



Installation Instructions
for the Hardinge®
Fourth-Axis Beta-i Drive Kit

(Required to operate a Hardinge GD5C2, GD16C2, GD3J2 or GD160LP Rotary Table Indexer
via true fourth axis on a Bridgeport® GX 480 Vertical Machining Center)

Original U.S.A. Instructions

Table of Contents

Safety Recommendations	3
1. Introduction	
1.1 Description	6
1.2 Parts List	6
1.3 Suggested Tools	7
2. Set Up	
2.1 Back up the original parameters on the machine.	7
2.2 Powering down the machine.	7
2.3 Locating the fiber optic port	8
2.4 Mounting the fourth-axis Beta-i drive and dynamic brake resistor	9
2.5 Installing the three-phase power cable.	11
2.6 Connecting the dynamic brake resistor and fiber optic cable.	12
2.7 Locating the two fourth-axis wires in the machine	13
2.8 Installing the chassis ground wire and connecting the shield wire of the feedback cable. . .	14
2.9 Installing the 24-volt power cable.	15
2.10 Installing the drive enable cable	17
2.11 Preparing the machine for a Hardinge fourth-axis rotary with a 24vdc clamp solenoid . . .	18
3. Modifying the Parameters	
3.1 Modify the parameters	19
3.2 Single-Axis Parameter Setup Sheet.	19

Safety Recommendations

READ COMPLETE INSTRUCTIONS CAREFULLY BEFORE OPERATING THIS UNIT. NOTE: Equipment refers to the rotary table and/or machine it is used with.

When this instruction book was printed, the information given was current. However, since we are constantly improving the design of our products, it is possible that the illustrations and descriptions may vary from the system.

- WARNING -

Occupational Safety and Health Administration (OSHA) Hazard Communication Standard 1910.1200, effective May 25, 1986, and various state "employee right-to-know laws" require that information regarding chemicals used with this equipment be supplied to you. Refer to the applicable section of the Material Safety Data Sheets supplied with your unit when handling, storing or disposing of chemicals.

HARDINGE SAFETY RECOMMENDATIONS

Your Hardinge rotary table is designed and built for maximum ease and safety of operation. However, some previously accepted shop practices may not reflect current safety regulations and procedures, and should be re-examined to insure compliance with the current safety and health standards.

Hardinge Inc. recommends that all shop supervisors, maintenance personnel, and machine tool operators be advised of the importance of safe maintenance, setup and operation of Hardinge-built equipment. Our recommendations are described below.

READ THESE SAFETY RECOMMENDATIONS BEFORE PROCEEDING ANY FURTHER.

READ THE APPROPRIATE MANUAL OR INSTRUCTIONS before attempting operation or maintenance of the equipment. Make certain that you understand all instructions.

DO NOT ALLOW the operation or repair of equipment by untrained personnel.

CONSULT YOUR SUPERVISOR when in doubt as to the correct way to do a job.

WEAR SAFETY GLASSES AND PROPER FOOT PROTECTION at all times. When necessary, wear respirator, helmet, gloves and ear muffs or plugs.

DO NOT OPERATE EQUIPMENT unless proper maintenance has been regularly performed and the equipment is known to be in good working order.

WARNING or INSTRUCTION TAGS are mounted on the unit for your safety and information. Do not remove them or damage them.

DO NOT ALTER THE EQUIPMENT to bypass any interlock, overload, disconnect or other safety device.

DO NOT OPERATE EQUIPMENT if unusual or excessive heat, noise, smoke, or vibration occurs. Report any excessive or unusual vibration, sounds, smoke or heat as well as any damaged parts.

LIFTING AND HANDLING OF THE UNIT should be done with full knowledge of the unit weight and using proper procedures.

MAKE CERTAIN that the equipment is properly grounded. Consult National Electric Code and all local codes.

Remove power from the unit by unplugging the power cord before attempting repair or maintenance.
(Where Applicable)

DON'T TOUCH ELECTRICAL EQUIPMENT when hands are wet or when standing on a wet surface.
(Where Applicable)

REPLACE BLOWN FUSES with fuses of the same size and type as originally furnished. (Where Applicable)

Safety Recommendations (continued)

ASCERTAIN AND CORRECT the cause of a shutdown caused by overload heaters before restarting the machine.
(Where Applicable)

KEEP THE AREA AROUND THE MACHINE well lit and dry.

