe running that MDI to present a table to an inspector containing the “Inspection Detail Labels” list in one column, and open fields intended to be filled in by the inspector prior to starting the actual image capturing process of the MDI. Double-click in an open box in column with the header “Inspection Detail Labels” to activate the box for data entry.



Inspection Details

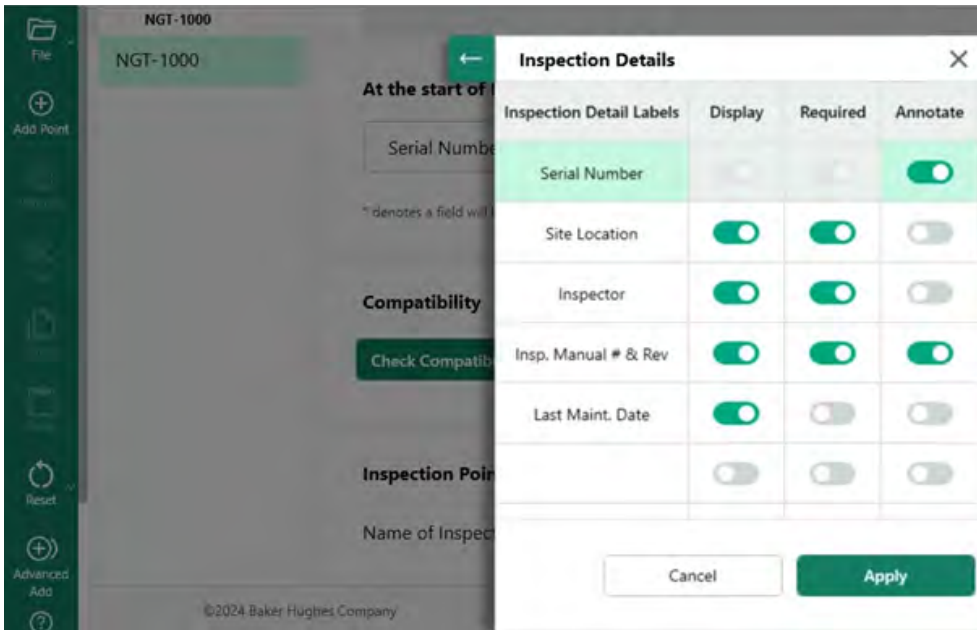
When building an MDI and defining the “Inspection Detail Labels”, you are given three(3) options associated with each Inspection Detail Label:

- 1** - Display: When Display is enabled, the Inspection Detail Label will show up as allowing data entry associated with the label by the inspector running the MDI.
- 2** - Required: When Required is enabled, the inspector running the MDI must enter data associated with that label in order to run the MDI.
- 3** - Annotate: When Annotate is enabled, the variable data entered by the inspector will show up as on-screen live annotation on the VideoProbe screen. This information will show up on all images and videos captured while this MDI is running. Typical uses of this feature may be to allow the automatic inclusion of asset serial number data, or inspection manual number & version information on all images and videos captured while running the MDI.

When all Inspection Detail Label information ,including associated Display, Required, and Annotate actions have been entered, click the “Apply” button to collapse the Inspection Details entry section of the MDI Builder tool.

EXAMPLE: ADDING INSPECTION DETAIL LABELS & SETTING ASSOCIATED REQUIREMENTS

For this example, the Inspection Details table has been filled-in to add Inspection Detail Labels, "Site Location", "Inspector", "Insp. Manual # & Rev", and "Last Maint. Date". The actions associated with each label (Display, Required, Annotate) are also set in this example.



Example Inspection Detail Label Table

Building the MDI Inspection Tree

The MDI Inspection Tree may contain up to five Branch Levels. Sub-branches from the main inspection tree are referred to as Nodes. When running an MDI, an image may only be captured at the end point of a branch level which is referred to as a “Leaf Node”.

The figure below shows a work-in-process build of an MDI and terminology which will be used in describing the building of an MDI tree structure. In this example, the main trunk MDI is named NGT-1000. One of the primary branches is named “LPC”. Including the LPC branch itself, there are five levels of branches shown associated with this LPC branch (LPC -Stage 1 - Blade -LE - Tip).

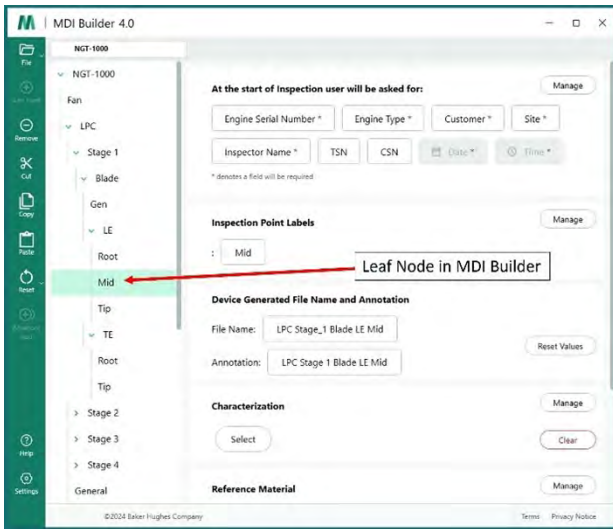
The screenshot displays the MDI Inspection Tree interface. On the left is a vertical toolbar with icons for File, Add Point, Remove, Cut, Copy, Paste, and Reset. The main area shows a tree structure under the root 'NGT-1000'. The tree levels are: NGT-1000 (1), Fan, LPC (2a), Stage 1 (2b), Blade (2c), LE (2d), Root, Mid, and Tip (2e). The 'Tip' node is highlighted in green. To the right of the tree are configuration panels. The top panel is titled 'Inspection Point Labels' and contains 'Inspection Level 5: Tip' and a 'Manage' button. The middle panel is titled 'Device Generated File Name and Annotation' and contains 'File Name: LPC Stage_1 Blade LE Tip' (3) and 'Annotation: LPC Stage 1 Blade LE Tip' (4), both with 'Reset Values' buttons. The bottom panel is titled 'Characterization' and contains a 'Manage' button. A note at the top right states '* denotes a field will be required'.

Example of a Branch which has (5) levels of detail in the MDI Tree

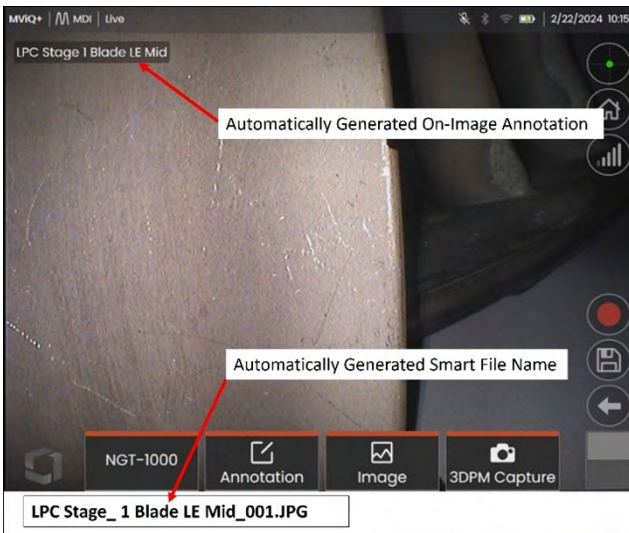
- 1** - Main trunk or Root Tree Level
- 2a** - First Branch level named LPC
- 2b** - Second Branch Level named Stage 1
- 2c** - Third Branch Level named Blade
- 2d** - Fourth Branch level named LE
- 2e** - Fifth Brand level (or Leaf Node) named Tip
- 3** - File name for image taken at Leaf Node level
- 4** - Annotation for image taken at Leaf Node level

Note: Concerning On-Screen Annotation & File Name Creation on VideoProbe: Annotation and file names are automatically created on the VideoProbe. The on-image annotation and the file name which is created for each image captured while running an MDI on a VideoProbe is defined by the MDI. The MDI program uses intelligent portions of the MDI branch path to create the on-image annotation and smart file name. The annotation & file name to be used when an image is captured at the end node of a branch (the so-called "LEAF NODE") is shown on the MDI Builder+ screen. If a change is needed to the annotation or file name which will be used during a Leaf Node capture – users may edit the "File Name" and/or "Annotation" boxes on the MDI Builder+ screen which shows that Leaf Node.

EXAMPLE: When an image is captured at the Leaf Node: LPC>Stage 1>LE>Blade>Mid as shown in the MDI Builder+ as shown in the figure below, the on-screen annotation and smart file names captured by the VideoProbe running the MDI NGT-1000 are shown in figure below.



Annotation & Smart File Name Defined by MDI Builder+

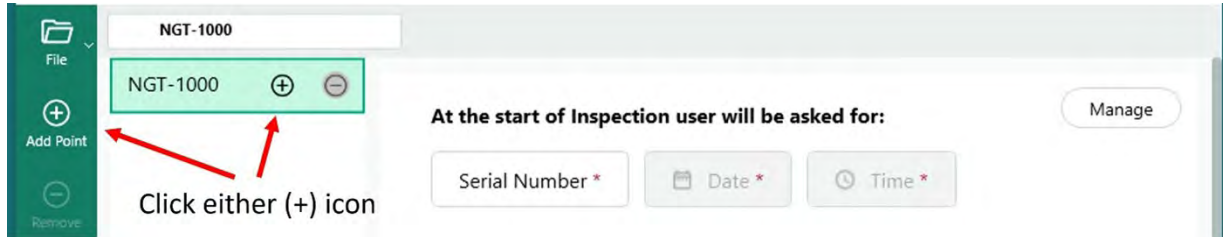


VideoProbe On-Screen Annotation & Smart File Name Automatically Generated at Leaf Node

Adding a Branch or Node to an MDI Tree

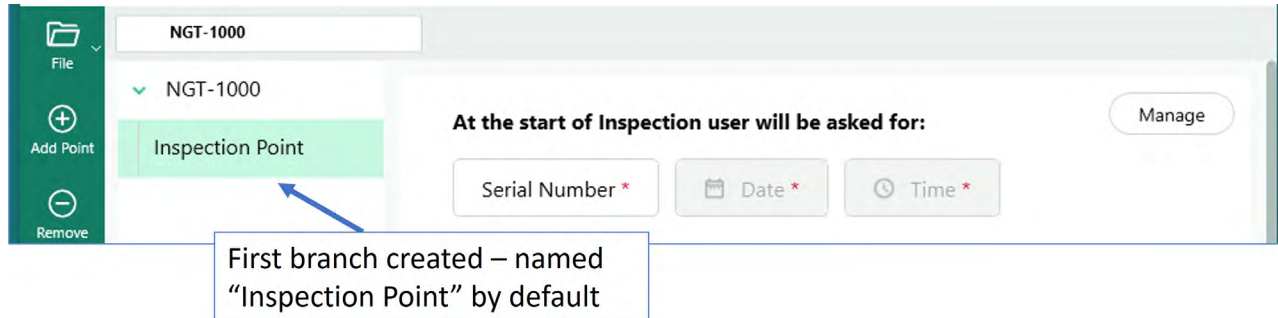
Branches or end nodes may be added to a tree component (main trunk or branch level) using two methods:

1. Highlight the MDI tree node by hovering the mouse pointer over it and click on the (+) icon.
2. Click on a node location to highlight it, then click on the “Add Point” (+) icon in the left banner menu.



