

# **MPG Handwheel Pendant**

# HARDWARE MANUAL

Revision 2.01



# 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 EN60947-5-5

Authorized Representative

/ Simon Smith, European Director Aerotech Ltd The Old Brick Kiln, Ramsdell, Tadley Hampshire RG26 5PR UK

Safety Requirements for Electrical Equipment Control circuit devices and switching elements

**Engineer Verifying** Compliance

Date

# (llox Minerel / Alex Weibel

Aerotech, Inc. 101 Zeta Drive Pittsburgh, PA 15238-2811 USA 9/21/2021

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### **Safety Procedures and Warnings**

**IMPORTANT**: This manual tells you how to carefully and correctly use and operate the handwheel pendant.

• Read all parts of this manual before you install or operate the handwheel pendant 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 Aerotech Global Technical Support.



This product has been designed for light industrial manufacturing or laboratory environments. If the product is used in a manner not specified by the manufacturer:

- The protection provided by the equipment could be impaired.
- The life expectancy of the product could be decreased.

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

- 1. Make sure that all system cables are correctly attached and positioned.
- 2. Do not use the cables or the connectors to lift or move this product.
- 3. Use this product only in environments and operating conditions that are approved in this manual.
- 4. Only trained operators should operate this equipment.

## **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 userprovided 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)		

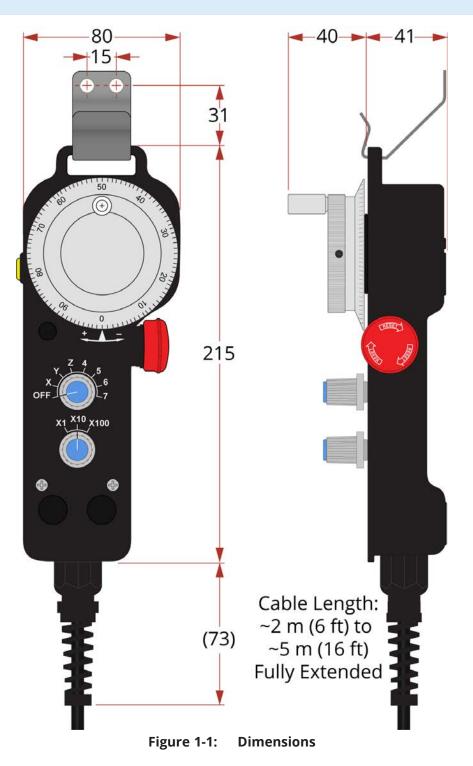


**IMPORTANT**: The user must provide a 24 VDC (500 mA) power supply.

## 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.



## **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)	
Ambient remperature	Storage: -20° to 70°C (-4° to 158° F)	
HumidityMaximum relative humidity is 80% for temperatures up to 31°HumidityDecreasing 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.	

## **Chapter 2: Installation and Configuration**

### 2.1. MPG Connections

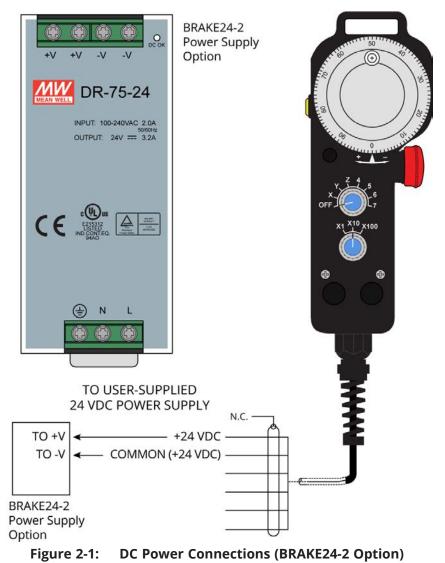
Each MPG adapter cable is labeled to identify the receiving connector on the drive.



**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.



#### **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.

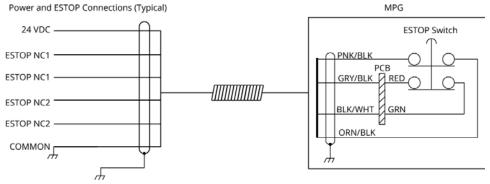
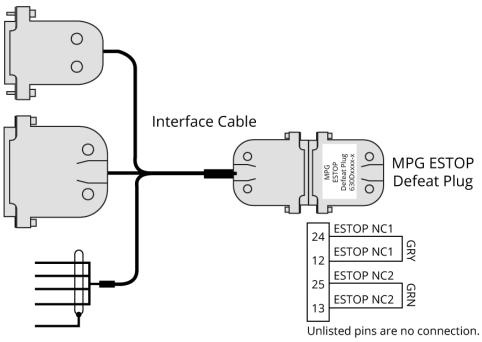


Figure 2-2: ESTOP Detail

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.





#### 2.1.1. Connect the MPG to the Automation1 XC4/XC4e

The drive (iXC4, XC4, iXC4e, 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 2-1: XC4/XC4e Adapter Cable Connector Pinout			
Connector	Pin	Description	
	1	Common	
	2	Input 0 (X Axis)	
	3	Input 1 (Y Axis)	
	4	Input 2 (Z Axis)	
DIGITAL IN 1	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)	
	17	Input 8 (x100 Distance Multiplier)	
	10	Cosine	
	11	Cosine-N	
AUX I/O	12	5 V	
AUX 1/0	1	Sine	
	2	Sine-N	
	21	Common	
	24	Common	
	RED	24 VDC	
To: User-Supplied Power Supply (Flying Leads)	BLK	Common	
	GRN	ESTOP NC1	
	BRN	ESTOP NC1	
	ORN	ESTOP NC2	
	YEL	ESTOP NC2	
	GRN/WHT	To Frame Ground	

#### Table 2-1: XC4/XC4e Adapter Cable Connector Pinout

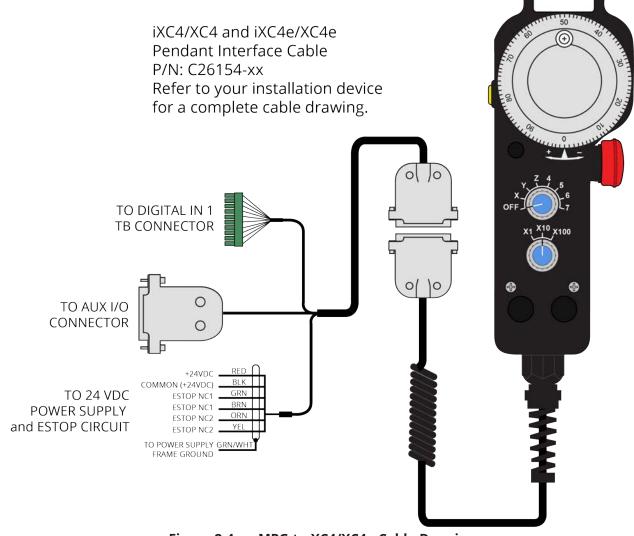


Figure 2-4: MPG to XC4/XC4e Cable Drawing

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 2-5.

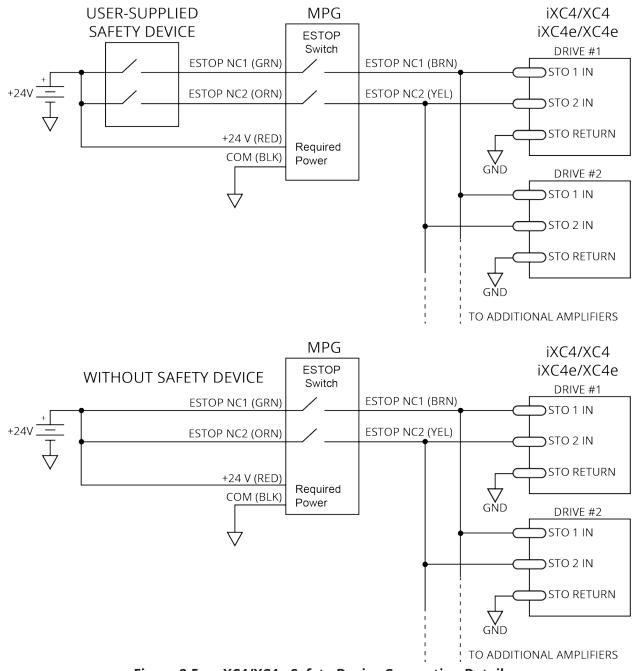


Figure 2-5: XC4/XC4e Safety Device Connection Detail

#### 2.1.2. Connect the MPG to the Automation1 XI4

The XI4 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.

Connector	Pin	Description
	19	Input Common
	6	Input 0 (X Axis)
	20	Input 1 (Y Axis)
	7	Input 2 (Z Axis)
	21	Input 3 (4 Axis)
DIGITAL I/O	8	Input Common
DIGITALINO	22	Input 4 (5 Axis)
	9	Input 5 (6 Axis)
	23	Input 6 (x1 Multiplier)
	10	Input 7 (x10 Multiplier)
	11	High Speed Input + (x100 Multiplier)
	24	High-Speed Input -
	6	Auxiliary Cosine
	19	Auxiliary Cosine-N
AXIS	8	5 V
AAIS	5	Auxiliary Sine
	18	Auxiliary Sine-N
	21	Common
	RED	24 VDC
To: User-Supplied Power Supply (Flying Leads)	BLK	Common
	GRN	ESTOP NC1
	BRN	ESTOP NC1
Supply (Light Leads)	ORN	ESTOP NC2
	YEL	ESTOP NC2
	GRN/WHT	To Frame Ground

 Table 2-2:
 XI4 Adapter Cable Connector Pinout

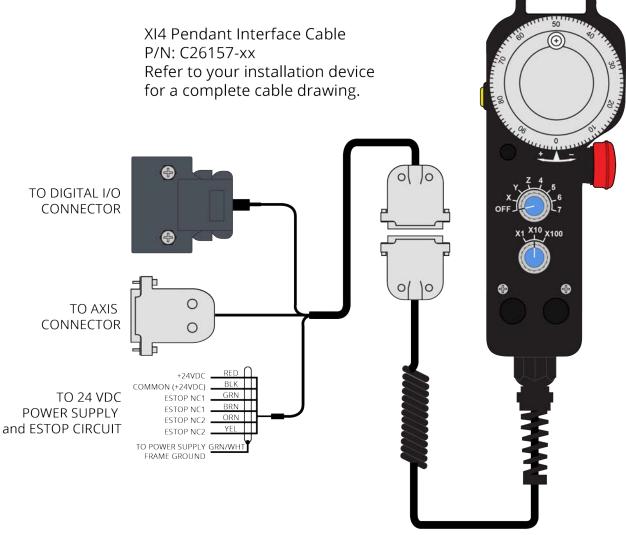


Figure 2-6: MPG to XI4 Cable Drawing

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.