KEEP CHEMICAL AND FLAMMABLE MATERIAL away from electrical or operating equipment.

HAVE THE CORRECT TYPE OF FIRE EXTINGUISHER handy when machining combustible material and keep chips clear of the work area.

DON'T USE a toxic or flammable substance as a solvent cleaner or coolant.

MAKE CERTAIN THAT PROPER GUARDING is in place and that all doors to the primary machine are closed and secured.

DON'T OPEN GUARD DOORS of the primary machine while any machine component is in motion.

MAKE SURE chucks, closers, fixture plates and all other spindle-mounted workholding devices are properly mounted and secured before starting the unit or the machine.

MAKE CERTAIN all tools are securely clamped in position before starting the unit or the machine.

REMOVE ANY LOOSE PARTS OR TOOLS left on the unit or the machine or in the work area before operating the equipment. Always check the machine and work area for loose tools and parts especially after work has been completed by maintenance personnel.

REMOVE CHUCK WRENCHES before starting the unit or the machine.

BEFORE PRESSING THE CYCLE START PUSH BUTTON, make certain that proper functions are programmed and that all controls are set in the desired modes.

KNOW WHERE ALL STOP push buttons are located in case of an emergency.

CHECK THE LUBRICATION OIL LEVEL before operating the machine.

MAKE CERTAIN that all guards are in good condition and are functioning properly before operating the equipment.

INSPECT ALL SAFETY DEVICES AND GUARDS to make certain that they are in good condition and are functioning properly before the cycle is started.

CHECK THE POSITION of any load/unload automation before pressing the CYCLE START push button.

CHECK SETUP, TOOLING, AND SECURITY OF THE WORKPIECE if the machine has been OFF for any length of time.

DRY CYCLE a new setup to check for programming errors.

MAKE CERTAIN that you are clear of any "pinch point" created by moving slides before starting the machine.

DON'T OPERATE any equipment while any part of the body is in the proximity of a potentially hazardous area.

DON'T REMOVE CHIPS with hands. Use a hook or similar device and make certain that all machine movements have ceased.

BE CAREFUL of sharp edges when handling a newly machined workpiece.

DON'T REMOVE OR LOAD a workpiece while any part of the equipment is in motion.

DON'T OPERATE ANY EQUIPMENT while wearing rings, watches, jewelry, loose clothing, neckties or long hair not contained by a net or shop cap.

DON'T ADJUST tooling or coolant hoses while the equipment is running.

DON'T LEAVE tools, workpieces or other loose items where they can come in contact with a moving component of the equipment.

DON'T CHECK finishes or dimensions of workpiece near running spindle or moving slides.

DON'T JOG SPINDLE in either direction when checking threads with a thread gage.

Safety Recommendations (continued)

DON'T ATTEMPT to brake or slow the equipment with hands or any makeshift device.

ANY ATTACHMENT, TOOL OR MACHINE MODIFICATION not obtained from Hardinge Inc. must be reviewed by a qualified safety engineer before installation.

USE CAUTION around exposed mechanisms and tooling especially when setting up. Be careful of sharp edges on tools.

DON'T USE worn or defective hand tools. Use the proper size and type for the job being performed.

USE ONLY a soft-faced hammer on tooling and fixtures.

DON'T USE worn or broken tooling on machine.

MAKE CERTAIN that all tool mounting surfaces are clean before mounting tools.

INSPECT ALL CHUCKING DEVICES daily to make certain that they are in good operating condition. Replace any defective chuck before operating the machine.

USE MAXIMUM ALLOWABLE gripping pressure on the chuck. Consider weight, shape and balance of the workpiece.

DON'T EXCEED the rated capacity of the equipment.

DON'T LEAVE the equipment unattended while it is operating.

DON'T CLEAN the equipment with an air hose.

KEEP TOTE PANS a safe distance from the machine. Don't overfill the tote pans.

DON'T LET STOCK project past the back end of the collet closer or equipment spindle without being adequately covered and properly supported.

UNLESS OTHERWISE NOTED, all operating and maintenance procedures are to be performed by one person.

To avoid injury to yourself and others, be sure that all personnel are clear of the equipment when opening or closing the coolant guard door and any access covers.