Adding a branch or node to the main root “NGT-1000”

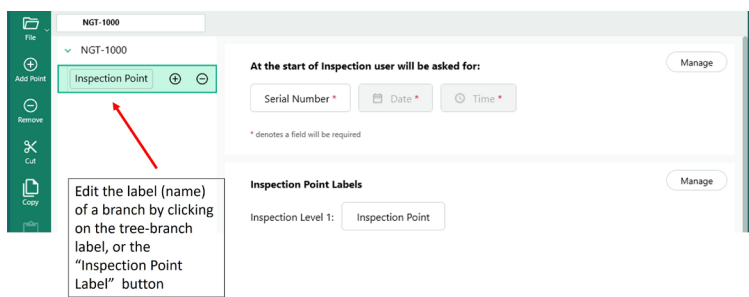
Once the (+) icon has been clicked, a branch (node) will appear with a default name of “Inspection Point”.



First level branch created from main trunk level

Renaming a Branch

The name or “label” associated with a branch may be renamed by clicking on the label shown in the tree layout. An edit box will appear and renaming can be done directly in the label box.

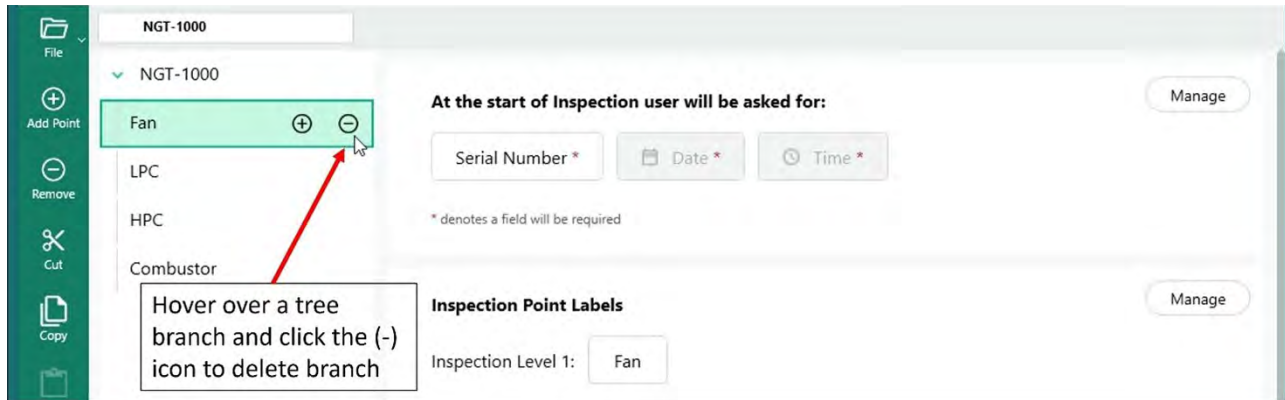


Renaming a branch label

Deleting a Branch

A branch node may be deleted by clicking into the branch name in the MDI tree, and clicking on the (-) icon. If there are sub-branches below the branch selected, those sub-branches will also be deleted.

EXAMPLE: The MDI tree shown below contains four branches (Fan, LPC, HPC, Combustor) coming from the MDI trunk . The person building this MDI wishes to delete the branch labeled “ Fan”. In order to delete this branch, use the mouse to hover over the MDI tree branch named “Fan” and click the (-) icon”.



Deleting a Branch

Moving a branch within the MDI Tree

In order to move a branch within an MDI tree, simply place the mouse-cursor on the branch to be moved, left-click and hold down left mouse click, and drag the branch to a new position.

- If the node is dragged and released between two other nodes, it will be added at the same tree-level as those two nodes.
- If the node is dragged and released on top of an existing node, then the node being moved will become a branch out of the node where it was dropped.

Copy and Paste or Cut and Paste a branch or set of branches

A branch may be cut or copied and pasted onto another node by:

- Placing the mouse-cursor on the branch node
- Right clicking on the node
 - If a group of branches are desired to be cut or copied, hold down the “Ctrl” key on the keyboard and move the cursor to additional nodes where users will right-click to highlight the nodes.
- Select Cut or Copy on the pop-up dialog box by left-clicking on the desired action.
- Paste the cut or copied nodes:
 - By moving the mouse cursor to another node to make the cut or copied nodes become child-nodes for that location.
 - Right clicking on that node and select “paste” from the pop-up dialog box.
- By moving the mouse cursor between other nodes to make the cut or copied nodes become nodes at the same tree level as the location above where it will be pasted.
 - Right clicking on that location and select “paste” from the pop-up dialog box.

Reset Tool

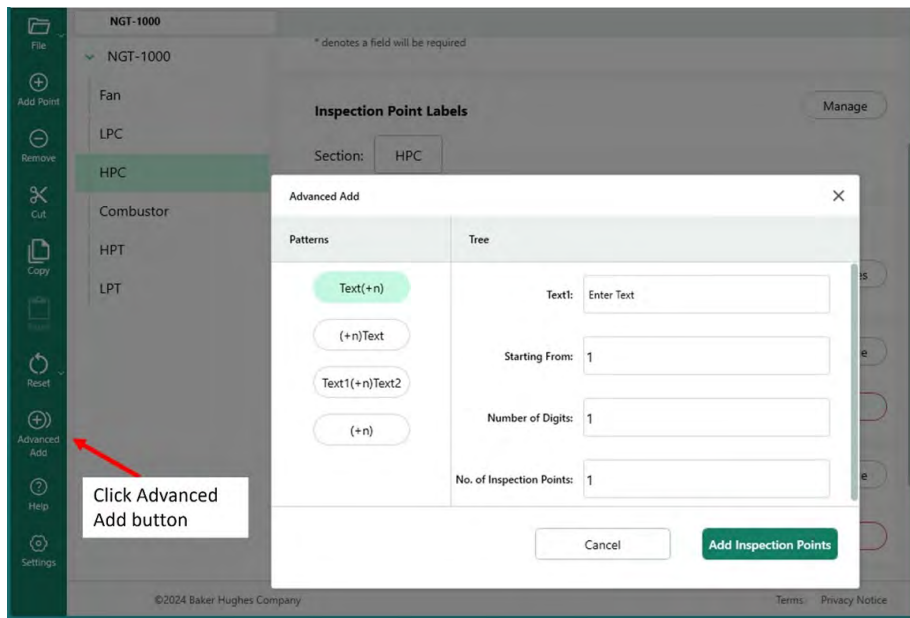
The Reset tool is used to refresh either File Name or Annotations associated with branches in the MDI Tree. When using the Copy or Cut and paste operations, the inspection nodes may be properly displaying in the locations you have chosen, but the supporting File Name basis and Annotations may not be properly synchronized with the new Tree structure.

It is a best practice to Reset the File Names and Annotations following Cut or Copy and Paste actions on the inspection Tree. The MDI Builder tool may indicate duplicate file names, or just general errors at the branch level where an error condition is detected .

Advanced Add Tool

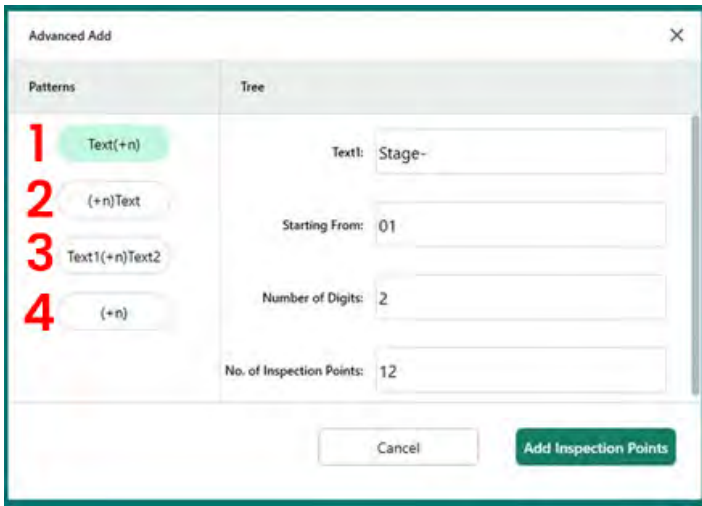
Generating Inspection Nodes using the “ Advanced Add” automatic sequence generation tool:

When building an MDI, it may be useful to generate a sequence of inspection point nodes, such as creating the sub-branches of “Stage 1, Stage2, Stage 3.....” under a branch called LPC. In order to facilitate the creation of inspection nodes in a sequence, the “Advanced Add” tool may be used.



