MPG Handwheel Pendant

HARDWARE MANUAL

Revision 2.00

GLOBAL TECHNICAL SUPPORT

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EU Declaration of Conformity

Manufacturer	Aerotech, Inc.
Address	101 Zeta Drive Pittsburgh, PA 15238-2811 USA
Product	MPG
Model/Types	All

This is to certify that the aforementioned product is in accordance with the applicable requirements of the following Directive(s):

2014/35/EU	Low Voltage Directive

and has been designed to be in conformity with the applicable requirements of the following Standard(s) when installed and used in accordance with the manufacturer's supplied installation instructions.

EN 61010-1:2010	Safety Requirements for Electrical Equipment
EN60947-5-5	Control circuit devices and switching elements

Authorized Representative:	Simon Smith, European Director Aerotech Ltd
Address:	The Old Brick Kiln, Ramsdell, Tadley Hampshire RG26 5PR UK

Name	/ Alex Weibel
Position	Engineer Verifying Compliance
Location	Pittsburgh, PA
Date	7/23/2020

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Safety Procedures and Warnings

IMPORTANT: This manual tells you how to carefully and correctly use and operate the MPG.

- Read all parts of this manual before you install or operate the MPG or before you do maintenance to your system.
- To prevent injury to you and damage to the equipment, obey the precautions in this manual.
- All specifications and illustrations are for reference only and were complete and accurate as of the release of this manual. To find the newest information about this product, refer to www.aerotech.com.

If you do not understand the information in this manual, contact AerotechGlobal Technical Support

WARNING: This product has been designed for light industrial manufacturing or laboratory environments. The protection provided by the equipment could be impaired if the product is used in a manner not specified by the manufacturer.

WARNING: To prevent damage to the equipment and decrease the risk of electrical shock, injury, and death, you must obey the precautions that follow.

1. Make sure that all system cables are correctly attached and positioned.
2. Use this product only in environments and operating conditions that are approved in this manual.
3. Only operators who have received training can operate this equipment. All servicing and maintenance must be done only by approved personnel.

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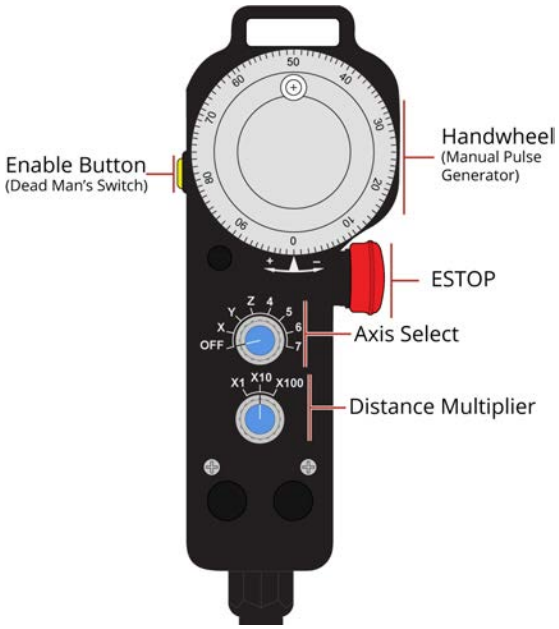
Chapter 1: Introduction

The MPG (Manual Pulse Generator) input device for the A3200 and Ensemble provides the capability to manually fine-position up to six axes.

- Six axis selector switch (Axis Select)
- Three position distance multiplier switch, x1, x10 and x100 (Distance Multiplier)
- Emergency stop switch for user-provided ESTOP circuit (ESTOP)
- 400 count per revolution handwheel (100x4)
- User programmable from within AeroScript, AeroBasic, or a G-Code program
- Dead-man, thumb-operated safety switch (ENABLE)
- Programmatically activated (or manually from the software)



Refer to Section 2.1. for connection information and Aerotech cable part numbers.

Table 1-1: Electrical Specifications

Description	MPG
5 VDC	Provided by the Automation1, A3200, or Ensemble drive
24 VDC	500 mA, supplied by the user or by Aerotech accessory: BRAKE24-2 (refer to Section 2.1. for DC Power Connections)

IMPORTANT: The user must provide a 24 VDC (500 mA) power supply.

1.1. Mechanical Design

IMPORTANT: All specifications and illustrations are for reference only and were complete and accurate as of the release of this manual. To find the newest information about this product, refer to www.aerotech.com.

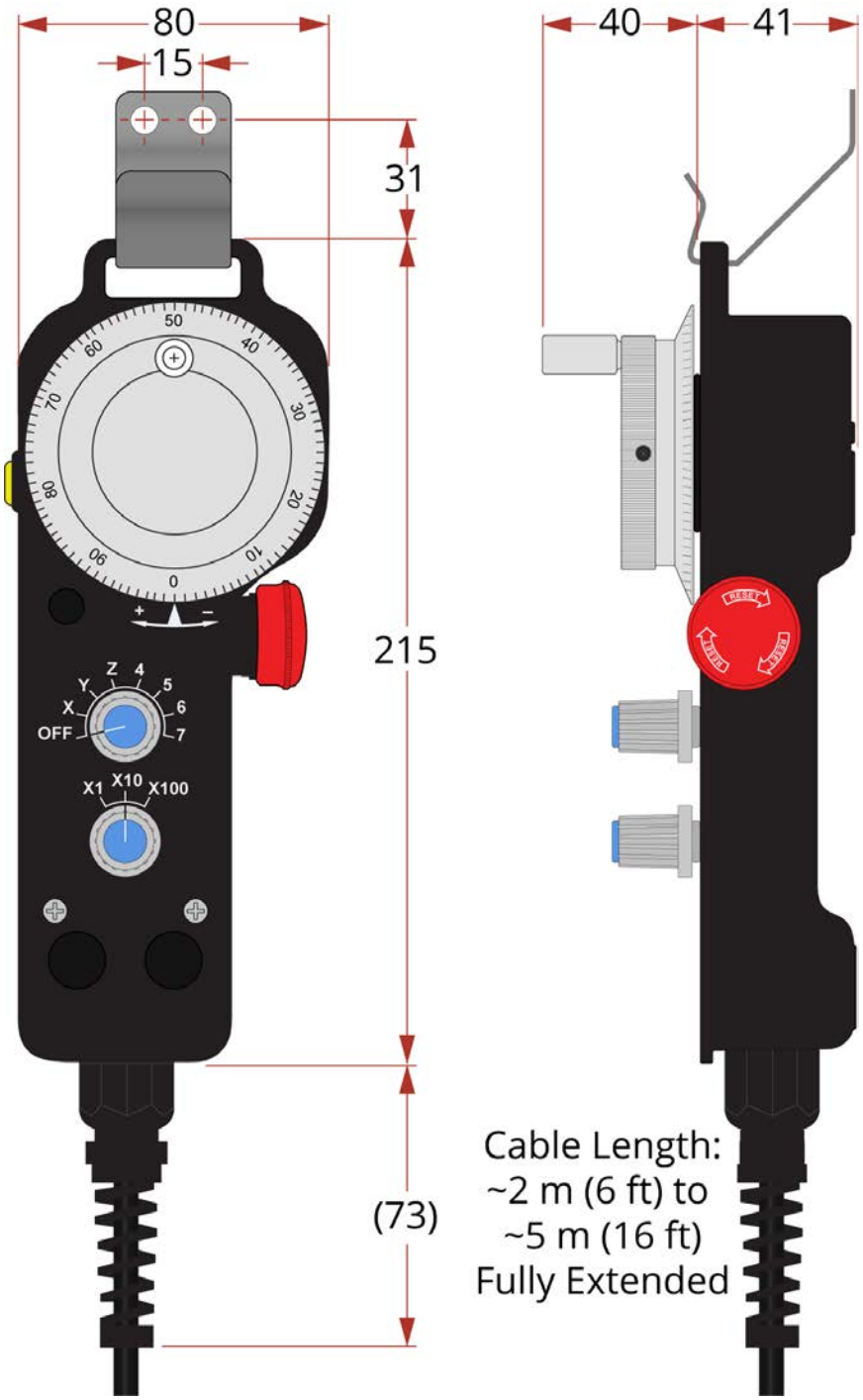


Figure 1-1: Dimensions

1.2. Environmental Specifications

The environmental specifications for the MPG are listed below.

Ambient Temperature	Operating: 5° to 40°C (41° to 104° F)
	Storage: -20° to 70°C (-4° to 158° F)
Humidity	Maximum relative humidity is 80% for temperatures up to 31°C. Decreasing linearly to 50% relative humidity at 40°C. Non condensing.
Altitude	Up to 2000 meters.
Pollution	Pollution degree 2 (normally only non-conductive pollution).
Use	Indoor use only.

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Chapter 2: Installation and Configuration

2.1. MPG Connections

Each MPG adapter cable is labeled to identify the receiving connector on the drive.

IMPORTANT: The 7th axis position of the axis select switch is not supported.

DC Power Connections

The MPG requires 24 VDC at 500 mA. Power can be supplied through the BRAKE24-2 option (Figure 2-1) or a user-provided power supply. Refer to the drive sub-sections for specific wire colors.

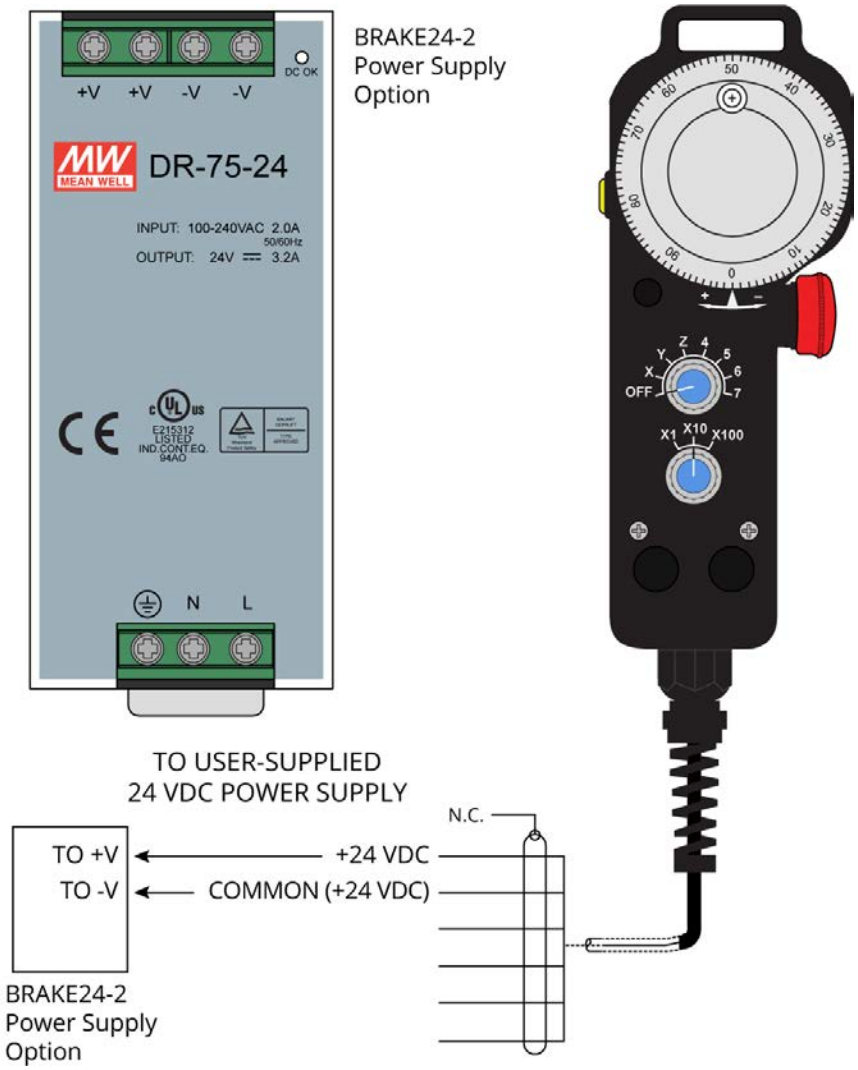

Figure 2-1: DC Power Connections (BRAKE24-2 Option)

Emergency Stop Connections

The emergency stop (ESTOP) switch on the MPG can be connected in series with the user-supplied ESTOP and Safe Torque Off (STO) circuit. There are two normally-closed switch contacts: ESTOP NC1 and ESTOP NC2. Refer to drive hardware manual for ESTOP switch connection information. Refer to the drive sub-sections for specific wire colors.

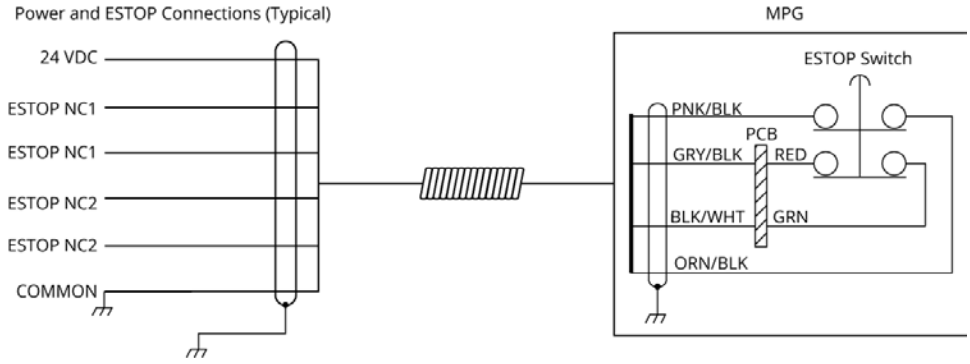

Figure 2-2: ESTOP Detail

Aerotech provides an ESTOP bypass connector that you can connect to the adapter cable. The bypass plug will close the user's ESTOP circuit and allow the machine to operate without the MPG.

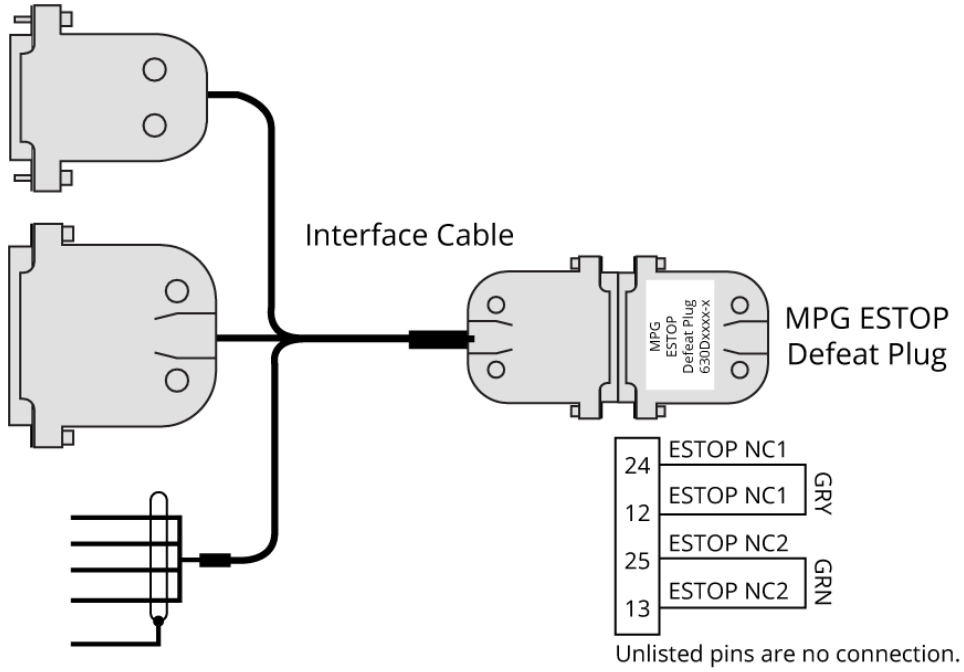

Figure 2-3: Bypass Plug

2.1.1. Connect the MPG to the Automation1 XR3

Connect to the Aux Encoder, DIN , and STO connectors and use digital input bits 0 through 8. The handwheel uses the second auxiliary encoder input channel.

Table 2-1: XR3 Adapter Cable Connector Pinout

Connector	Pin	Description
DIN	25	Key
	23	Input 0 (X Axis)
	22	Input 1 (Y Axis)
	21	Input 2 (Z Axis)
	20	Input 3 (4 Axis)
	18	Input 4 (5 Axis)
	17	Input 5 (6 Axis)
	16	Input 6 (x1 Multiplier Distance)
	15	Input 7 (x10 Multiplier Distance)
	12	Input 8 (x100 Multiplier Distance)
	19	Port 1 Input Common
	24	Port 0 Input Common
	13	Port 2 Input Common
AUX ENCODER	8	Cosine
	3	Cosine-N
	4	5 V
	1	Sine
	6	Sine-N
	2	Common
STO	6	STO 1-
	7	STO 2-
	1	STO 1+
	2	STO 2+
To: User-Supplied Power Supply (Flying Leads)	GRN/WHT	Ground
	WHT	ESTOP NC2
	GRN	ESTOP NC1
	PNK	24 VDC
	GRY	Common

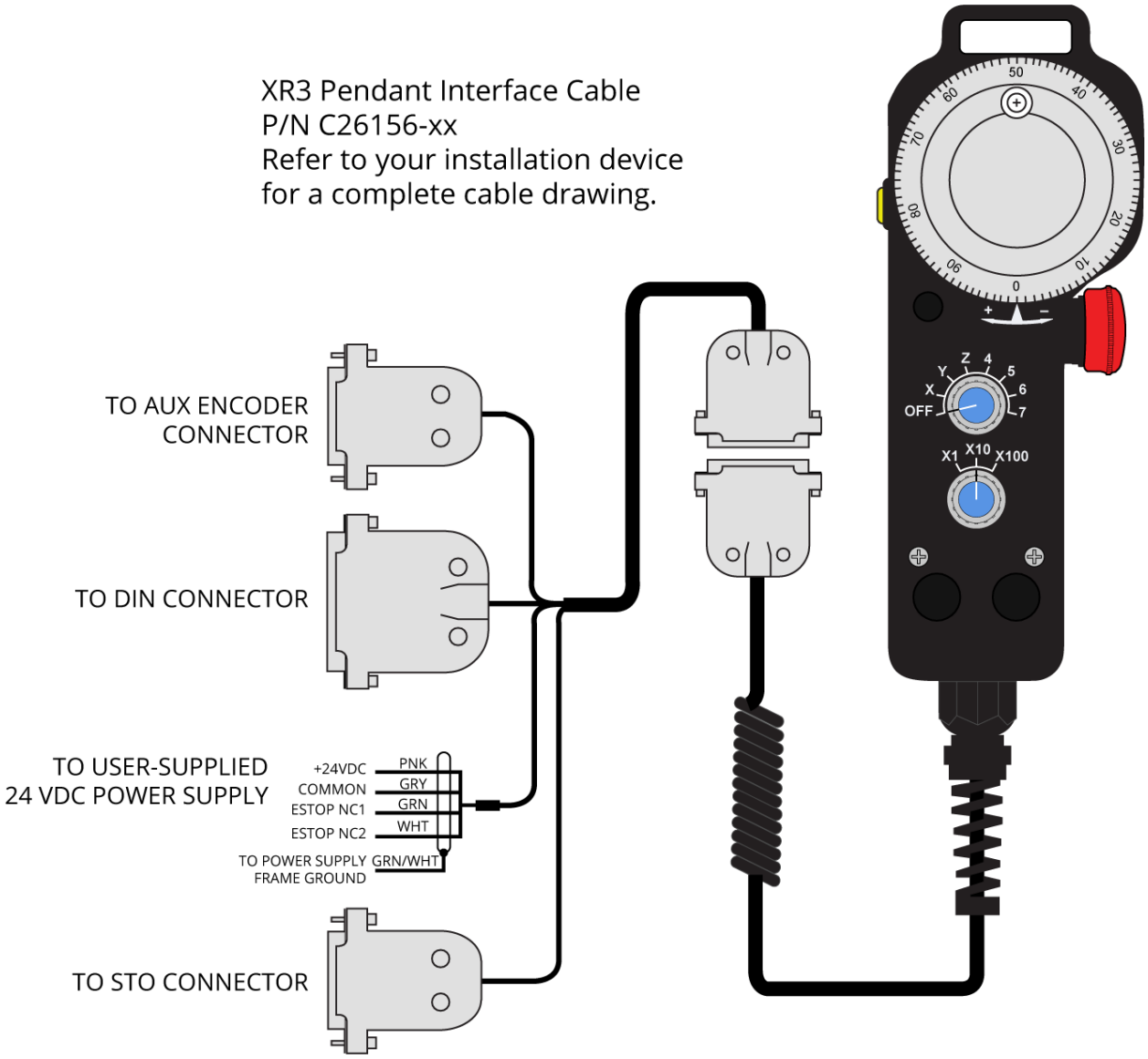

Figure 2-4: MPG to XR3 Cable Drawing

The adapter cable that is supplied by Aerotech has wires (ESTOP NC1 and ESTOP NC2) that can be connected to a user-supplied safety device. To bypass the user-supplied safety device, connect the ESTOP NC1- and ESTOP NC2-labeled wires directly to the 24 V. Refer to Figure 2-5.

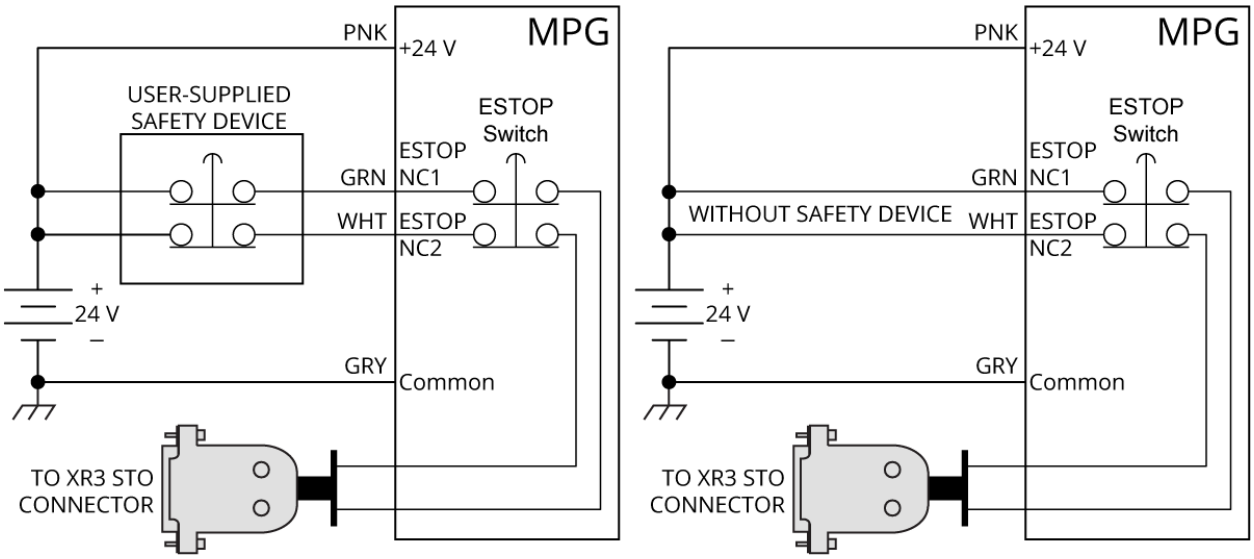

Figure 2-5: Automation1 XR3 Safety Device Connection Detail

2.1.2. Connect the MPG to the Automation1 XC4/XC4e

The XC4 or XC4e must be equipped with the -IO option. Connect to the AUX I/O and DIGITAL IN 1 connectors and use digital input bits 0 through 8. The handwheel uses the auxiliary encoder input channel.