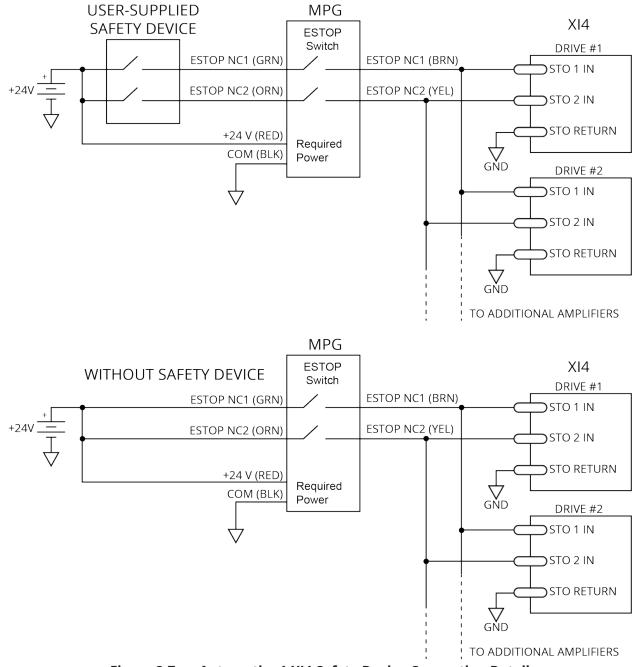


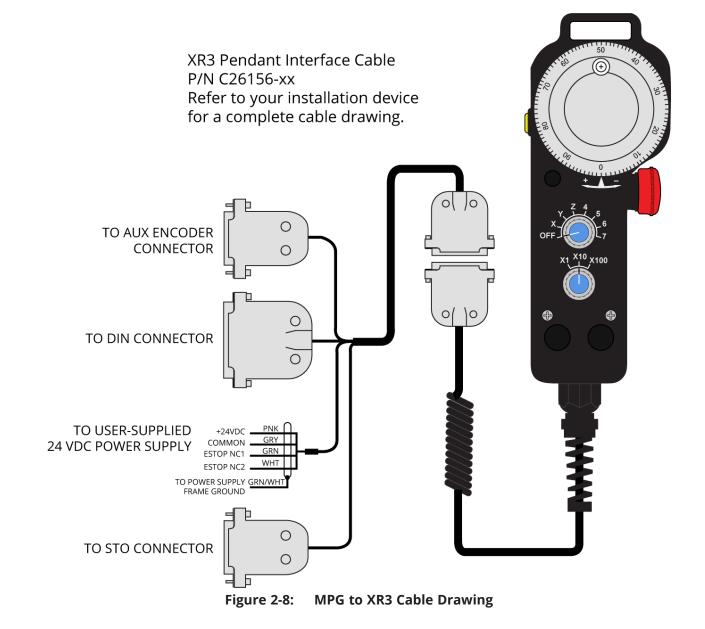
Figure 2-7: Automation1 XI4 Safety Device Connection Detail

#### 2.1.3. Connect the MPG to the Automation1 XR3

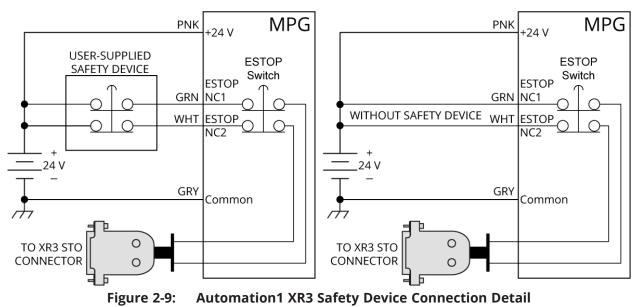
Connect to the Aux Encoder, DIN , and STO connectors and use digital input bits 0 through 8. The handwheel uses the second auxiliary encoder input channel.

Table 2-3: XR3 Adapter Cable Connector Pinout

Table 2-5. ANS Adapter cable of		
Connector	Pin	Description
	25	Кеу
	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)
DIN	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
	8	Cosine
	3	Cosine-N
AUX ENCODER	4	5 V
AOX ENCODER	1	Sine
	6	Sine-N
	2	Common
	6	STO 1-
STO	7	STO 2-
510	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



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 2-9.



## **Chapter 3: 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.

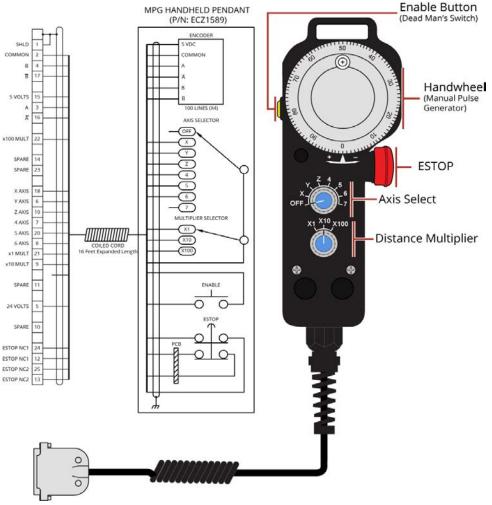


Figure 3-1: Using the MPG

## **Chapter 4: 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 4-1: Troubleshooting			
Symptom	Symptom Possible Cause and Solution		
Axes will not	Axes are not enabled or the controller is not correctly configured to run the required MPG.Pgm program		
move	Dead-man switch is not depressed		

### 4.1. 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 4-2:
 Preventative Maintenance

Check	Action to be Taken
Visually inspect MPG enclosure for loose or damaged parts / hardware.	Parts should be repaired as required. If internal damage is suspected, these parts should be
<b>Note</b> : Internal inspection is not required.	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 Global Technical Support Portal 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

**TAIWAN** Aerotech Taiwan Full-Service Subsidiary **CHINA** Aerotech China Full-Service Subsidiary

**UNITED KINGDOM** Aerotech United Kingdom Full-Service Subsidiary **GERMANY** Aerotech Germany Full-Service Subsidiary

## **Appendix B: Legacy Devices**

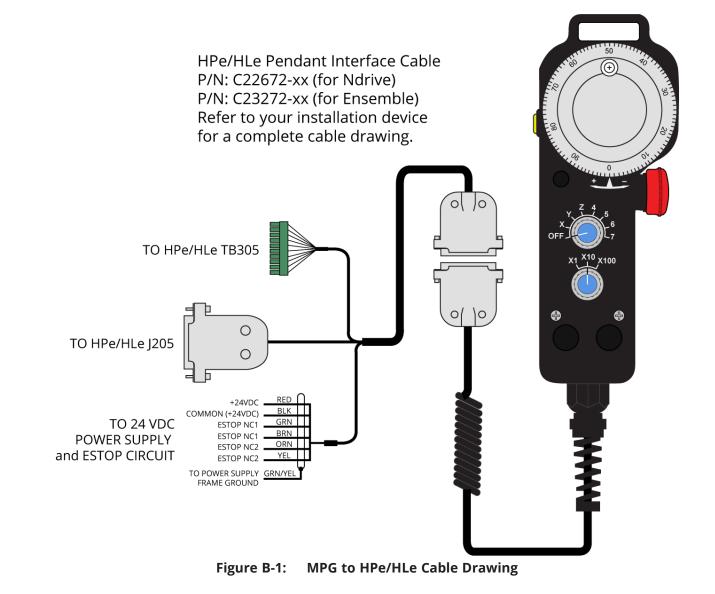
### **B.1. Connecting the MPG**

#### B.1.1. 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 B-1:
 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)
		<b>ENSEMBLE</b> : Input 6 (x10 Distance Multiplier)
	9	NDRIVE: Input 7 (x10 Distance Multiplier)
		<b>ENSEMBLE</b> : 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



## B.1.2. 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 B-2: CP/CL Adapter d		
Connector	Pin	Description
	1	Common
	2	Input 0 (X Axis)
	3	Input 1 (Y Axis)
	4	Input 2 (Z Axis)
	5	Input 3 (4 Axis)
TB204 [DIGITAL IN]	6	Input 4 (5 Axis)
	7	Input 5 (6 Axis)
	8	NDRIVE: Input 6 (x1 Distance Multiplier)
	0	<b>ENSEMBLE</b> : Input 6 (x10 Distance Multiplier)
	9	NDRIVE: Input 7 (x10 Distance Multiplier)
	9	<b>ENSEMBLE</b> : Input 7 (x100 Distance Multiplier)
	10	Ground
	17	NDRIVE: Input 8 (x100 Distance Multiplier)
	17	ENSEMBLE: N/C
	10	Cosine
CL: J105 [AUX I/O]	11	Cosine-N
	12	5 V
CP: J104 [AUX I/O]	1	Sine
	2	Sine-N
	21	Common
	24	Common
	RED	24 VDC
	BLK	Common
Ter Llear Cumplied Dower	GRN	ESTOP NC1
To: User-Supplied Power Supply (Flying Leads)	BRN	ESTOP NC1
Supply (Fightig Leaus)	ORN	ESTOP NC2
	YEL	ESTOP NC2
	GRN/YEL	To Frame Ground
1		

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

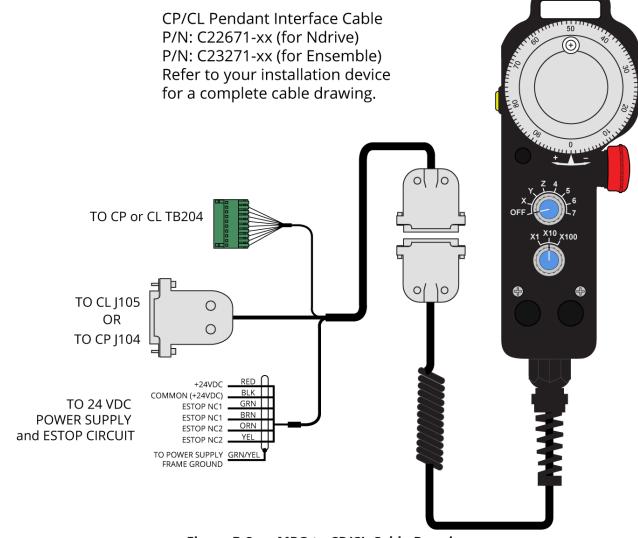


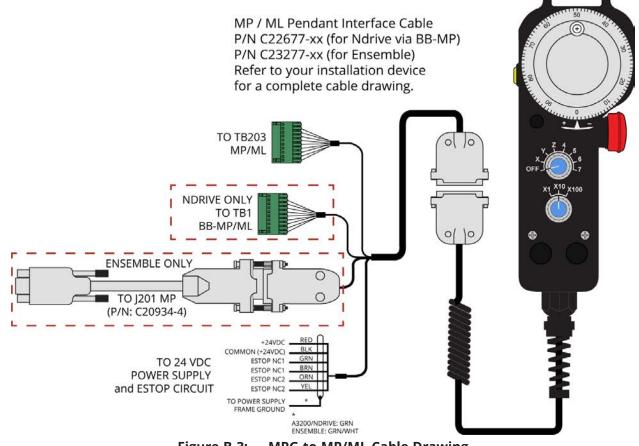
Figure B-2: MPG to CP/CL Cable Drawing

## B.1.3. 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 B-3: MP/ML Adapter	Cubic Com	
Connector	Pin	Description
	1	Common
	2	Input 0 (X Axis)
	3	Input 1 (Y Axis)
	4	Input 2 (Z Axis)
TB203 [DIGITAL IN]	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
	TB1-1	Sine
	TB1-2	Sine-N
Ndrive:	TB1-3	Cosine
BB-MP/ML Module TB1	TB1-4	Cosine-N
	TB1-7	5 VDC
	TB1-8	Common
	2	Cosine
	7	Cosine-N
Ensemble	4	5 VDC
J201 [AUX I/O]	1	Sine
	6	Sine-N
	9	Common
	RED	24 VDC
	BLK	Common
Ndrive	GRN	ESTOP NC1
To: User-Supplied Power	BRN	ESTOP NC1
Supply (Flying Leads)	ORN	ESTOP NC2
	YEL	ESTOP NC2
	GRN	To Frame Ground
	RED	24 VDC
	BLK	Common
Ensemble	GRN	ESTOP NC1
To: User-Supplied Power	BRN	ESTOP NC1
Supply (Flying Leads)	ORN	ESTOP NC2
	YEL	ESTOP NC2
	GRN/WHT	To Frame Ground