Accessing the Advanced Add Feature

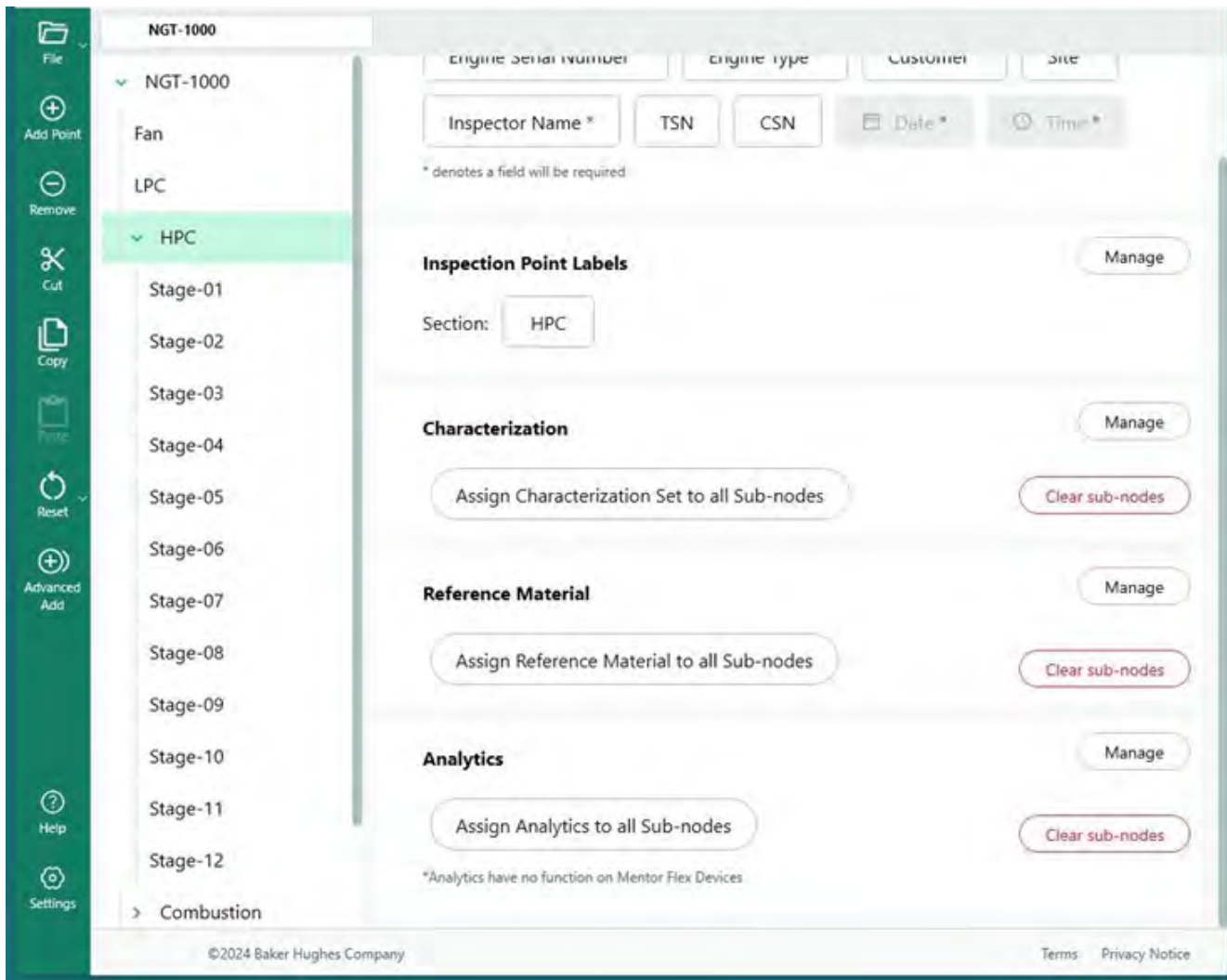
Example: Advanced Add table filled in to create the sequence of “ Stage 1, Stage 2..... Stage 12” as sub branches of the branch “HPC” . Fill in the table as shown below with the desired wording and sequence commands and click the “Add Inspection Point” button.



- 1 - Add sub-branch with inputted text followed by sequential numbers.
- 2 - Add sub-branch with sequential numbers followed by inputted text.
- 3 - Add sub-branch with inputted text followed by sequential numbers and inputted text(2).
- 4 - Add sub-branch with sequential numbers only.

Contents of "Advanced Add" table set up for adding 12 sub-branches under the "HPC" branch

Once the " Add Inspection Points" button is clicked, 12 sub-branches of Stage-01 through Stage 12 are added to the "HPC" branch as shown below.

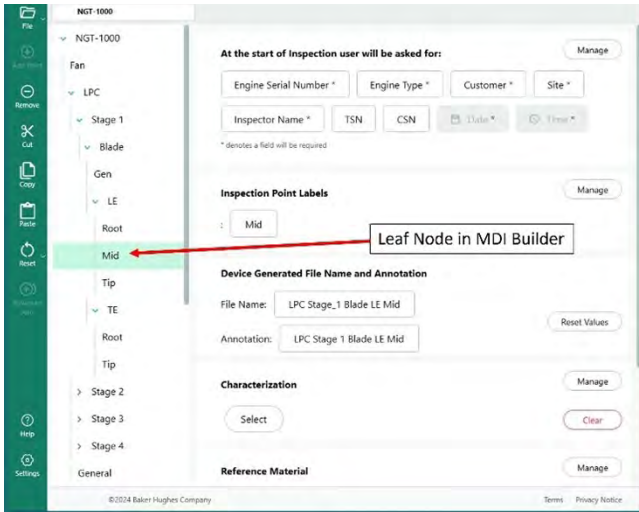


MDI Tree after adding 12 Branches using "Advanced Add" tool

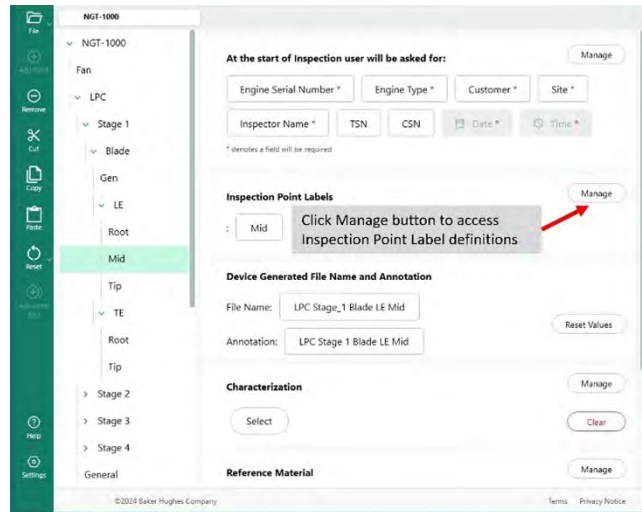
Define Inspection Point Labels

When an MDI Report is generated by a VideoProbe, the inspector is given the option to include a table summary of the asset location and any manually entered Comments and Classifications (selected from a drop-down table). Each Branch Level in an MDI Tree must be assigned an "Inspection Point Label" in order that the table next to an image in an MDI report properly identifies the image's location in the MDI tree.

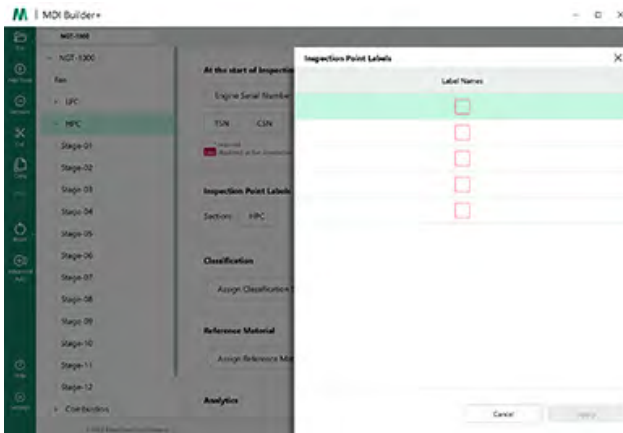
See example showing the Leaf Node location in the MDI Builder+ where an image was subsequently captured on a VideoProbe, and the "Inspection Point Labels" associated with each branch of the five levels of the MDI Tree.



Leaf Node in MDI Builder+

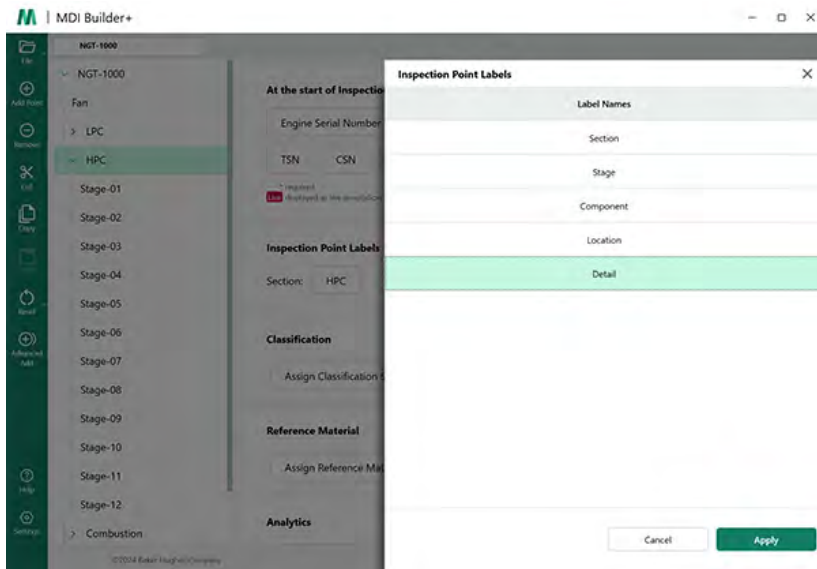


Accessing Inspection Point Labels for MDI Tree



Blank Inspection Point Label Table


When initially accessed, the Inspection Point Label table will be blank. Fill in each Inspection Point Label with a description which is appropriate to the MDI Tree structure created. In the example below, the Inspection Point Label table is filled in with phrases appropriate to the NGT-1000 MDI Tree branch levels.



Filled-In Inspection Point Label Table for NGT-1000 MDI

Below is an example of an image captured on an MViq running the NGT-1000 MDI. This image was captured at Leaf Node LPC>Stage 1>Blade>LE>Mid. Notice the following characteristics of this image and associated table created in the MDI Report generated by the VideoProbe:

- The Inspection Point Labels of “Section, Stage, Component, Location, and Detail” are shown in the table and are indicating the location in the asset where this image was captured.
- The table associated with the image also contains the result of the measurement shown in the image and that a Measurement Plane was used in this measurement.
- When this image was captured, the inspector chose “FOD Impact” as a drop-down Classification.
- When this image was captured, the inspector manually entered the free-form text entry “Damage exceeds AMM zone B limits” as a comment during the image save process.
- Since this image was captured as a “Flagged” image, the smart file name of “LPC Stage_1 Blade LE Mid_001-FLAG” was shown in red text in the report.