Table 2-2: XC4/XC4e Adapter Cable Connector Pinout

Connector	Pin	Description
DIGITAL IN 1	1	Common
	2	Input 0 (X Axis)
	3	Input 1 (Y Axis)
	4	Input 2 (Z Axis)
	5	Input 3 (4 Axis)
	6	Input Common
	7	Input 4 (5 Axis)
	8	Input 5 (6 Axis)
	9	Input 6 (x1 Distance Multiplier)
	10	Input 7 (x10 Distance Multiplier)
AUX I/O	17	Input 8 (x100 Distance Multiplier)
	10	Cosine
	11	Cosine-N
	12	5 V
	1	Sine
	2	Sine-N
	21	Common
	24	Common
To: User-Supplied Power Supply (Flying Leads)	RED	24 VDC
	BLK	Common
	GRN	ESTOP NC1
	BRN	ESTOP NC1
	ORN	ESTOP NC2
	YEL	ESTOP NC2
	GRN/WHT	To Frame Ground

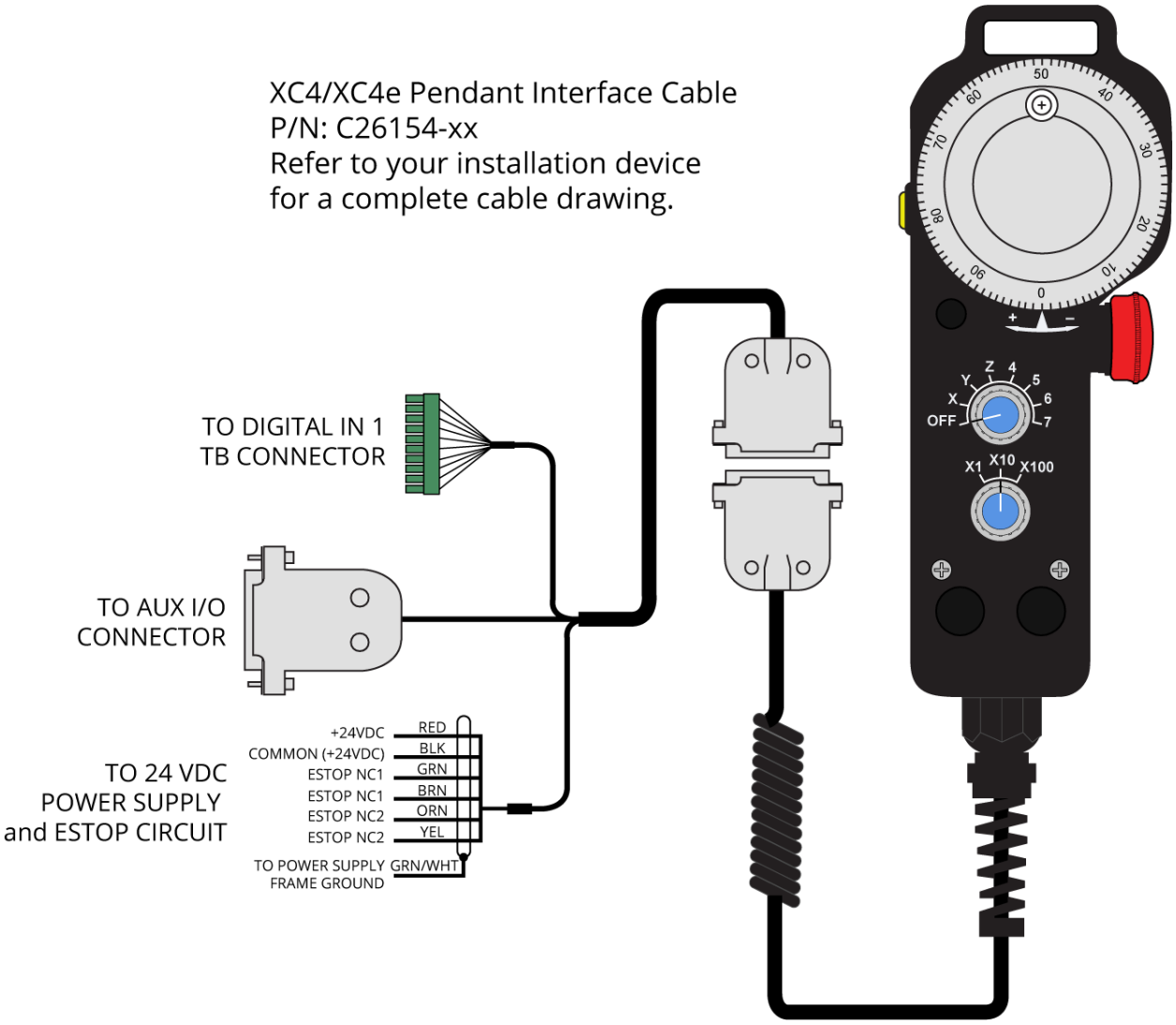

Figure 2-6: MPG to XC4/XC4e Cable Drawing

The adapter cable that is supplied by Aerotech has wires (ESTOP NC1 and ESTOP NC2) that can be connected to a user-supplied safety device. To bypass the user-supplied safety device, connect the ESTOP NC1 and ESTOP NC2 labeled wires directly to the 24 V. Refer to Figure 2-7.

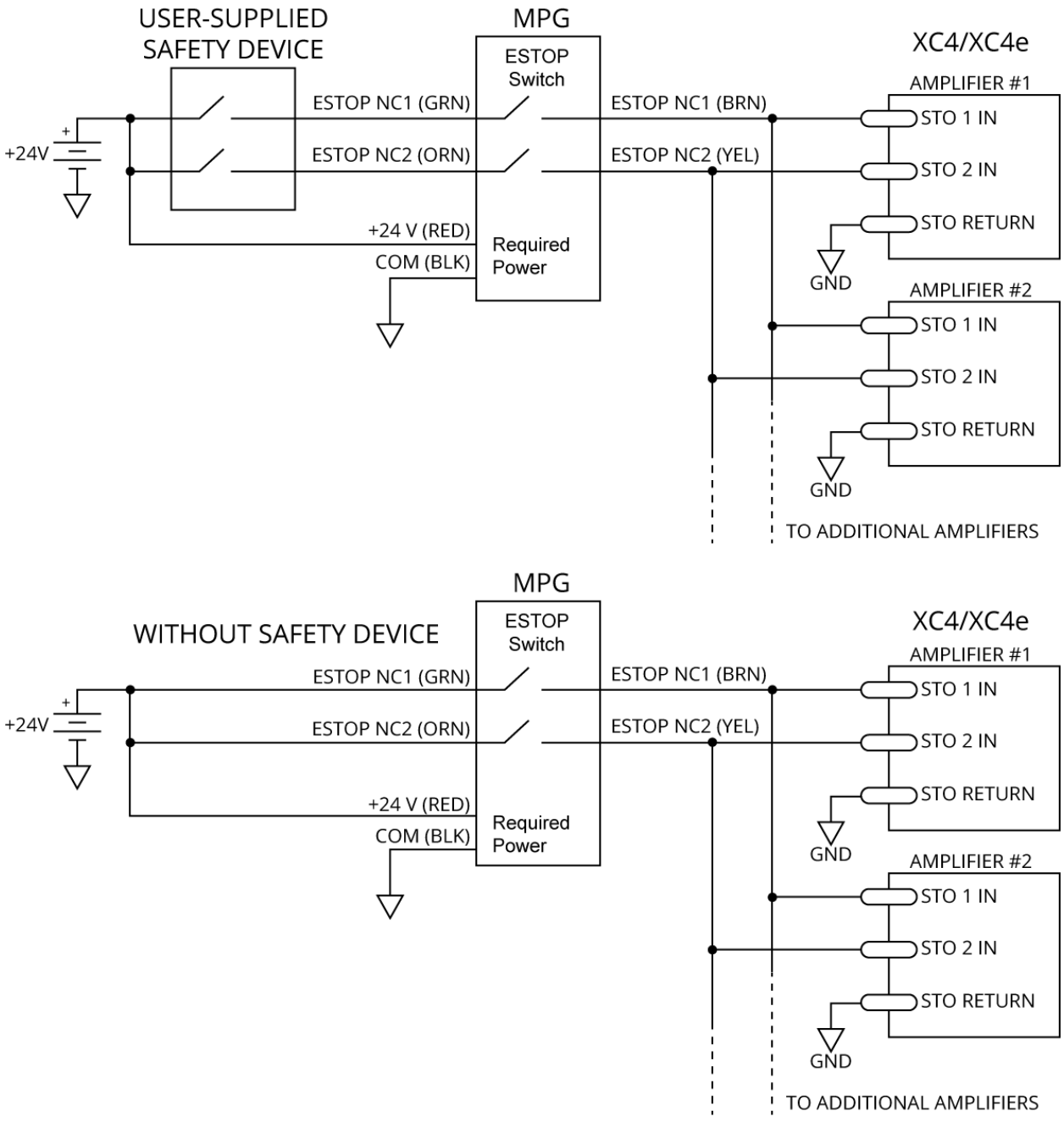

Figure 2-7: Automation1 XC4/XC4e Safety Device Connection Detail

2.1.3. Connect the MPG to the HPe/HLe

The HPe or HLe must be equipped with the -IO option. Connect to the J205 (Auxiliary I/O) and TB305 (I/O) connectors and use digital input bits 0 through 8. The handwheel uses the auxiliary encoder input channel.

Table 2-3: HPe/HLe Adapter Cable Connector Pinout

Connector	Pin	Description
TB305 [DIGITAL IN]	1	Common
	2	Input 0 (X Axis)
	3	Input 1 (Y Axis)
	4	Input 2 (Z Axis)
	5	Input 3 (4 Axis)
	6	Input 4 (5 Axis)
	7	Input 5 (6 Axis)
	8	**NDRIVE**: Input 6 (x1 Distance Multiplier)
		ENSEMBLE: Input 6 (x10 Distance Multiplier)
	9	**NDRIVE**: Input 7 (x10 Distance Multiplier)
		ENSEMBLE: Input 7 (x100 Distance Multiplier)
	10	Ground
J205 [AUX I/O]	17	**NDRIVE**: Input 8 (x100 Distance Multiplier)
		ENSEMBLE: N/C
	10	Cosine
	11	Cosine-N
	12	5 V
	1	Sine
	2	Sine-N
	21	Common
	24	Common
To: User-Supplied Power Supply (Flying Leads)	RED	24 VDC
	BLK	Common
	GRN	ESTOP NC1
	BRN	ESTOP NC1
	ORN	ESTOP NC2
	YEL	ESTOP NC2
	GRN/YEL	To Frame Ground

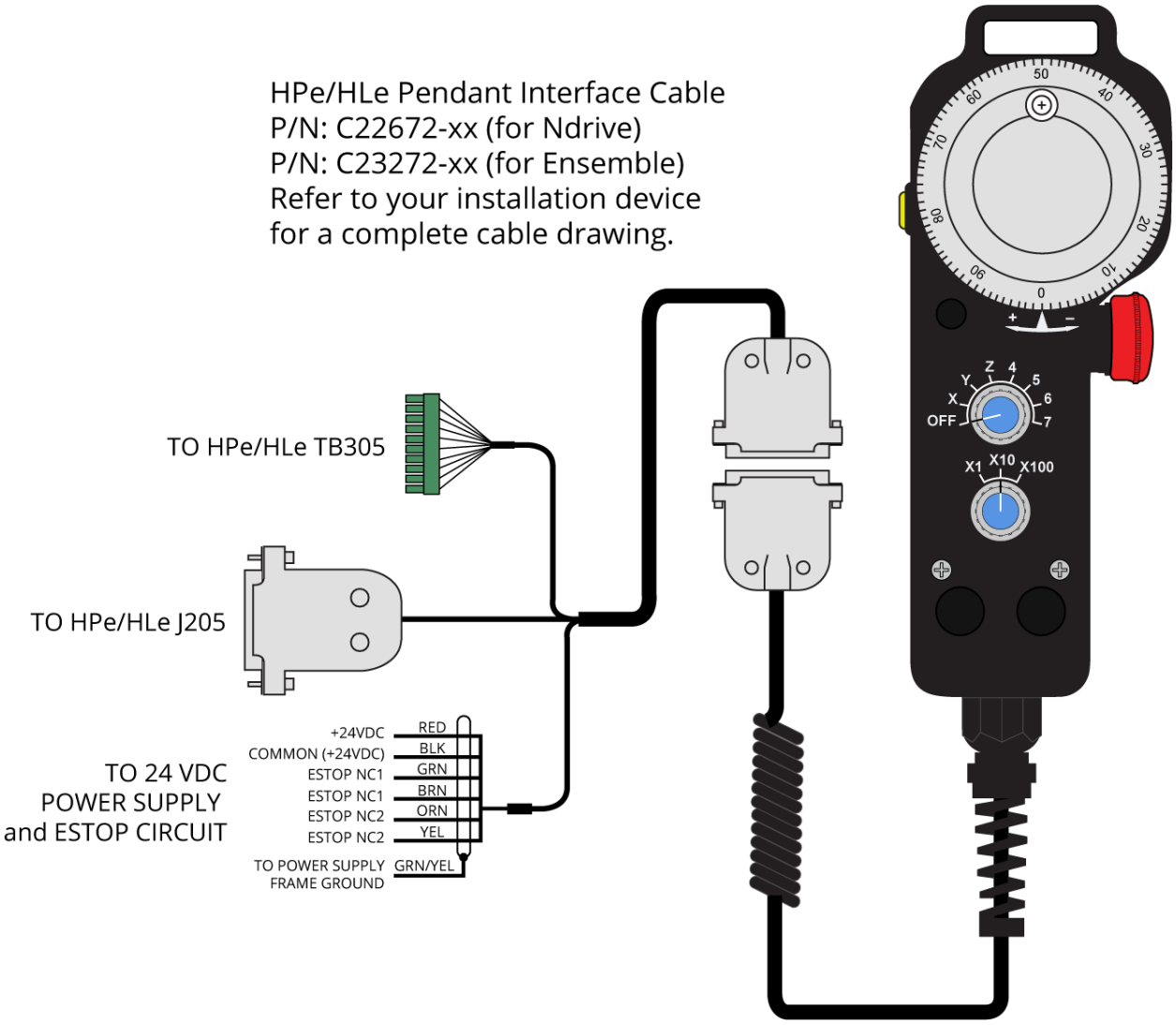

Figure 2-8: MPG to HPe/HLe Cable Drawing

2.1.4. Connect the MPG to the CP/CL

The CP or CL must be equipped with the -IO option. Connect to the Auxiliary I/O (CP: J104; CL: J105) and TB204 (I/O) connectors and use digital input bits 0 through 8. The handwheel uses the auxiliary encoder input channel.

Table 2-4: CP/CL Adapter Cable Connector Pinout

Connector	Pin	Description
TB204 [DIGITAL IN]	1	Common
	2	Input 0 (X Axis)
	3	Input 1 (Y Axis)
	4	Input 2 (Z Axis)
	5	Input 3 (4 Axis)
	6	Input 4 (5 Axis)
	7	Input 5 (6 Axis)
	8	**NDRIVE**: Input 6 (x1 Distance Multiplier)
		ENSEMBLE: Input 6 (x10 Distance Multiplier)
	9	**NDRIVE**: Input 7 (x10 Distance Multiplier)
		ENSEMBLE: Input 7 (x100 Distance Multiplier)
	10	Ground
CL: J105 [AUX I/O] CP: J104 [AUX I/O]	17	**NDRIVE**: Input 8 (x100 Distance Multiplier)
		ENSEMBLE: N/C
	10	Cosine
	11	Cosine-N
	12	5 V
	1	Sine
	2	Sine-N
	21	Common
	24	Common
To: User-Supplied Power Supply (Flying Leads)	RED	24 VDC
	BLK	Common
	GRN	ESTOP NC1
	BRN	ESTOP NC1
	ORN	ESTOP NC2
	YEL	ESTOP NC2
	GRN/YEL	To Frame Ground

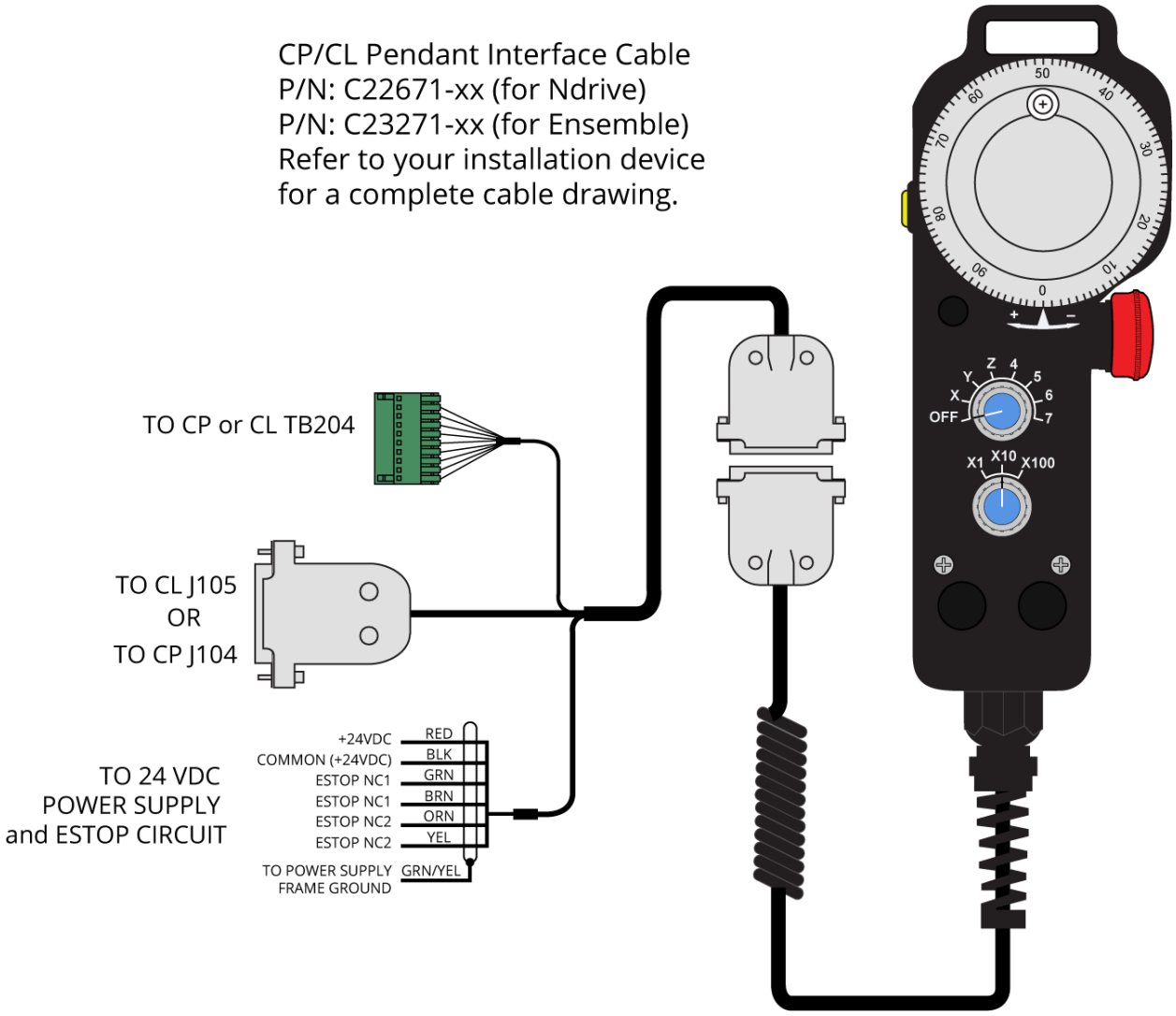

Figure 2-9: MPG to CP/CL Cable Drawing

2.1.5. Connect the MPG to the MP/ML

The MP or ML must be equipped with the -IO option. Connect to the J201 (Auxiliary I/O) and TB203 (I/O) connectors and use digital input bits 0 through 7. The handwheel uses the auxiliary encoder input channel.

Table 2-5: MP/ML Adapter Cable Connector Pinout

Connector	Pin	Description
TB203 [DIGITAL IN]	1	Common
	2	Input 0 (X Axis)
	3	Input 1 (Y Axis)
	4	Input 2 (Z Axis)
	5	Input 3 (4 Axis)
	6	Input 4 (5 Axis)
	7	Input 5 (6 Axis)
	8	Input 6 (x10 Distance Multiplier)
	9	Input 7 (x100 Distance Multiplier)
	10	Common
Ndrive: BB-MP/ML Module TB1	TB1-1	Sine
	TB1-2	Sine-N
	TB1-3	Cosine
	TB1-4	Cosine-N
	TB1-7	5 VDC
	TB1-8	Common
Ensemble J201 [AUX I/O]	2	Cosine
	7	Cosine-N
	4	5 VDC
	1	Sine
	6	Sine-N
	9	Common
Ndrive To: User-Supplied Power Supply (Flying Leads)	RED	24 VDC
	BLK	Common
	GRN	ESTOP NC1
	BRN	ESTOP NC1
	ORN	ESTOP NC2
	YEL	ESTOP NC2
	GRN	To Frame Ground
Ensemble To: User-Supplied Power Supply (Flying Leads)	RED	24 VDC
	BLK	Common
	GRN	ESTOP NC1
	BRN	ESTOP NC1
	ORN	ESTOP NC2
	YEL	ESTOP NC2
	GRN/WHT	To Frame Ground

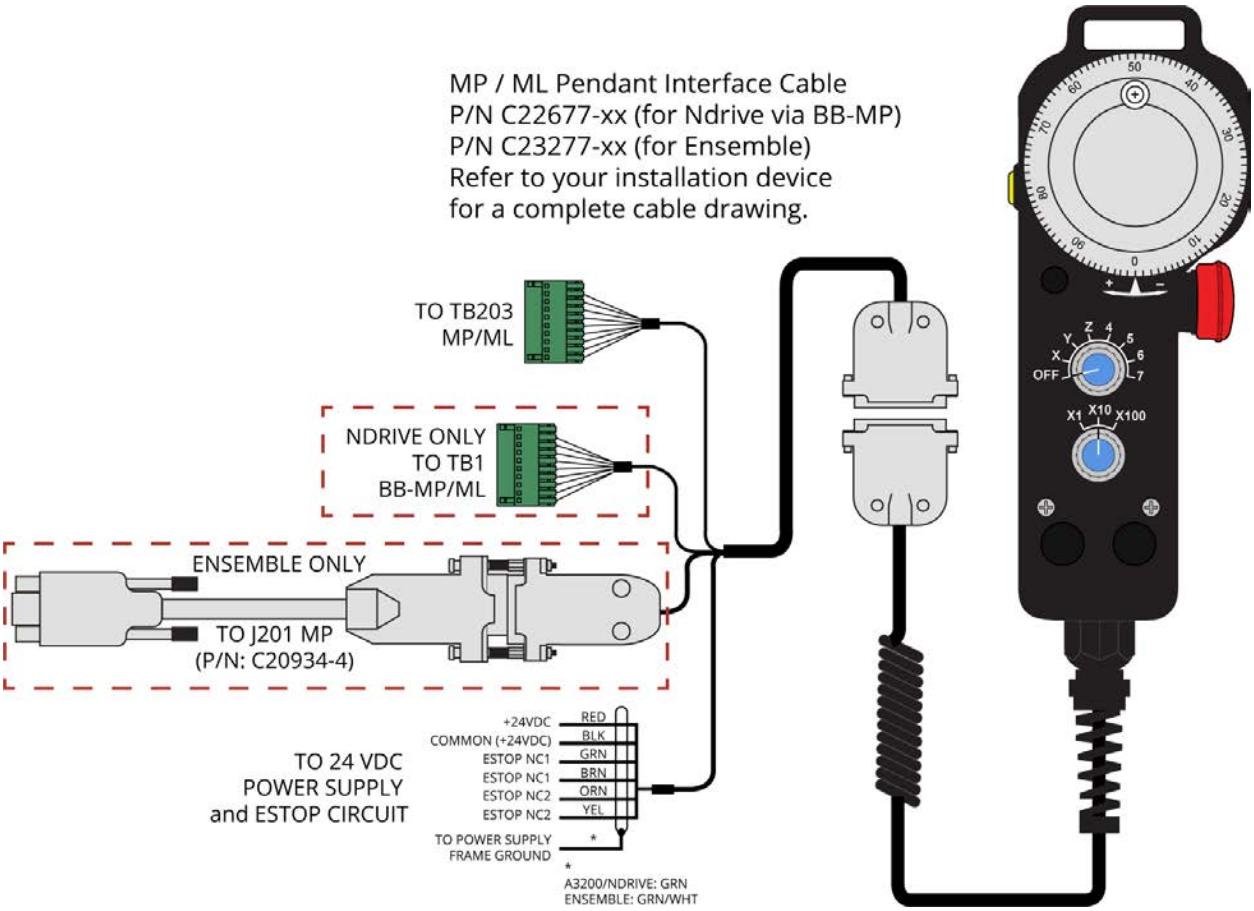

Figure 2-10: MPG to MP/ML Cable Drawing

2.1.6. Connect the MPG to the Nservo

Connect to the J107 (Auxiliary Encoder), J108 (Digital Outputs), J109 (Digital Inputs) and J110 (PSO/Brake) connectors and use digital input bits 0 through 7 and 12. The handwheel uses the auxiliary encoder input channel on J107.

Table 2-6: Nservo Adapter Cable Connector Pinout

Connector	Pin	Color	Description
J107 [ESTOP and Extra Encoder Channel]	AUXSIN+	ORN	Sine
	AUXSIN-	WHT/ORN	Sine-N
	AUXCOS+	RED	Cosine
	AUXCOS-	WHT/RED	Cosine-N
	UINT+	WHT/GRY	x100 Distance Multiplier
	UINT-	WHT	Common
J109 [OPTO InputS]	0	BLK	X Axis
	1	YEL/BLK	Y Axis
	2	BLU	Z Axis
	3	BLU/BLK	4 Axis
	4	YEL	5 Axis
	5	WHT/YEL	6 Axis
	6	GRY/BLK	x1 Distance Multiplier
	7	GRY/RED	x10 Distance Multiplier
	C	BLK/ORN	Common
J110 [PSO and BRAKE]	+5 VDC	VIO and WHT/VIO	+5 VDC
	ND	WHT/GRN and GRN	Common
To: User-Supplied Power Supply (Flying Leads)	RED		24 VDC
	BLK		Common
	GRN		ESTOP NC1
	BRN		ESTOP NC1
	ORN		ESTOP NC2
	YEL		ESTOP NC2
	GRN/YEL		To Frame Ground

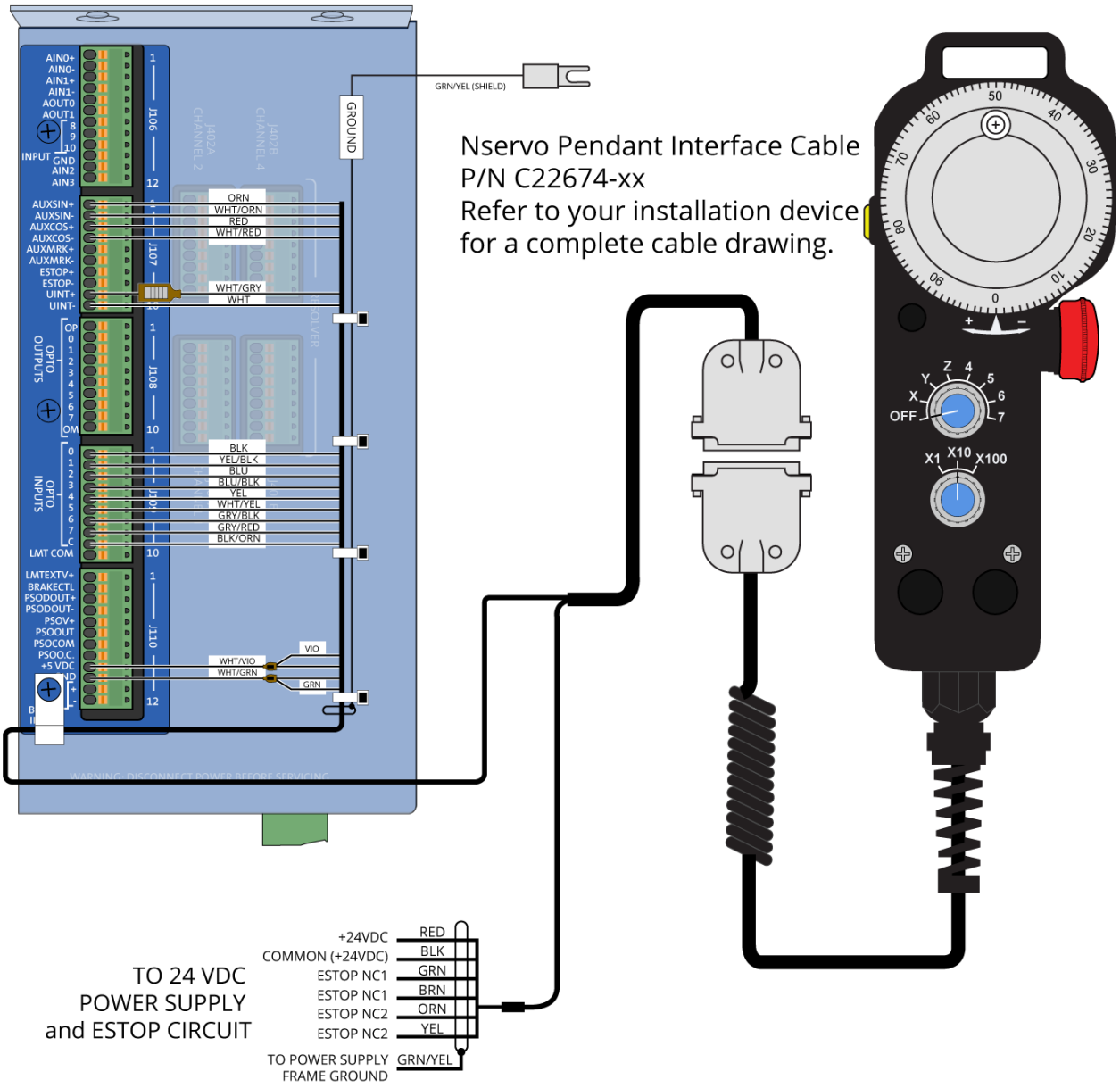

Figure 2-11: MPG to Nservo Cable Drawing

2.1.7. Connect the MPG to the Npaq

Connect to the J8 (High Speed I/O), J9 (I/O) and J12 (Misc. I/O) connectors and use digital input bits 0 through 7 and 12. The handwheel uses the second auxiliary encoder input channel.