 Table B-3:
 MP/ML Adapter Cable Connector Pinout



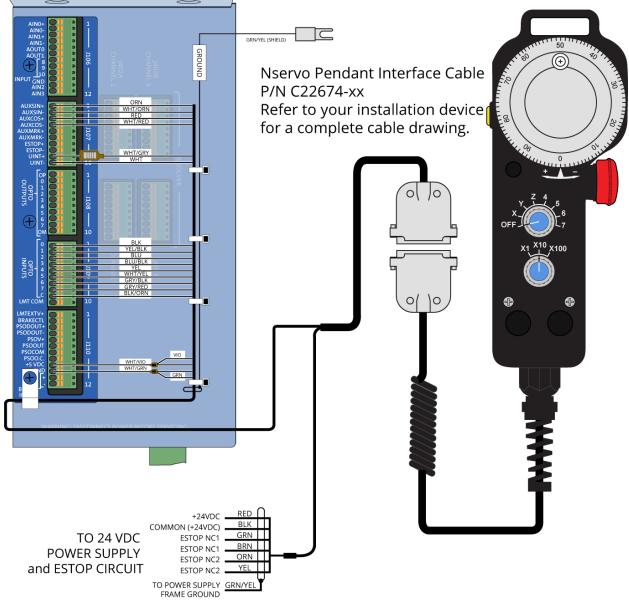


## B.1.4. Connect the MPG to the Nservo

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 B-4. NServo Auapter	cubic com		
Connector	Pin	Color	Description
	AUXSIN+	ORN	Sine
	AUXSIN-	WHT/ORN	Sine-N
J107 [ESTOP and Extra	AUXCOS+	RED	Cosine
Encoder Channel]	AUXCOS-	WHT/RED	Cosine-N
	UINT+	WHT/GRY	x100 Distance Multiplier
	UINT-	WHT	Common
	0	BLK	X Axis
	1	YEL/BLK	Y Axis
	2	BLU	Z Axis
	3	BLU/BLK	4 Axis
J109 [OPTO InputS]	4	YEL	5 Axis
	5	WHT/YEL	6 Axis
	6	GRY/BLK	x1 Distance Multiplier
	7	GRY/RED	x10 Distance Multiplier
	С	BLK/ORN	Common
J110 [PSO and BRAKE]	+5 VDC	VIO and WHT/VIO	+5 VDC
JI TO [PSO and BRAKE]	ND	WHT/GRN and GRN	Common
	R	ED	24 VDC
	В	LK	Common
Tot User Supplied Dower	G	RN	ESTOP NC1
To: User-Supplied Power Supply (Flying Leads)	BI	RN	ESTOP NC1
Supply (Fighting Leaus)	0	RN	ESTOP NC2
	Y	EL	ESTOP NC2
	GRN	I/YEL	To Frame Ground

### Table B-4: Nservo Adapter Cable Connector Pinout





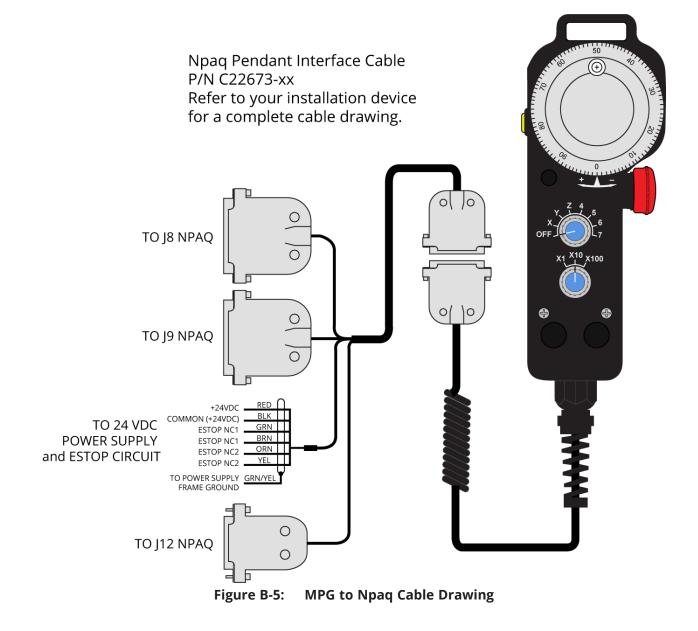
MPG to Nservo Cable Drawing

# B.1.5. 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 B-5:
 Npaq Adapter Cable Connector Pinout

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



# B.1.6. 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 B-6: Epaq Adapter Ca		
Connector	Pin	Description
	1	Common
	2	Input 0 (X Axis)
	3	Input 1 (Y Axis)
	4	Input 2 (Z Axis)
Digital Inputs	5	Input 3 (4 Axis)
Digital inputs	6	Input 4 (5 Axis)
	7	Input 5 (6 Axis)
	8	Input 6 (x10 Distance Multiplier)
	9	Input 7 (x100 Distance Multiplier)
	10	Common
	2	Cosine
	7	Cosine-N
Aux Encoder	4	5 VDC
Aux Elicodel	1	Sine
	6	Sine-N
	9	Common
	RED	24 VDC
	BLK	Common
To: User Supplied Bower	GRN	ESTOP NC1
To: User-Supplied Power Supply Flying Leads	BRN	ESTOP NC1
	ORN	ESTOP NC2
	YEL	ESTOP NC2
	GRN/YEL	To Frame Ground

 Table B-6:
 Epaq Adapter Cable Connector Pinout

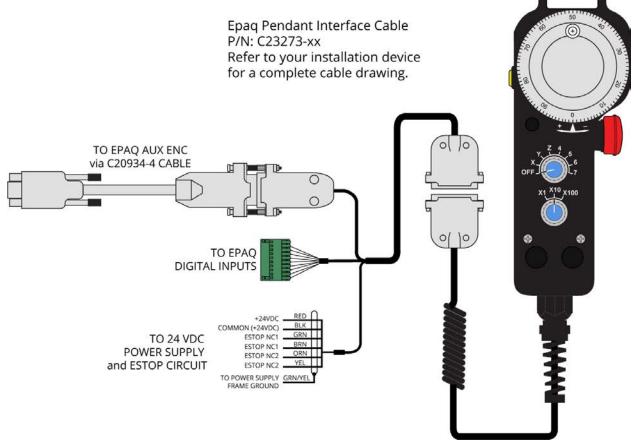


Figure B-6: MPG to Epaq Cable Drawing

# B.1.7. 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.

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

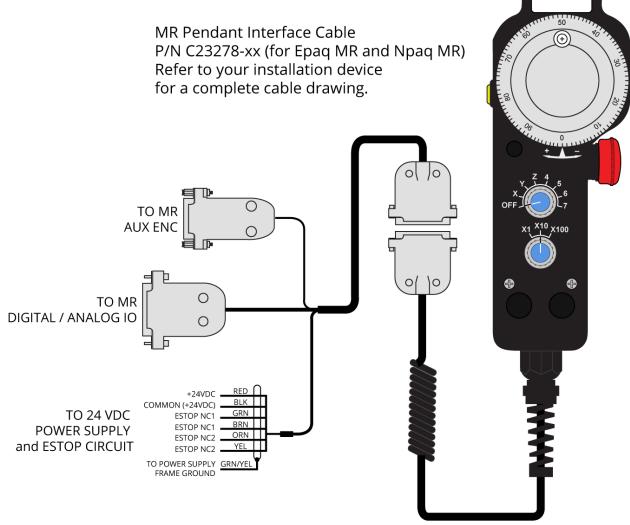


Figure B-7: MPG to Epaq MR/Npaq MR Cable Drawing

# **B.2. A3200 Configuration Information**

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

# B.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 B.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.

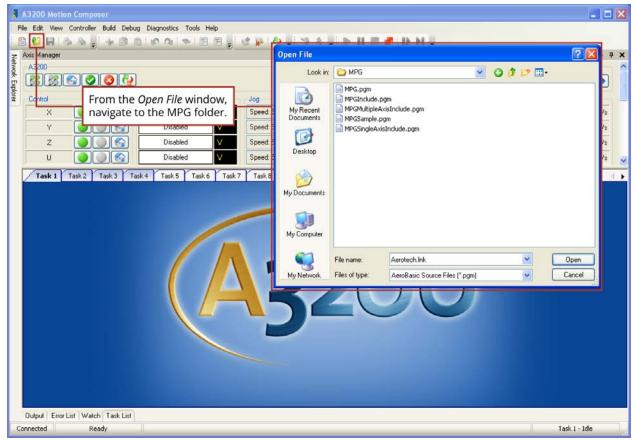


Figure B-8: Opening the MPG Folder

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.

Open File						? 🗙
Look in:	🗀 MPG		*	0 🕫	• 🖽	
My Recent Documents Desktop My Documents	MPG.pgm MPGInclude.pg MPGMultipleAxi MPGSample.pg	sInclude.pgm m				
	File name:	Aerotech.Ink			~	Open
My Network	Files of type:	AeroBasic Source Files (*.pg	m)		*	Cancel

Figure B-9: 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.

	3200 Motion Composer								
File	Edit View Controller Build Debug								
-	😢 🖬 😂 💩 🚽 🖝 🗃 🛍			s . 🕨 🖬 🔳					-
A	kis Manager A3200							•	<b>7</b> ×
A	<u>*****</u>		Commar	d []				<b>&gt;</b>	
	Control	Status	Jog		Position Feedback		Velocity Feedback		
	× 🔵 💽 🚱	Disabled 🗸 🗸	Speed: 50		0.000	mm	0.000	mm/s	
	Y 💽 💽 Y	Disabled 🗸 🗸	Speed: 50		0.000	mm	0.000	mm/s	
	z 🕘 💽 😭	Disabled 🗸 🗸	Speed 50		0.000	mm	0.000	mm/s	
	U 🔵 💽 U	Disabled V	Speed: 50		0.000	mm	0.000	mm/s	
Ē	Task 1 Task 2 Task 3 Task	4 Task 5 Task 6	Task 7 Task 8 Task 9 T	ask 10 Task 11	Task 12 Task 13	Task 14 Task	15 Task 16 Ta	ask 17	
ł		PG.pgm	Task 7 Task 8 Task 9	ask 10 Task 11	Task 12 Task 13	Task 14 Task	15 Task 16 Ta		0 3
	18 ' an HPe, HLe, ( 19 ' for the MP and 20 ' if you are us:	P, or CL. There : ML. Select the ling an Npaq or Nser	.pgm if you are using is no MPG support pro MultipleAxisMPGInclu rvo. Check the axis they are <u>correct for</u>	vided le.pgm names					
	22 ' system 23 #INCLUDE "MPGSin	ngleàxisInclude.pgn AltipleàxisInclude.	"" The MPG MPG*Ax for your	i.pgm should isInclude.pg	d include the m appropriate				
	27 #DEFINE SetHand	DEF EXECCANNEDFUNG	CTION 8, 1					1	~
	Jutput Error List Watch Task List								-
1	and and the second s								

Figure B-10: 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.