Stage	Stage 1
Component	Blade
Location	LE
Detail	Mid
Point-to-Line	0.025 in
Measurement Plane	--
Observation	Fod Impact
Comments	Damage exceeds AMM zone B limits

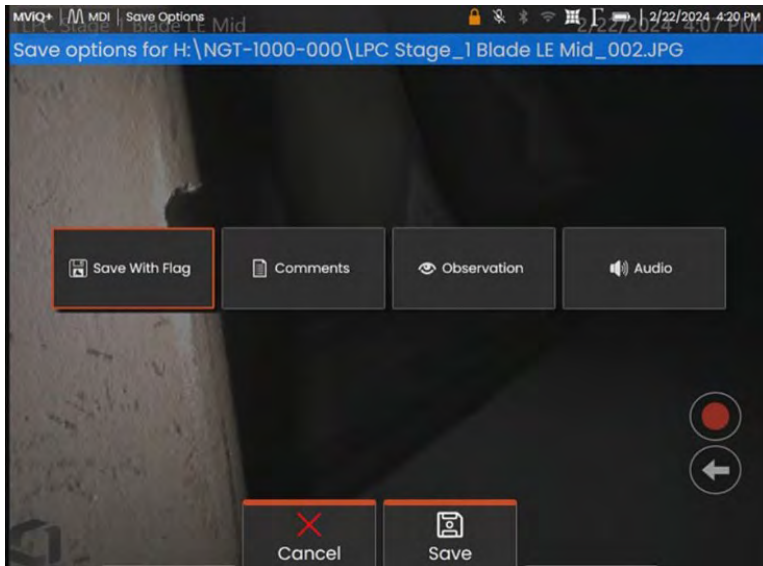
LPC Stage_1 Blade LE Mid_001-FLAG.JPG

Image shown in MDI-1000 MDI report generated on VideoProbe

Classification

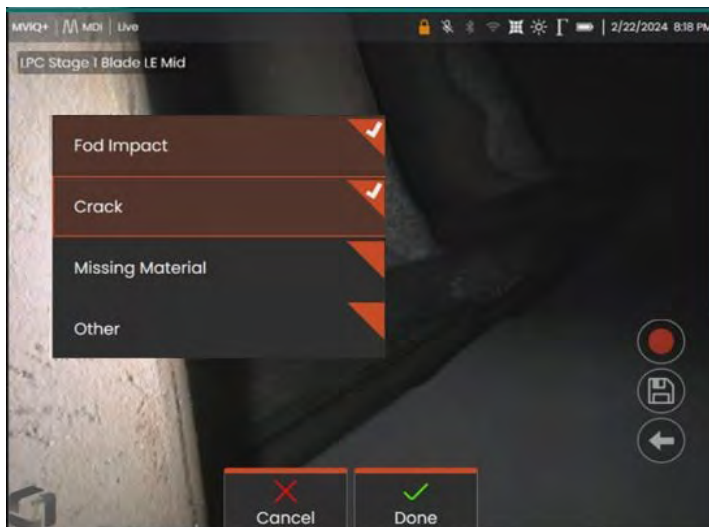
Classifications, Characterizations, or Observations (as called in earlier-version MDIs) are pre-defined text scripts which are built into an MDI by using the Classification Tool in MDI Builder+. A Classification is a text entry which is presented to the inspector at the Leaf Node point prior to saving an image. The Classifications are contained in a drop-down menu of words or phrases accessible at a Leaf Node by clicking on the "Observations" or Classifications tile on the VideoProbe which shows up on-screen during the Image Save process. Users can choose one or more Observations which will be associated with the image being saved. The chosen Observations will show up in the MDI report next to the captured image in the "Observations" box as well as be captured as database tags for future searching and sorting purposes.

EXAMPLE: In the image below, the inspector is at a Leaf Node and is preparing to save the image and is presented with options of "Save, Save with Flag, Comments, Observations, and Audio (create an audio clip associated with the image)".



SAVE options available on a VideoProbe running an MDI

Before an image is saved on a VideoProbe running an MDI, if Classifications / Observations have been built into the MDI and assigned to the Leaf Node being captured, clicking on the "Observations" tile will reveal the drop-down Observations menu for that Leaf Node.



Classifications Drop-Down menu of Classifications

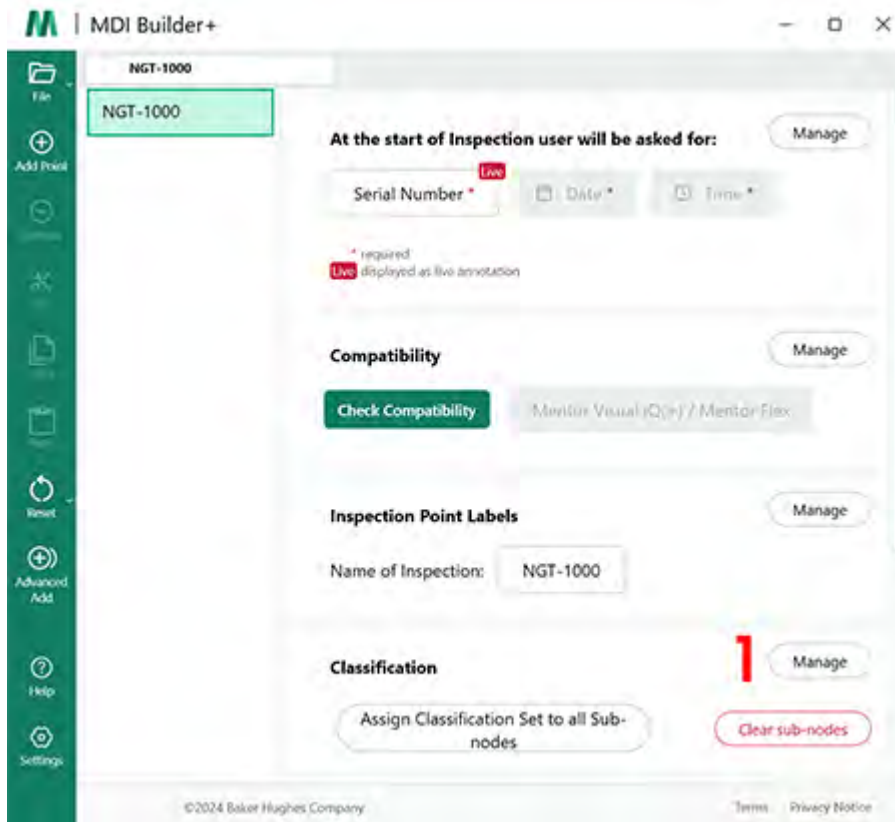
Building Classifications Sets

Classifications are one or more descriptions which may be associated with a Branch or Leaf Node in an MDI inspection tree. Typically, Classifications are single words or short descriptions which indicate an asset's health or status at the Leaf Node where an image is being captured. For example, in a turbine engine inspection, classifications such as "Cracked, Bent, Missing Material..." may be appropriate.

There are different sets of classifications for Leaf Nodes. For this reason, the MDI Builder+ allows users to create "Classifications Sets" which can be applied to Nodes or full Branches of the MDI. Each set of classifications is uniquely named. During the MDI building process, users may assign the "Classification Sets" to MDI Branches or Nodes.

EXAMPLE: Creating Classification Sets & Applying Them to the MDI Tree Branches & Nodes

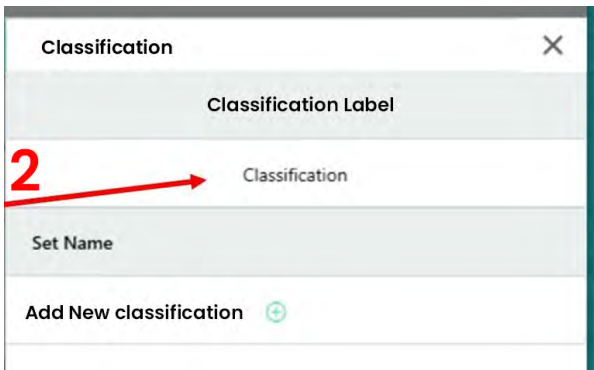
1 - Create Classification Set Names by clicking on the "Manage" button in the Classification section of MDI Builder+.



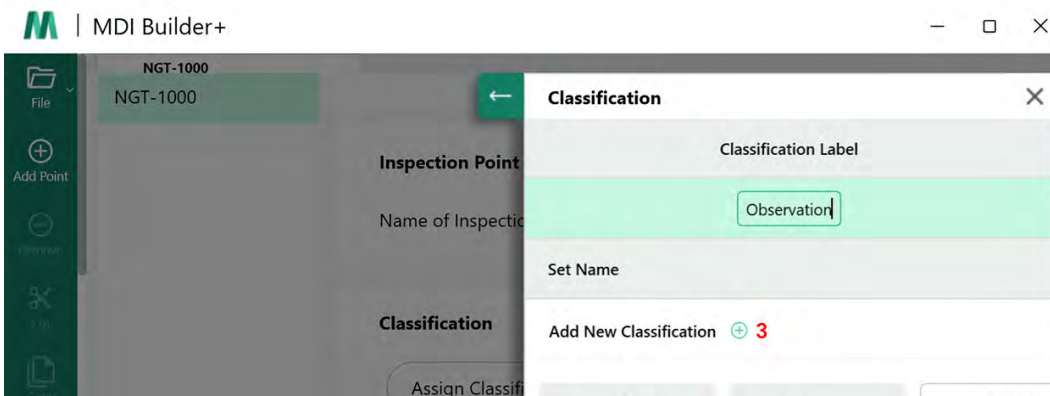
Begin Creating Classification Set

2 (Optional) Change "Classification Label" – the name which will show up on VideoProbe above drop-down Classifications.

By default, MDIs built on MDI Builder+ will have the heading name of "Classification" for their drop-down Classifications. For this example, the word "Classification" was deleted and the word "Observation" was typed in its place.



Viewing default Classification label



Changing Classification Label to "Observation"

3 – Create Classification Set Names & Classification Names: In order to create Classification Sets, click Add New Classification (+) icon.

The demo MDI which is used by example in this manual is a Gas Turbine engine. A logical set of Classification Set labels would be:

1. Fan
2. Compressor
3. Combustor
4. Turbine

Importing or Exporting Classification Sets

Classification sets may be Imported or exported using the Classification tools in the MDI Builder+.

Two options to import include:

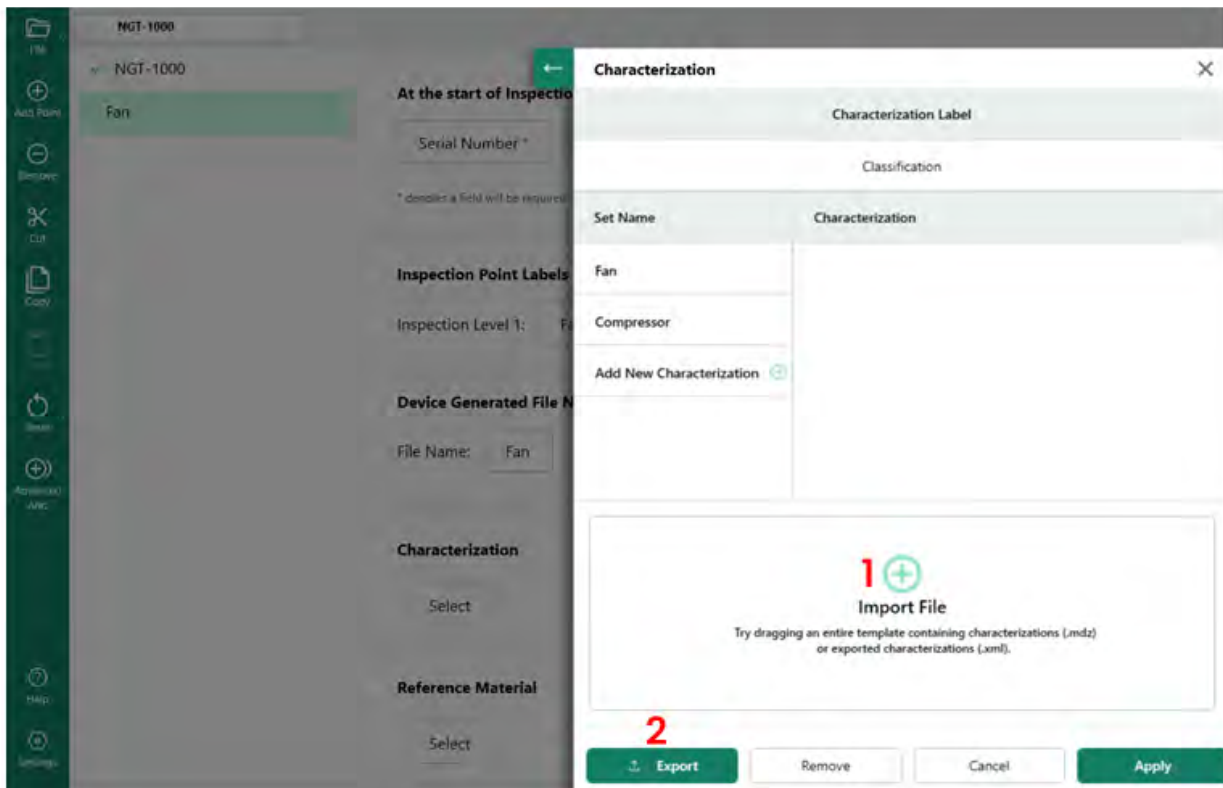
- Click the (+) icon in the "Import File box (1)
- Drag and Drop a Classification Set from files (it must be an .xml formatted file)

To Export a Classification Set:

- Click on the "Export " button and name and save the set – it will be a .xml file format (2)

NOTE: For importing and editing complete MDIs

- If an MDI is opened for the purposes of editing it users may find that it may already contain Classification sets which may be used or edited.



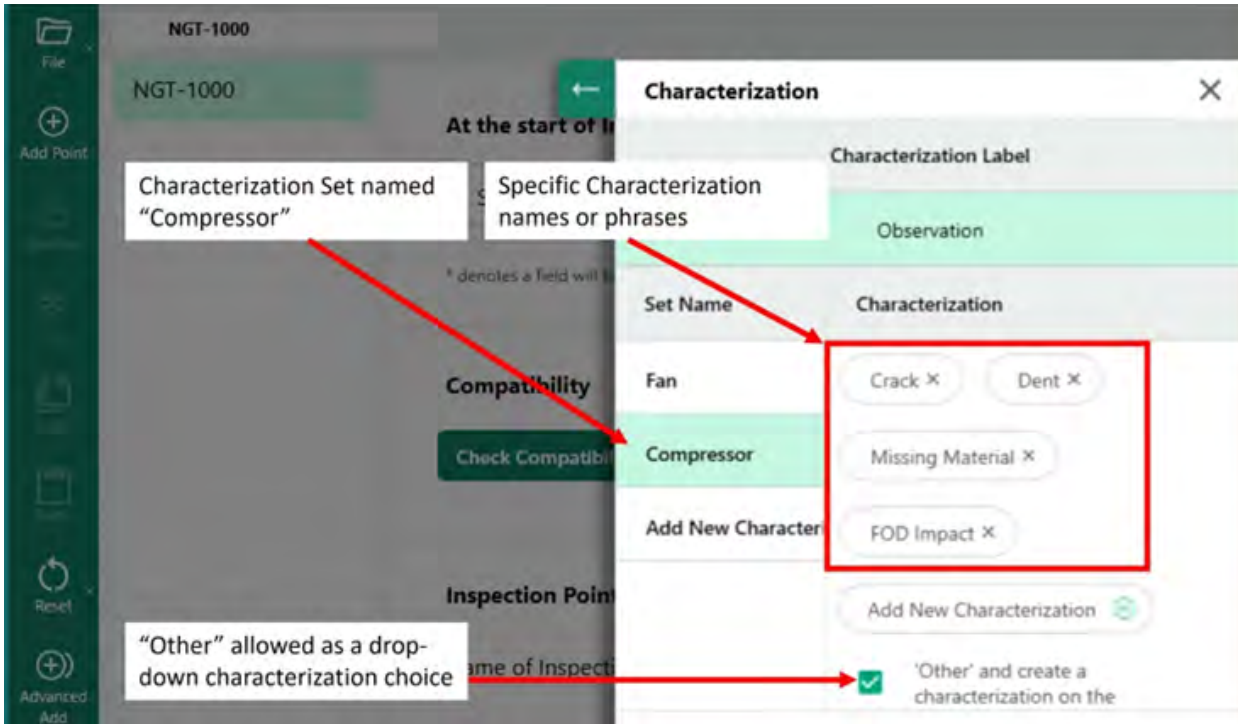
Importing & Exporting Classification Sets

By clicking "Add New Classification", the MDI Builder+ will present a screen where users can

- 1** - Name a Classification Set.
- 2** - Fill in names for the Classifications which will appear in the drop-down list on the VideoProbe.
- 3** - Click to allow 'other' as a drop-down Classification choice.

Classification Overview

- 1 - A Classification Set named "Compressor"
- 2 - A set of Classifications for the compressor: Crack, Dent, Missing Material, FOD Impact
- 3 - The box was checked to allow "Other" as a Classification value

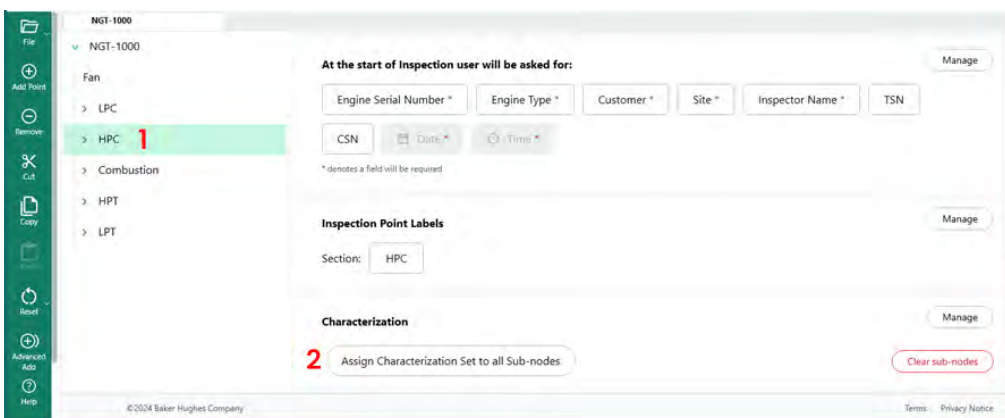


Classification Set called Compressor and Specific Classifications entered in that set

Assigning Classification Sets to Branches or Nodes of an MDI

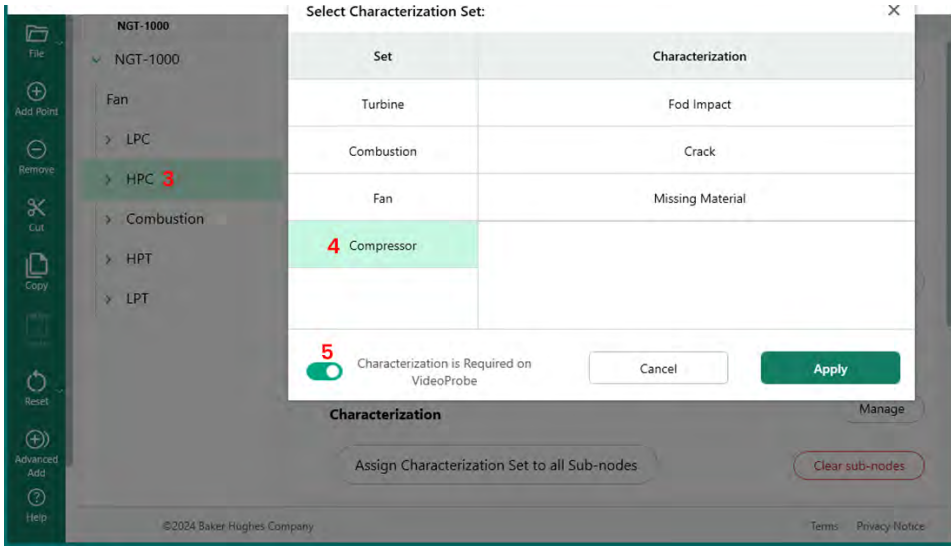
After creating a single, or group of Classifications, and included them in a given named "Set" of Classifications, users can proceed to assign that set, or other Classification "Sets" to a given Branch or Node in the MDI Tree. See example below for the process of assigning a Classification Set to a Branch or Node.

EXAMPLE: Assigning the Classification set named "Compressor" to the Node "HPC"



Select Node to Assign Classification

- 1** - Create and name "Classification Sets" which include the descriptors appropriate for branches in the MDI Tree and highlight the "HPC" Node in the MDI Tree.
- 2** - Click to Assign Classification Set to all Sub-nodes.
- 3** - A dialog box allowing users to assign Classification sets to the highlighted node "HPC" will appear on the screen.
- 4** - Under the heading "Select Classification Set", highlight the name of the Classification set to apply to the Node "HPC".. In this example, the Classification Set "Compressor" is selected.
- 5** - NOTE: If users would like to require that a Classification be entered before an image on the VideoProbe is allowed to be saved, then click the "Classification is Required on VideoProbe" slider button.



Assigning Classification Set to a Node

Clearing Classifications from Sub-Nodes

When assigning a Classification Set to a Node,– those Classifications are assigned to all sub-nodes. To clear sub-node Classifications below a node in the MDI Tree, highlight that node and click "Clear sub-nodes".