Table 2-7: Npaq Adapter Cable Connector Pinout

Connector	Pin	Description
J9 [I/O]	15	Input 0 (X Axis)
	16	Input 1 (Y Axis)
	17	Input 2 (Z Axis)
	18	Input 3 (4 Axis)
	19	Input 4 (5 Axis)
	20	Input 5 (6 Axis)
	21	Input 6 (x1 Multiplier Distance)
	22	Input 7 (x10 Multiplier Distance)
	14	Common
J12 [Misc. I/O]	12+	Input 8 (x100 Multiplier Distance)
	12-	Common
J8 [High Speed I/O]	15	Cosine
	16	Cosine-N
	25	5 VDC
	13	Sine
	14	Sine-N
	24	Common
To: User-Supplied Power Supply (Flying Leads)	RED	24 VDC
	BLK	Common
	GRN	ESTOP NC1
	BRN	ESTOP NC1
	ORN	ESTOP NC2
	YEL	ESTOP NC2
	GRN/YEL	To Frame Ground

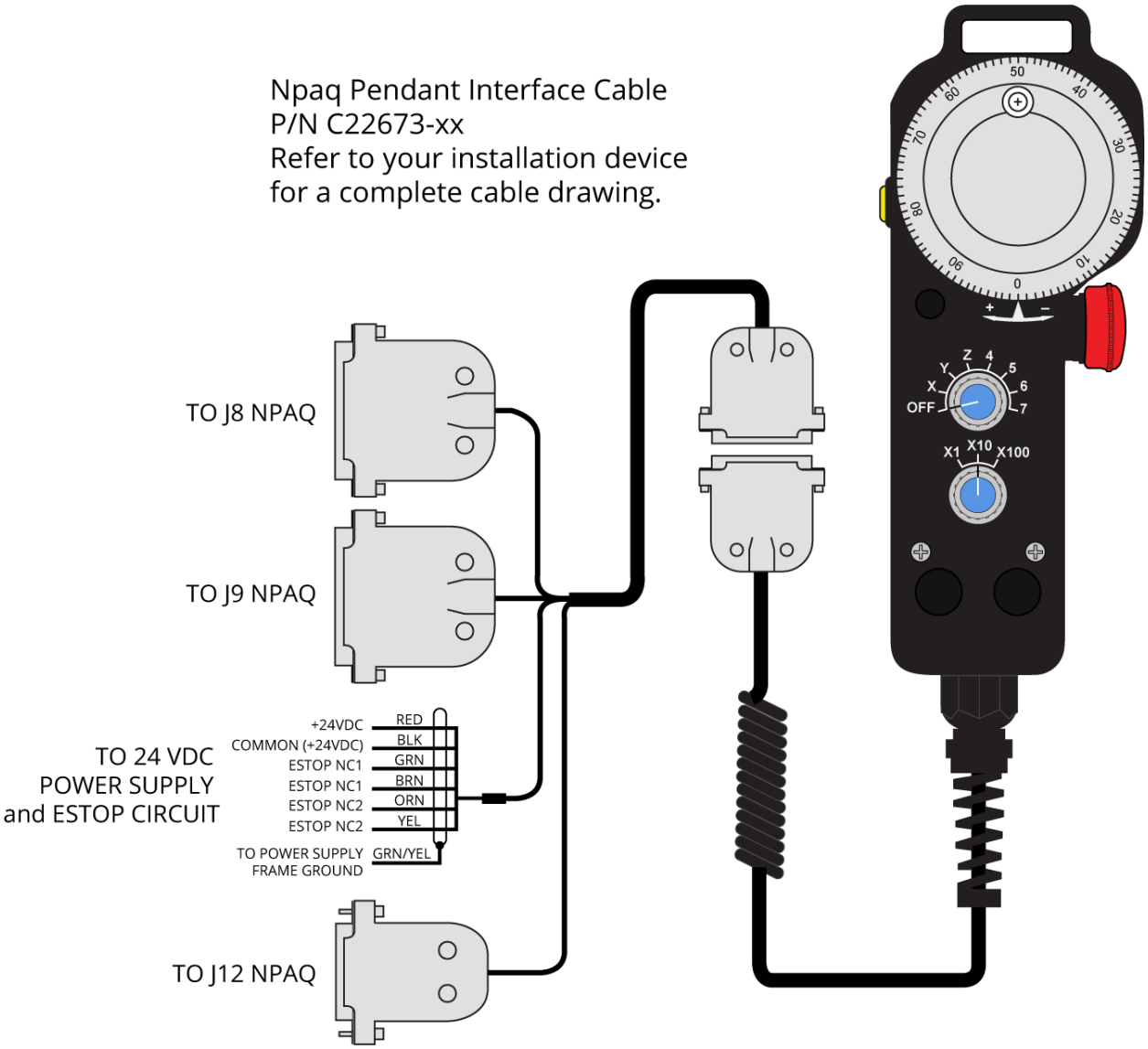

Figure 2-12: MPG to Npaq Cable Drawing

2.1.8. Connect the MPG to the Epaq

Connect to the Opto-In, and the Auxiliary Encoder connectors and use digital input bits 0 through 7. The handwheel uses an auxiliary encoder input channel.

Table 2-8: Epaq Adapter Cable Connector Pinout

Connector	Pin	Description
Digital Inputs	1	Common
	2	Input 0 (X Axis)
	3	Input 1 (Y Axis)
	4	Input 2 (Z Axis)
	5	Input 3 (4 Axis)
	6	Input 4 (5 Axis)
	7	Input 5 (6 Axis)
	8	Input 6 (x10 Distance Multiplier)
	9	Input 7 (x100 Distance Multiplier)
	10	Common
Aux Encoder	2	Cosine
	7	Cosine-N
	4	5 VDC
	1	Sine
	6	Sine-N
	9	Common
To: User-Supplied Power Supply Flying Leads	RED	24 VDC
	BLK	Common
	GRN	ESTOP NC1
	BRN	ESTOP NC1
	ORN	ESTOP NC2
	YEL	ESTOP NC2
	GRN/YEL	To Frame Ground

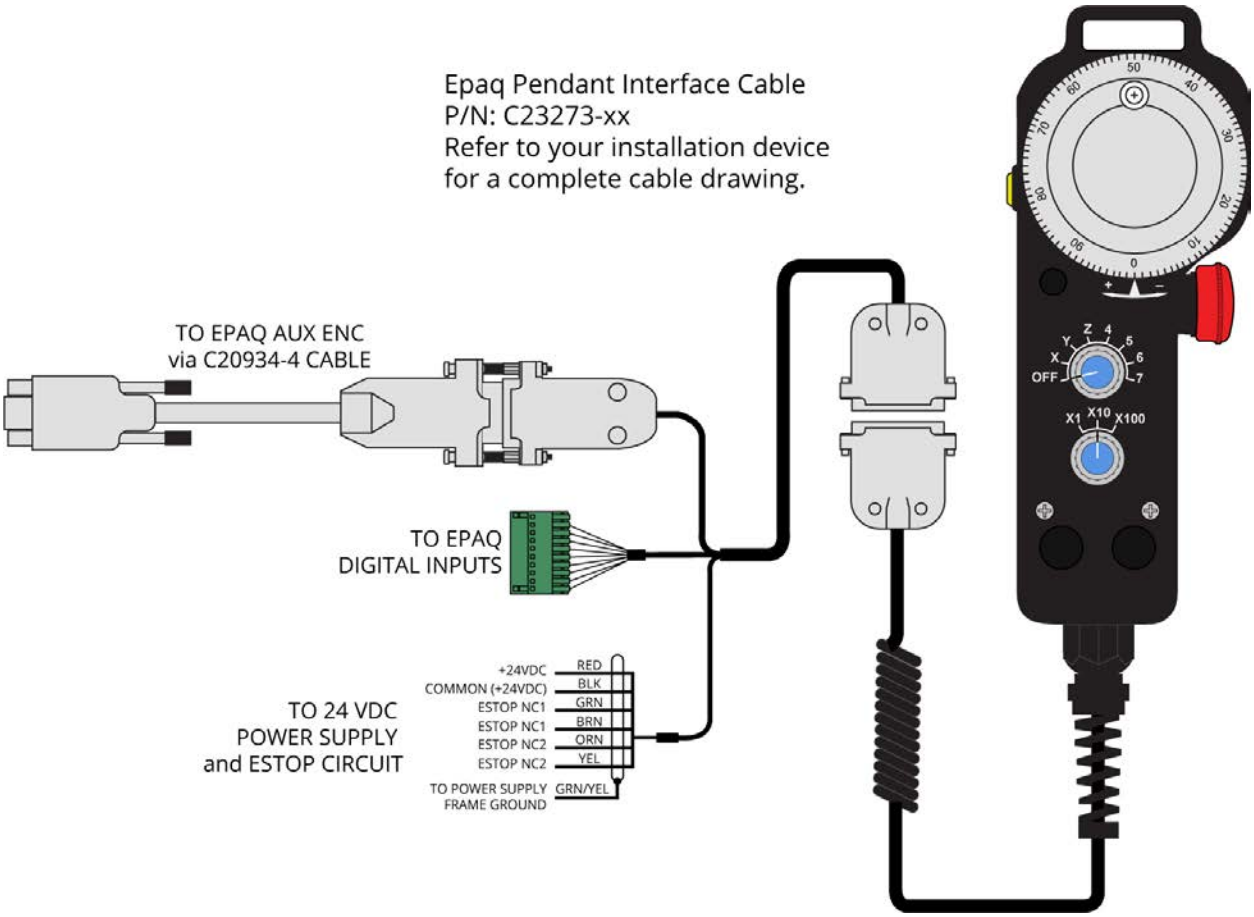

Figure 2-13: MPG to Epaq Cable Drawing

2.1.9. Connect the MPG to the Epaq MR/Npaq MR

Connect to the Digital/Analog I/O, and the Auxiliary Encoder connectors and use digital input bits 0 through 7. The handwheel uses an auxiliary encoder input channel.

Table 2-9: MR Adapter Cable Connector Pinout

Connector	Pin	Description
DIGITAL/ANALOG I/O	4	Common
	16	Common
	5	Input 0 (X Axis)
	6	Input 1 (Y Axis)
	7	Input 2 (Z Axis)
	8	Input 3 (4 Axis)
	17	Input 4 (5 Axis)
	18	Input 5 (6 Axis)
	19	Input 6 (x10 Distance Multiplier)
	20	Input 7 (x100 Distance Multiplier)
AUX ENCODER	2	Cosine
	7	Cosine-N
	4	5 VDC
	1	Sine
	6	Sine-N
	9	Common
	5	Common
To: User-Supplied Power Supply (Flying Leads)	RED	24 VDC
	BLK	Common
	GRN	ESTOP NC1
	BRN	ESTOP NC1
	ORN	ESTOP NC2
	YEL	ESTOP NC2
	GRN/YEL	To Frame Ground

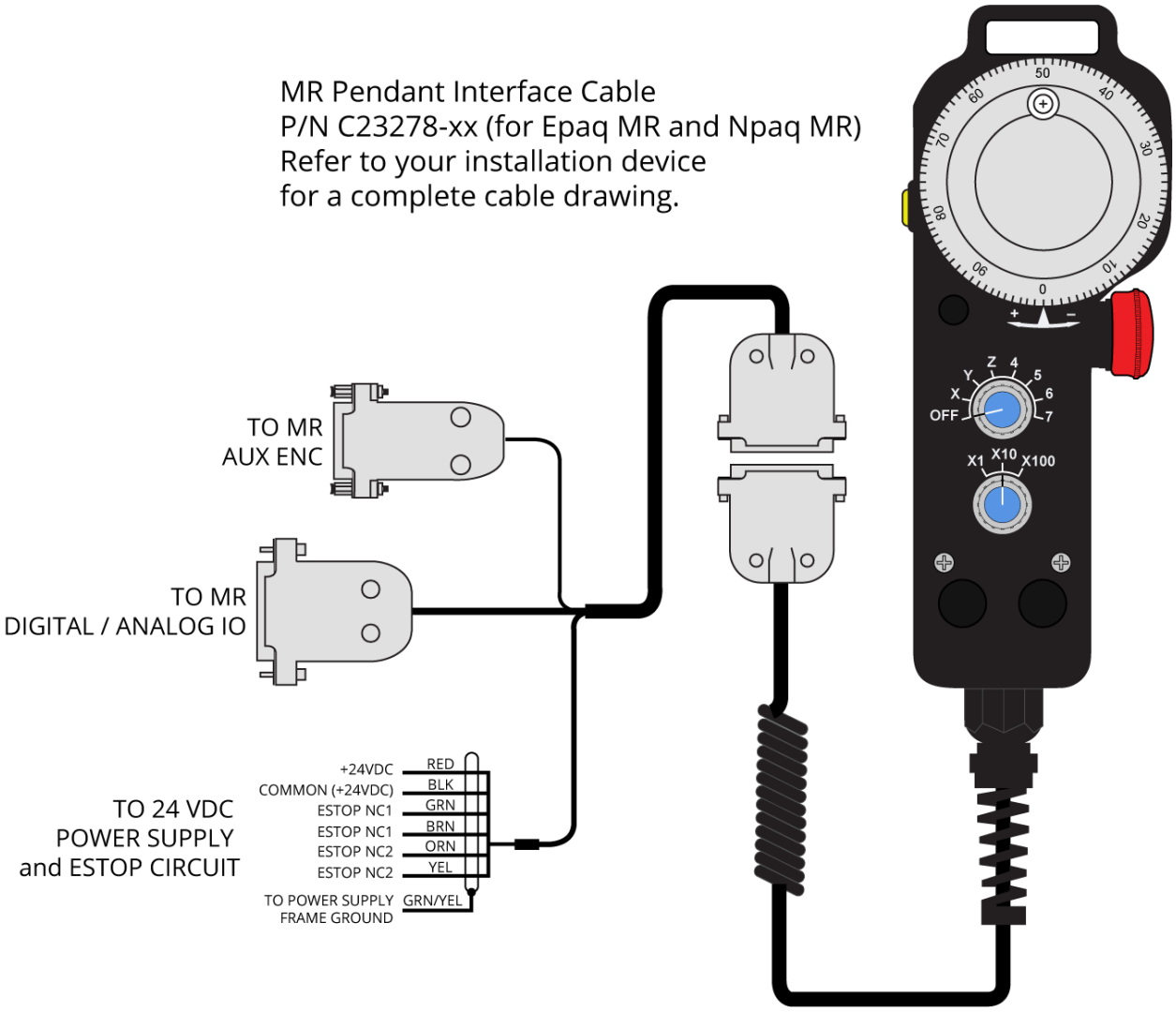

Figure 2-14: MPG to Epaq MR/Npaq MR Cable Drawing

2.2. A3200 Configuration Information

The MPG configuration details for the A3200 controller vary based upon the version of software which your controller is running.

2.2.1. Software Version 3.00.000 and Above

IMPORTANT: This configuration is applicable for customers that have installed software version 3.00.000 or higher. Refer to Section 2.2.2. if you have a software version lower than 3.00.000.

The MPG requires an AeroBasic program running on a secondary task to monitor the MPG switches and command the axes to move when the user rotates the manual pulse generator (MPG or handwheel). This program and other required files are distributed with the Automation 3200 software. They can be found in the \Program Files\A3200\Samples\AeroBasic\MPG folder.

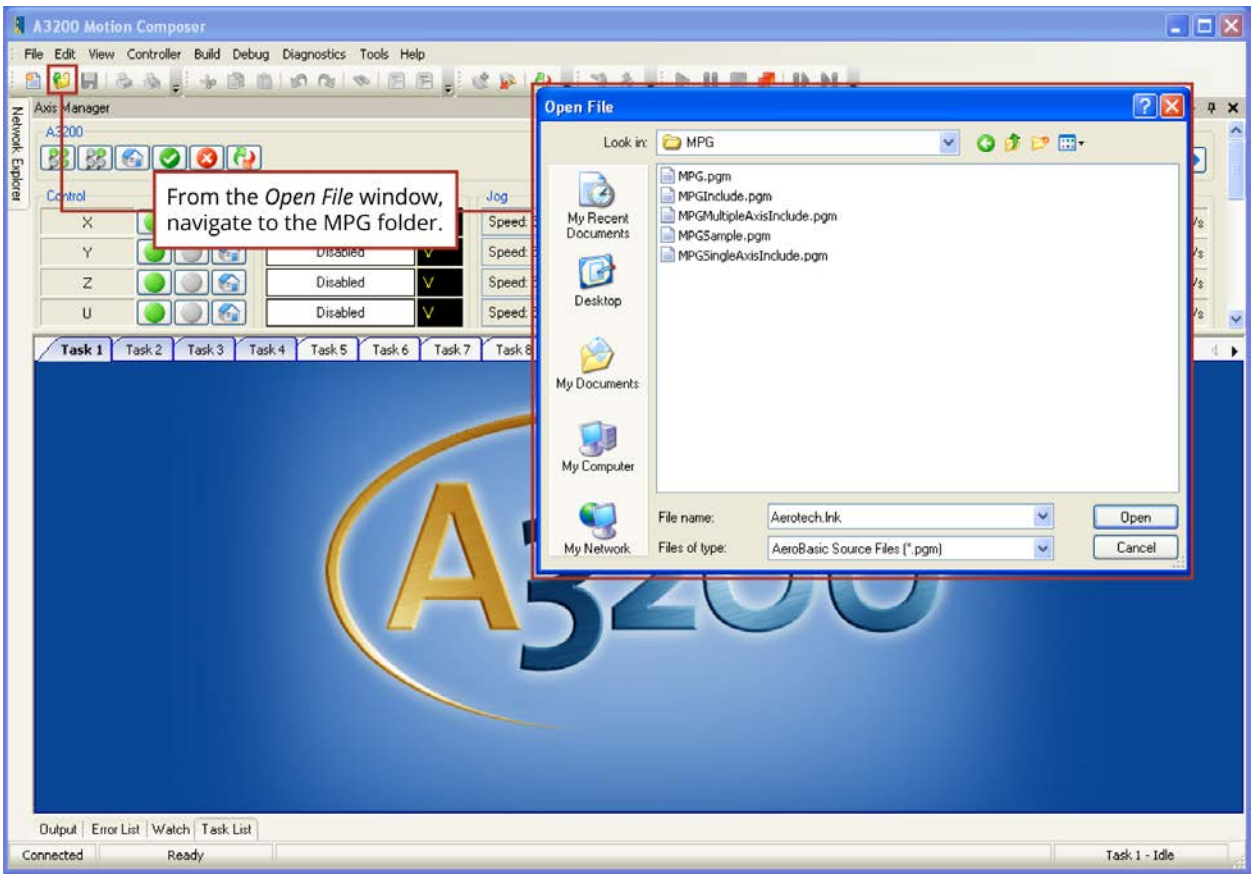

Figure 2-15: Opening the MPG Folder

The MPG.pgm program controls the MPG and includes either the MPGMultipleAxisInclude.pgm or the MPGSingleAxisInclude.pgm file. MPGMultipleAxisInclude.pgm and MPGSingleAxisInclude.pgm define the parameters by which the MPG operates. The MPGInclude.pgm file sets global variables to allow the system to recognize the MPG. The MPGSample.pgm shows a sample of how the MPG can be used.

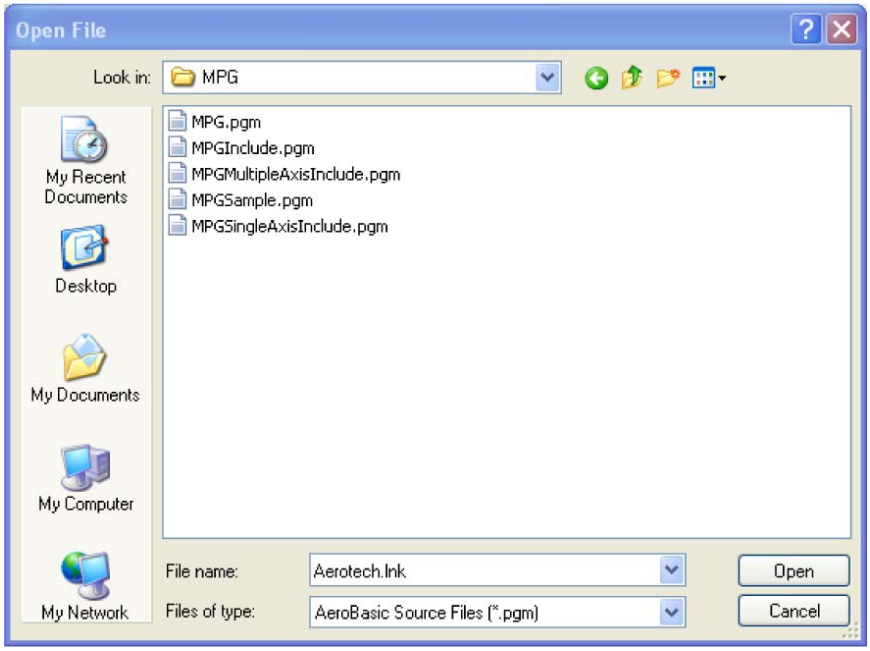

Figure 2-16: MPG Program Options

The following steps will show how to configure the MPG.pgm, select the single or multiple axis include file, add the MPGInclude.pgm and MPG.pgm to program automation, and will also show how to open the sample program (MPGSample.pgm).

Open the MPG.Pgm and the appropriate include file. If you have the MPG connected to an Npaq or Nservo then you should open the MPGMultipleAxisInclude.pgm. If you have the MPG connected to an HLe, HPe, CP, CL, MP, or ML then open the MPGSingleAxisInclude.pgm.

Modify the MPG.pgm file to reference the appropriate include file. By default MPG.pgm includes the MPGSingleAxisInclude.pgm.

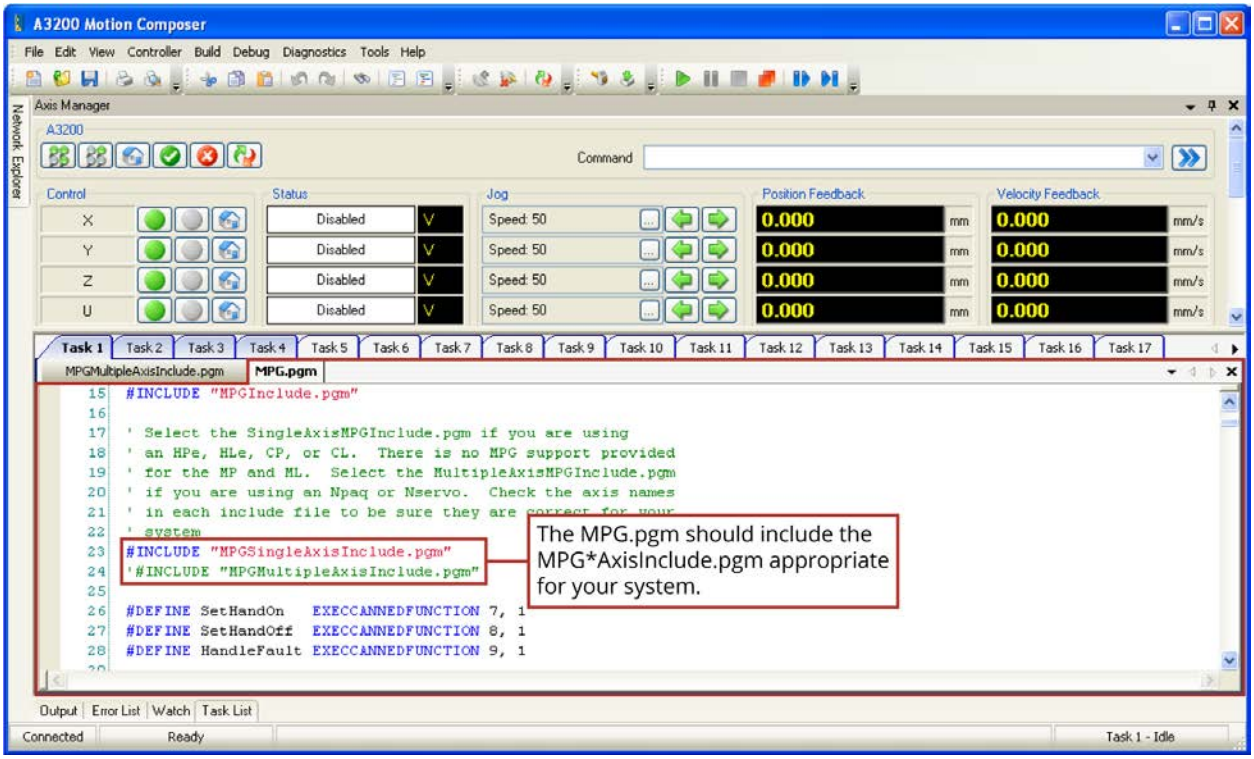

Figure 2-17: Set the Correct Include File

Step 1:

Modify the first six lines of the program beginning with "#define", changing the second column of axis names to match the names of the axes in your system.