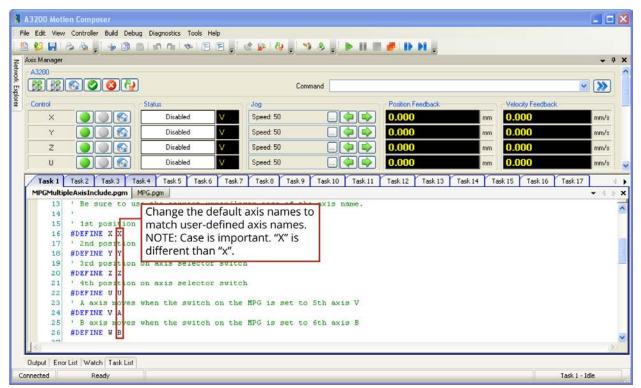


Figure B-11: Assigning Axis Names

#### 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.

A3200								-
A3200								
00 00								
55 55			Co	mmand				× >>>
Control		Status	Jog		Position Feedback		Velocity Feedback	
×		Disabled	V Speed: 50		0.000	mm	0.000	mm/s
Y		Disabled	V Speed: 50		0.000	mm	0.000	mm/s
z		Disabled	Speed: 50		0.000	mm	0.000	mm/s
						1000 C		
U		Disabled	Speed: 50		0.000	mm	0.000	mm/s
Task 1	Task 2 Task 3 Task	4 Task 5 Task 6	Task 7 Task 8 Task 9	Task 10 Task 11	Task 12 Task 13	Task 14 Ta	sk 15 Task 16 Task	17
MPGMultin	leAxisInclude.pgm	G.pam						
29	<pre>' define the dis ' distance is in #DEFINE BaseIncr</pre>	De .005 axi	fine the smallest i is move. This dista	nce will be equ	202 I			
30 31 32 33 34	' distance is in #DEFINE BaseIncr ' Define which a #DEFINE EncCh	xis's enco	is move. This dista one tick of the ha	ance will be equ ndwheel.	202 I			
30 31 33 34 35	' distance is in #DEFINE BaseIncr ' Define which a #DEFINE EncCh	xis's enco	is move. This dista	ance will be equ ndwheel.	202 I			
30 31 32 33 34	<pre>' distance is in #DEFINE BaseIncr ' Define which a #DEFINE EncCh ' !!!!!!!! DIFF '</pre>	xis's enco Y ERENCE BETWEEN 1	is move. This dista one tick of the ha	ance will be equ ndwheel.	202 I			
30 31 32 33 34 35 36 37 38	<pre>' distance is in #DEFINE BaseIncr ' Define which a #DEFINE EncCh ' !!!!!!!! DIFF ' Change the axi ' For Npag thi</pre>	ERENCE BETWEEN 1 s defined for I4 s should be the	is move. This dista one tick of the har NPAQ and NSERVO !!! OAxis as follows: name of the first	ance will be equ ndwheel.	ual			
30 31 32 33 34 35 36 37 38 39	<pre>' distance is in fDEFINE BaseIncr ' Define which a fDEFINE EnoCh ' !!!!!!! DIFF ' Change the axi ' For Npag thi ' For Nservo ti</pre>	ERENCE BETWEEN 1 s defined for Id s should be the his should be the	is move. This dista one tick of the har NPAQ and NSERVO !!! OAxis as follows:	ance will be equ ndwheel.	ual			
30 31 32 33 34 35 36 37 38 39 40	<pre>' distance is in #DEFINE BaseIncr ' Define which a #DEFINE EncCh ' !!!!!!!! DIFF ' Change the axi ' For Npag thi</pre>	ERENCE BETWEEN 1 s defined for I4 s should be the	is move. This dista one tick of the har NPAQ and NSERVO !!! OAxis as follows: name of the first	ance will be equ ndwheel.	ual			
30 31 32 33 34 35 36 37 38 39	<pre>' distance is in fDEFINE BaseIncr ' Define which a fDEFINE EnoCh ' !!!!!!! DIFF ' Change the axi ' For Npag thi ' For Nservo ti</pre>	ERENCE BETWEEN 1 s defined for Id s should be the his should be the	NPAQ and NSERVO !!! OAxis as follows: name of the first he name of the axis	ance will be equ ndwheel.	ual			
30 31 32 33 34 35 36 37 38 39 40 41	<pre>' distance is in #DEFINE BaseIncr ' Define which a: #DEFINE EncCh ' Change the axi ' For Npaq thi ' For Nservo t #DEFINE IOAxis</pre>	ERENCE BETWEEN 1 s defined for Id s should be the his should be the	NPAQ and NSERVO !!! OAxis as follows: name of the first of he name of the axis axis switches	ance will be equ ndwheel.	ual			
30 31 32 33 34 35 36 37 38 39 40 41 42	<pre>' distance is in #DEFINE BaseIncr ' Define which a #DEFINE EnoCh ' 11111111 DIFF ' Change the axi ' For Npaq thi ' For Nservo t #DEFINE IOAxis ' Define inputs/</pre>	TERENCE BETWEEN I s defined for IV s should be the his should be the X state for the 6	IS MOVE. This dista one tick of the har NPAQ and NSERVO !!! OAxis as follows: name of the first n he name of the axis axis switches EQ 1	ance will be equ ndwheel.	ual			
30 31 32 33 34 35 36 37 38 39 40 41 41 42 43	<pre>' distance is in #DEFINE BaseIncr ' Define which a #DEFINE EnoCh ' !!!!!!!! DIFF ' Change the axi ' For Npaq thi ' For Nservo ti #DEFINE IOAxis ' Define inputs/ #DEFINE Xin</pre>	The primary u axi axi axi axi axi axi axi axi	NPAQ and NSERVO !!! OAxis as follows: name of the first he name of the axis axis switches EQ 1 EQ 1	ance will be equ ndwheel.	ual			

Figure B-12: 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).

A3200								
88 88			C	Command				× >>>
Control		Status	Jog		Position Feedback		Velocity Feedback	
×		Disabled	V Speed: 50		0.000	mm	0.000	mm/
Y		Disabled	V Speed 50		0.000	mm	0.000	mm/
								1000110
Z		Disabled	Speed: 50		0.000	mm	0.000	mm/
U		Disabled	V Speed: 50		0.000	mm	0.000	mm/s
Task 1	Task 2 Task 3 Task	4 Task 5 Task 6	Task 7 Task 8 Task	9 Task 10 Task 11	Task 12 Task 13	Task 14 Ta	ask 15 Task 16	Task 17
		G.pam	1031(7) 1031(0) 1031(	100K10 100K11	105(12 105(15	Tuble I I I I	5K15 105K10	• d
27 28 29 30		primary units wi	ck (or change) of which defaults to r	nm				
28 29	<pre>' distance is in fDEFINE BaseIncr ' Define which a fDEFINE EnoCh ' !!!!!!!! DIFF '</pre>	If you are will expect to be con	connecting to a connecting to a ct the EncCh (enc nected to the se on the Npaq (typ	n Npaq, the A32 coder channel) o cond Auxiliary B	200 system of the MPG Encoder			
28 29 30 31 32 33 34 35 36 37 38	<pre>' distance is in #DEFINE BaseIncr ' Define which a #DEFINE EncCh ' !!!!!!! DIFF ' ' Change the axi ' For Npag thi</pre>	If you are will expect to be con Channel of s defined for 100 s should be the	which defaults to r e connecting to a ct the EncCh (enc inected to the se on the Npaq (typ whis as follows: name of the first	nn Npaq, the A32 coder channel) o econd Auxiliary E bically the Y axis	200 system of the MPG Encoder ).			
28 29 30 31 32 33 34 35 36 37 38 39 40	<pre>' distance is in #DEFINE BaseIncr ' Define which a #DEFINE EncCh ' !!!!!!! DIFF ' ' Change the axi ' For Npag thi</pre>	If you are will expect to be con Channel of s defined for 100 s should be the	thich defaults to r e connecting to a ct the EncCh (en- nected to the se on the Npaq (typ Axis as follows:	nn Npaq, the A32 coder channel) o econd Auxiliary E bically the Y axis	200 system of the MPG Encoder ).			
28 29 30 31 32 33 34 35 36 37 38 39	<pre>' distance is in #DEFINE BaseInor ' Define which a #DEFINE EnoCh ' HIHHHH DIFF ' ' Change the axi ' For Npag thi ' For Nservo t #DEFINE IOAxis</pre>	If you are will expect to be con Channel of s should be the his should be the	which defaults to r e connecting to a ct the EncCh (enc nected to the se on the Npaq (typ Axis as follows: name of the first e name of the axis	nn Npaq, the A32 coder channel) o econd Auxiliary E bically the Y axis	200 system of the MPG Encoder ).			
28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43	<pre>' distance is in #DEFINE BaseIncr ' Define which a #DEFINE EncCh ' HIHHHH DIFF ' Change the axi ' For Nysaç thi ' For Nysaç thi ' For Nysaç thi ' DEFINE IOAxis ' DEFINE IOAxis</pre>	If you are will expect to be con ERENC Channel of s should be the x state for the 6 SDI[0].IOAxis 1	which defaults to r e connecting to a ct the EncCh (enc nected to the se on the Npaq (typ Axis as follows: name of the first e name of the axis axis switches EQ 1	nn Npaq, the A32 coder channel) o econd Auxiliary E bically the Y axis	200 system of the MPG Encoder ).			
28 29 30 31 32 33 34 35 36 37 38 39 40 41 42	<pre>' distance is in #DEFINE BaseIncr ' Define which a #DEFINE EnoCh ' HIHHHH DIFF ' Change the axi ' For Npsq thi ' For Nservo t #DEFINE IOAxis ' Define inputs/</pre>	ERENC Channel C s defined for IOU s should be the X state for the 6	which defaults to r e connecting to a ct the EncCh (enc inected to the se on the Npaq (typ Waxis as follows: name of the first e name of the first axis switches EQ 1 EQ 1	nn Npaq, the A32 coder channel) o econd Auxiliary E bically the Y axis	200 system of the MPG Encoder ).			

Figure B-13: 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).

kis Mana A3200							
							•
BB	, ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;	Cor	mmand			1	• »
Control	ol Status	Jog		Position Feedback		Velocity Feedback	
>	× 💽 Sable Disable	d V Speed: 50		0.000	mm	0.000	mm/s
1	Y 🕘 💽 🚱 Disable	d V Speed: 50		0.000	mm	0.000	mm/s
Z	Z O Disable	d V Speed: 50		0.000	mm	0.000	mm/s
i.	U Disable	d V Speed: 50		0.000	mm	0.000	mm/s
_					~		
Task	sk 1 Task 2 Task 3 Task 4 Task 5 MultipleAxisInclude.pgm MPG.pgm	Task 6 Task 7 Task 8 Task 9	Task 10 Task 11	Task 12 Task 13 T	ask 14 Ta	ask 15 👘 Task 16 👘 Task 17	1
	27 28 ' define the distance for 29 ' distance is in primary 30 #DEFINE BaseIncr .005	one tick (or change) of t units which defaults to mm		1			• d
	<pre>27 28 ' define the distance for 29 ' distance is in primary 30 #DEFINE BaseIncr .005 31 32 ' Define which axis's end #DEFINE EncCh Y 34</pre>	units which defaults to mm oder channel is connected TWEEN NPAQ and NSERVO !!!!	n to the MPG	1			• 4
	<pre>27 28 ' define the distance for 29 ' distance is in primary 30 #DEFINE BaseIncr .005 31 32 ' Define which axis's end 33 #DEFINE EncCh Y 34 35 ' !!!!!!!! DIFFERENCE BE 36 '</pre>	units which defaults to mm oder channel is connected TWEEN NPAQ and NSERVO !!!! for IOAxis as follows: The A3200 system will (input/output) of the N to the first axis on the	n to the MPG IIIII I expect the IO/ MPG to be coni	Axis nected			• 4
	27 28 ' define the distance for 29 ' distance is in primary 30 #DEFINE BaseIncr .005 31 32 ' Define which axis's end 33 #DEFINE EncCh Y 34 35 ' HIHHHH DIFFERENCE BE 36 ' 37 ' Change the axis defined 39 ' For Ngaq this should 39 ' For Ngaq this should 40 #DEFINE IOAXIS X 41 42 ' Define inputs/state for 43 #DEFINE Xin SDI[0].	units which defaults to mm oder channel is connected TWEEN NPAQ and NSERVO !!!! for IOAxis as follows: The A3200 system will (input/output) of the M to the first axis on the IOAxis EQ 1	n to the MPG IIIII I expect the IO/ MPG to be coni	Axis nected			• 4
	27 28 ' define the distance for 29 ' distance is in primary 30 #DEFINE BaseIncr .005 31 32 ' Define which axis's end 33 #DEFINE EncCh Y 34 35 ' HIHHHH DIFFERENCE BE 36 ' ' Change the axis defined 37 ' Change the axis defined 38 ' For Ngaq this should 49 ' For Ngaq this should 40 #DEFINE IOAXIS X 41 42 ' Define inputs/state for 4 #DEFINE Xin SDI[0]. 44 #DEFINE Yin SDI[1].	units which defaults to me oder channel is connected TWEEN NPAQ and NSERVO !!!! for IOAxis as follows: The A3200 system will (input/output) of the N to the first axis on the	n to the MPG IIIII I expect the IO/ MPG to be coni	Axis nected			• 4