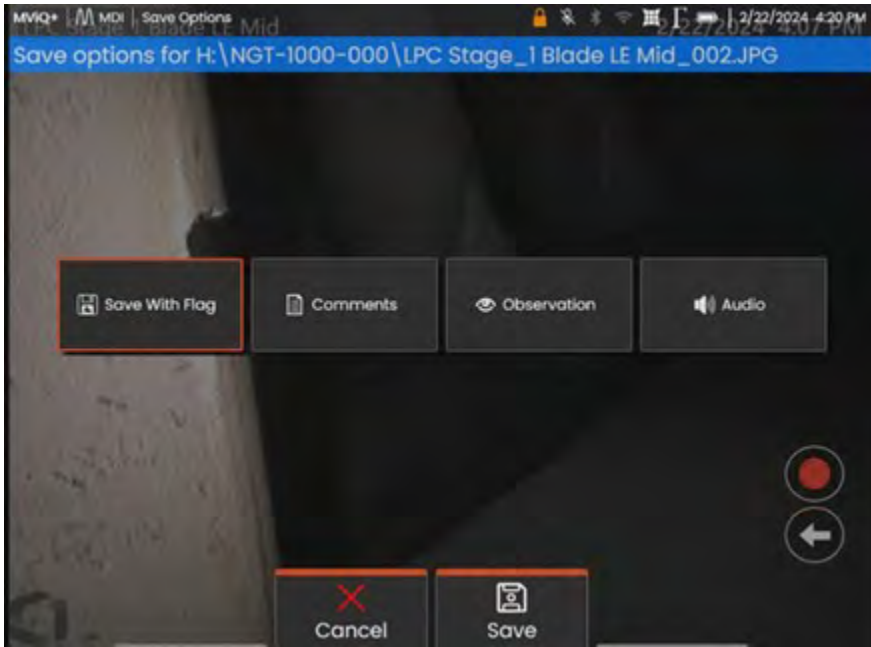
Clearing sub-nodes

Classification "Other" Actions on VideoProbe

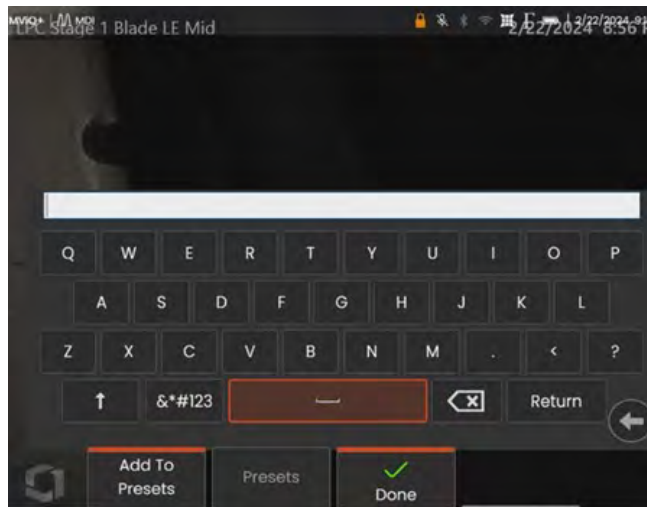
If the Classification "other" is allowed in a Classification set, the videoprobe will activate the "Comments" feature on the Videoprobe which allows free-form text entry. If "Other" is chosen, the on-screen keyboard shown below which allows free-form text entry which will show up in the MDI report in the Comments box next to the captured image.

NOTE: Prior to saving an image, a tiles for the Save Options of "Comments" and Observation are shown. . When the "Comments" tile is activated an on-screen keyboard will be shown on-screen,

and free-form text entry may be added. Any text added as a “Comment” will show up in the MDI report in the Comments box next to the captured image.



VideoProbe Comments & Observation Options before saving an image



VideoProbe on-screen keyboard

Reference Materials

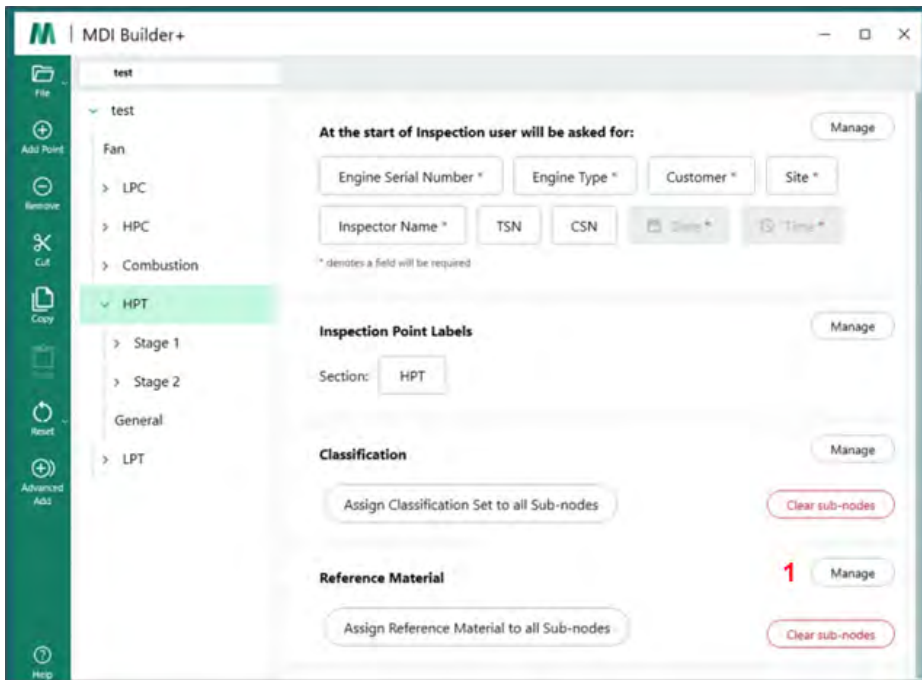
Reference material may be built into an MDI such that the material may be viewed on the VideoProbe during the operation of an MDI. Reference materials may be viewed:

- At any node along the MDI tree including the end Leaf Node.
- Reference material may be viewed as a full-screen image, or in Split-Screen viewing mode on a VideoProbe.

Adding Reference Images to the MDI’s Available Image Set

PDFs and JPEG images may be added into a central file location in an MDI such that they may be individually assigned to branch level or end nodes. You must always first add the reference material into this central file using the following steps:

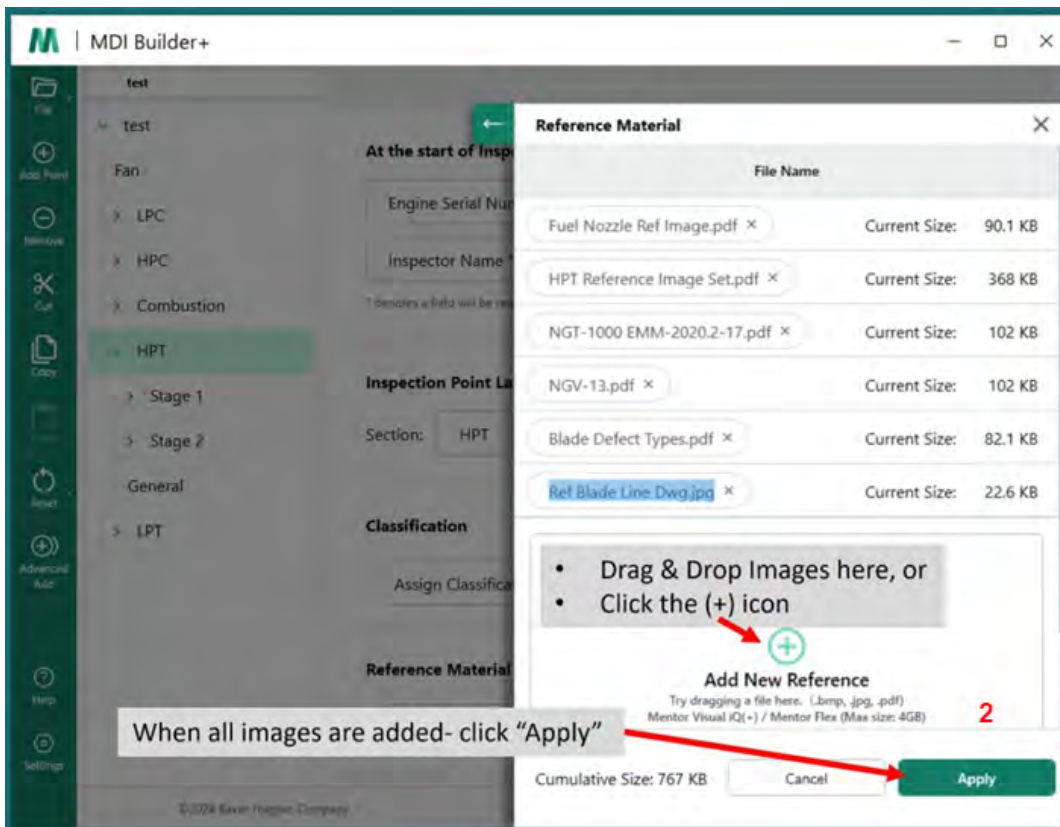
- 1.0 Select the “Manage” button in the Reference Material section of the MDI Builder



Adding Reference Material into the MDI Builder

2 - Assign the Reference Material to Node(s)

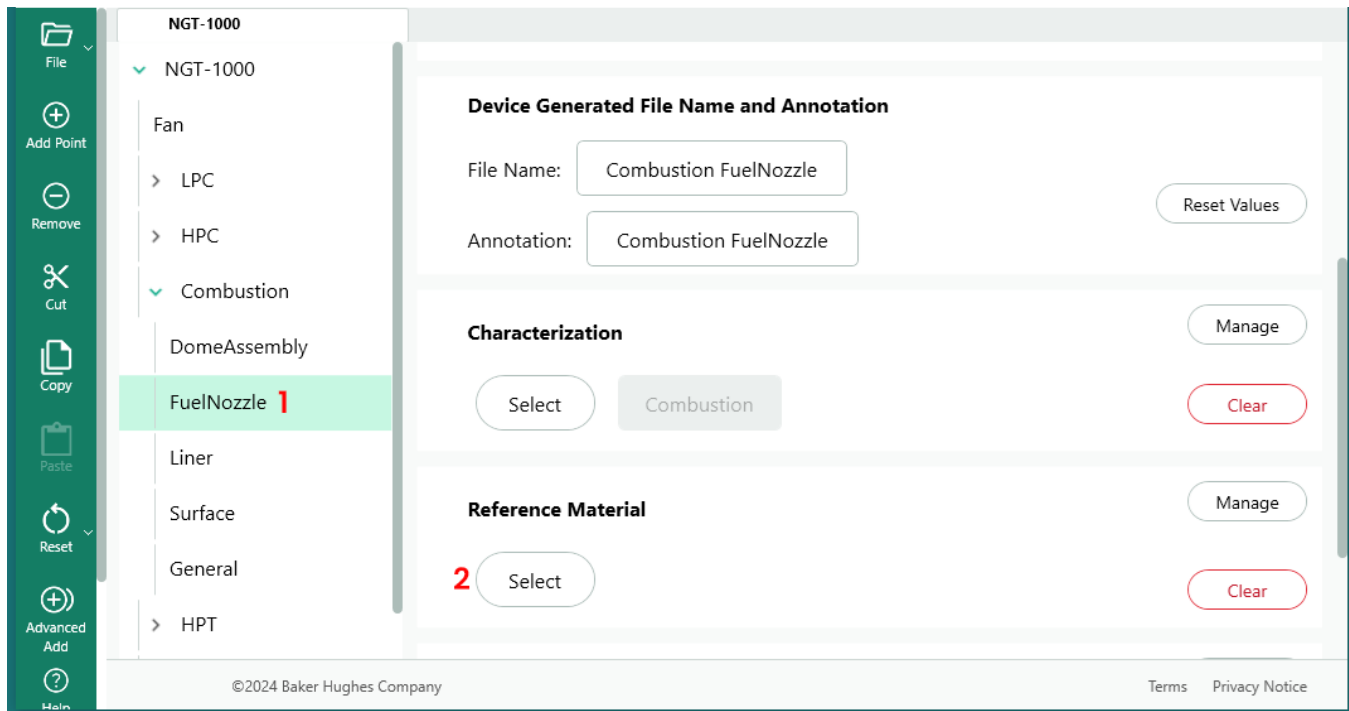
When “manage ” is clicked, a new dialog box appears which allows you to either click the (+) icon to search you PC for Reference Material to add, or you may “Drag & Drop” images into the target drag & drop zone. Click the “Apply” button when complete.