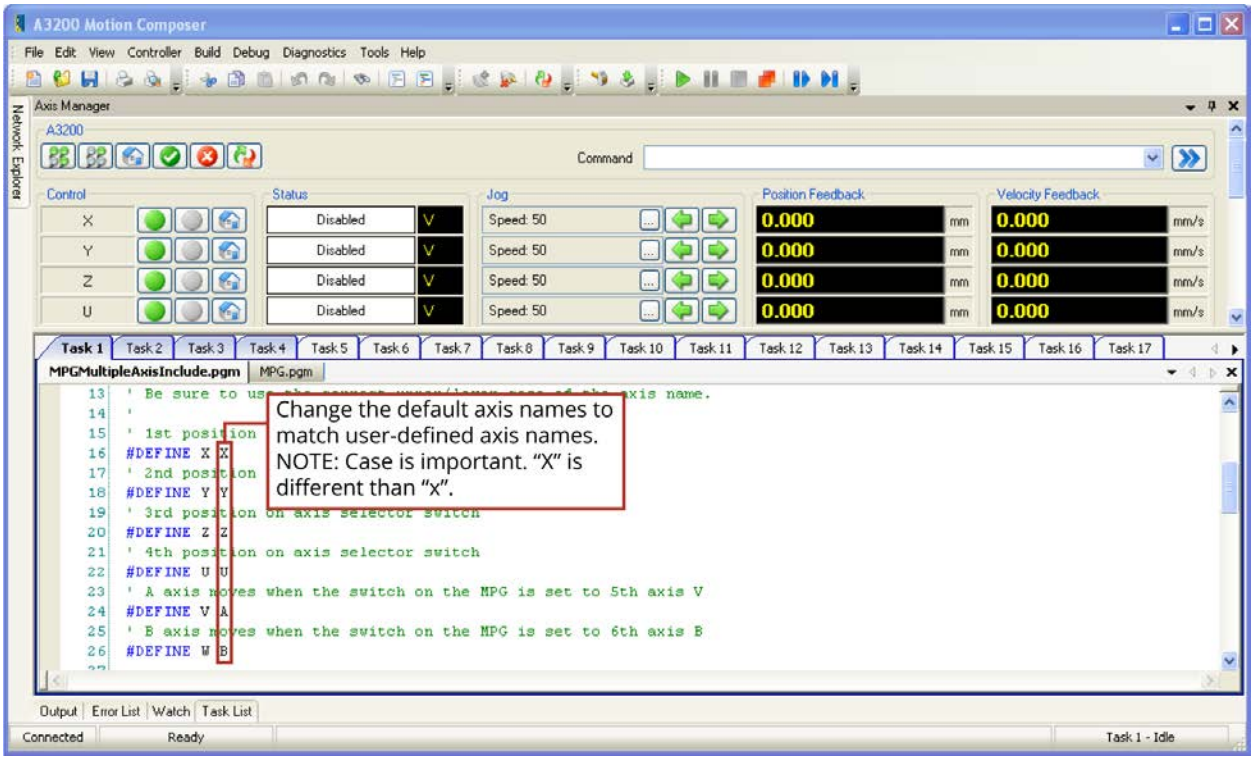

Figure 2-18: Assigning Axis Names

Step 2:

Define the distance (metric) of an axis move equal to one tick of the handwheel.

WARNING: If this distance is too large, Position Errors or other faults will occur as the axis motion is commanded by the MPG.

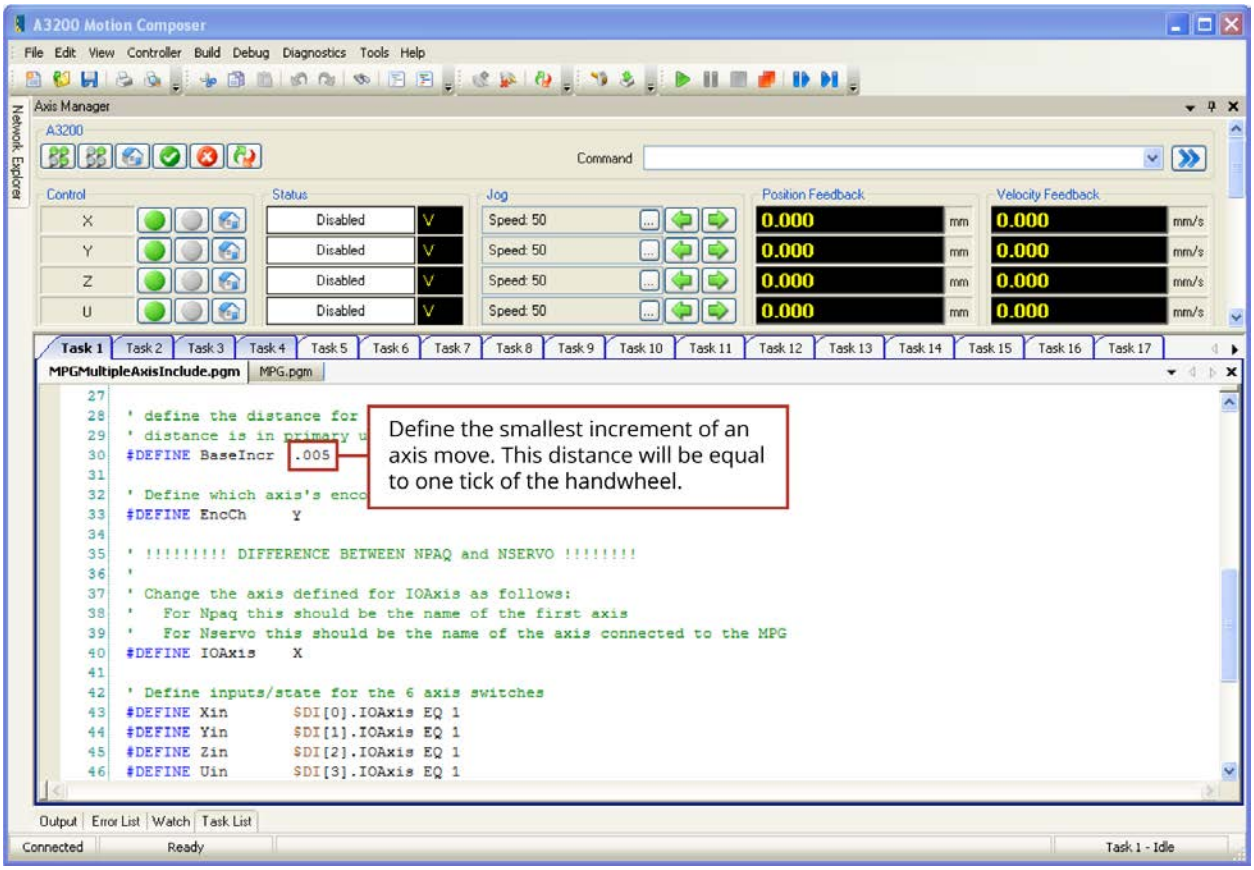

Figure 2-19: Defining Incremental Distance

Step 3:

Define the name of the axis that the MPG handwheel is connected to.

IMPORTANT: If connecting an MPG to an Npaq, the A3200 controller will expect the encoder channel of the MPG to be connected to the second auxiliary encoder channel of the Npaq (typically designated as the Y axis).

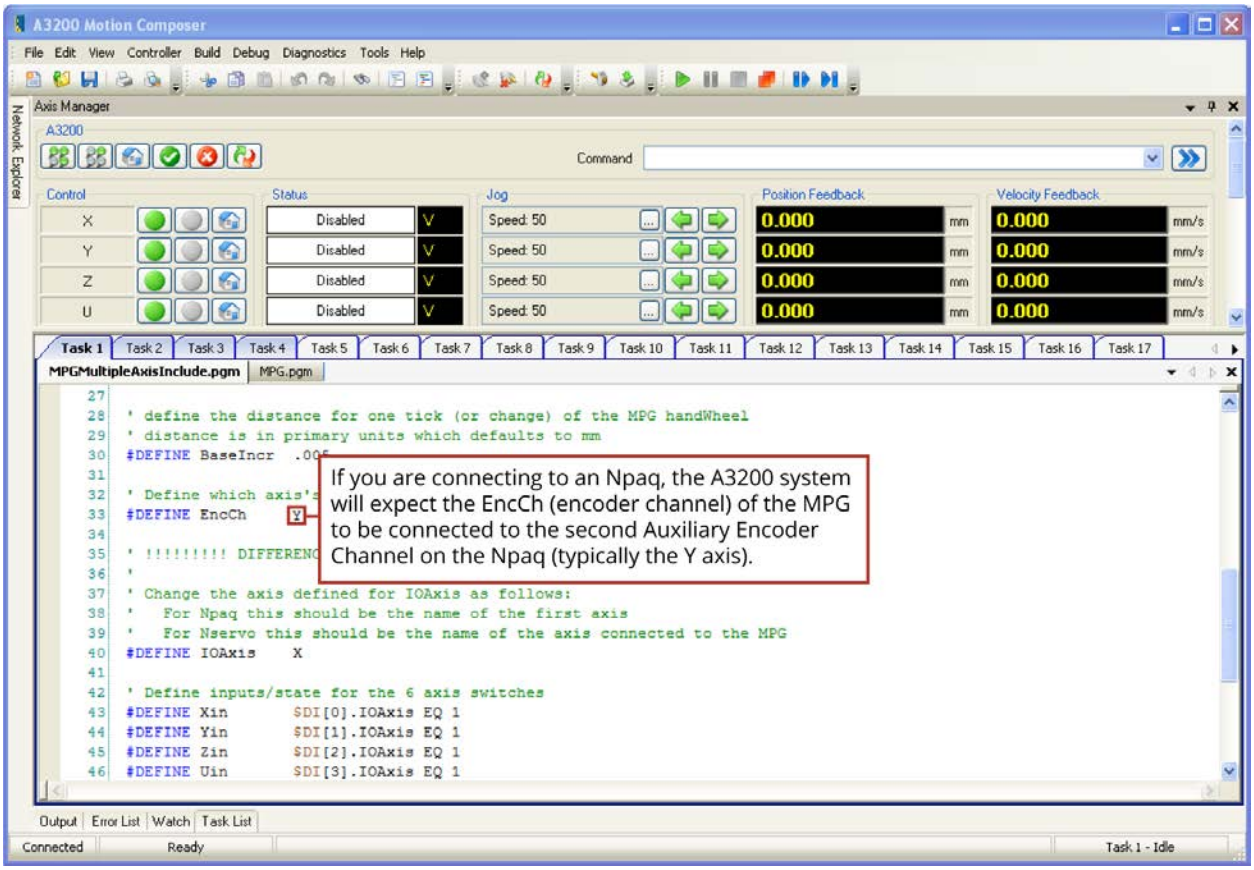

Figure 2-20: Defining the MPG Handwheel Connection (Npaq example shown)

Step 4:

Define the name of the axis that the MPG I/O is connected to.

IMPORTANT: If connecting an MPG to an Npaq, the A3200 controller will expect the I/O of the MPG to be connected to the first axis of the Npaq (typically designated as the X axis).

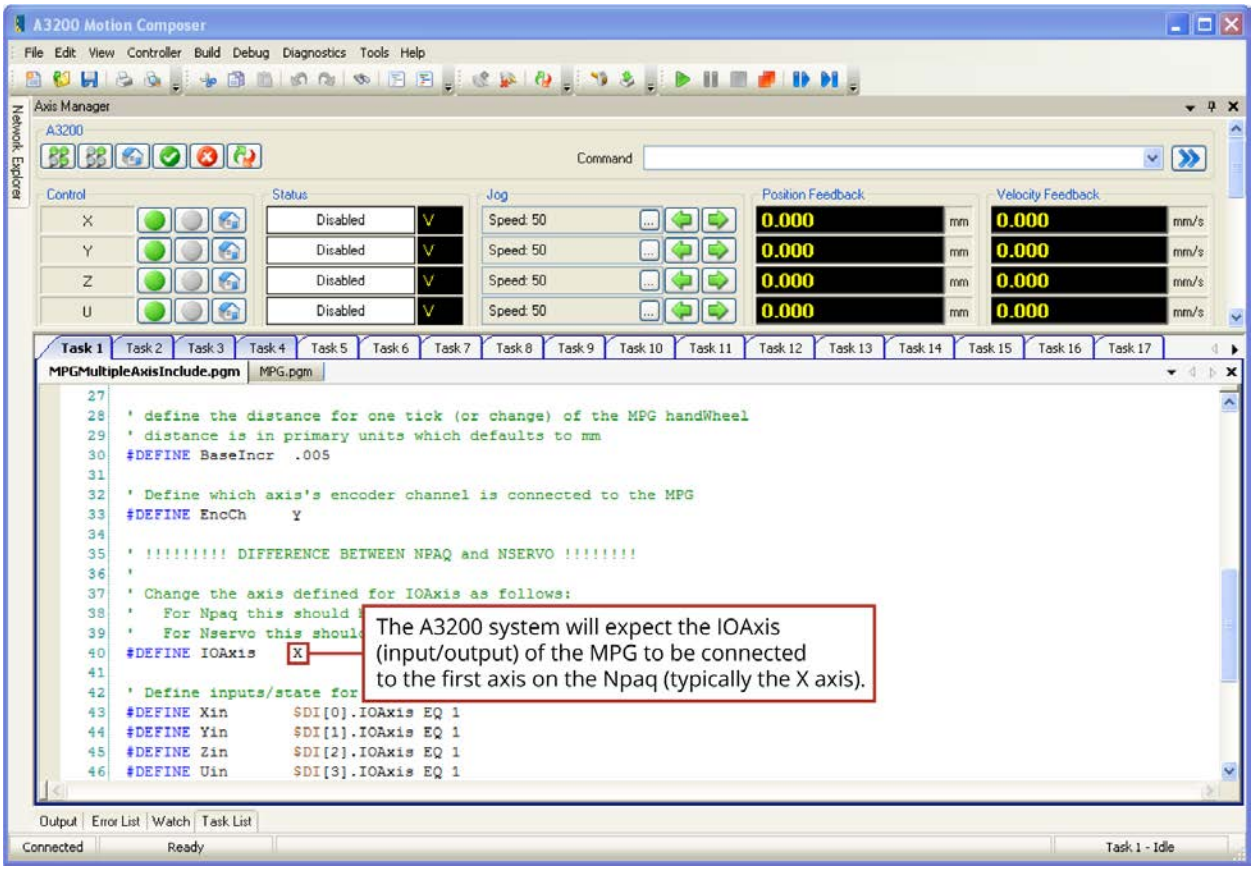

Figure 2-21: Defining the MPG I/O Connection (Npaq example shown)

Step 5:

IMPORTANT: This step is only for users running software version 4.05.000 and have the MPG connected to an Ndrive MP or Ndrive ML.

Define the inputs for the three multiplier switches in the MPGSingleAxisInclude.pgm.

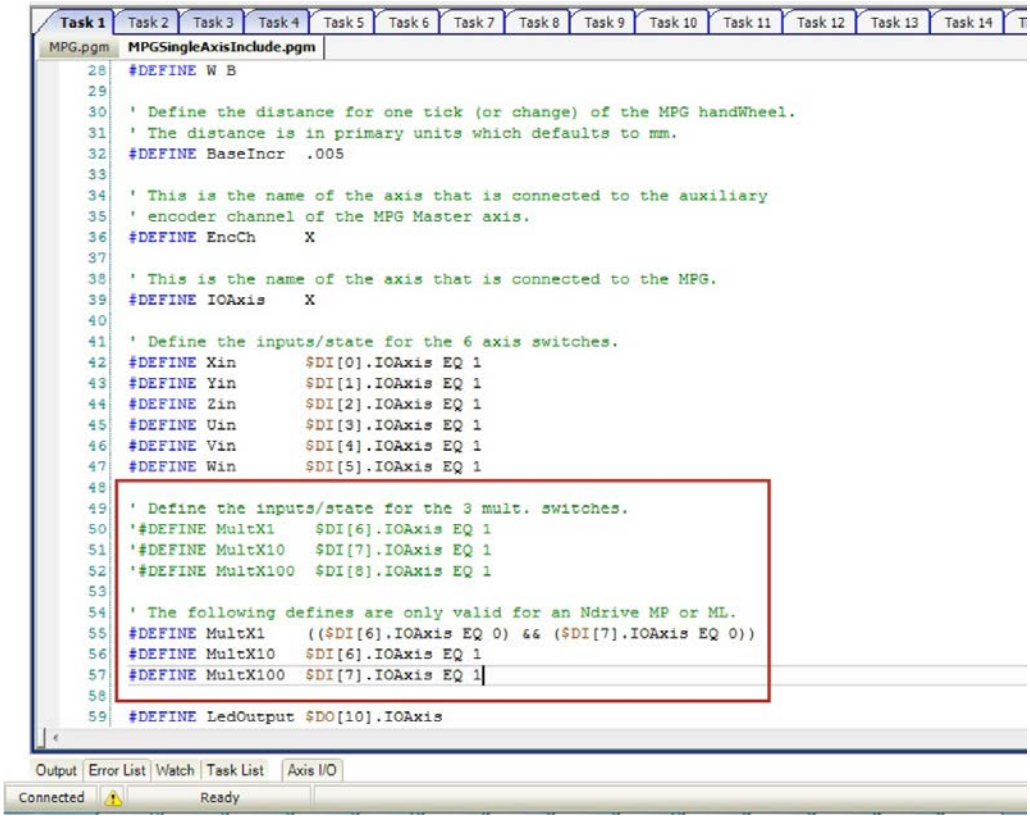

Figure 2-22: Define Multiplier Switch Inputs (4.05.000 and MP/ML only)

Step 6:

Save any changes made to each file by selecting the file and clicking the save button on the toolbar. The Save All option (located in the File menu) can also be used. After saving, these files can be closed.

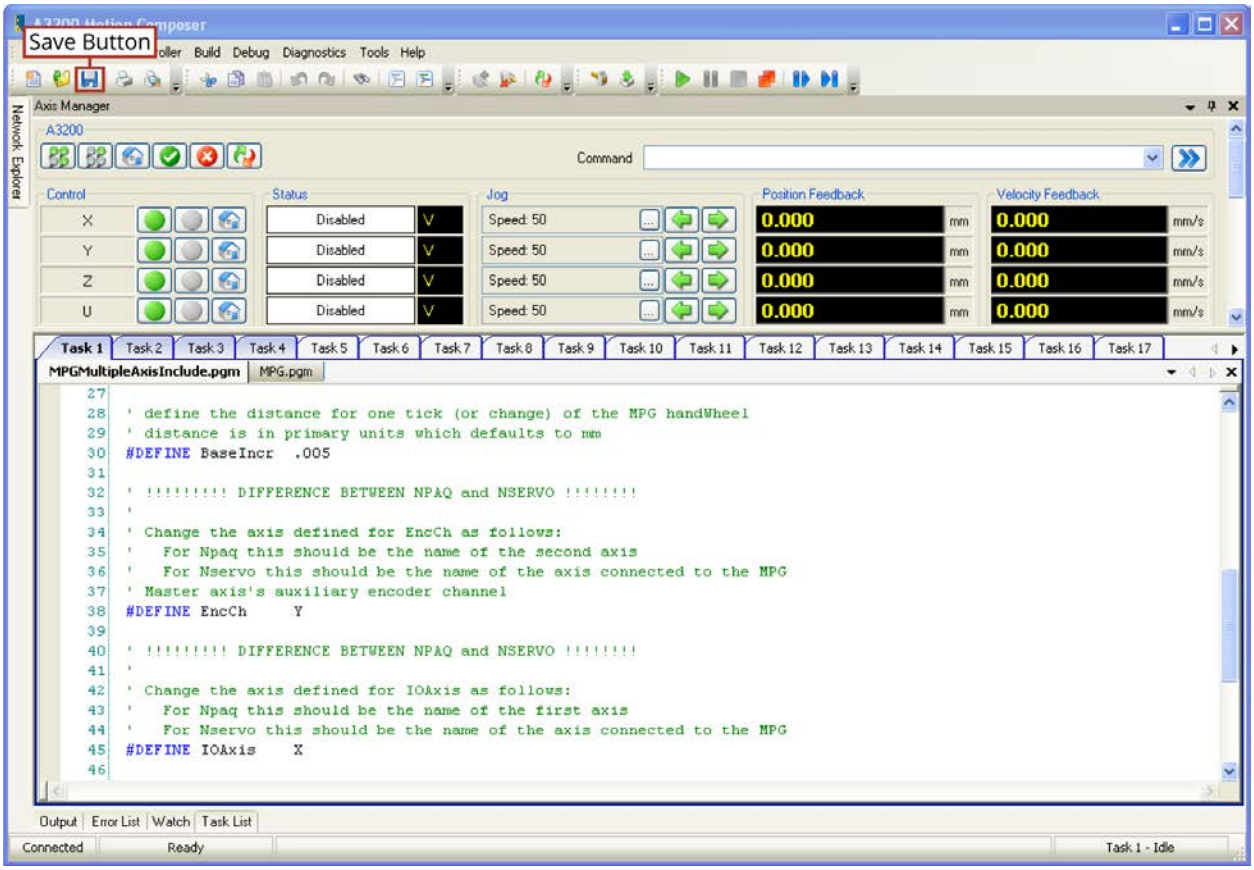

Figure 2-23: Save Program Changes

Step 7:

Open the Program Automation folder under the controller node in the Network Explorer. The Network Explorer can be pinned to the page to see the changes being made to Program Automation. Right click on the Program Automation folder and select Add... to bring up the Program Automation dialog.

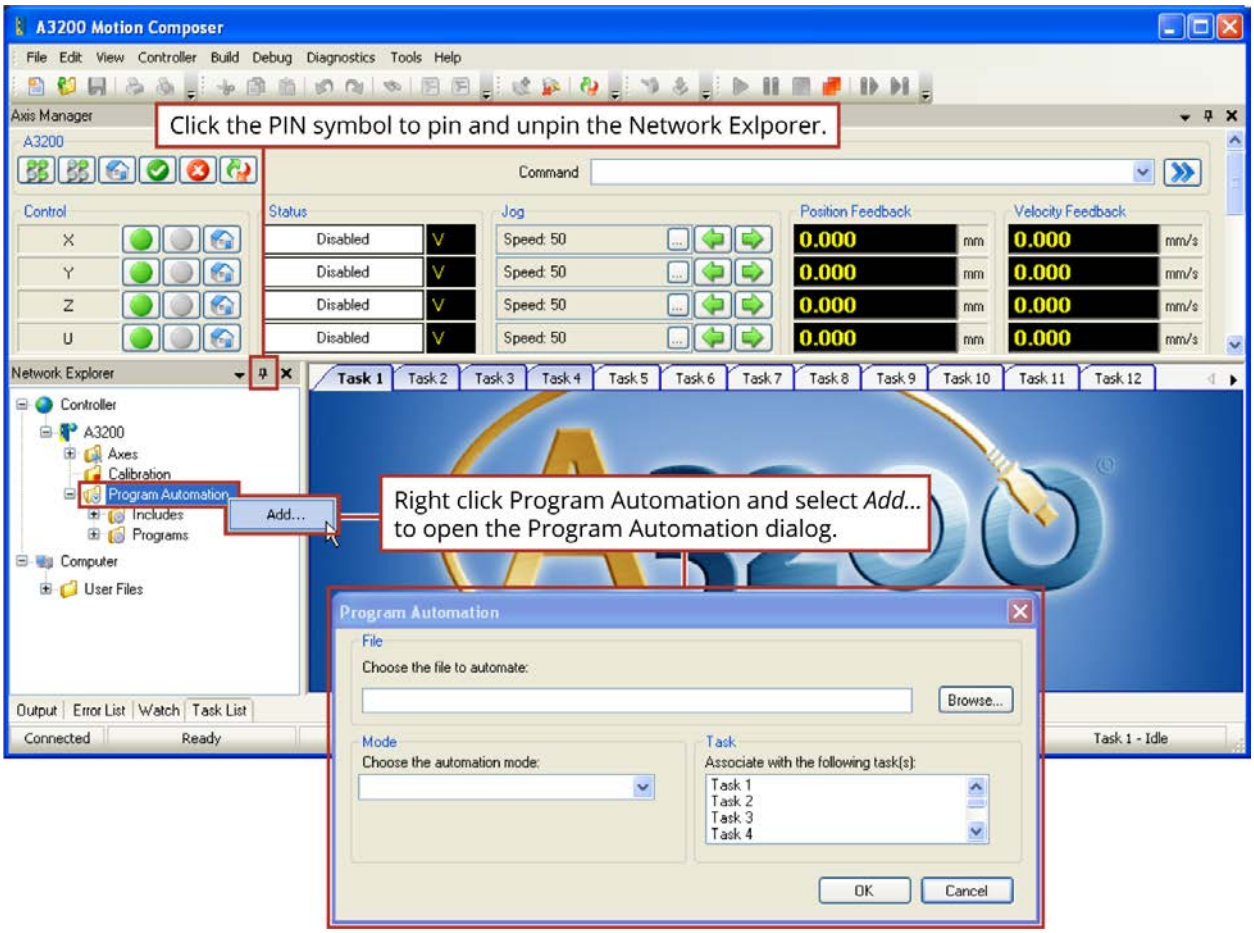

Figure 2-24: Opening the Program Automation Page

Step 8:

Add the MPG.pgm to the Program Automation Page by clicking the Browse... button. The MPG folder should be selected, but if not, navigate to it and select/open the MPG.pgm file.