Figure B-14: 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.

```
Task 1 Task 2 Task 3 Task 4 Task 5 Task 6 Task 7 Task 8 Task 9 Task 10 Task 11 Task 12 Task 13 Task 14 T
   MPG.pgm MPGSingleAxisInclude.pgm
        28
            #DEFINE W B
       29
            ' Define the distance for one tick (or change) of the MPG handWheel.
       30
            ' The distance is in primary units which defaults to mm.
       31
           #DEFINE BaseIncr .005
       32
       33
       34
            ' This is the name of the axis that is connected to the auxiliary
            ' encoder channel of the MPG Master axis.
       35
       36 #DEFINE EncCh
                                х
       37
            ' This is the name of the axis that is connected to the MPG.
       38
       39
           #DEFINE IOAxis X
        40
            ' Define the inputs/state for the 6 axis switches.
        41
                            $DI[0].IOAxis EQ 1
$DI[1].IOAxis EQ 1
            #DEFINE Xin
        42
            #DEFINE Yin
        43
                           SDI[2].IOAxis EQ 1
SDI[3].IOAxis EQ 1
SDI[4].IOAxis EQ 1
SDI[5].IOAxis EQ 1
            #DEFINE Zin
        44
            #DEFINE Uin
        45
        46
            #DEFINE Vin
        47
            #DEFINE Win
        48
            ' Define the inputs/state for the 3 mult. switches.
        49
            '#DEFINE MultX1 $DI[6].IOAxis EQ 1
'#DEFINE MultX10 $DI[7].IOAxis EQ 1
        50
       51
       52
            '#DEFINE MultX100 $DI[8].IOAxis EQ 1
       53
            ' The following defines are only valid for an Ndrive MP or ML.
       54
           #DEFINE MultX1 (($DI[6].IOAxis EQ 0) 66 ($DI[7].IOAxis EQ 0))
#DEFINE MultX10 $DI[6].IOAxis EQ 1
       55
       56
            DEFINE MultX100 $DI[7].IOAxis EQ 1
       57
        58
           #DEFINE LedOutput $DO[10].IOAxis
        59
  Output Error List Watch Task List Axis I/O
Connected 🔥 Ready
```

Figure B-15: 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.

1000	200 8 88 6										
B	8 88					1				1000	
	ereer				Co	mmand				~ ( <b>&gt;&gt;</b>	
Co	ntrol		Status	Je	og j		Position Feedback		Velocity Feedback		
	×		Disabled	V S	peed: 50		0.000	mm	0.000	mm/s	\$
	Y		Disabled	V s	peed: 50		0.000	mm	0.000	mm/:	*
-	z		Disabled		peed: 50		0.000		0.000		
								mm		mm/:	
	U		Disabled	VS	peed: 50		0.000	mm	0.000	mm/:	\$
1	Task 1	Task2 Task3 Task	k4 Task5 Task6	Task 7	Task 8 Task 9	Task 10 Task 11	Task 12 Task 13	Task 14 Ta	ask 15 Task 16 T	ask 17	-
м	PGMultip	leAxisInclude.pgm	PG.pgm								1
	27										
	28	I define the dis									
			stance for one t	tick (or c	hange) of	the MPG handWhee	1				
	20					the MPG handWhee	1				
	29	' distance is in	n primary units				1				
	30		n primary units				1				
	30 31	' distance is in #DEFINE BaseIncr	n primary units r .005	which def	aults to m	to	1				
	30	' distance is in	n primary units r .005	which def	aults to m	to	1				
	30 31	' distance is in #DEFINE BaseIncr	n primary units r .005	which def	aults to m	to	1				
	30 31 32	' distance is in #DEFINE BaseIncr ' !!!!!!!!! DIFF	n primary units r .005 FERENCE BETWEEN	which def	aults to m NSERVO !!!	to	1				
	30 31 32 33 34	' distance is in #DEFINE BaseIncr ' !!!!!!! DIFF ' ' Change the axi	n primary units r .005 FERENCE BETWEEN is defined for E	which def NPAQ and EncCh as f	aults to m NSERVO !!! ollows:	no ! ! ! ! !	1				
	30 31 32 33 34 35	<pre>' distance is in #DEFINE BaseIncr ' !!!!!!!! DIFF ' Change the axi ' For Npaq thi</pre>	n primary units r .005 FERENCE BETWEEN is defined for E is should be the	which def NPAQ and EncCh as f a name of	aults to m NSERVO !!! ollows: the second	m !!!!! axis					
	30 31 32 33 34 35 36	<pre>' distance is in #DEFINE BaseIncr ' HILLIN DIFF ' ' Change the axi ' For Npaq thi ' For Nservo t</pre>	n primary units r .005 FERENCE BETWEEN is defined for E is should be the this should be t	which def NPAQ and EncCh as f a name of the name of	aults to m NSERVO !!! ollows: the second f the axis	no ! ! ! ! !					
	30 31 32 33 34 35 36 37	<pre>' distance is in #DEFINE BaseIncr ' IIIIIIII DIFF ' Change the axi ' For Npaq thi ' For Nservo t ' Master axis's</pre>	n primary units r .005 FERENCE BETWEEN is defined for E is should be the this should be t auxiliary encod	which def NPAQ and EncCh as f a name of the name of	aults to m NSERVO !!! ollows: the second f the axis	m !!!!! axis					
	30 31 32 33 34 35 36 37 38	<pre>' distance is in #DEFINE BaseIncr ' HILLIN DIFF ' ' Change the axi ' For Npaq thi ' For Nservo t</pre>	n primary units r .005 FERENCE BETWEEN is defined for E is should be the this should be t	which def NPAQ and EncCh as f a name of the name of	aults to m NSERVO !!! ollows: the second f the axis	m !!!!! axis					
	30 31 32 33 34 35 36 37 38 39	<pre>' distance is in #DEFINE BaseIncr ' lilling DIFF ' ' Change the axi ' For Npaq thi ' For Nservo t ' Master axis's #DEFINE EncCh</pre>	n primary units r .005 PERENCE BETWEEN is defined for E is should be the this should be t auxiliary encod Y	which def NPAQ and EncCh as f a name of the name o ier channe	aults to m NSERVO !!! ollows: the second f the axis 1	m axis connected to the					
	30 31 32 33 34 35 36 37 38	<pre>' distance is in #DEFINE BaseIncr ' IIIIIIII DIFF ' Change the axi ' For Npaq thi ' For Nservo t ' Master axis's</pre>	n primary units r .005 PERENCE BETWEEN is defined for E is should be the this should be t auxiliary encod Y	which def NPAQ and EncCh as f a name of the name o ier channe	aults to m NSERVO !!! ollows: the second f the axis 1	m axis connected to the					
	30 31 32 33 34 35 36 37 38 39	<pre>' distance is in #DEFINE BaseIncr ' lilling DIFF ' ' Change the axi ' For Npaq thi ' For Nservo t ' Master axis's #DEFINE EncCh</pre>	n primary units r .005 PERENCE BETWEEN is defined for E is should be the this should be t auxiliary encod Y	which def NPAQ and EncCh as f a name of the name o ier channe	aults to m NSERVO !!! ollows: the second f the axis 1	m axis connected to the					
	30 31 32 33 34 35 36 37 38 39 40	<pre>' distance is in #DEFINE BaseIncr ' lilling DIFF ' ' Change the axi ' For Npaq thi ' For Nservo t ' Master axis's #DEFINE EncCh</pre>	n primary units r .005 FERENCE BETWEEN is defined for E is should be the this should be th auxiliary encod Y FERENCE BETWEEN	which def NPAQ and EncCh as f is name of the name of ier channe NPAQ and	aults to m NSERVO !!! ollows: the second f the axis 1 NSERVO !!!	m axis connected to the					
	30 31 32 33 34 35 36 37 38 39 40 41 42	<pre>' distance is in #DEFINE BaseIncr ' titte DIFF ' Change the axi ' For Nyaq thi ' For Nyarvo t ' Master axis's #DEFINE EncCh ' titte DIFF ' Change the axi</pre>	n primary units r .005 FERENCE BETWEEN is defined for E is should be the this should be t auxiliary encod Y FERENCE BETWEEN is defined for I	which def NPAQ and EncCh as f s name of the name of der channe NPAQ and IOAxis as	aults to m NSERVO !!! ollows: the second f the axis 1 NSERVO !!! follows:	m axis connected to the					
	30 31 32 33 34 35 36 37 38 39 40 41 42 43	<pre>' distance is in #DEFINE BaseIncr ' IIIIIIII DIFF ' Change the axi ' For Nyaq thi ' For Nservo t ' Master axis's #DEFINE EncCh ' IIIIIII DIFF ' Change the axi ' For Nyaq thi</pre>	n primary units r .005 FERENCE BETWEEN is should be the this should be t auxiliary encod Y FERENCE BETWEEN is defined for I is should be the	which def NPAQ and EncCh as f a name of the name of der channe NPAQ and IOAxis as a name of	aults to m NSERVO !!! ollows: the second f the axis 1 NSERVO !!! follows: the first	m axis connected to the IIIIII axis	e MPG				
	30 31 32 33 34 35 36 37 38 39 40 41 42 43 44	<pre>' distance is in #DEFINE BaseIncr ' IIIIIIII DIFF ' Change the axi ' For Npaq thi ' For Nservo t ' Master axis's #DEFINE EncCh ' IIIIIII DIFF ' Change the axi ' For Npaq thi ' For Nservo t</pre>	n primary units r .005 FERENCE BETWEEN is defined for E is should be the this should be the auxiliary encod Y FERENCE BETWEEN is defined for I is should be the this should be t	which def NPAQ and EncCh as f a name of the name of der channe NPAQ and IOAxis as a name of	aults to m NSERVO !!! ollows: the second f the axis 1 NSERVO !!! follows: the first	m axis connected to the	e MPG				
	30 31 32 33 34 35 36 37 38 39 40 41 42 43	<pre>' distance is in #DEFINE BaseIncr ' IIIIIIII DIFF ' Change the axi ' For Nyaq thi ' For Nservo t ' Master axis's #DEFINE EncCh ' IIIIIII DIFF ' Change the axi ' For Nyaq thi</pre>	n primary units r .005 FERENCE BETWEEN is should be the this should be t auxiliary encod Y FERENCE BETWEEN is defined for I is should be the	which def NPAQ and EncCh as f a name of the name of der channe NPAQ and IOAxis as a name of	aults to m NSERVO !!! ollows: the second f the axis 1 NSERVO !!! follows: the first	m axis connected to the IIIIII axis	e MPG				

Figure B-16: 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.

