

Geomet

Digital I/O User Guide

Version 6.66
June 2006

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Universal CMM Software Digital I/O User Guide

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Geomet Digital I/O Operations

Introduction

Geomet provides functionality to interface with many external machining centers, robots and conveyor systems for in-line automated inspections. To communicate with these outside services, Geomet relies on a digital I/O interface, built by Helmel Engineering.

The standard Digital I/O interface product provides 24 programmable I/O ports connected to Geomet through a standard USB port. The Digital I/O product is based on the Measurement Computer, USB-1024LS product. From the 1024LS Helmel Engineering provides an Opto22 I/O Module Rack populated with Opto22 Single Channel I/O Modules.

All I/O components are supplied in a stand alone cabinet, or integrated into the CMM electronics / computer cabinet depending on design.



Measurement Computing PMD-1024LS Digital I/O

Geomet Digital I/O Operations

Summary of Operation

Geomet monitors the I/O ports which are connected to the PLC controller. Depending on system requirements, Geomet can work with robot loading systems, CNC machining centers to provide tool offset values and conveyor systems for part transport.

In the standard Digital I/O package, there are 10 Digital I/O ports in use. The table below explains the operation of these ports.

| | Description | Control |
|----------|--|---------|
| 0 | CMM Ready (In Stage area) | CMM |
| 1 | Start Inspection Program | PLC |
| 2 | Seating sensor in place | PLC |
| 3 | Inspection program completed | CMM |
| 4 | Fault found in inspection results | CMM |
| 5 | Inspection Program Index Number – bit 0 | PLC |
| 6 | Inspection Program Index Number – bit 1 | PLC |
| 7 | Inspection Program Index Number – bit 2 | PLC |
| 8 | Inspection Program Index Number – bit 3 | PLC |
| 9 | Outside Error (Door Lifted, Air Pressure, Etc) | PLC |

NOTE: The full Digital I/O package has support for up to 24 programmable I/O ports for handling other operations.

The programmable I/O package can be customized to fit the immediate needs of a customer. For example, additional I/O lines can be activated to control operations with a loading robot, or to flash a light when an Out-of-Tolerance condition exists.

Geomet Digital I/O Operations

Operational Sequence

During standard operations where an operator manually loads and unloads the CMM, the following sequence of events occurs:

| | Description | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Notes |
|------|---|---|---|---|---|---|---|---|---|---|---|------------------------------------|
| 1.0 | CMM in "Stage Area" location with the Door Closed | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 1.1 | CMM in "Stage Area" location with the Door Open | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | |
| 2.0 | Operator loads parts and closes clamps | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | |
| 3.0 | PLC Test Seating Sensors OK | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 4.0 | CMM Begins Inspection Sequence | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 5.0 | CMM Reads inspection program index | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Read 4 I/O ports for program ID |
| 6.0 | CMM loads inspection program and commences operations. | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 7.0 | CMM Aborts on outside error | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Outside PCL error |
| 8.0 | CMM completes inspection with no inspection limit faults | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | Good Inspection |
| 8.1 | CMM completes inspection with OOT inspection results | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | Inspection result out-of-tolerance |
| 9.0 | CMM returns to stage location with no inspection limit faults | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 9.1 | CMM returns to stage location with OOT inspection results | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | |
| 10.0 | Operator unloads parts | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | |

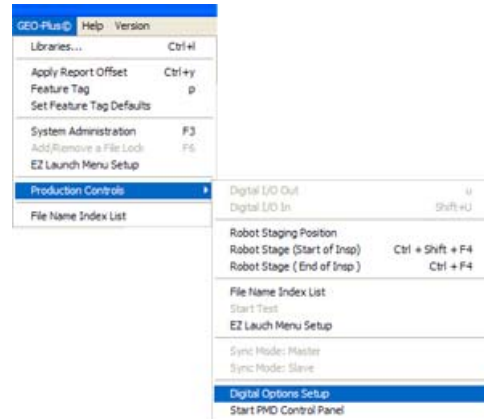
NOTE: Digital I/O line 0, 3 and 4 are controlled by Geomet.

Geomet Digital I/O Operations

Digital I/O Setup

Geomet provides a digital I/O setup tool to configure the behaviors of the automation. To launch the setup tool, choose from the drop-down menus:

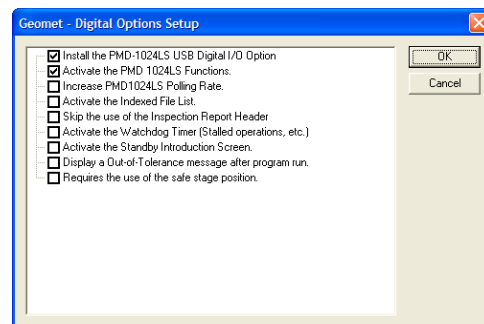
[GEO-Plus©→Production Controls→Digital Options Setup]



From this setup tool you can choose behaviors and message controls.

Install the PMD-1024LS USB Digital I/O Option:

Geomet must be notified to start using the PMD-1024LS I/O service. When you check this option, it starts a polling service that first connects to the device, if successful, begins monitoring. It is not necessary to activate the service every time Geomet is started, it remains active until the check is removed. By default, this option will automatically place a check next to Activate the PMB 1024LS Functions.



Activate the PMD 1024LS Functions:

This option activates the full polling service which monitors the PMD-1024LS. It will not function if the service has not been loaded, *see above*.

Increase PMD-1024LS Polling Rate:

By placing a check here, you allow Geomet to provide more resources to the polling service. This is not required under most conditions.