FOR YOUR PROTECTION - WORK SAFELY

DON'T OPERATE THE EQUIPMENT with damaged or worn electrical cables.

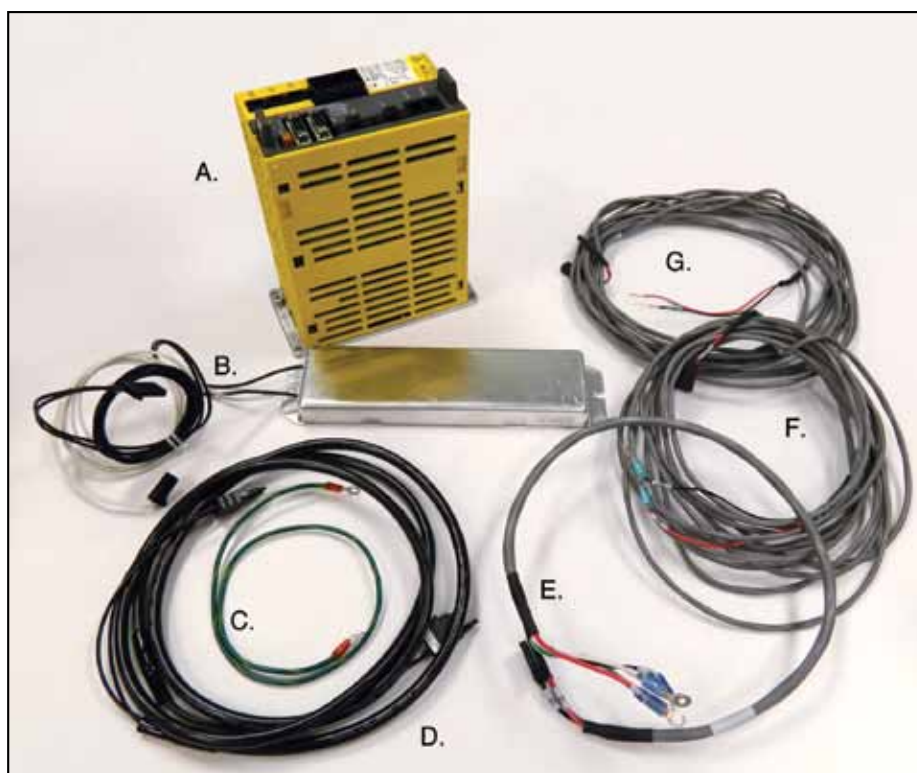
VERIFY that the electrical cables are not restrained or pinched during full travel movement of the machine.

I. Introduction

I.1 Description

The Hardinge® Fourth-Axis Beta-i Drive Kit contains wiring and components necessary to operate a Hardinge gear-driven rotary unit via fourth-axis of the CNC. The machine must have the fourth-axis pre-wiring installed. Hardinge rotary models GD5C2, GD16C2, GD3J2 and GD160LP rotary table indexers can be mounted on a Bridgeport GX 480 vertical machining center and operate via fourth-axis when this kit is installed.

I.2 Fourth-Axis Beta-i Drive Kit — Parts List



Fourth-Axis Beta-i Drive Kit — Part No. CI 000040016AE

Figure	Part Number	Description	Qty
A	A06B6130H002	20-Amp Beta-i Servo Drive	1
B	A06B6130H402	Dynamic Brake Resistor	1
		Connectors (shown attached)	2
C		Chassis Ground Wire	1
D	A66L60010026L2R003	Fiber Optic Cable	1
E	CI 0003011I36I	Three-Phase Power Cable	1
F	CI 0003011I36F	24-Volt Power Cable	1
G	CI 0003011I36J	Drive Enable Cable for CE machine	1
	CI 0003011I36E	Drive Enable Cable for non-CE machine	1
		Wire-Joint (not shown)	2
		Large Ty-wrap (not shown)	2
		Small Ty-wrap (not shown)	10
		M4 x .7 x 8mm SHCS (not shown)	7

1.3 Suggested Tools

1. Power drill and #30 tap drill
2. M4 x .7 tap and tap handle
3. M4 Allen wrench(s) - ball-nose or long T-handle
4. Diagonal wire cutters
5. Needle nose pliers - fine
6. center punch
7. Fine-tip felt marker pen
8. Pin crimpers for dynamic brake resistor
9. Clean shop rags
10. Wire strippers - 18-22 average
11. Crimping tool for wire joints