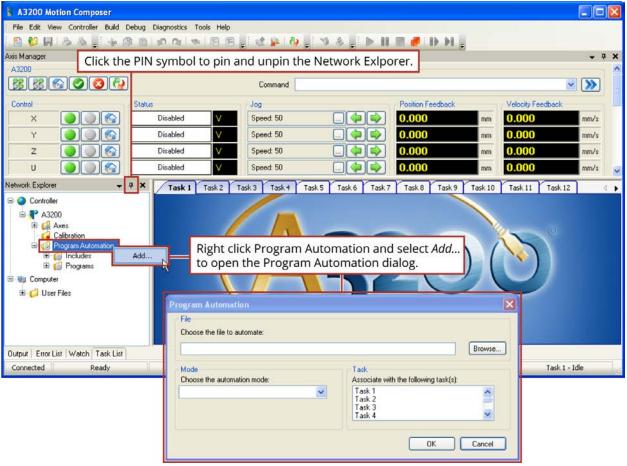


Figure B-17: Opening the Program Automation Page

#### 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.

Program Automation	X
File	Browse to open the MPG.pgm.
Choose the file to automate:	
C:\Program Files\Aerotech\A3200\Samples\AeroBas	ic\MPG\MPG.pgm Browse
	Task
Choose the automation mode:	Associate with the following task(s):
RunSilent 🔽	Task 1
	Task 2 Task 3
Set the Mode to RunSilent.	Run this program on Task 2.
	OK Cancel

Figure B-18: Configure Program Automation (MPG.Pgm)

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

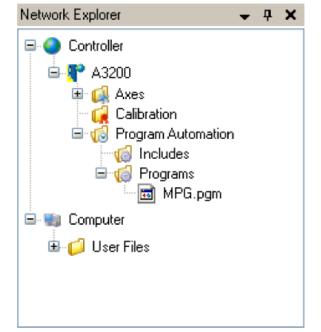


Figure B-19: Completed Program Automation Configuration

#### 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.

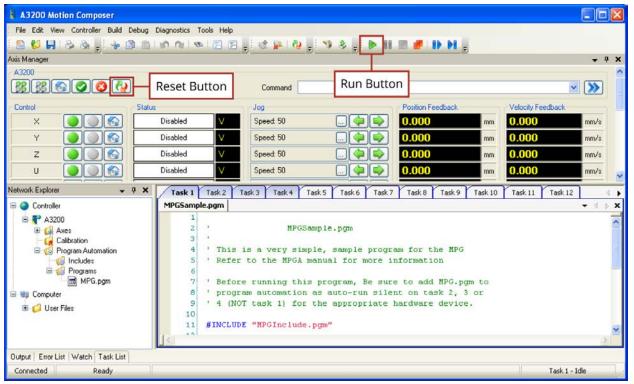


Figure B-20: Opening the Sample Program (MPGSample.pgm)

### B.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 B.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.

Open				<u>? ×</u>		
Loo	kin: 😑 MPG		• 🗈 💣	53 ·		
NView HMI	History Deebtap My Door My Do	suter ppp [A:] Dick [C:] 00 supple: BCode 3. Navig	ate to the MP		use the	F8 F8 F9 The File Page, F8 - Open button a file browser.
						F12
	·					
	Current File:	C:\A3200\SAMPLE	SVGCODEVMPGVINCLU	DEVMPG_INCLUDE.F	PGM	
	FZ	F3	F4	F5	F6	E40 (Home Page) F1
	(File Menu)	(Edit Menu)	(Find Menu)	(Run Menu		Help
						1
F2 F3	Manual			e Nview HMI - File button		ile Page.

Figure B-21: 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.

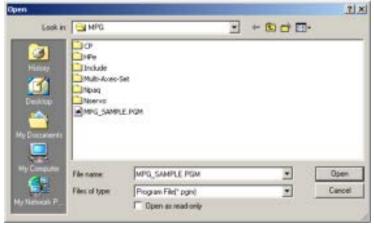


Figure B-22: MPG Program Options

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.

🙀 Miew HMI								
			File Pag	e (Run Menu)	F7			
Task1	Task.2	Teck 2	Task.d ]	Sciatch )				
7 Refer to the sure to the sure to a sure a	tion 1	New Fill						
7 changing 7 De sur define X X	define X X / 1st position on axis selector switch							
define Y Y define Z Z define U U define V A define V B	Idefine Y Y       / 2nd position on axis selector switch         Idefine Z Z       / Jed position on axis selector switch         Idefine U U       / 4th position on axis selector switch         Idefine V X       / A axis moves when the switch on the MPGAJZ is set to 5th							
/ Autometion / Version 04					Error Dheck F11			
/ Interfec ) / 1/0/2003 - / may need t	· · · · · · · · · · · · · · · · · · ·		kis names ned axis n		Bun F12			
	NOTE: Case is important. "X" is different than "x".							
Current File: C:	A3200/SAMPLES\GC	ODEMPGNPA0MPO	1 POM					
F2	F3	F4	P5	F6	Esc driane Pages F1			
(File Menuo	di di Menu-	(Find Menu)	diun Menuo		Help			

Figure B-23: 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.

Minw HMI	_D×
File Page (Run Menu)	F7
Tesk1       Tesk2         / define the distance if a define base increment of an axis move. This distance will be equal to one tick of the handwheel.         / change the Y below to the descede upper/lower dase of the axis have / define EncCh         X       / Master axis's suriliary encoder channel (change the X below to the name of the first axis in the Kpag)	New F8 Open F9
/ Be sure to use the correct upper/lower case of the axis name / define IORxis X define Xin \$910.DORxis E0 1 / define inputs/state for the 6 axis sw define Yin \$911.DORxis E0 1 define Vin \$913.DORxis E0 1 define Vin \$913.DORxis E0 1 define Vin \$915.DORxis E0 1 define Win \$915.DORxis E0 1 define Win \$915.DORxis E0 1 define Win \$915.DORxis E0 1 define Win \$915.DORxis E0 1	Sine F10 Error Dreck F11 Pun F12
Ourrent/File:         C:\A3200/SAMPLES\GCODE\MPG\NPA0\MPG.PGM           F2         F3         F4         F5         F6	Enc
<file di="" menuo="" menuo<="" nenuo="" td="" «e="" «find="" «fun=""><td>dHome Pages Fil Help</td></file>	dHome Pages Fil Help

Figure B-24: 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).

Niew IMI					
Task1 ) / define the c		Task3	Task.g )	ge (Run Menu)	F7 New F8
/ Change the 3 / Be sure to define EnoCh / Change the 3 / Be sure to define JOAria	t below to use the co Y to to use the co Ch	ou are conne ll expect the E be connected	cting to an Np ncCh (encode	paq, the A3200 r channel) of t d Auxiliary Enc	hế MPG
define Xin define Yin define Vin define Vin define Vin define Win define HultX: define HultX:	5010. IOAxis 5011. IOAxis 5012. IOAxis 5013. IOAxis 5014. IOAxis 5015. IOAxis 5016. IOAxis 5016. IOAxis	EQ 1 EQ 1 EQ 1 EQ 1 EQ 1 EQ 1 EQ 1 7 define : EQ 1	inputs/state for inputs/state for		F11 F11 F12
	J200/SAMPLES/GC	ODEMPGNPA0MP0	3.PGM	re	Esc driana Page
(File Menuo	(Edi Meno	FindMenu	-Bun Menuo		F1 Help

Figure B-25: 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).

Niew HMI	_IC X
File Page (Run Menu)	77
Task1 Task2 Task3 Task4 Soudoh	
/ define the distance for one tick (or change) of the MPG bandWheel belo	New
#define BaseIncr .005 / METRIC units (see G71 helow)	F8
/ Change the Y below to the name of the second axis in the Mpsg	
/ Be sure to use the correct upper/lower case of the axis name ?	Open
#define IncCh I / Master axis's auxiliary encoder chann	F9
Change the X below to The A3200 system will expect the IOAxis	
I BE SUPE TO USE THE OD	arve:
#define Tolkiz I (input/output) of the MPG to be connected	
#define Iin \$PID.I to the first axis on the Npaq (typically the X	axis).
Hdefine Tin \$DI1.ICorris ng 1 Hdefine Zin \$DI2.IOkxis E0 1	Engr Chards
Mdefine Vin SDI3. IOksis EQ 1	FII
define Vin \$DI4.IOAxis EQ 1	
define Vin \$DI5.IOkxis EQ 1	
#define BultI1 \$DIS.IOAxis EQ 1 / define inputs/state for the 3 mult, s	Run
Hdefine BultIIO \$DI7.IOAxis EQ 1 Hdefine BultIIOO \$DI12.IOAxis EQ 1	F12
Current File: C\A3200\SAMPLES\GC0DE\MPG\NPA0\MPG.PGM	
F2 F3 F4 F5 F6	Enc
	«Home Page»
CEie Menuo (Edit Menuo (Eint Menuo (Eun Menuo	F1 Heb
ALIKE HOURS. CONTRACTOR AND AN AND AND	moy.

Figure B-26: 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.

Nites (P4)					
			File F	Page (Run Menu)	F7
Task1	Task 2	Task 3	Task <u>4</u>	<u>S</u> cratch	1
/ define the #define Dase	distance for one nor .005	tick (or change / METRIC a	) of the MPGAS mits (see G71	2 handWheel belo	FB
	Y below to the m				Open
/ Se sare () #define EncCl	and the correct		9 - <i>Save</i> butt	1	F9
	X below to the movies the correct a X	program	changes.		Save
Edefine Xin		TO I A DOMESTIC	dan seka fakaka d	and the standards	F10
Edefine Yin	SDI1.IOAxis	EQ 1	inpots/state f	or the 6 axis sw	Encr Check
Edefine Zin Edefine Uin	SDI2.ICAxis SDI3.ICAxis				F11
Edefine Vin	SDI4.ICAXis SDI5.ICAXis	EQ 1			
Edefine Bult	Ci SDIG.ICAxis	EQ 1 / define	imputs/state f	or the Samit, s	Bun
Edefine Hult: Edefine Hult:	C10 SD17.ICAxis C100 SD12.ICAxis			-	F12
100000000 100000					
Current File: C:	A3200,SAMPLES/GC0				
	F3			age> button	Esc
		to return	to the Nviev	VHMI.	(Home Page

Figure B-27: 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.

	_ [C] X
Use the <i>F7</i> - <i>Setup</i> button to open the Setup page.	F7 Setup
	F8 LO F9 Personale Echter F10
Setup Page	<b>G17</b> G18 G70 G71 G90 G91 Task initialization
Use the F8 - Program Automation button to open the Program Automation page.	F8 Program Automation
Browcze Edit	HM Options

Figure B-28: 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).

Program Automation Page	F7 Add
Execute         Task           0 - Auto Include         1.2.3.4           0 - Auto Include         1.2.3.4	F8
Use the F7 - Add but configure Program	Automation.
	Benezee F10

Figure B-29: 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.

	Browse to open the MPG_INCLUDE.PGM						
Auto Program Setup							
File: CNA3200NSampler/IGCode/MPG_INCLUDE.PGM F2-Biowee							
Esecute Type: Auto Include	F3+DK						
Task of Execution           F5-Task 1         F6-Task 2         F7-Task 3         F8-Task 4         F4-Concel							
Set Execute Type: to Auto Include	Apply settings to all four tasks.						

Figure B-30: Configure Program Automation (MPG\_INCLUDE.Pgm)

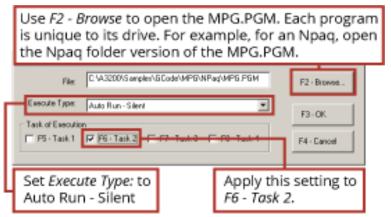
#### Step 8:

Add the MPG.Pgm to the Program Automation Page.

Open the Auto Program Setup dialog box (Figure B-31).

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 B-31: Configure Program Automation (MPG.Pgm)

When complete, the Program Automation should have two new entries similar to those highlighted in Figure B-32.

Nites IM				
	F7			
File C. VG2001n/AseParan pgn	Esecute 0 - Auto Include	Task 1,2,3,4	FB	Add
C-W3200S ample/\6Code/MPD/Include/MPG_INCLUDE_PGM C-W3200S ample/\6Code/MPD/NPag/MPG PGN	0 - Auto Include 2 - Auto Flun - Silent	1.2.3.4	F9	Update
Two new entries should now be included in the Program Autom			F10	lenove

Figure B-32: 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.



#### Step 10:

After the Reset routine has completed, run the MPG\_SAMPLE.Pgm.