Filled-in sample Reference Material Add Screen

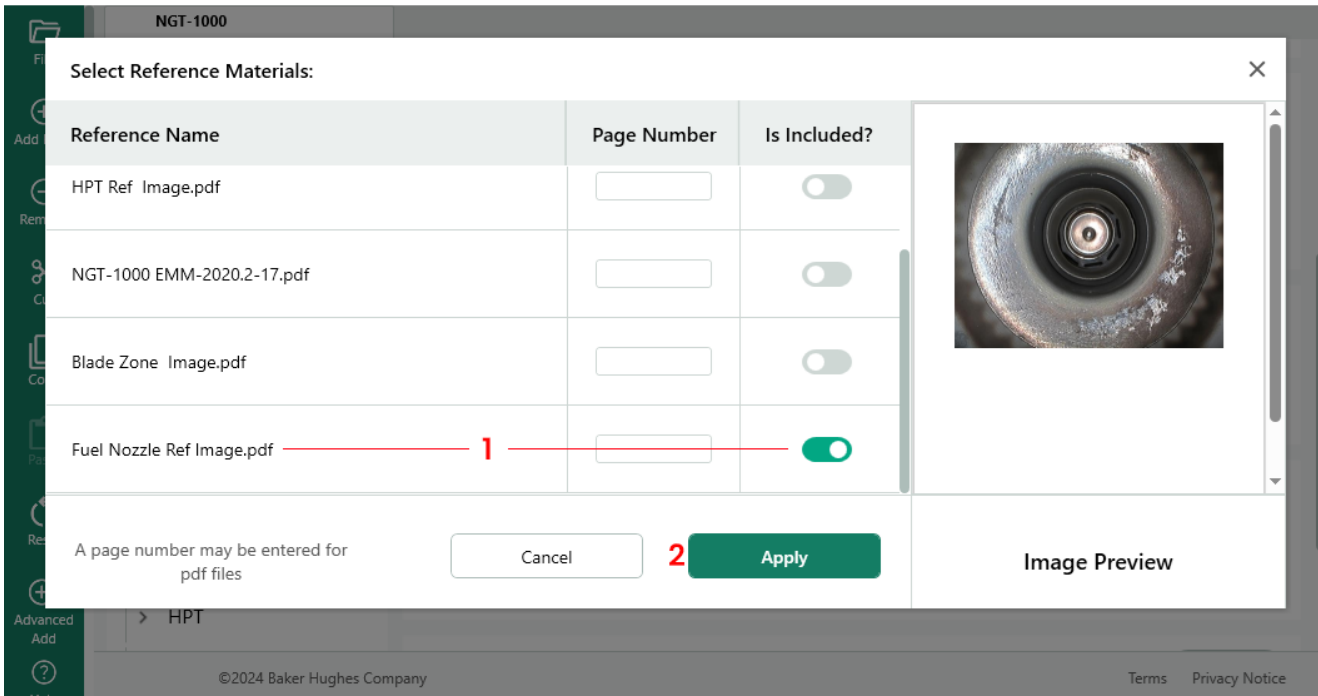
Assigning Reference Material to Nodes

Once you have added the Reference Material into the MDI Builder's central file location, you may then assign that material to branches or end nodes by clicking on the "Select" button in the Reference Material section.



Beginning Reference Material Assignment Process

- 1** - Select the Node that the reference material will be added
- 2** - Choose Select to assign the reference material



Selecting Reference documents

1 - Select an image and click the button to include

2 - Choose Apply when finished selecting reference materials

Automatically Enabling Analytics Based on Inspection Tree Location

For MDIs built to operate on the MVIQ+ (include MVIQ with OS 3.75 or later), the MDI may be built to cause the automatic enablement of a selected VideoProbe Analytic features. The MVIQ platform currently supports two types of Analytics:

ADR - Assisted Defect Recognition:

- Currently only available on MVIQ+ products.
- Choices are Gas Power Assist, Aiir Edge Hot, and Aiir Edge Cold
- Live-ADR and Still-ADR may be selected

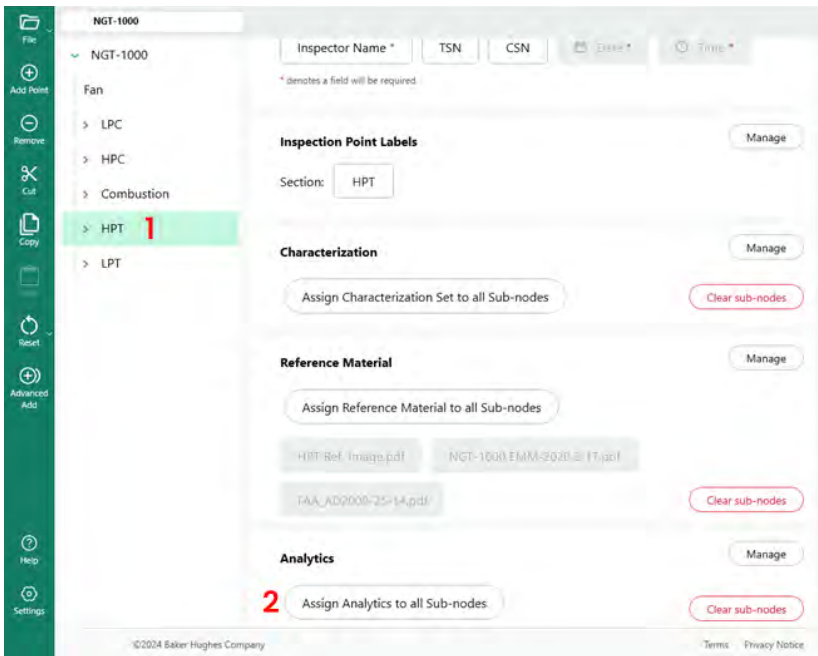
Non-ADR:

- Blade Counter 1.0 - currently only supported on Flame MVIQ products
- Blade Counter 2.0 - currently only supported on MVIQ+

The available Analytic features appear in an Analytic sub-menu which allows users to map one or more Analytics to a Branch or Node of an MDI Tree.

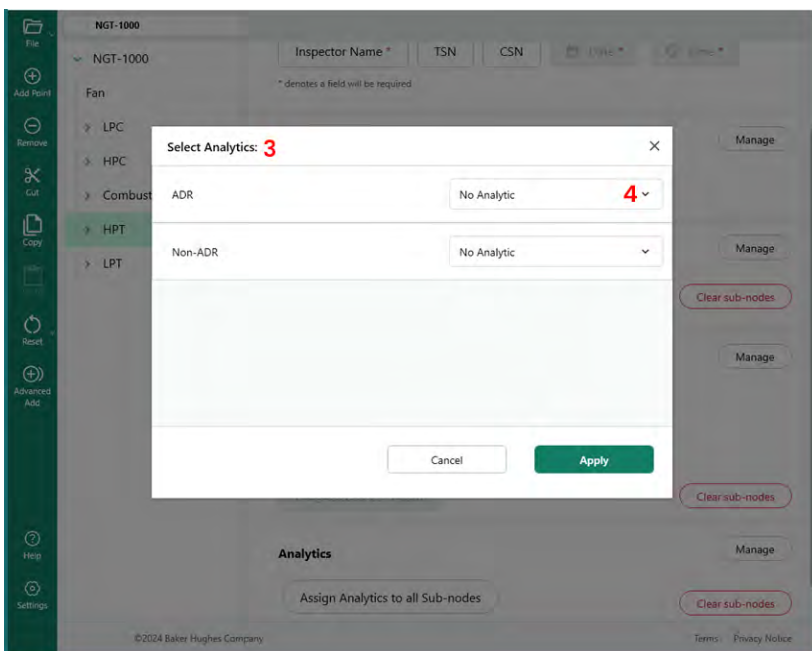
EXAMPLE: Mapping Analytics onto Branches of demo MDI NGT-1000

NOTE: The intended VideoProbe which this MDI will operate on is an MVIQ+ which supports Blade Counter 2.0 and the ADR named Gas Power Assist. This example shows the sequence of actions necessary to enable "Blade Counter 2.0" and both the "Live" and "Still" capability of the ADR "gas power assist" onto all HPT sub-branches of the NGT-1000 MDI tree



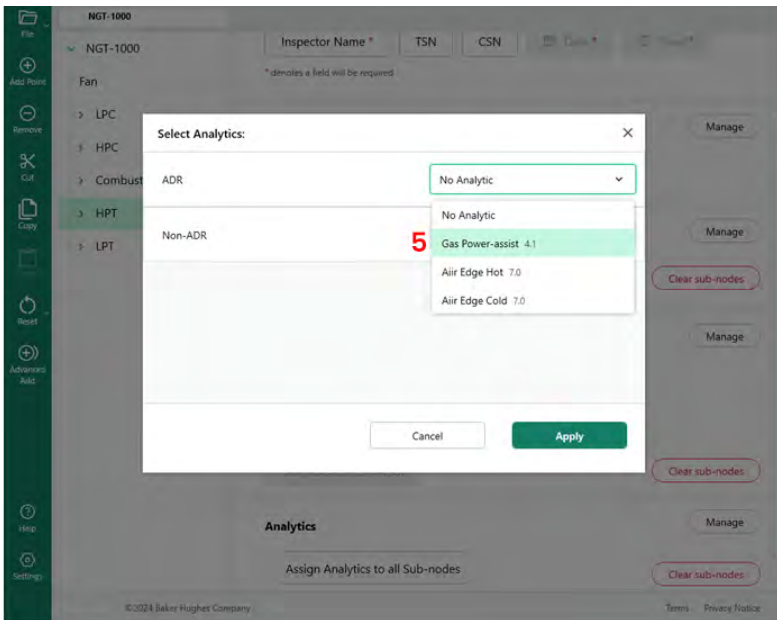
MDI Builder+ Primary Build Screen

- 1** - Highlight the Branch or Node where the Analytic(s) should be applied.
- 2** - Click on “Assign Analytics to all sub-nodes” button.