Set the Mode to RunSilent and set the Task to "Task 2". This will start the MPG.pgm program running in Task 2 after initializing the A3200. Click OK when complete.

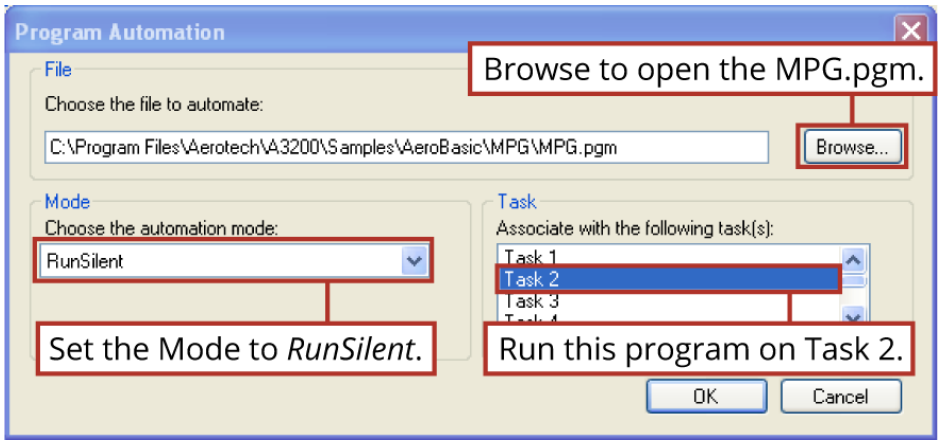

Figure 2-25: Configure Program Automation (MPG.Pgm)

You will now see this file listed under the Programs folder in the Network Explorer.

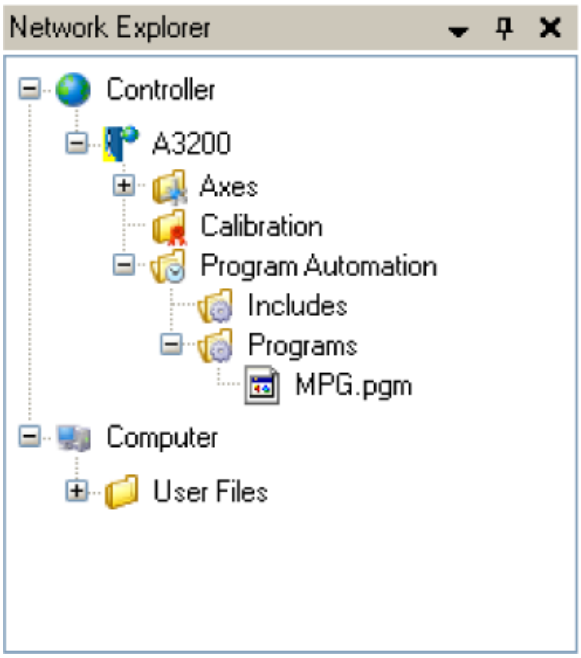

Figure 2-26: Completed Program Automation Configuration

Step 9:

Reset the SMC by clicking the Reset button in the Axis Manager (pictured below) or by selecting Reset from the Controller menu.

After the Reset routine has completed, run the MPGSample.pgm by opening it in Task 1 and then clicking the run button. The code within MPGSample.pgm can be used as an example of how to interface with the MPG from your own program.

If you switch to Task 2, notice that the MPG program is already running in that task.

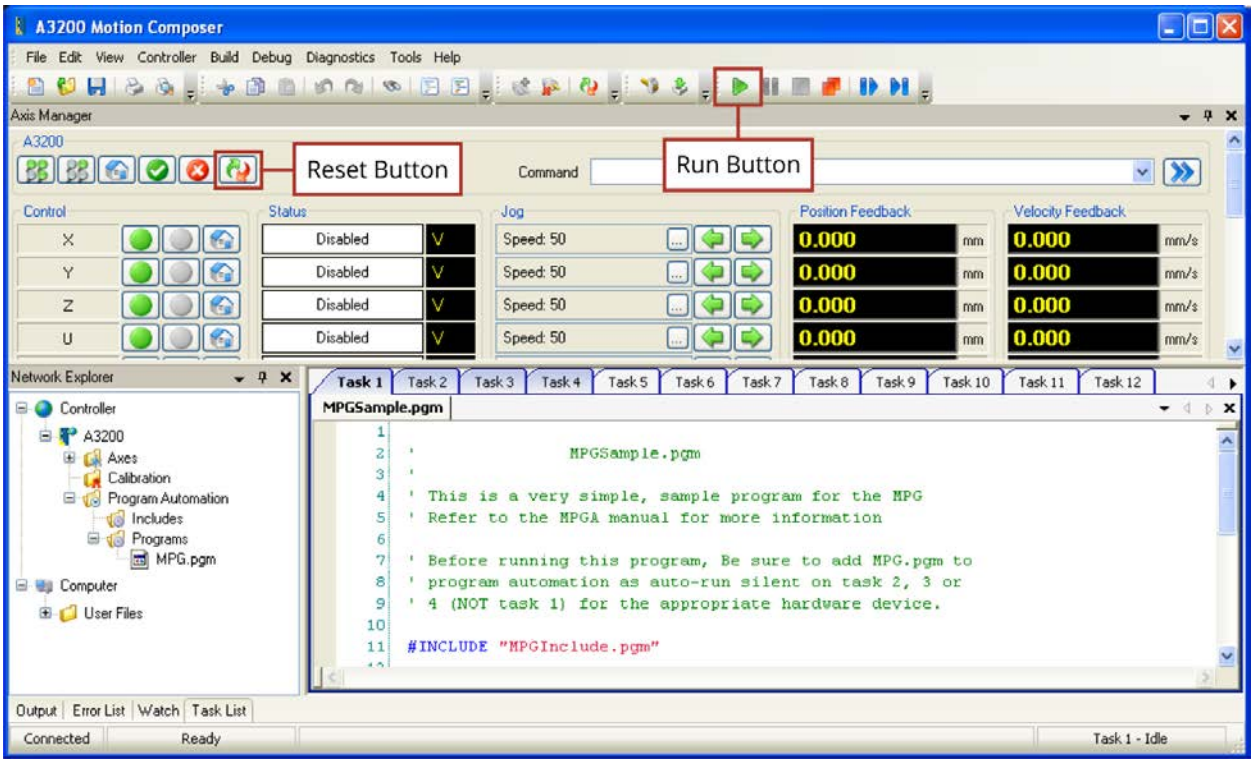

Figure 2-27: Opening the Sample Program (MPGSample.pgm)

2.2.2. Software Version 2.55 or Lower

IMPORTANT: This configuration is applicable for customers that have installed software version 2.55 or lower. Refer to Section 2.2.1. if you have a software version 3.00.000 or higher.

The MPG requires a CNC G-Code program running on a secondary task to monitor the MPG switches and command the axes to move when the user rotates the manual pulse generator (MPG or handwheel). This program and other required files are distributed with the A3200 software. They can be found in the \A3200\Samples\Gcode\MPG folder.

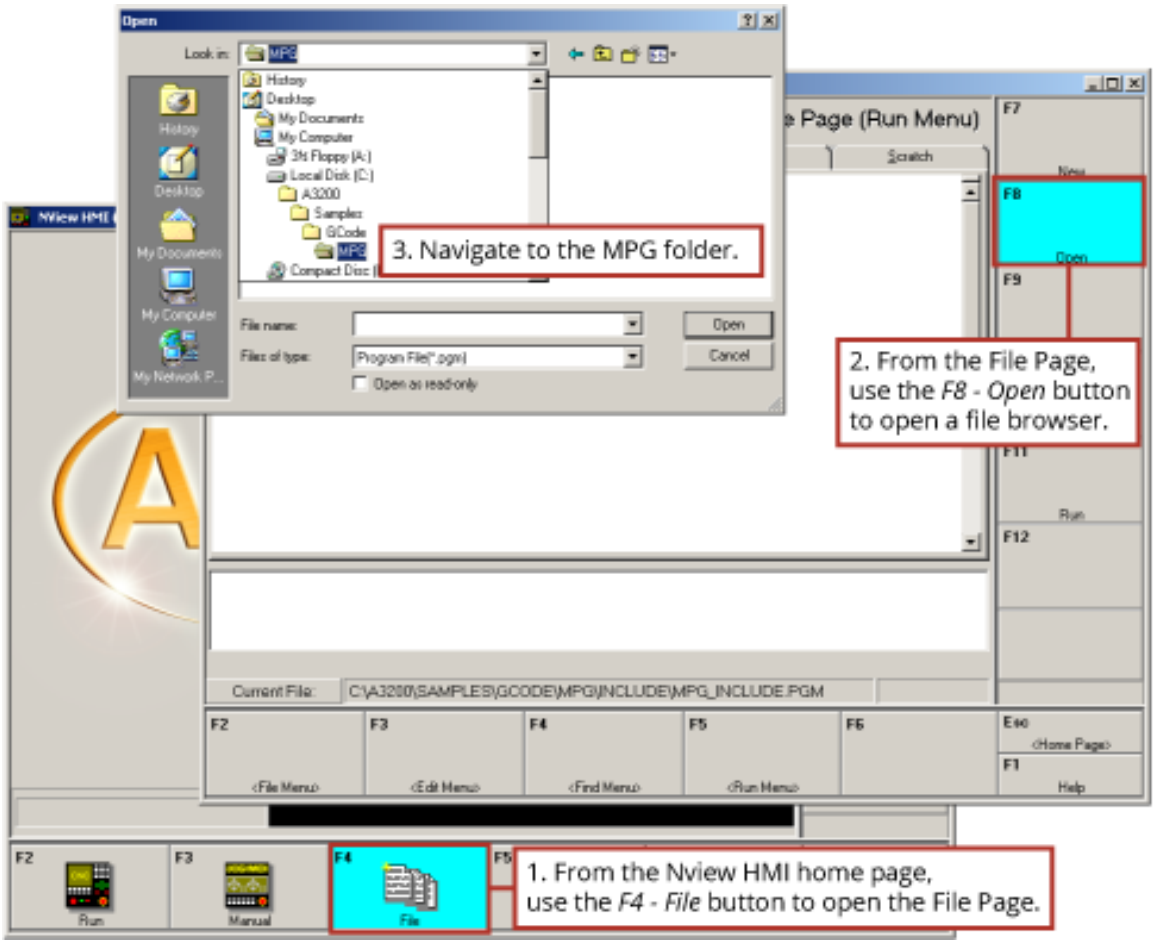

Figure 2-28: Opening the MPG Folder

There are six sub-folders within the MPG folder. Four sub-folders contain variations of the MPG.Pgm program required for the four models of the MPG. The MPG.Pgm defines the parameters by which the handwheel operates. The Include sub-folder contains MPG_INCLUDE.Pgm. The MPG_INCLUDE.Pgm sets global variables to allow the system to recognize the MPG.

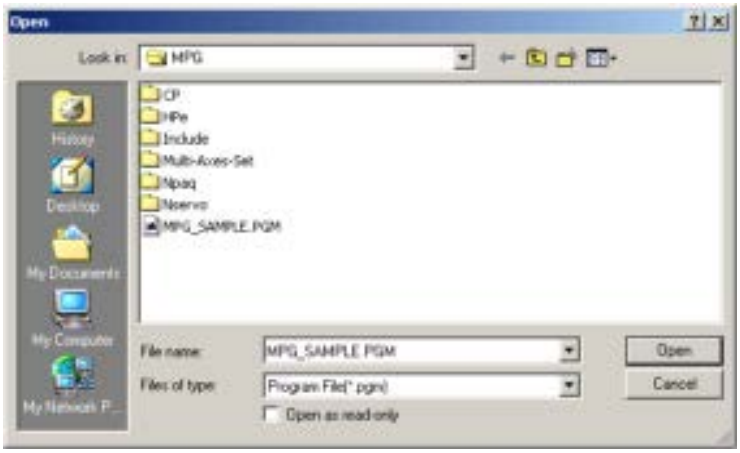

Figure 2-29: MPG Program Options

The following steps will show how to configure the MPG.Pgm, add the MPG_Include.Pgm and MPG.Pgm into program automation, and will also show how to open the sample program (MPG_SAMPLE.Pgm).

Step 1:

Open the MPG.Pgm for the model of your MPG (Npaq, Nservo, HPe, HLe, or CP/CL), from the appropriate sub-folder.

Modify the first six lines of the program beginning with "#define", changing the second column of axis names to match the names of the axes in your system.

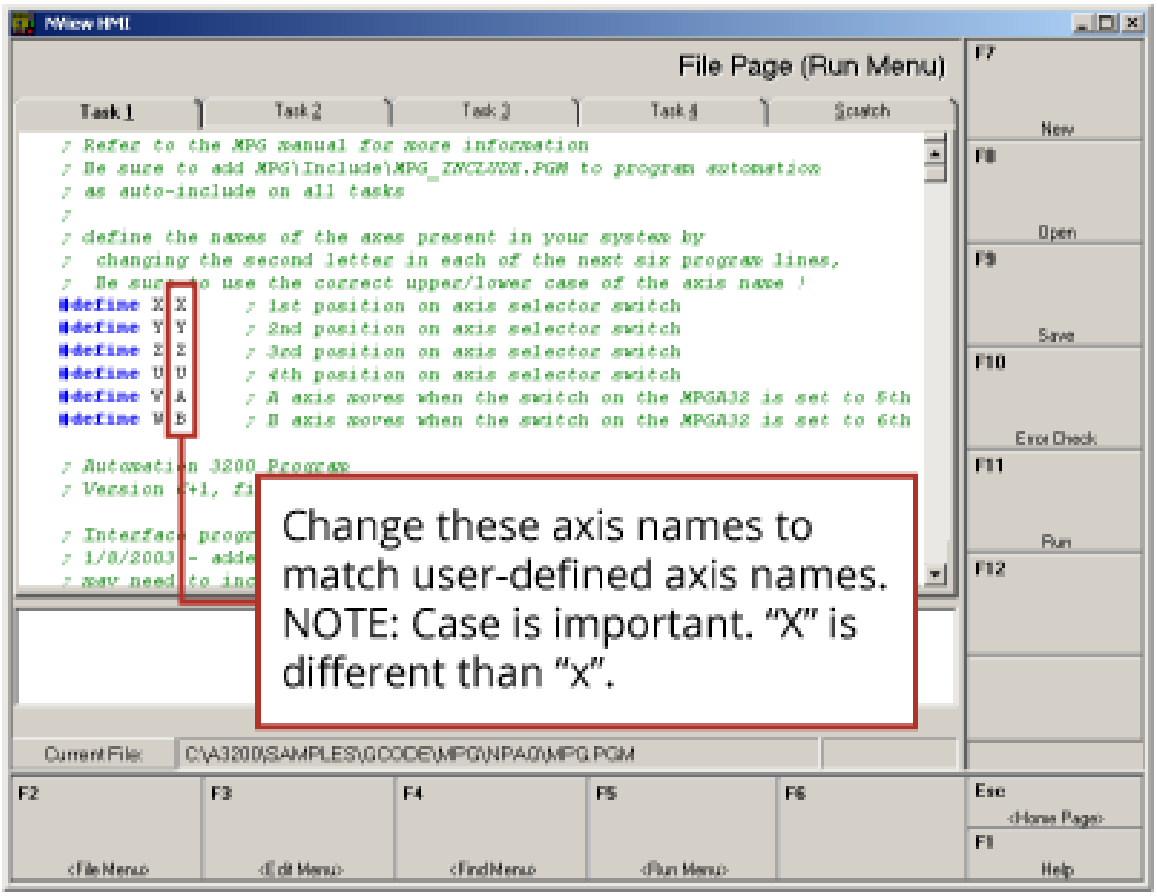

Figure 2-30: Assigning Axis Names

Step 2:

Define the distance (metric) of an axis move equal to one tick of the handwheel.

WARNING: If this distance is too large, Position Errors or other faults will occur as the axis motion is commanded by the MPG.

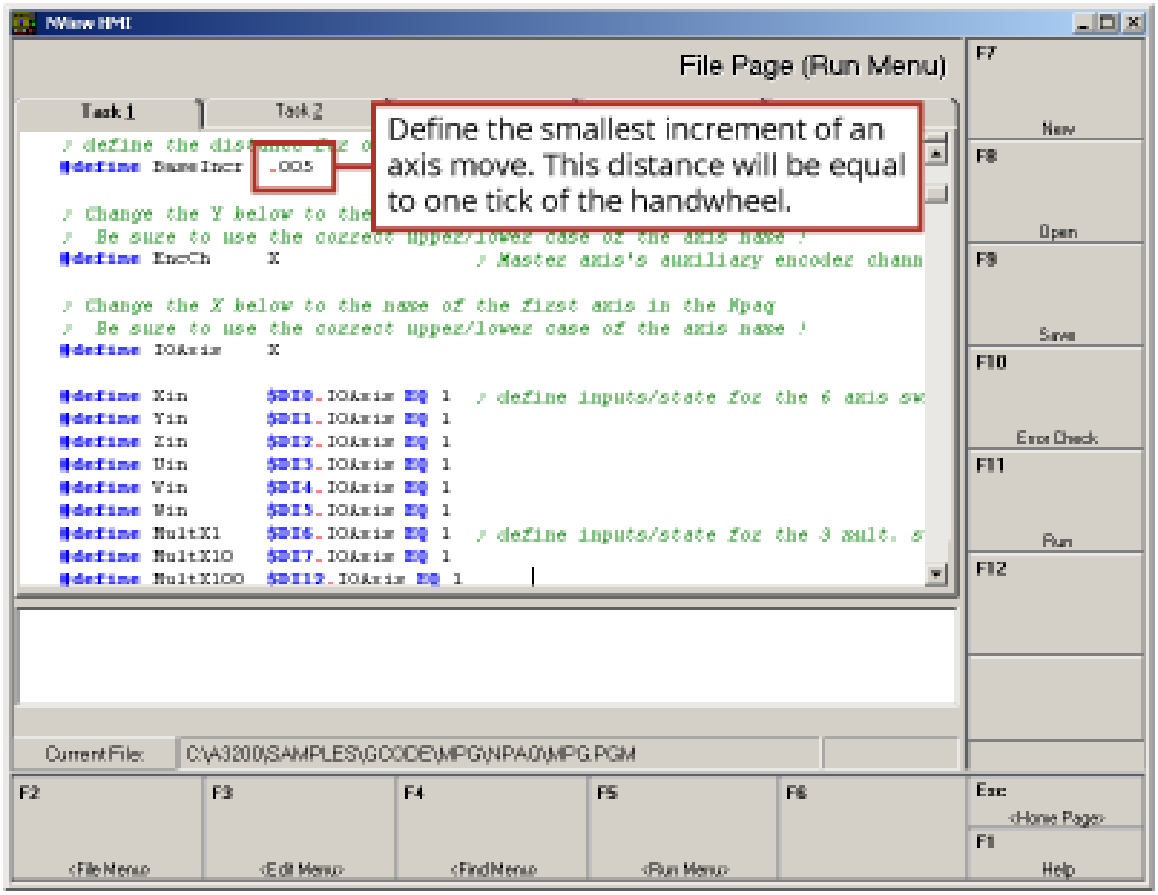

Figure 2-31: Defining Incremental Distance

Step 3:

Define the name of the axis that the MPG handwheel is connected to.

IMPORTANT: If connecting an MPG to an Npaq, the A3200 controller will expect the encoder channel of the MPG to be connected to the second auxiliary encoder channel of the Npaq (typically designated as the Y axis).

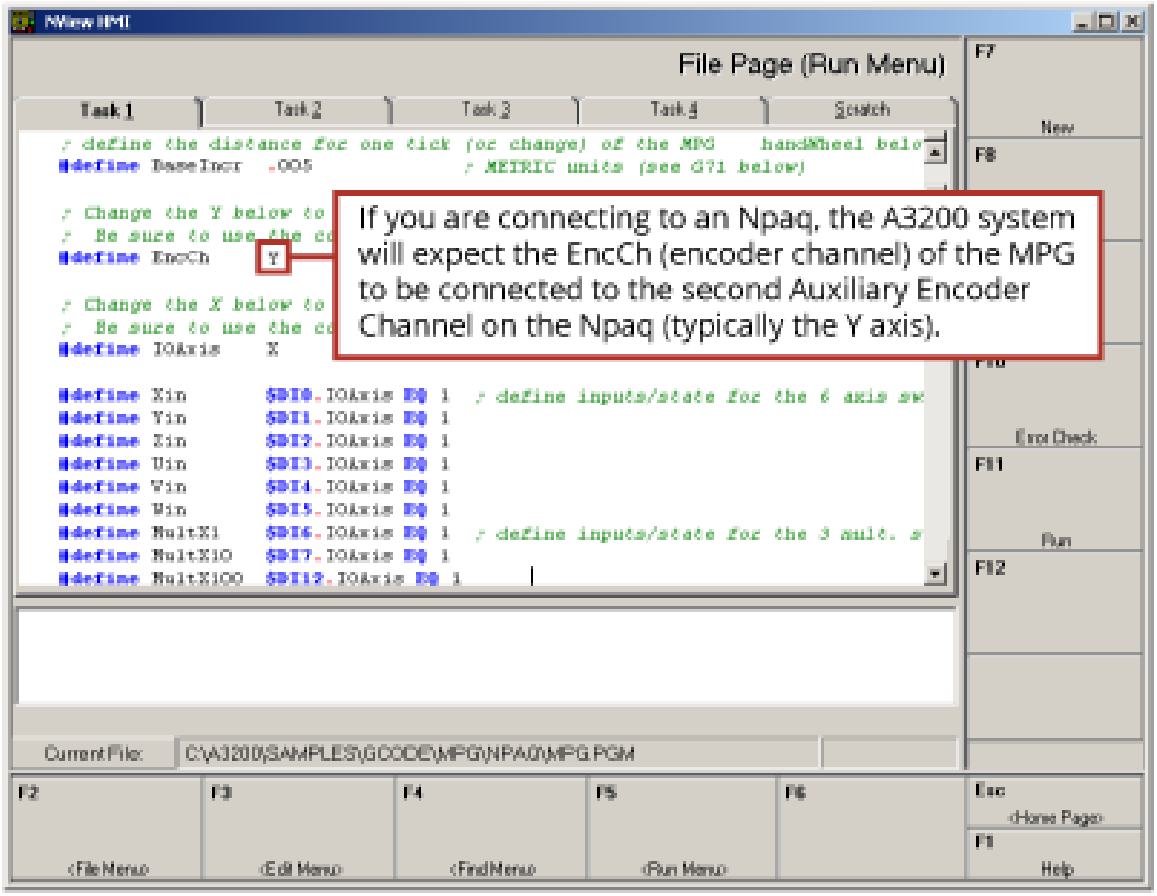

Figure 2-32: Defining the MPG Handwheel Connection (Npaq example shown)

Step 4:

Define the name of the axis that the MPG I/O is connected to.

IMPORTANT: If connecting an MPG to an Npaq, the A3200 controller will expect the I/O of the MPG to be connected to the first axis of the Npaq (typically designated as the X axis).

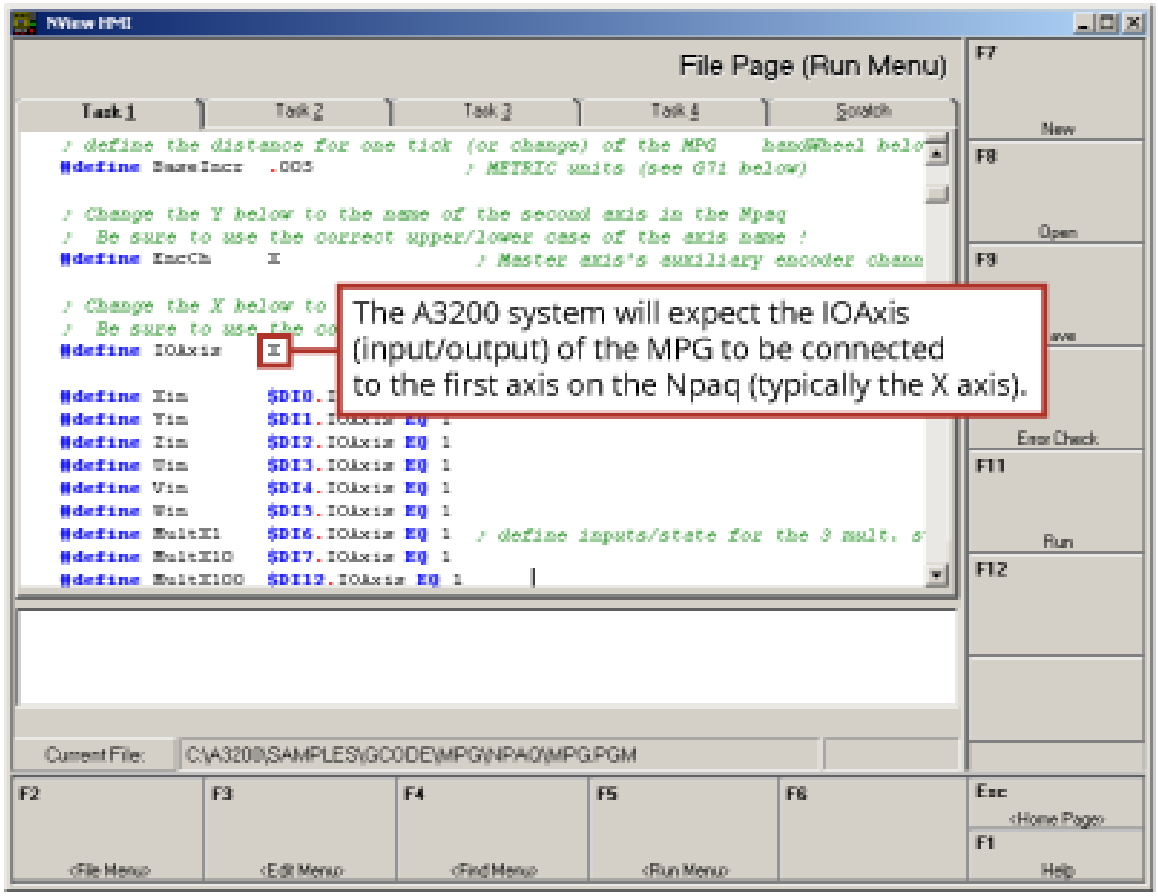

Figure 2-33: Defining the MPG I/O Connection (Npaq example shown)

Step 5:

Save any program changes before continuing and then return to the Nview HMI home page.