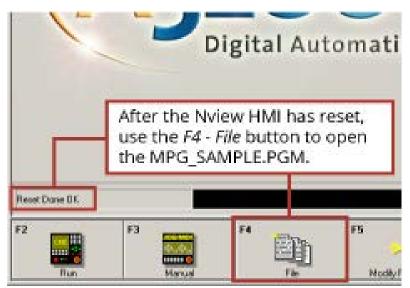


Figure B-34: Confirm Reset Results

Niew HMC				Use F8-Oper	🤉 to open 🗵
			File Pag	the file brow	vser.
Terk1	Taok 2	Task.3	Task 4	Sorach	New
				I	FB
9	pen			7 2	cj Open
	Look.ix: 🔤 MPG		- + 🖻	🖆 📼-	1
	3 DP				Sava
I II	History	Navigate to	the MPG folde	er to	10
I II			PG_SAMPLE.P		
I II	Decktop	, <u> </u>			Error Check
I II	<u> </u>	32_SAMPLEURGH			n
I II	My Documents				
I II					Run
	My Computer File name	MPS SAMPLE P		- Open	12
	Files of tw			Carcel	1
	Hy Network P	C Open as read-			J
Ľ			-		de la companya de la
Current File: N	e= program				
		F4	er.	<b>CO</b>	Enc
F2	F3	r.4	FS	F6	<pre>cHome Page&gt;</pre>
(File Menu)	(Edit Menup	Find Menuo	(Run Menup		F1 Help
The second second second second	APPENDIX CONTRACTOR	THE REAL PROPERTY AND	CONTRACTOR OF CONTRACTOR		e soake

Figure B-35: Opening the Sample Program (MPG\_Sample.Pgm)

# **B.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.

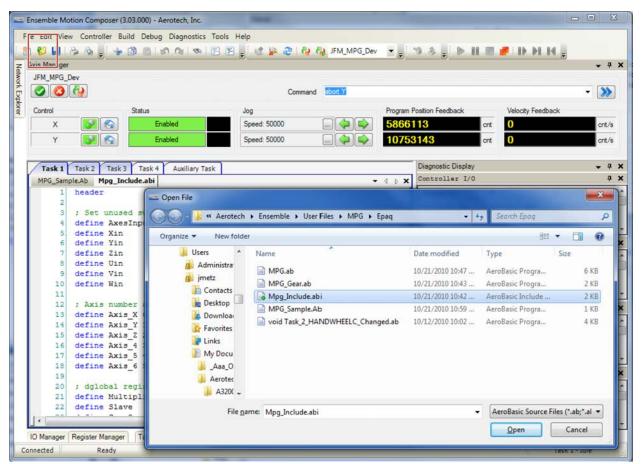


Figure B-36: Opening the MPG Folder

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.

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<b>@</b>	C:\Program F	iles\Aerotech\Ensemble\Sample	es\AeroBasic\Mpg 🔹 🚽	Search Mpg	٩
Organize 🔻	New folder			8≕	• 🔟 🔞
		Name MPG.ab MPG_Gear.ab MPG_Sample.Ab	Date modified           10/21/2010 10:47           10/21/2010 10:43           10/21/2010 10:42           Type: AeroBasic Include File           Size: 1.51 KB           Date modified: 10/21/2010 10:42	Type AeroBasic Progra AeroBasic Include PBasic Progra 2 AM	Size 6 KB 2 KB 2 KB 1 KB
	File <u>n</u> ar	ne: Mpg_Include.abi	•	AeroBasic Source F	iles (*.ab;*.al ▼ Cancel

Figure B-37: 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.

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	11	Contacts	Mpg Include.abi	10/21/2010 10:42	AeroBasic Include	2.KB
	12 ; Axis number	🖡 Desktop 🛁	MPG_Sample.Ab	10/21/2010 10:59	AeroBasic Progra	1 KB
	13 define Axis_X	S Downloa	void Task 2_HANDWHEELC_Changed.ab	10/12/2010 10:02	AeroBasic Progra	4 KB
	14 define Axis_Y 15 define Axis Z	🔓 Favorites	wid tast_2_nertbwneecc_changed.ab	10/12/2010 10/02	Herobesis Program	4 60
- 1	15 define Axis_Z 16 define Axis 4	👔 Links				
	17 define Axis 5	My Docu				
	18 define Axis_6	Aaa_O				
	19	Aerotec				
	20 ; dglobal regi					
	21 define Multipl					
		👃 A320( 🚽	ame: Mpg_Include.abi		AeroBasic Source Fi	les (*.ab;*.al 🔻

Figure B-38: 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.

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JFM_MPG_	Dev									
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	define Yin define Zin define Uin define Vin	1 2 3 4	, define in	put bit numbers	for the 6 axis s	Witc]	Axis I/O Property CW Limit In CCW Limit I	X Hi Hi	Y Hi Hi	
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10 11 12 13 14 15 16 17 18	define Yin define Zin define Uin define Vin define Win ; Axis numb define Axis define Axis define Axis	1 2 3 4 5 x 0 Y 1 Z 2 4 3 5 4	nments for ex ; 1st posit; ; 2nd posit; ; 3rd posit; ; 4th posit; ; 5th posit;	ach of 6 MPG swi ion on axis sele ion on axis sele ion on axis sele ion on axis sele ion on axis sele	tch positions ctor switch is a ctor switch is a ctor switch is a ctor switch is a	xis xis xis xis xis xis xis	Axis I/O Property CW Limit In CCW Limit I Home Limit Axis Fault Property Position Er Over Curren	X Hi Hi Hi X No No	Y Hi Hi Hi Y No No	
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10 11 12 13 14 15 16 17 18 19	define Yin define Zin define Uin define Win ; Axis numbu define Axis define Axis define Axis define Axis define Axis	1 2 3 4 5 5 7 assig X 0 Y 1 Z 2 4 3 5 4 6 5 6 5	nments for e ; 1st posit; ; 2nd posit; ; 3rd posit; ; 4th posit; ; 5th posit; ; 6th posit;	ach of 6 MPG swi ion on axis sele ion on axis sele ion on axis sele ion on axis sele ion on axis sele	tch positions ctor switch is a ctor switch is a ctor switch is a ctor switch is a ctor switch is a	xis xis xis xis xis xis xis	Axis I/O Property CW Limit In CCW Limit I Home Limit I Axis Fault Property Position Er Over Curren CW End of T Axis Status Property	X Hi Hi X No No No X	¥ Ні Ні Ні У No No No Х	
10 11 12 13 14 15 16 17 18 19 20	define Yin define Zin define Uin define Vin define Win ; Axis numbh define Axis define Axis define Axis define Axis define Axis ; dglobal re	1 2 3 4 5 7 8 7 1 7 2 2 4 3 5 4 6 5 9 1 7 1 2 2 2 4 3 5 4 5 9 1 7 1 7 1 7 1 7 1 7 1 7 1 7 1 7 1 7 1	nments for e ; 1st posit; ; 2nd posit; ; 3rd posit; ; 4th posit; ; 5th posit; ; 6th posit; assignments	ach of 6 MPG swi ion on axis sele ion on axis sele ion on axis sele ion on axis sele ion on axis sele	tch positions ctor switch is a ctor switch is a ctor switch is a ctor switch is a ctor switch is a	xis xis xis xis xis xis xis	Axis I/O Property CW Limit In CCW Limit I Home Limit I Axis Fault Property Position Er Over Curren CW End of T Axis Status	X Hi Hi X No No No	Y Hi Hi Hi Y No No No	

Figure B-39: 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.

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	Y		Enabled		Speed: 50000		10753	3143	cnt 0	C	nt/
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	14	define Axis_Y	1 ;	2nd posit:	ion on axis sele	ector switch is	axis _	Property	х	Y	
		define Axis_Z				ector switch is		Position Co	5866113 cnt	10753143.4.	
		define Axis_4				ector switch is		Position Fe	5866113 cnt	10753143 cn	
		define Axis_5				ector switch is					
		define Axis_6	5 ;	6th posit:	ion on axis sele	ector switch is	axis	ProgramPosi	5866113 cnt	10753143.4.	-
	19	; dglobal regi						Axis I/O			
		define Multipl		signments				Property	х	Y	
		define Slave	1er 0					CW Limit In	Hi	Hi	
		define GearOn	2					CCW Limit I	Hi	Hi	
		define MPG On	3					Home Limit	Hi	Hi	-
	25							Axis Fault			
	26	; define the d	listance	for one t:	ick (or change)	of the MPG hand	Wheel _		1.44		
		define BaseInc	r 1		; counts per tic	ck .	10 M	Property	x	Y	
	28			1,				Position Er	No	No	
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				correct up		of the axis nam		CW End of T	No	No	_
	31	define EncCh	1		; Master axi	is's auxiliary e	ncode	Axis Status			
		· Change the V	helow	to the name	of the first	axis in the Epag	while	Property	x	Y	-
	34					of the axis nam		and the second se		1.5	_
		define IOAxis	1	overeov uj	pper/ rower odde	es ens unas lida		CWLimitActive	No	No	_
1							*	CCWLimitActive	No	No	
1	•		11					Axis Enabled	Yes	Yes	

Figure B-40: Defining Handwheel scaling

## Step 4:

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

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15	define Axis	-		tion on axis sele		~	Position Co	5866113 cnt	10753143.4.	-
16	define Axis	4 3	; 4th posi	tion on axis sele	ctor switch is a	xis				-
17	define Axis	5 4	; 5th posi	tion on axis sele	ctor switch is a	xis	Position Fe	5866113 cnt	10753143 ent	t
18	define Axis	6 5	; 6th posi	tion on axis sele	ctor switch is a	xis	ProgramPosi	5866113 cnt	10753143.4.	-
19							Axis I/O			Ę
20	; dglobal re	-	21 B.C.				Property	x	Y	
21	define Multi	-	0			-	CW Limit In	84	Hi	-
22	define Slave		1						- 122	-
23	define Gear		2				CCW Limit I	Hi	Hi	_
24 25	define MPG_0	'n	3				Home Limit	Hi	Hi	-
25	· define the	distan	ce for one	tick (or change)	of the MDG hand	heel	Axis Fault			5
27	define Basel		ou tor one	; counts per tic		E	Property	х	Y	
28			-				Position Er	No	No	
29	; Change the	Y belo	to the name	me of the axis in	the Epaq, which	the	Over Curren	No	No	-
30	; Be sure t	o use t	he correct	upper/lower case	of the axis name	1	1000 - COLOR DOM TO COLOR	1000	No	-
31	define EncCh	1 1		; Master axi	s's auxiliary er	code	CW End of T	No	NQ	1
32		8. 27. 24	1				Axis Status			
33				me of the first a			Property	х	Y	
34			he correct	upper/lower case	of the axis name	11	CWLimitActive	No	No	
35	define IOAx:	ls 1				-	CCWLimitActive	No	No	
22		111					Axis Enabled	Yes	Yes	-

Figure B-41: Defining the MPG Handwheel Connection

## Step 5:

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

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24			3				Axis I/O			
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26					of the MPG handW	heel	CW Limit In	Hi	Hi	ī
28	define Ba	eincr i	,	counts per tic	x		CCW Limit I	Hi	Hi	-
29	; Change	he Y bel	ow to the name	of the axis in	the Epaq, which	the i-	Home Limit	Hi	Hi	-
30					of the axis name		Axis Fault			-
31	define En	Ch 1		; Master axi	s's auxiliary en	code	Property	x	Y	-
33	; Change	he X bel	ow to the name	of the first a	xis in the Epag,	whil	Position Er	No	No	Ĩ
34	; Be sur	to use			of the axis name		Over Curren	No	No	
35	define IO	xis 1					CW End of T	No	No	
36 37	define Mu	±¥10 6	· define inn	ute/state for t	he 2 mult. switc	hee	Axis Status			l
38	define Mu		, acture mp	ACCIDENCE TOT P	ne z muzo, owite		Property	x	¥	ī
39							CWLimitActive	No	No	1
40	end heade:					-		No	No	-
4		111				•	Axis Enabled	Yes	Yes	-

Figure B-42: 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.