Main Analytics Select Table

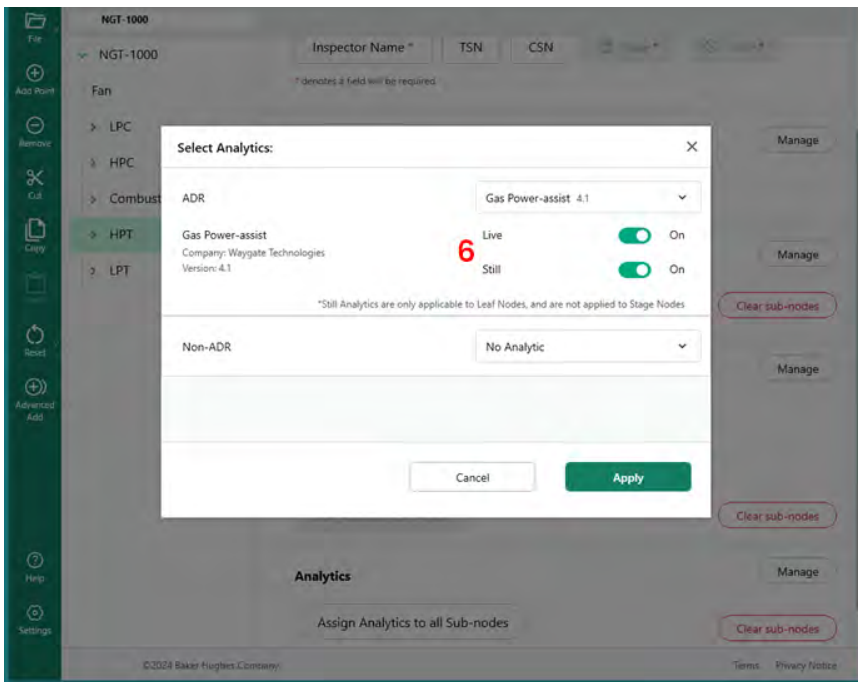
- 3** - An Analytics Menu screen appears. By default, both the ADR and non-ADR Analytics are set to “No Analytic”.
- 4** - Click on the carrot inside the ADR “No Analytic” button. Clicking this button reveals the available ADR Analytics.
- 5** - Once the drop-down is clicked, locate the option for “Gas Power Assist 4.1” and click on that text script.



Analytic ADR Options

6 - Choose to turn on either or both Live and Still ADR functions.

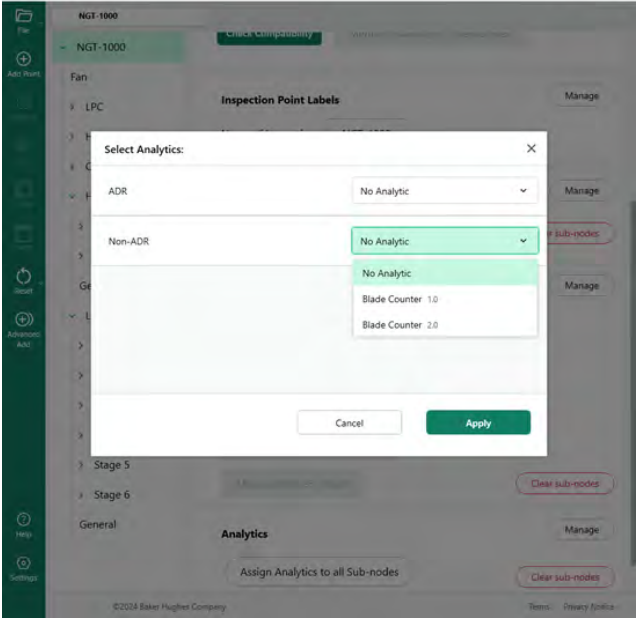
NOTE: Still Analytics are only applicable to Leaf Nodes and are not applied to Stage Nodes. Once the choice has been made, click the Apply button.



Live or Still ADR Selection

NON-ADR Analytic Selection

The process to enable the non-ADR Blade Counter features follows a similar methodology as was described for enabling the ADR Analytic.

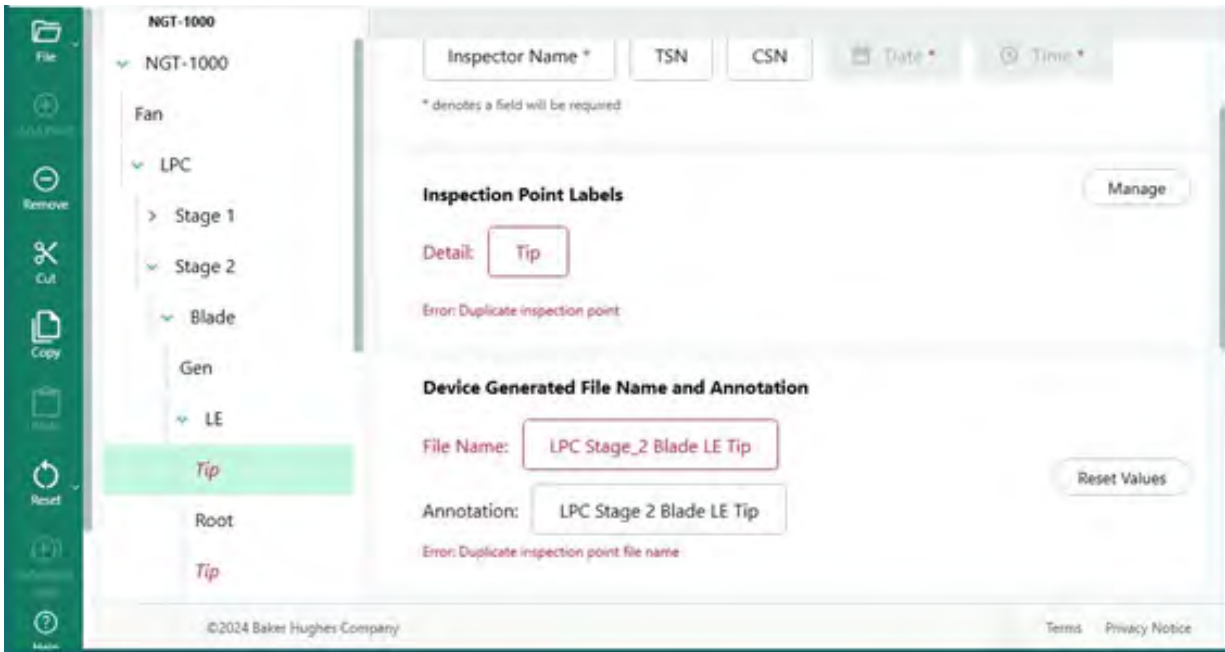


Non-Analytic Blade-Counter features

5. Troubleshooting

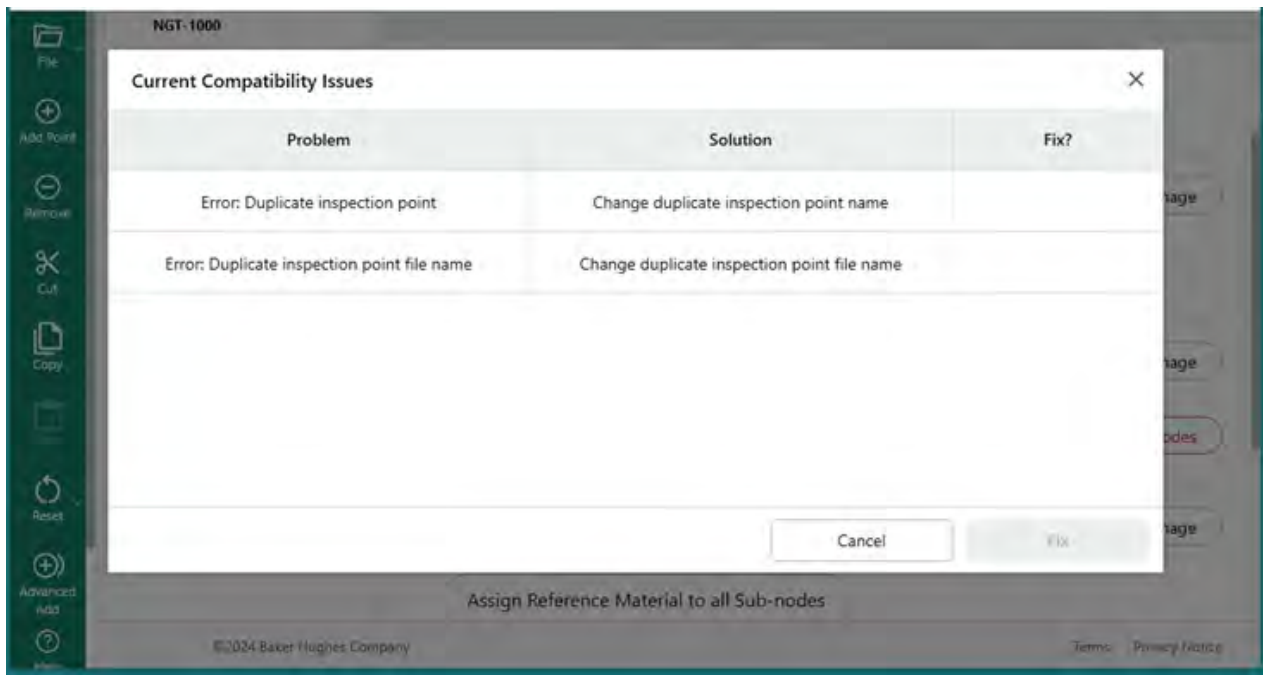
Error Indications

Duplicate Branch Names: When the MDI Builder detects an error condition, if you currently have highlighted the branch with the error – the branch names associated with the error will be highlighted, and the error condition will be described as illustrated in the image below (the fault condition is a duplicate branch name).



Duplicate branch name error

Error Saving an MDI File: When building an MDI, users may inadvertently create a duplicate File name or Annotation, which will cause a fault condition. When saving an MDI with a fault condition, an error message will be displayed. For some errors, the MDI Builder may activate the “Fix” button on the error screen (which may clear the error), or users may have to manually search for the error source by opening branches of the tree and inspecting the Branch, Annotation, and File names.



Error while saving an MDI file

6. Technical Specifications

Operating System	Windows 10, 64-bit
Recommended Resolution	1024 x 768
Languages	English, Chinese (traditional and simplified), Czech, Dutch, Finnish, French, German, Hungarian, Italian, Japanese, Korean, Polish, Portuguese(BR), Russian, Spanish, Swedish, and Turkish

7. Service

For all service inquiries, please contact your local service technician at:

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RemoteService@BakerHughes.com

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