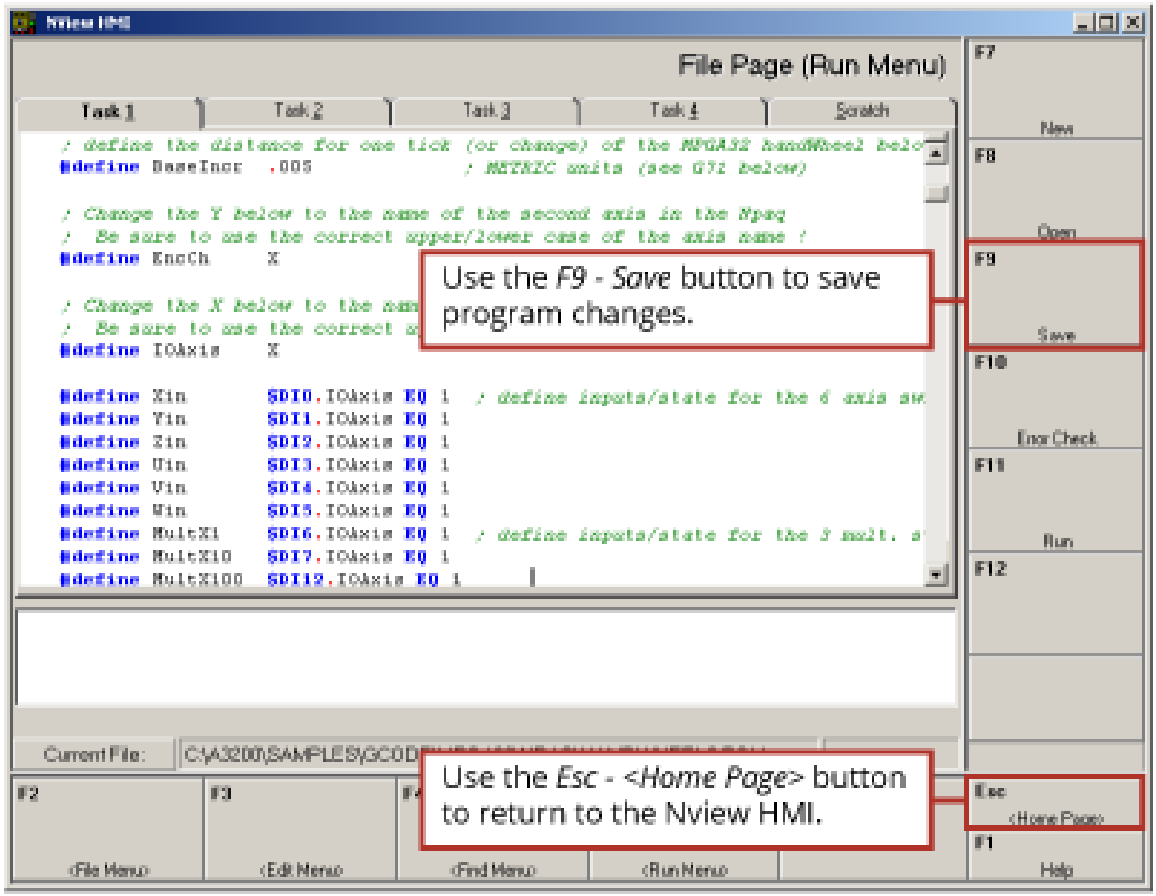

Figure 2-34: Save Program Changes

Step 6:

Open the Program Automation page. From the main screen of the Nview HMI, select F7-Setup page, then select F8-Program Automation.

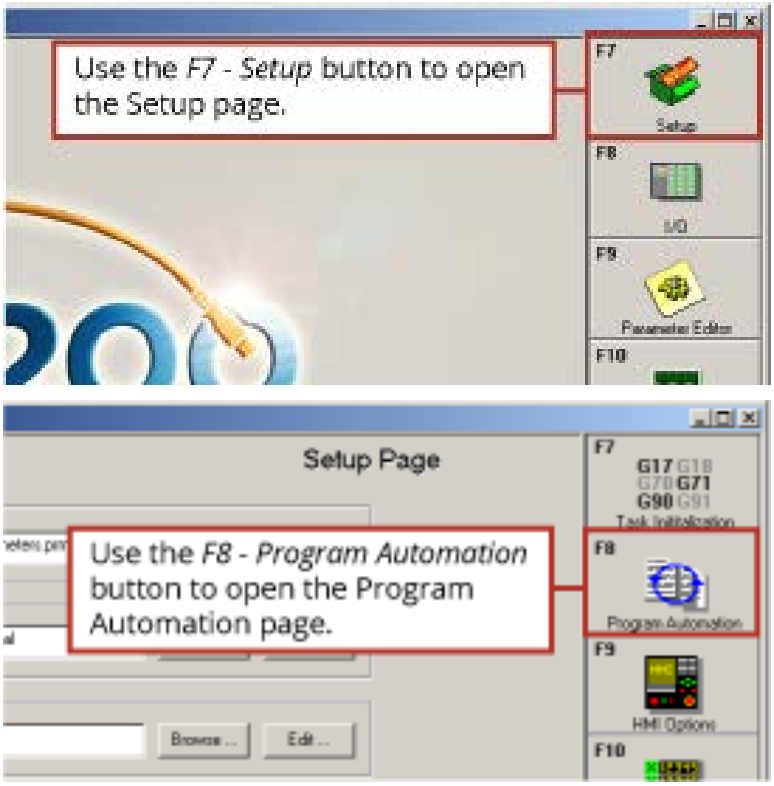

Figure 2-35: Opening the Program Automation Page

Step 7:

Add the MPG_INCLUDE.Pgm to the Program Automation Page file list by pressing the F7-Add button (Figure 2-30). The Add button will open the **Auto Program Setup** dialog box (Figure 2-31).

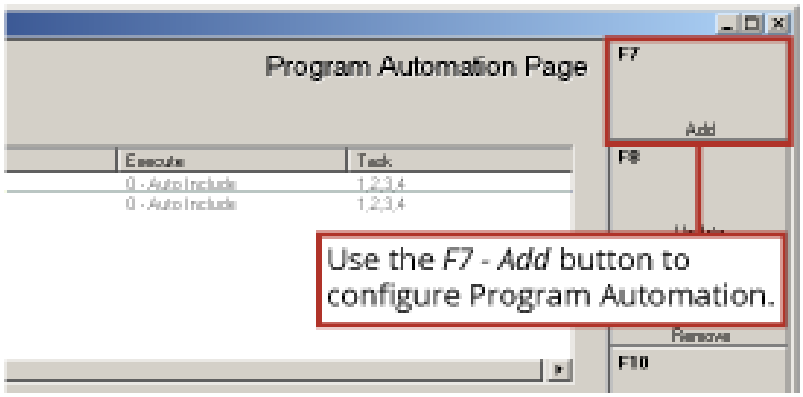

Figure 2-36: Configuring Program Automation

Navigate to the "C:\A3200\Samples\Gcode\MPG\Include" folder and select/open the MPG_Include.Pgm file.

Set the Execute Type field to "Auto Include" and set the Task of Execution to all tasks (check all task boxes). Click F3-Ok, when complete.

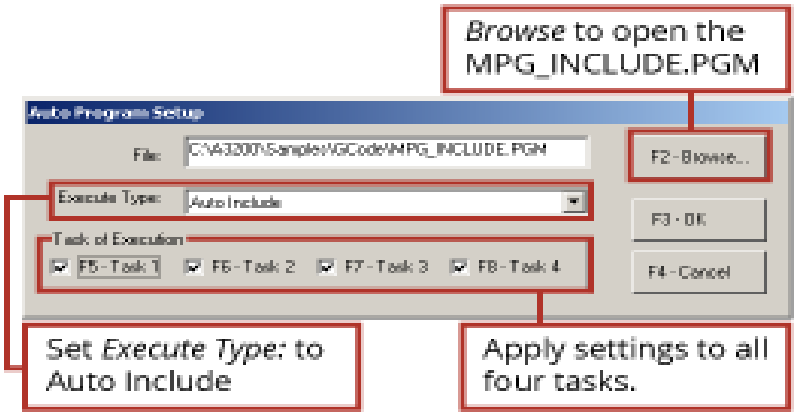

Figure 2-37: Configure Program Automation (MPG_INCLUDE.Pgm)

Step 8:

Add the MPG.Pgm to the Program Automation Page.

Open the **Auto Program Setup** dialog box (Figure 2-38).

Navigate to the "C:\A3200\Samples\Gcode\MPG" folder and select the MPG.Pgm based on the model of the MPG (choose from Ndrive HPe/HLe, Npaq, Nservo, and Ndrive CP/CL).

Set the Execute Type field to "Auto Run - Silent" and set the Task of Execution to "Task 2" (add a check mark to Task 2). Click F3-Ok, when complete.

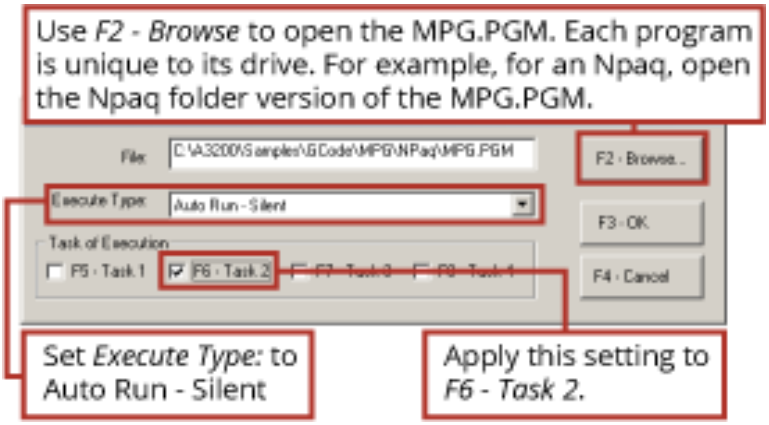

Figure 2-38: Configure Program Automation (MPG.Pgm)

When complete, the Program Automation should have two new entries similar to those highlighted in Figure 2-39.

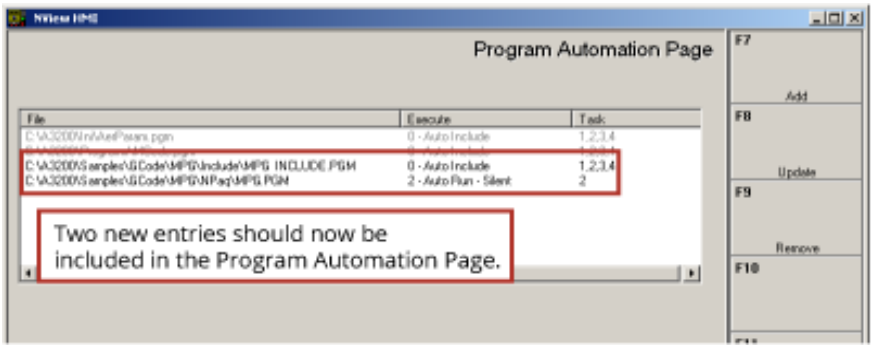

Figure 2-39: Completed Program Automation Configuration

Step 9:

Press the "ESC" button to return to the main page of the Nview HMI. When prompted to Reset, select Yes.

Figure 2-40: Reset to Activate Program Automation

Step 10:

After the Reset routine has completed, run the MPG_SAMPLE.Pgm.

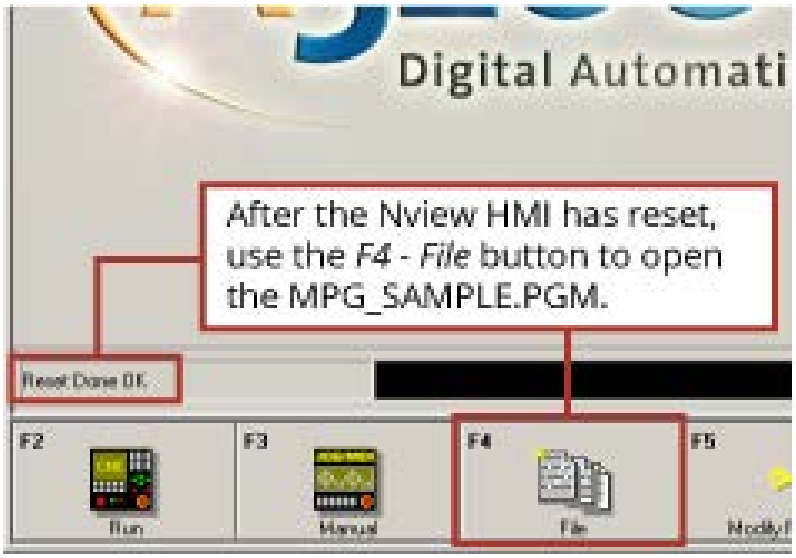

Figure 2-41: Confirm Reset Results

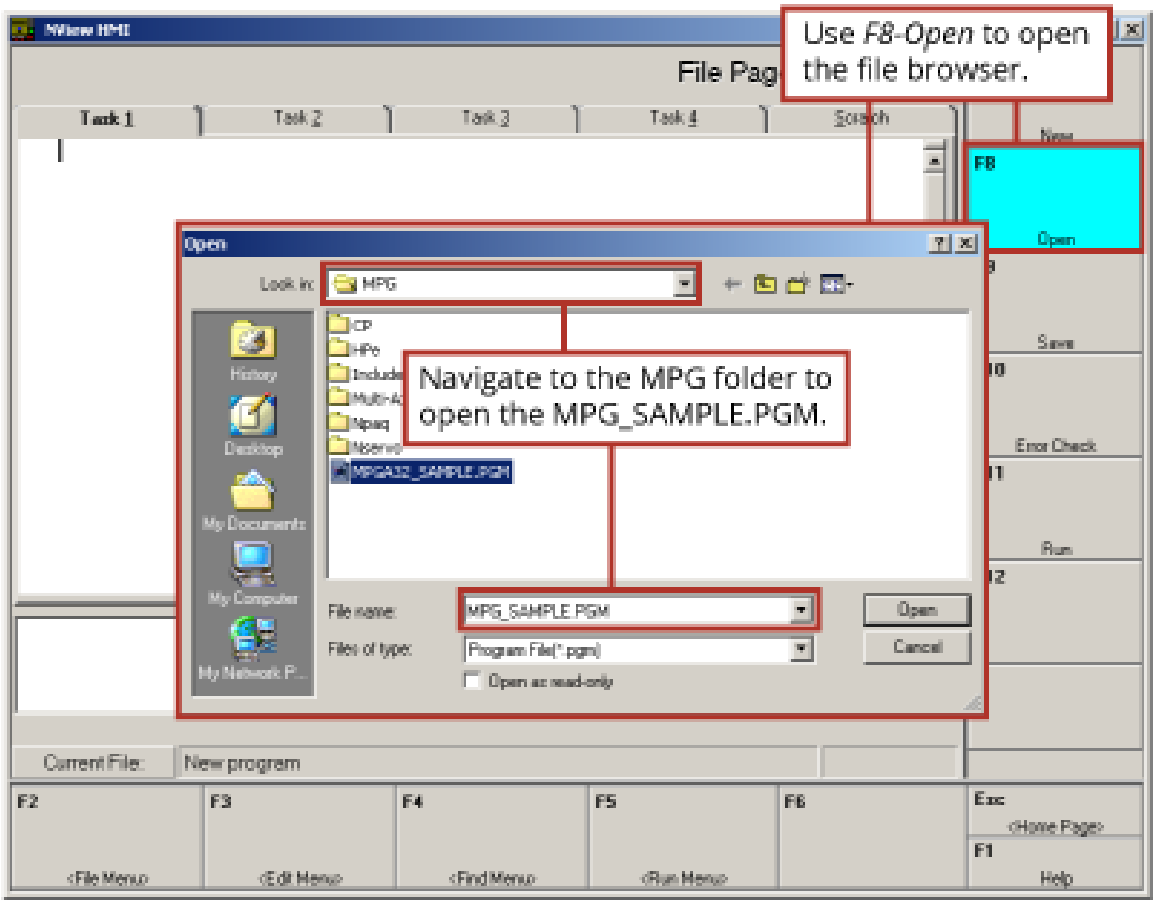

Figure 2-42: Opening the Sample Program (MPG_Sample.Pgm)

2.3. Ensemble Configuration Information

The MPG requires two AeroBasic programs running on secondary tasks to monitor the MPG switches and activate gearing to move the axes when the user rotates the manual pulse generator (MPG or handwheel). These two programs and other required files are distributed with the Ensemble software. They can be found in the \Program Files\Ensemble\Samples\AeroBasic\MPG folder.

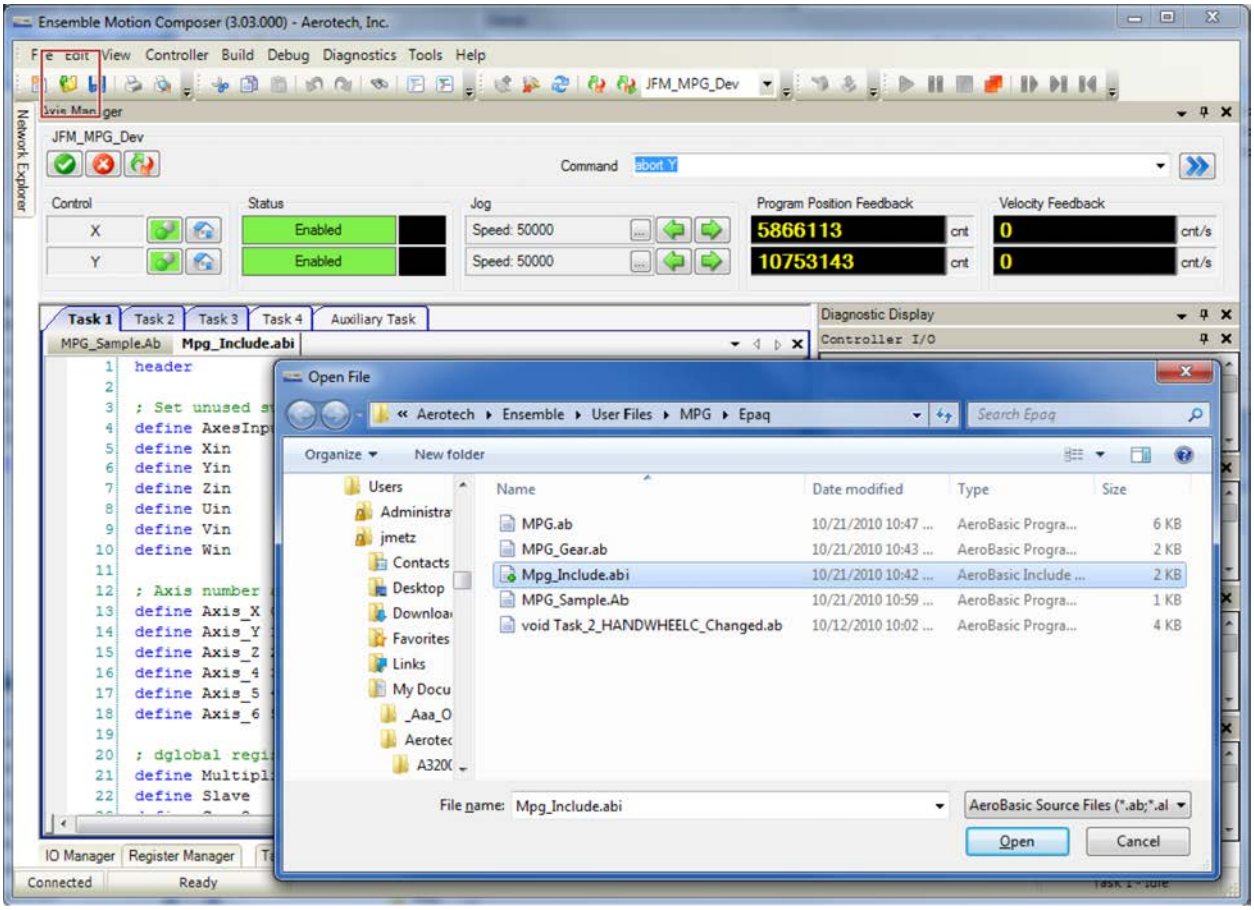

Figure 2-43: Opening the MPG Folder

The MPG.ab program monitors the MPG and includes the MPG_Include.ab file. MPG_Include.ab defines the parameters by which the MPG operates. The MPG_Include.ab file defines global variables that allow the user program to activate the MPG. The MPG_Sample.ab program illustrates a sample of how the MPG can be used in a user's program.

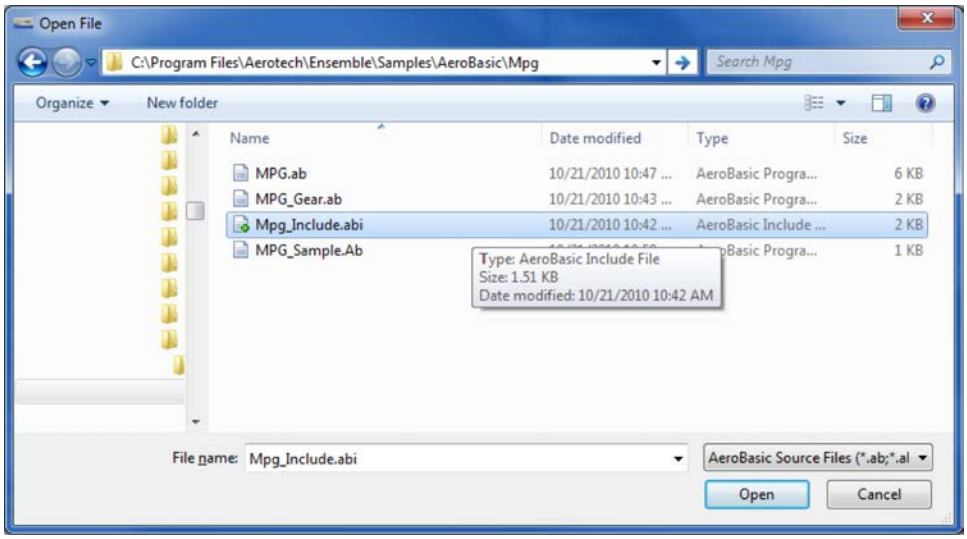

Figure 2-44: MPG Program Options

The following steps will show how to configure the MPG_Include.ab file and add the MPG.ab and MPG_Gear.ab programs to automatically run on the controller, as well as how to open the sample program (MPG_Sample.ab).

Step 1:

Open the MPG_Include.abi include file.

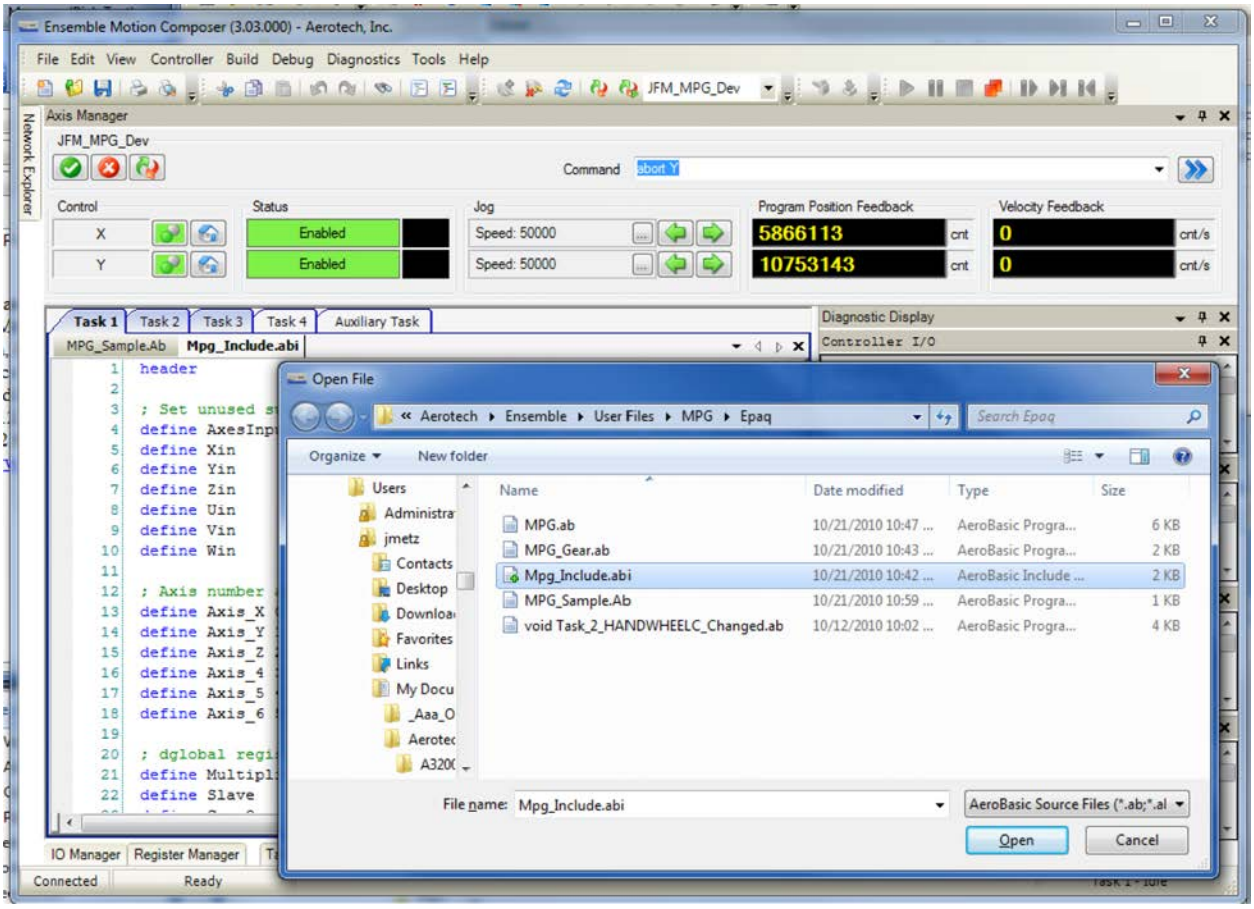

Figure 2-45: Open the MPG_Include.abi Include File

Step 2:

Modify lines 5-10 of the program beginning with "#define", changing the 0-5 numbers in the last column to -1, for any switch position of the MPG which will not command an axis to move.