Activate the Indexed File List:

This activates the monitoring of I/O line 5-8. These lines provide a numeric value between 0-15 which is then mapped to indexed inspection files. These files are assigned an index using the File Name Index List function described later in this guide.

When this function is not checked, the CMM expects to cycle the same part inspection program.

Skip the use of the Inspection Report Header:

Under normal conditions, the Inspection Report Header would appear at the beginning of the inspection run. This allows the operator to update required information. If you place a check here, then the inspection commences immediately.

Activate the Watchdog Timer (Stalled Operations, etc.):

Placing a check here activates the Watchdog Timer and activates the internal safety systems that monitor the I/O services. The timer is reset with every communication between the CMM to the PLC and from the PLC to the CMM. If no communications occur for a 30 second time span, the Geomet pauses and informs the operator of a communication error.

Activate the Standby Introduction Screen:

When Geomet is waiting in the staging area, and no error condition exists, then it displays an Introduction screen. The text inside the screen is read from the file, DefHeader.rtf and can be customized.

Display Out-of-Tolerance message after the program run:

When checked, Geomet will display a special message used to inform the operator that one or more features have an out-of-tolerance condition. The text for this message is contained in the file OotMsg.rtf.

Requires the use of the safe stage position:

When this is checked, each inspection starts and stops from the same CMM location. The inspection complete flag is not set until the CMM repositions itself to the safe stage location. This is required when working with robot loading systems to ensure the CMM will not be damaged.

Geomet Digital I/O Operations

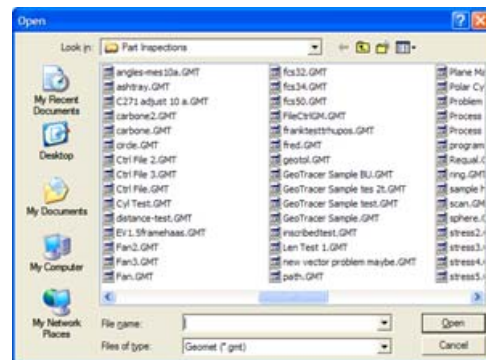
File Name Index List

When the File Name Index option is activated, Geomet will receive a pattern through digital I/O line 5-8. This pattern will translate to the integer value ranging from 0 to 15.

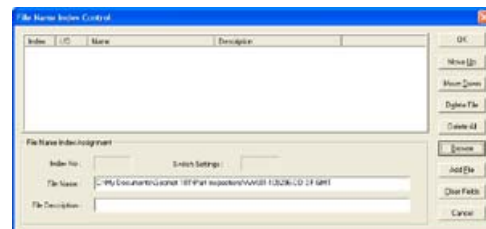
The File Name Index List is Geomet's tool to match the value provided by the PLC to the inspection program to call up. To launch the File Name Index Tool, use the drop down menu:

[GEO_Plus©→Production Controls→File Name Index List]

To assign a new inspection file to the list, locate and press the **<Browse>** button. A standard Windows open dialog appears. Navigate to the directory where your inspection file exists. Highlight that file and press **<Open>**.



The file name will be transferred to the File Name: data field. Add an optional description to describe this file and press the **<Add File>** button.



The File Name Index Tool will assign the available index number to this new file and update the database.

In our example we added the new file and it was provided an index number of 0.



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<Move Up>, <Move Down>

These commands are active when one file has been selected in the list. Press <Move Up> and the placement of the file moves up one position in the listing and will renumber the entire list.

<Delete File>

Deletes the selected file in the list and will renumber the list automatically.

<Delete All>

Deletes all files in the list.

Setting the Safe Stage Position

As a safe practice, we recommend that the CMM utilize the Safe Stage Position tool to ensure the CMM always starts and stops operations in the same location. This is very important when working with a robot loading system.

The Safe Stage Position consists of three operational functions:

Set Robot Staging Position

This function sets and saves an XYZ position that becomes the Safe Stage Position. To set this position, choose from the drop down menus:

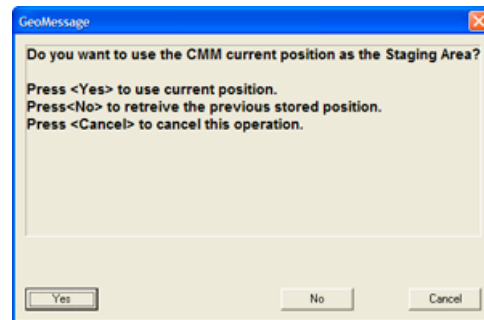
[GEO-Plus©→Production Controls→Robot Staging Position]

A message appears from which you choose.

Yes: While this message is up, position the CMM in the location you would like to establish as the Safe Stage Position. When you are there, press <Yes> and that position will be saved.

No: Pressing this choice, Geomet will retrieve any previous saved position from the registry and set that value as the Safe Stage Position.

Cancel: Cancels the operation.



Robot Stage (Start of Insp)

This should be your first step of any inspection program that will utilize the Safe Staging Position tool. This command can be found at:

[GEO-Plus©→Production Controls→Robot Stage (Start of Insp)]

This command will prompt you to move to the Safe Stage Position and when in position, it will create a new program step in your inspection program.

All inspection programs using this command will not run unless it is starting in the Safe Stage Position.

Robot Stage (End of Insp)

This should be your last step of any inspection program that will utilize the Safe Staging Position tool. This command can be found at:

[GEO-Plus©→Production Controls→Robot Stage (End of Insp)]

This command will prompt you to move to the Safe Stage Position and when in position, it will create a new program step in your inspection program. During inspections, it will drive the CMM into the Safe Stage Position using a +Z move followed by an XY move until it is over the Safe Stage Position. Then it will move -Z until it is at position.