= Ensemble M	otion Composer (3.03.000) - Aerotech, Inc.					
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B (2 H)	3 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	🖹 🚽 🐮 🔛 🥭 🙌 🚯 JFM_MPG_Dev		1 8 I D H	III 🥔 ID DI	14 -
						- 4
JFM_MPG_	Dev					
Axis JFM_MPG_ JFM_MPG_	<u>.</u>	Command abort Y				- >>>
Control	Status	Jog	Program F	Position Feedback	Velocity Feed	fback
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Y	Enabled	Speed: 50000 🟟 📦	1075:	3143	cnt 0	cnt/s
Task 1	Task 2 Task 3 Task 4 Auxiliary Task		_	Diagnostic Display		<b>~</b> ņ
	pleAb Mpg Include.abi	•	d b X	Controller I/O		<b></b>
19		57.) 57.)	-	Property	x	Y
20	; dglobal register assignments		<u>^</u>	Position Co	5866113 cnt	10753143.4
21	define Multiplier 0 define Slave 1			Position Fe	5866113 cnt	10753143 cnt
22	define GearOn 2			ProgramPosi	5866113 cnt	10753143.4
24	define MPG On 3		_	Axis I/O		<b>4</b>
25				Property	x	¥
26		.ck (or change) of the MPG handWi	heel	CW Limit In	Hi	Hi
27	define Baseiner i	counts per tick		CCW Limit I	Hi	Hi
29	; Change the Y below to the name	of the axis in the Epaq, which	the I	Home Limit	Hi	Hi
30	; Be sure to use the correct up			Axis Fault		<b>4</b>
31	define EncCh 1	; Master axis's auxiliary en	code:	Property	x	Y
33	; Change the X below to the name	of the first axis in the Epag.	whil	Position Er	No	No
34	; Be sure to use the correct up			Over Curren	No	No
35	define IOAxis 1			CW End of T	No	No
36 37	define MultX10 6 ; define int	uts/state for the 2 mult. switch		Axis Status	W-C	д
38	define MultX100 7	ausystate for the 2 marc. Switch		Property	x	Y
39				CWLimitActive	No	No
40	end header		-	CCWLimitActive		No
	m		<b>.</b>	Axis Enabled	Yes	Yes
IO Manager	Register Manager Task List			LASIS Enabled	143	1163
Connected	Ready					Task 1 - Idle

Figure B-43: 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.

	ebug Diagnostics I						14	
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M_MPG_Dev								
			Command abort Y				- 2	
ntrol Status		Jog		Program Posit	ion Feedback	Velocity Feedb	ack	
х 🚱 🚱 🗗	nabled	Speed: 50000		> 5866113	3 a	nt 🚺	cnt	t/s
Y 🚺 🔂	nabled	Speed: 50000		> 1075314	<b>43</b> a	nt O	cnt	t/s
ork Explorer 🗸 🗣 🗙	Task 1 Task 2	Task 3 Task 4	Auxiliary Task		Diagnostic Display		•	
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FM_MPG_Dev	7 define			*	Property	x	Y	
🕀 🔂 Axes	8 define 9 define				Position Co	5866113 cnt	10753143.4	-
File System	10 define				Position Fe	5866113 cnt	10753143 cnt	;
MPG.bcx	11				ProgramPosi	5866113 cnt	10753143.4	
🗄 🎑 Firmware Plugins	12 ; Axis	number assi	gnments for eac	h of 6 MPG	ProgramPosi	5866113 cnt	10753143 cnt	
Computer		Axis_X 0	; 1st positio		Velocity Fe	0 cnt/s	0 cnt/s	
- 🥵 User Files		Axis_Y 1	; 2nd positio					_
🕀 🚺 ASRT	the second se	Axis_Z 2 Axis 4 3	; 3rd position ; 4th position		Axis I/O		1	4
🕀 💋 MPG		Axis 5 4	; 5th positio		Property	x	¥	
Epaq		Axis 6 5	: 6th positio		CW Limit In	Hi	Hi	_
void Task_2_	19	-			CCW Limit I	Hi	Hi	-
HANDWHEEL			assignments		Home Limit	Hi	Hi	-
MPG.ab		Multiplier	0					_
MPG.bco	22 define 23 define	GearOn	1		Marker Inpu	Lo	Lo	_
MPG box		MPG On	3		Hall A Inpu	Hi	Lo	_
MPG_Gear.bc	25		-		Axis Fault	M.a.	- 16	ņ
MPG Gear.bc	26 ; defi	ne the dista	nce for one tic	k (or chang				Ŧ
Mpg_Include.		BaseIncr 1	. ;	counts per H	Property	x	Y	_
Mpg_Include.     MPG_Sample	28				Position Er	No	No	_
MPG Sample			ow to the name		Over Curren	No	No	_
MPG_Sample	31 define		the correct upp	: Master	CW End of T	No	No	
MPGA32_SA	32	Litter 1	·).	, 1100001	CCW End of	No	No	
MPGA32_SA     MPGA32_SA		ge the X bel	ow to the name	of the firs	CW Software	No	No	
MPGA32_SA	34 ; Be	sure to use	the correct upp	er/lower ca				_
MPGA32_SA	The second se	IOAxis 1			Axis Status		1	ņ
MPGA32_SA	36			10000	Property	х	Y	
Task_2_HAN	The second se	MultX10 6 MultX100 7	; define inpu	its/state fo	CWLimitActive	No	No	
Task_2_HAN	39	HUICKIOO /			CCWLimitActive	No	No	-
Task_2_HAN	40 end he	ader			Axis Enabled	Yes	Yes	
Task 2 HAN	41	or execution				No	No	_
Task_2_HAN				<b>T</b>	Home Cycle			_
III T 2 11AM	4 111	1			In Position	Yes	Yes	

Figure B-44: Copying Files to the Controller

# Step 8:

Open the Configuration Manager from the Tools Menu

		d Debug Diagnost		a constant						
		3 III IA A I Y		Digital Scope		* e	19 8 🚽 🕨 H	🗏 🍯 IÞ ÞI	14 -	
Axis Manager			2	Configuration Manager	rs III				•	Ą
JFM_MPG_U			123	Motion Designer						
0			3	Preferences	abort Y				- 2	>>
Control		Status		Jog		Program	Position Feedback	Velocity Fee	dback	
X		Enabled		Speed: 50000		5866	113	cnt 0	cr	nt/s
Y		Enabled		Speed: 50000		1075		cnt 0	cr	nt/s
1						1				
Task 1	Task 2 Task 3	Task 4 Auxilian	Task				Diagnostic Display		•	ą
MPG_Sam	ple.Ab Mpg_Incl	ude.abi			-	4 þ <b>X</b>	Controller I/O			ą
20	; dglobal re	egister assign	ents			-	Property	х	¥	
21	define Mult:						Position Co	5866113 cnt	10753143.4.	
22	define Slave						Position Fe.	5866113 cnt	10753143 cm	
23	define Gear( define MPG (						ProgramPosi	5866113 cnt	10753143.4.	_
24	derine MPG_(	Jn 3					Axis I/O	0000113 010	10/00140.4.	4
	; define the	distance for	one ti	ck (or change)	of the MPG hand	Theel	Property	x	Y	_
27	define Basel	Incr 1	;	counts per tic	k		CW Limit In	Hi	Hi	_
28								100		_
29					the Epaq, which of the axis name		CCW Limit I		Hi	
30 31	define EncCl		ect up		s's auxiliary er	and a second	Home Limit	Hi	Hi	
32	derine Enoor			, Habter aki	o o duvillary ci	coue.	Axis Fault			<b></b>
33	; Change the	X below to t	ne name	of the first a	xis in the Epag,	whil	Property	x	Y	
34	; Be sure t	to use the cor	ect up	per/lower case	of the axis name	1	Position Er	No	No	
35	define IOAx:	is 1				=	Over Curren	No	No	
36	define Mult					1	CW End of T	No	No	_
38	define Mult		ne inp	uts/state for t	he 2 mult. swite	nes	Axis Status			<b></b>
39	detane nutor	1200					Property	x	Y	-
40	end header						CWLimitActive	No	No	-
41						-	CCWLimitActive	No	No	_
1.							Avis Enabled		Yes	_
							LAX19 Enabled	Yes	165	_

Figure B-45: 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.

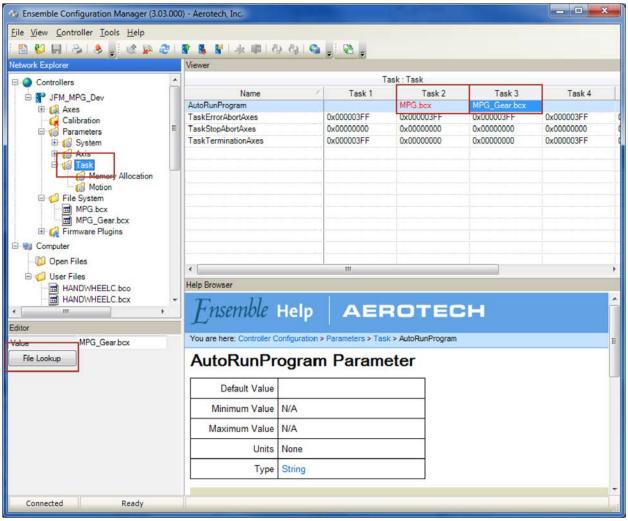


Figure B-46: Select the Auto-Run Task parameters

### 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.

Controller Nam	ne:	2	JFM_MPG_Dev		🥏   样   View
Name		File Size (bytes)	Creation Date	System Attributes	User Attributes
聞 MPG.bcx 聞 MPG_Gea	r.bcx	3535 2208	2010-10-21 10:5 2010-10-21 10:5		0x0000000 0x00000000
File Name:					Open

Figure B-47: 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.

3 Ensemble Configuration Manager (3.03.000	0) - Aerotech, Inc.						
File View Controller Tools Help							
🗈 😫 🔲 🗞 😓 🚦 🎕 🖗 🍘	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	9 (B) 🚳 🚽 🚳 🖕					
Network Explorer	Viewer						
- Controllers		Controller : System					
B JFM_MPG_Dev	Name	Value 0x000003FF					
Axes	DisplayAxes ExternalSyncFrequency	0					
Calibration	RequiredAxes	0x0000000					
😟 👩 System	TaskExecutionSetup	0x0000000E					
⊕ (⊘ Axis ⊖ (⊘ Task							
Memory Allocation							
Motion							
⊟- 🥬 File System □ 💼 MPG.bcx							
MPG_Gear.bcx							
🗈 📢 Firmware Plugins							
🖻 🐏 Computer							
🎁 Open Files							
	Help Browser						
HANDWHEELC.bco		×					
< III >	Finsemble	Help AEROTECH					
Editor							
Tasks Enabled	You are here: Controller C	Configuration > Parameters > System > TaskExecutionSetup					
🕅 Auxiliary Task	TaskExecu	tionSetup Parameter					
Task 1							
Task 2	Default Value	0x00000002					
V Task 3	Minimum Value	N/A					
Task 4	Maximum Value	N/A					
Calculator	Units	None					
	Туре	32-bit signed integer					
		*					
Connected Ready							

Figure B-48: 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.

ork Explorer	Viewer		
Controllers	*		Controller Info
JFM MPG Dev	Data		Value
E Axes	Name		JFM_MPG_Dev
Calibration	Communication Type		Usb
	Master Type		CP
🕀 👩 System	Blinking		False
🕀 👩 Axis	DHCP Enabled		False
🖻 🄞 Task	IP Address		192.168.1.10
- 6 Memory Allocation	Subnet Mask		255.255.0.0
- 🕼 Motion	Default Gateway		10.101.0.72
🖻 🣁 File System	MAC Address		0x00118900028C
MPG.bcx	Firmware Version		3.03
MPG_Gear.bcx	FPGA Version		0x01122010
🐵 🙀 Firmware Plugins	Hardware Version		0x00000102
Computer			
Open Files			
🗉 📢 User Files			
HANDWHEELC.bco	Help Browser		
HANDWHEELC.bcx	11		· / · · · · · · · · · · · · · · · · · ·
	Husemple	Heln	AEROTECH
	Lincinna	incip	
r	You are here: Controller	Configuration	> Parameters > Task > AutoRunProgram
	Tou are nere. Controller	Comguration	Parameters > Pask > Autorum Program
	AutoRunP	rogran	n Parameter
	Default Value		
	Minimum Value	N/A	
	Maximum Value	N/A	
	Units	None	

Figure B-49: 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.

# **Appendix C: Revision History**

Revision	Description	
2.01	<ul> <li>added XI4 connection information</li> <li>moved legacy device information to Appendix B.</li> </ul>	
	General Updates	
2.00	Section 2.1.	
	added XC4/XC4e connection information	
	added XR3 connection information	
1.05		
1.04		
1.03	Revision changes have been archived. If you need a copy of this revision, contact	
1.02	AerotechGlobal Technical Support.	
1.01		
1.00		

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