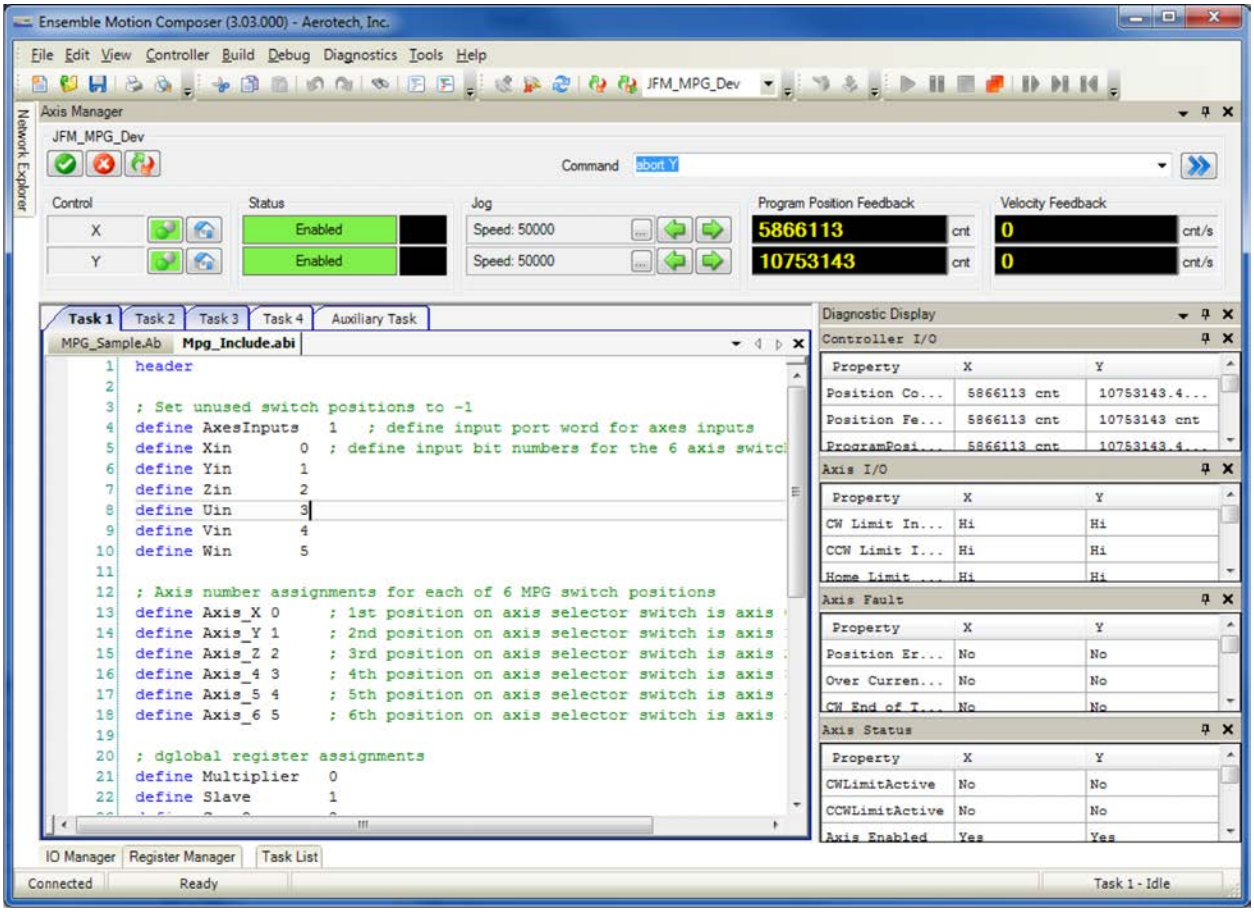

Figure 2-46: Assigning Axis Names

Modify lines 13-18 of the program beginning with "#define", changing the 0-5 numbers in the last column to define which axis number will be commanded to move by the six switch positions. Note that axis numbers are 0-based, so the first axis (typically X) will be represented by 0, the second axis (typically Y) would be 1, etc.

Step 3:

Define the number of encoder counts to move the axis, per tick (or change) of the handwheel.

WARNING: If this distance is too large, Position Errors or other faults will occur as the axis motion is commanded by the MPG.

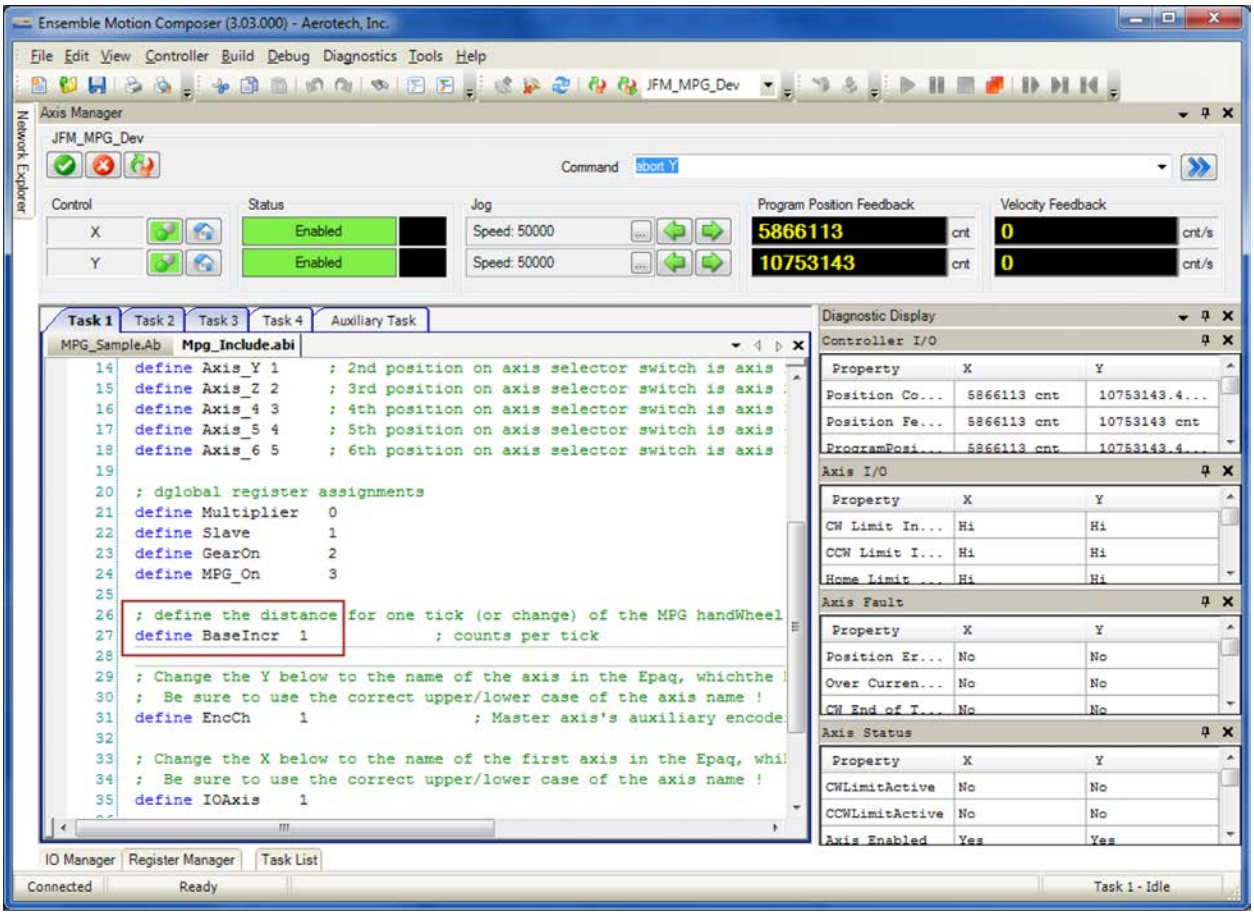

Figure 2-47: Defining Handwheel scaling

Step 4:

Define the 0-based axis index of the axis that the MPG handwheel is connected to.

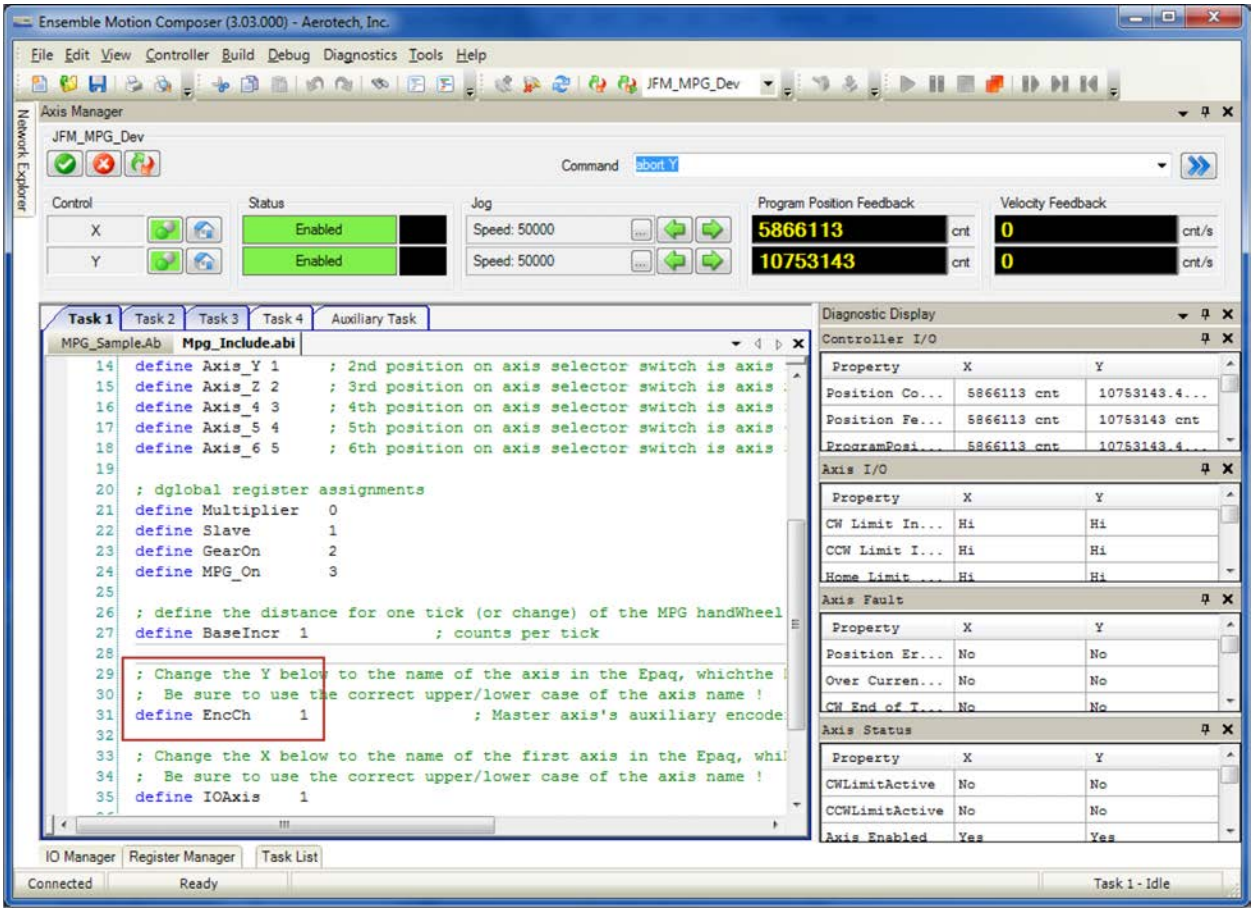

Figure 2-48: Defining the MPG Handwheel Connection

Step 5:

Define the 0-based axis index of the axis that the MPG I/O is connected to.

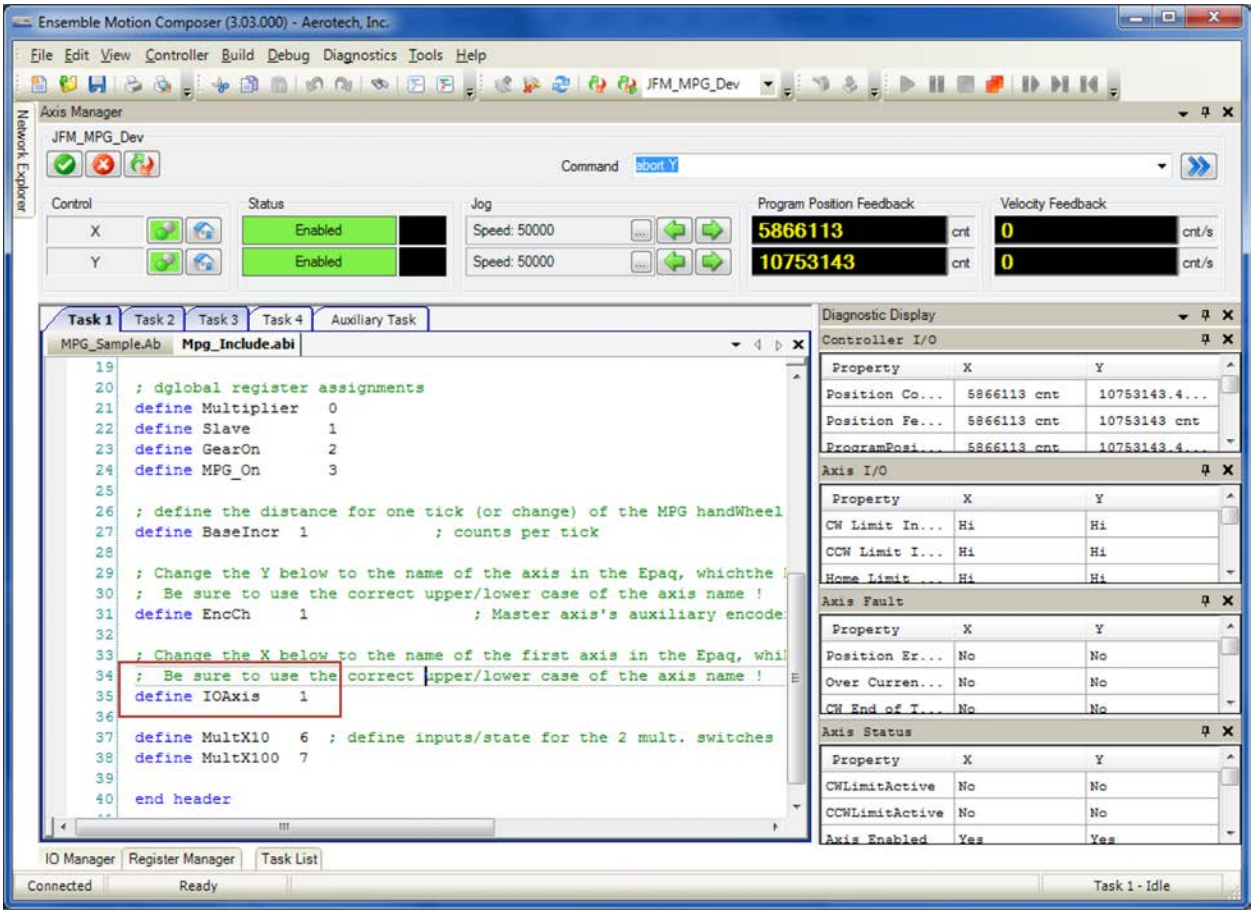

Figure 2-49: Defining the MPG I/O Connection

Step 6:

Save changes made to the file by clicking the save button on the toolbar, then close the file.

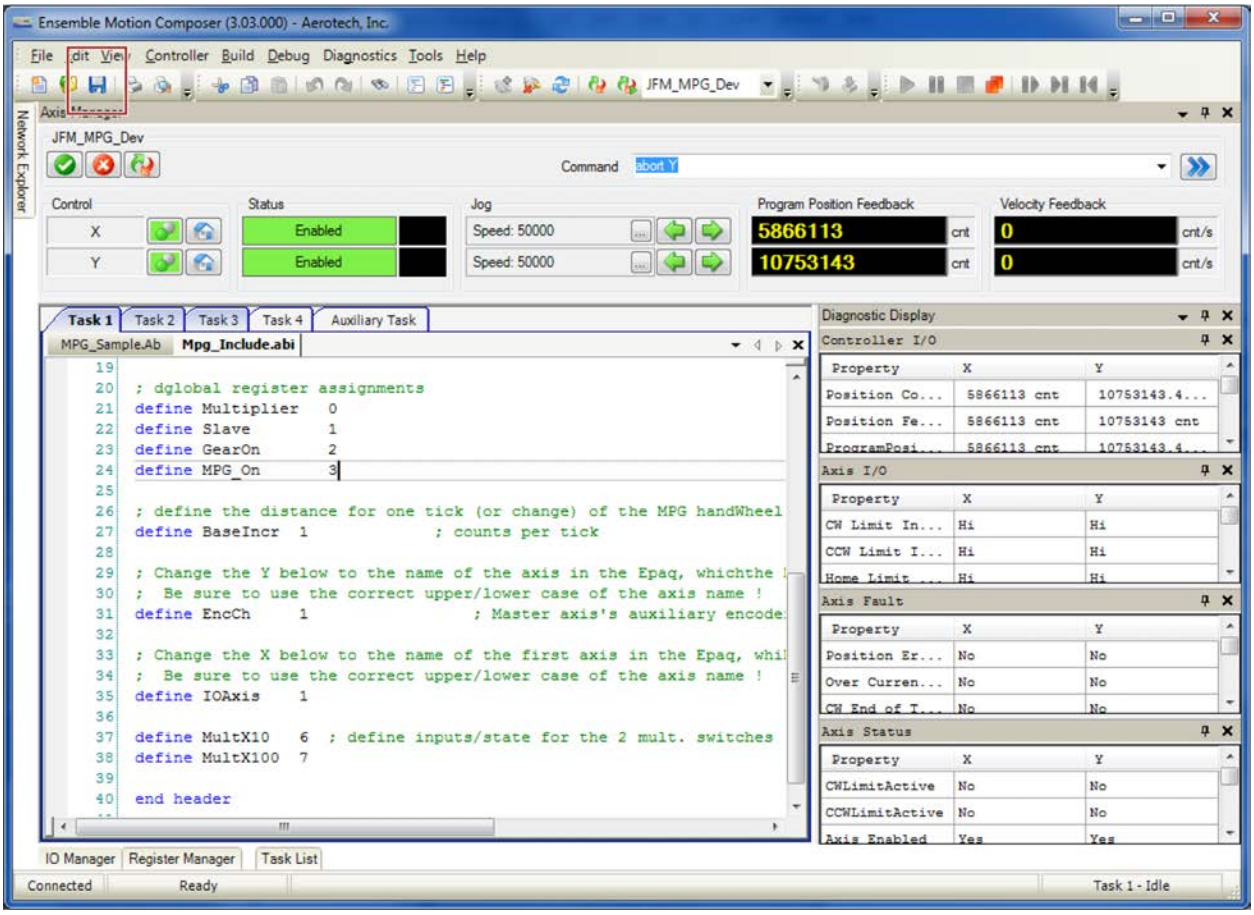

Figure 2-50: Save Program Changes

Step 7:

From within the Network Explorer of the HMI, drag the MPG.bcx file and the MPG_Gear.bcx files from the User Files to the File System on the controller to copy them to the controller.

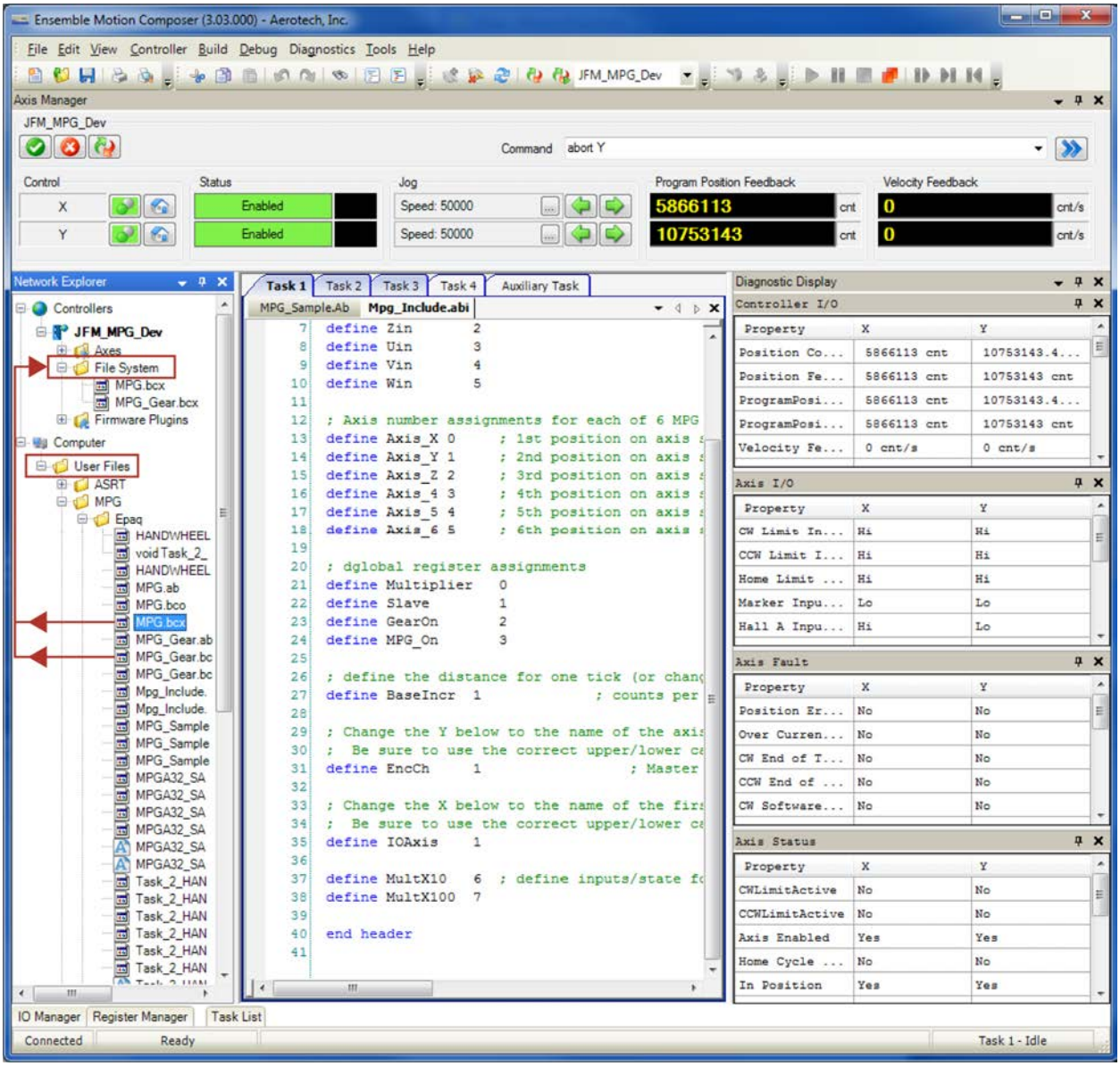

Figure 2-51: Copying Files to the Controller

Step 8:

Open the Configuration Manager from the Tools Menu

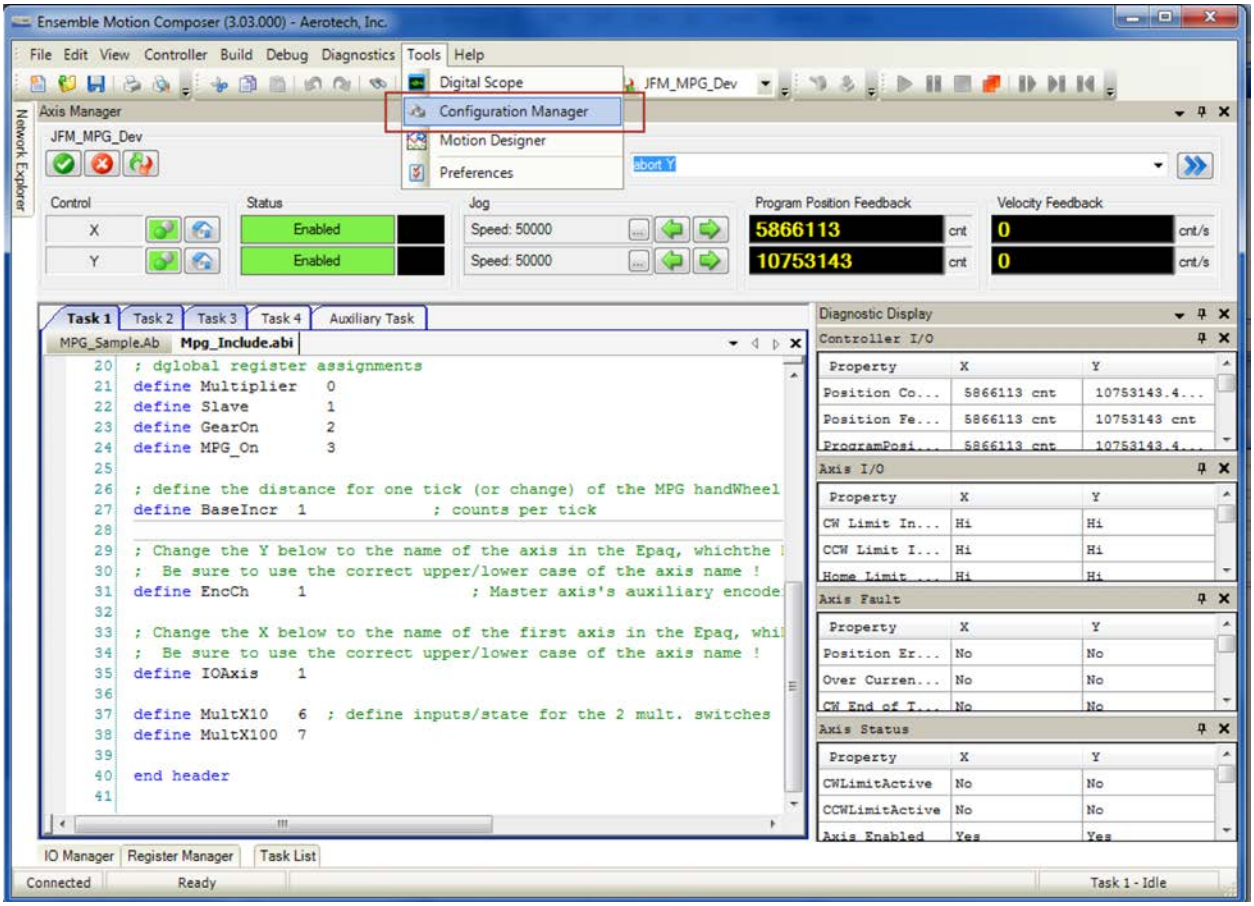

Figure 2-52: Opening the Configuration Manager

Step 9:

Retrieve the parameters from the controller and click the plus-sign symbol to the left, to expand the parameters and then select the Task parameters, so they are visible on the right side of the screen. Select the AutoRunProgram parameter for task 2 on the right side of the screen and then select the File Lookup button in the Editor area of the screen.

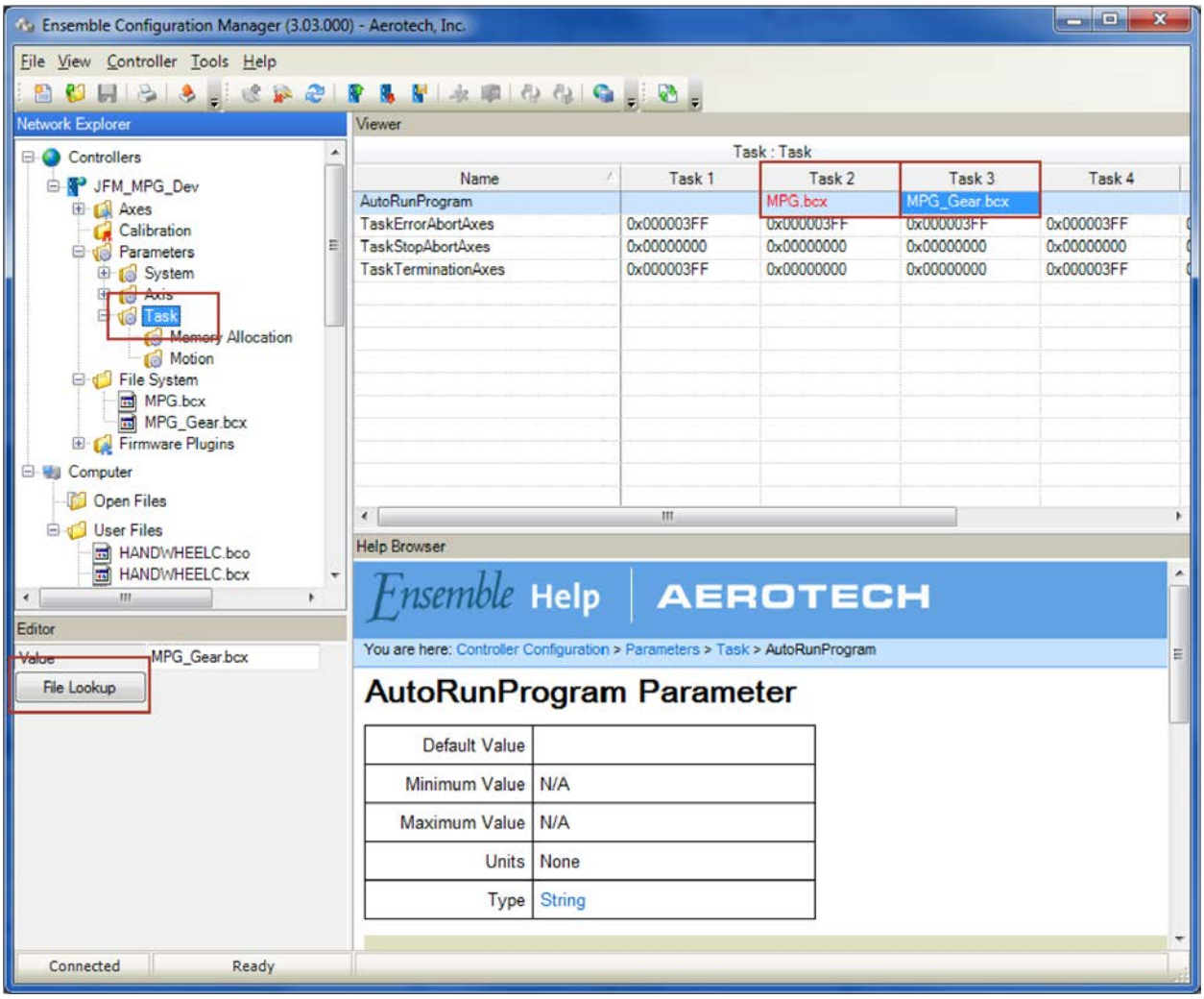

Figure 2-53: Select the Auto-Run Task parameters

Step 10:

Select MPG.bcx for the Task 2 AutoRunProgram and repeat Step 7 to select MPG_Gear.bcx for the Task 3 AutoRunProgram task parameters.

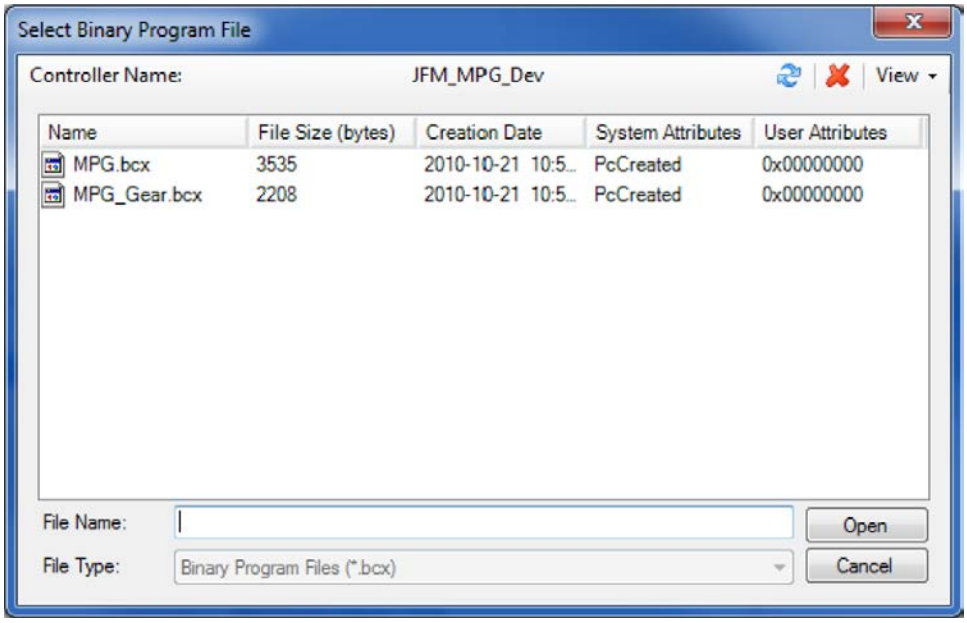

Figure 2-54: Configure the Auto-Run Task parameters

Step 11:

Highlight the System parameters then select the TaskExecutionSetup parameter on the right side of the screen in the Viewer. Now Check the Task 2 and Task 3 checkboxes in the Editor area of the screen in the lower left.

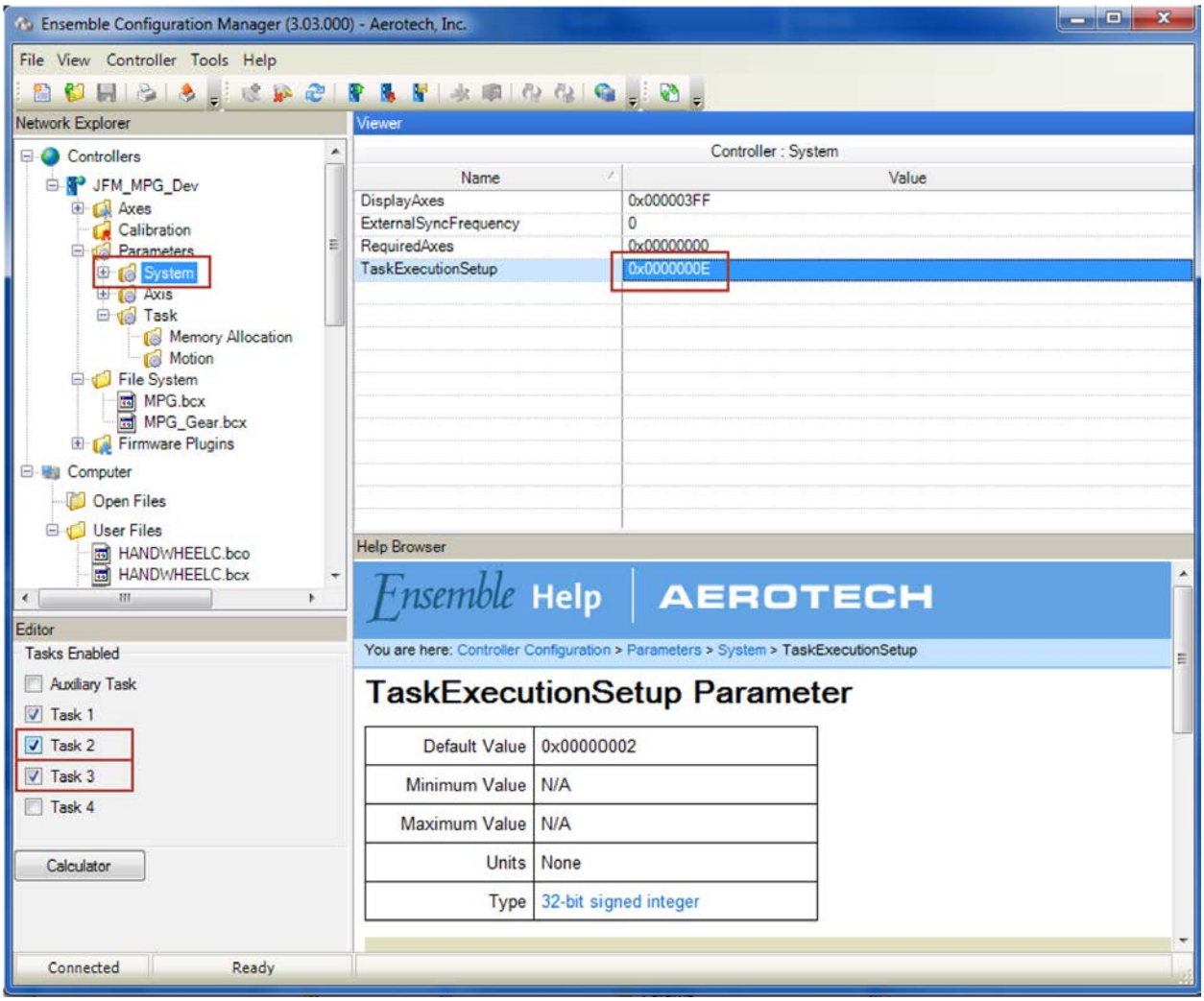

Figure 2-55: Activating Task 2 and Task 3 on the controller

Step 12:

Click the right mouse button on the controller name and select Send Parameters, then click the Reset Controller w/Auto-Run button.

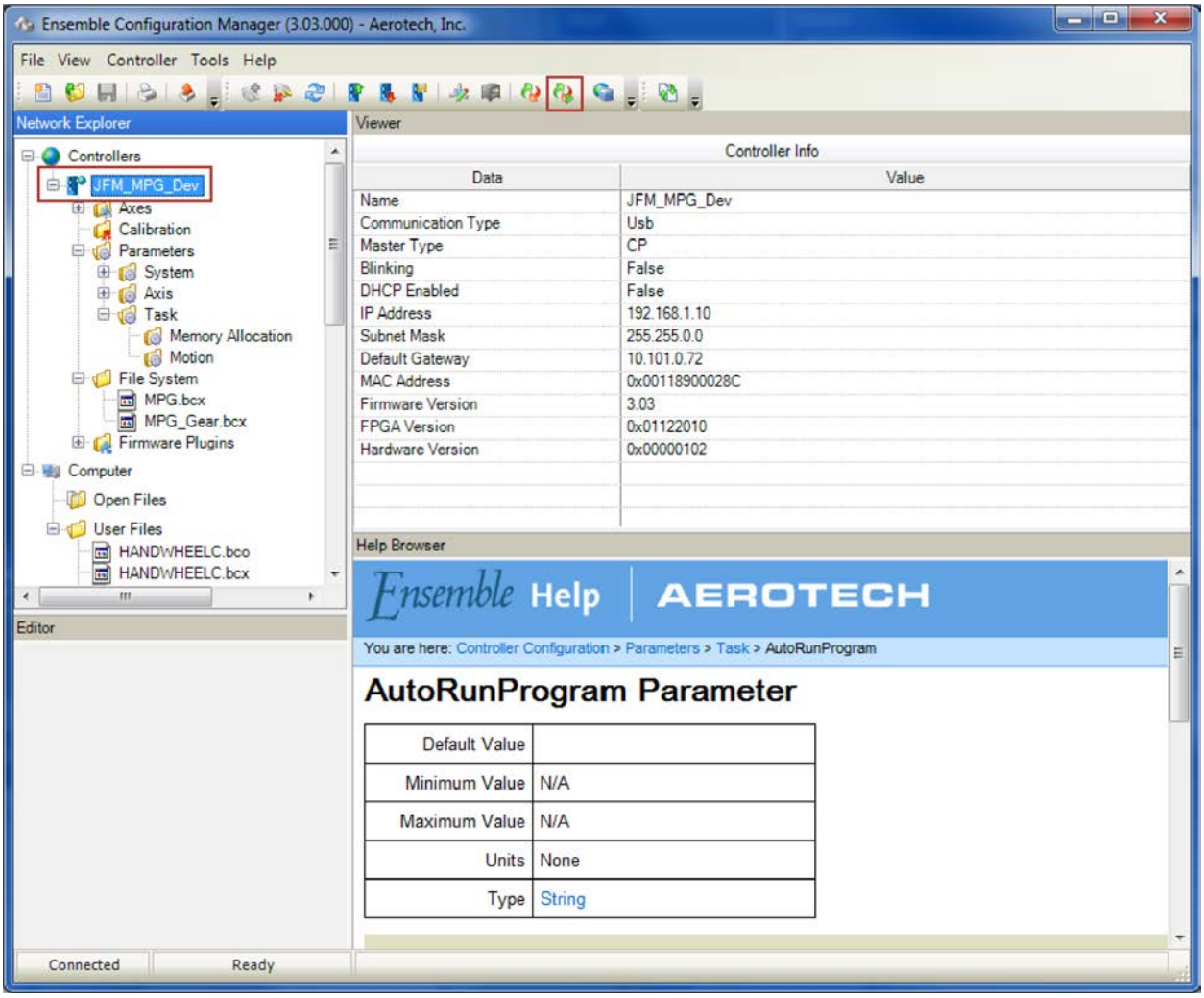

Figure 2-56: Sending the new parameters and Resetting the controller

Step 13:

After the Reset routine has completed, open and run the MPG_Sample.ab program on Task 1. The MPG_Sample.ab program illustrates how to enable the MPG from within a user program.

2.4. Operation Information

After configuring the controller for the MPG and enabling the MPG (for example, running the sample program) the MPG will be active.

With the MPG active:

1. Select an axis [**Axis Select** knob]
2. Set the distance increment [**Distance Multiplier** knob]
3. Depress the enable button [**ENABLE** button]

IMPORTANT: The ENABLE button acts as a "dead man switch" and must be depressed for the MPG to operate.

4. Rotate the Manual Pulse Generator [**Handwheel**] to manually fine tune position an axis.

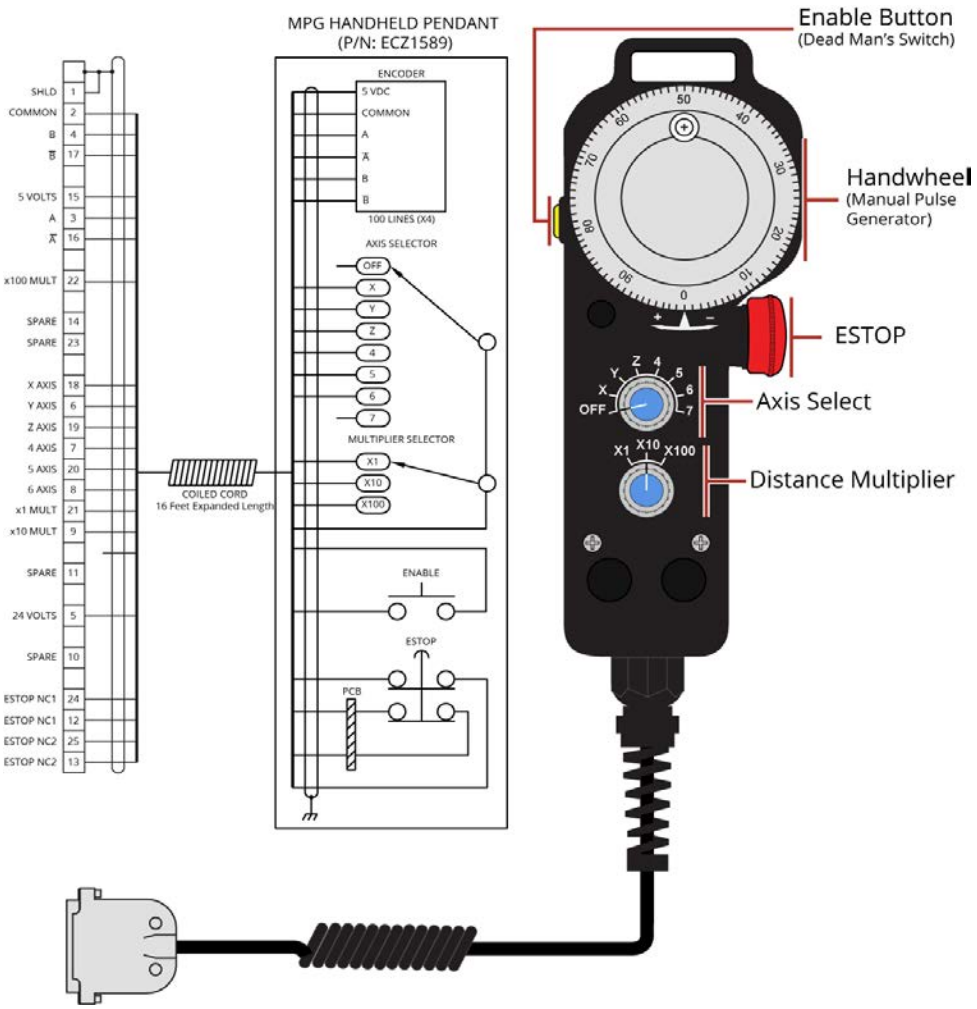

Figure 2-57: Using the MPG

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Chapter 3: Troubleshooting

This section covers symptoms, probable causes, and solutions related to MPG operation.

WARNING: There are no user-serviceable parts inside of the MPG.

WARNING: Disconnect power before you do service to the MPG.

WARNING: Voltages must be mechanically secured before you apply power to the MPG.

Table 3-1: Troubleshooting

Symptom	Possible Cause and Solution
Axes will not move	Axes are not enabled or the controller is not correctly configured to run the required MPG.Pgm program
	Dead-man switch is not depressed

3.1. Preventative Maintenance

The MPG and external wiring should be inspected monthly. Inspections may be required at more frequent intervals depending on the environment and use of the system.

WARNING: All service and maintenance must be performed by qualified personnel.

WARNING: Do not use of this product in a manner other than its intended use.

Table 3-2: Preventative Maintenance

Check	Action to be Taken
Visually inspect MPG enclosure for loose or damaged parts / hardware. **Note**: Internal inspection is not required.	Parts should be repaired as required. If internal damage is suspected, these parts should be checked and repairs made if necessary.
Check for fluids or electrically conductive material exposure.	Any fluids or electrically conductive material must not be permitted to enter the MPG.
Visually inspect all cables and connections.	Tighten or re-secure any loose connections. Replace worn or frayed cables. Replace broken connectors.

Cleaning

The MPG enclosure can be wiped with a clean, dry, soft cloth. The cloth may be slightly moistened if required with water or isopropyl alcohol to aid in cleaning if necessary. In this case, be careful not to allow moisture to enter the MPG or onto exposed connectors / components. Fluids and sprays are not recommended because of the chance for internal contamination, which may result in electrical shorts and/or corrosion. The electrical power must be disconnected from the MPG while cleaning. Do not allow cleaning substances or other fluids to enter the MPG or to get on to any of the connectors. Cleaning labels should be avoided to prevent removing label information.

Appendix A: Warranty and Field Service

Aerotech, Inc. warrants its products to be free from harmful defects caused by faulty materials or poor workmanship for a minimum period of one year from date of shipment from Aerotech. Aerotech's liability is limited to replacing, repairing or issuing credit, at its option, for any products that are returned by the original purchaser during the warranty period. Aerotech makes no warranty that its products are fit for the use or purpose to which they may be put by the buyer, whether or not such use or purpose has been disclosed to Aerotech in specifications or drawings previously or subsequently provided, or whether or not Aerotech's products are specifically designed and/or manufactured for buyer's use or purpose. Aerotech's liability on any claim for loss or damage arising out of the sale, resale, or use of any of its products shall in no event exceed the selling price of the unit.

THE EXPRESS WARRANTY SET FORTH HEREIN IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, BY OPERATION OF LAW OR OTHERWISE. IN NO EVENT SHALL AEROTECH BE LIABLE FOR CONSEQUENTIAL OR SPECIAL DAMAGES.

Return Products Procedure

Claims for shipment damage (evident or concealed) must be filed with the carrier by the buyer. Aerotech must be notified within thirty (30) days of shipment of incorrect material. No product may be returned, whether in warranty or out of warranty, without first obtaining approval from Aerotech. No credit will be given nor repairs made for products returned without such approval. A "Return Materials Authorization (RMA)" number must accompany any returned product(s). The RMA number may be obtained by calling an Aerotech service center or by submitting the appropriate request available on our website (www.aerotech.com). Products must be returned, prepaid, to an Aerotech service center (no C.O.D. or Collect Freight accepted). The status of any product returned later than thirty (30) days after the issuance of a return authorization number will be subject to review.

Visit https://www.aerotech.com/global-technical-support.aspx for the location of your nearest Aerotech Service center.

Returned Product Warranty Determination

After Aerotech's examination, warranty or out-of-warranty status will be determined. If upon Aerotech's examination a warranted defect exists, then the product(s) will be repaired at no charge and shipped, prepaid, back to the buyer. If the buyer desires an expedited method of return, the product(s) will be shipped collect. Warranty repairs do not extend the original warranty period.

Fixed Fee Repairs - Products having fixed-fee pricing will require a valid purchase order or credit card particulars before any service work can begin.

All Other Repairs - After Aerotech's evaluation, the buyer shall be notified of the repair cost. At such time the buyer must issue a valid purchase order to cover the cost of the repair and freight, or authorize the product(s) to be shipped back as is, at the buyer's expense. Failure to obtain a purchase order number or approval within thirty (30) days of notification will result in the product(s) being returned as is, at the buyer's expense.

Repair work is warranted for ninety (90) days from date of shipment. Replacement components are warranted for one year from date of shipment.

Rush Service

At times, the buyer may desire to expedite a repair. Regardless of warranty or out-of-warranty status, the buyer must issue a valid purchase order to cover the added rush service cost. Rush service is subject to Aerotech's approval.

On-site Warranty Repair

If an Aerotech product cannot be made functional by telephone assistance or by sending and having the customer install replacement parts, and cannot be returned to the Aerotech service center for repair, and if Aerotech determines the problem could be warranty-related, then the following policy applies:

Aerotech will provide an on-site Field Service Representative in a reasonable amount of time, provided that the customer issues a valid purchase order to Aerotech covering all transportation and subsistence costs. For warranty field repairs, the customer will not be charged for the cost of labor and material. If service is rendered at times other than normal work periods, then special rates apply.

If during the on-site repair it is determined the problem is not warranty related, then the terms and conditions stated in the following "On-Site Non-Warranty Repair" section apply.

On-site Non-Warranty Repair

If any Aerotech product cannot be made functional by telephone assistance or purchased replacement parts, and cannot be returned to the Aerotech service center for repair, then the following field service policy applies:

Aerotech will provide an on-site Field Service Representative in a reasonable amount of time, provided that the customer issues a valid purchase order to Aerotech covering all transportation and subsistence costs and the prevailing labor cost, including travel time, necessary to complete the repair.

Service Locations

http://www.aerotech.com/contact-sales.aspx?mapState=showMap

USA, CANADA, MEXICO
Aerotech, Inc.
Global Headquarters
Phone: +1-412-967-6440
Fax: +1-412-967-6870

CHINA
Aerotech China
Full-Service Subsidiary
Phone: +86 (21) 5508 6731

GERMANY
Aerotech Germany
Full-Service Subsidiary
Phone: +49 (0)911 967 9370
Fax: +49 (0)911 967 93720

TAIWAN
Aerotech Taiwan
Full-Service Subsidiary
Phone: +886 (0)2 8751 6690

UNITED KINGDOM
Aerotech United Kingdom
Full-Service Subsidiary
Phone: +44 (0)1256 855055
Fax: +44 (0)1256 855649

Have your customer order number ready before calling.

Appendix B: Revision History

Revision	Description
2.00	General Updates Section 2.1. • added XC4/XC4e connection information • added XR3 connection information
1.05	Revision changes have been archived. If you need a copy of this revision, contact Aero-techGlobal Technical Support.
1.04	
1.03	
1.02	
1.01	
1.00	

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