2. Set Up

2.1 Back up the original machine parameters from the CNC control

- Insert a card into the card slot.
- The Setting Screen should be set to Channel 4 and set Parameter Write to 1.
(You may need to hit Cancel & Reset to clear an alarm)
- Push the System key.
- Right arrow until you see the All IO screen, click on All IO screen and go into Edit mode.
- Save parameters by selecting parameter, push OPRT, and File Output.
- Name the file using the keypad incorporating a (.txt) suffix.
- Push F Name to store the name in the alpha file.
- Push Execute to save the parameters on the card.

2.2 Powering Down the Machine

Before adding the fourth-axis Beta-i drive, you must power down the machine:



E-STOP



OFF

- Push the E-Stop button on the operator control panel in the front of the machine.
- Turn off the control by pushing the OFF button.

- Turn off the main power to the machine on the power panel in the rear of the machine by rotating the selector switch counterclockwise to the OFF position. This allows access to the inside of the power panel.
- Disconnect the machine from the main power supply at the fuse box or other source so that the machine is totally isolated from power.



CAUTION: Wait for the light to go out under the Fanuc Beta-I SVPM3 drive package, indicating that the drives have discharged and the DC output bus has gone to zero. Discharge time could take over two minutes.

2.3 Locating the Fiber Optic Port



The newer Fanuc SVMP3 drive packages have a COP10A and a COP10B fiber optic port to the right of the SVMP3 drive package (yellow box). The COP10A optic port provides the ability to add a fourth-axis after the SVMP3 package.

NOTE: If the combination drive package on the machine does NOT have a COP10A connection (many older machines do not), then the fiber optic cable must be removed from the COP10B port on the SVMP3 drive package and re-attached to the COP10B port on the fourth-axis Beta-i drive. Then the kit provided fiber optic cable is run from the COP10A port on the fourth-axis Beta-i drive to the COP10B connector on the SVMP3 drive package. This inserts the fourth-axis Beta-i drive between the Fanuc CNC control and the SVMP3 drive package. In this case there is only one fiber optic cable on the combination drive package and there are two fiber optic cables connected to the fourth-axis Beta-i drive. The FSSB drive allocation table in the control must then be re-assigned. Please call the factory for complete instructions.


Fourth-Axis Beta-i Drive Kit User Manual B-I 65A

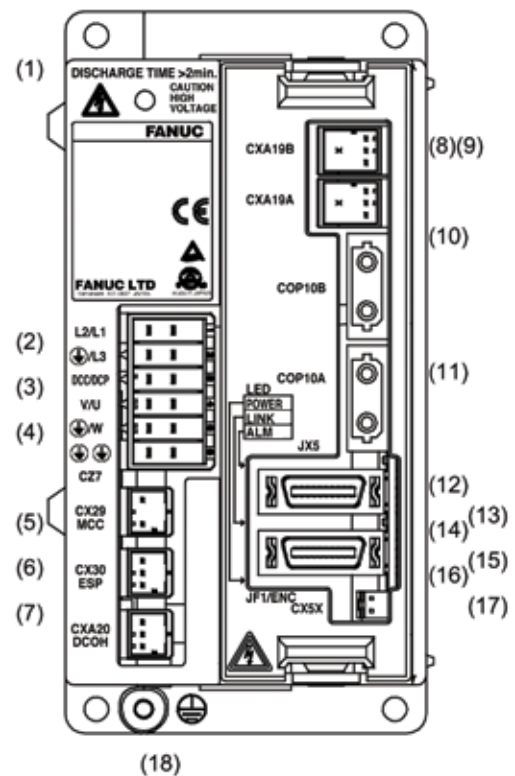
2.4 Mounting the Fourth-Axis Beta-i Drive and Dynamic Brake Resistor



There are four pre-drilled holes to the left of the yellow SVMP3 drive package that match the footprint of the Beta-i drive. This is where you will mount the drive. Mount the Beta-i drive using four M4 SHCS screws. Hand-tighten using an M4 ball-nosed Allen wrench or an 8-inch M4 T-handle Allen wrench.

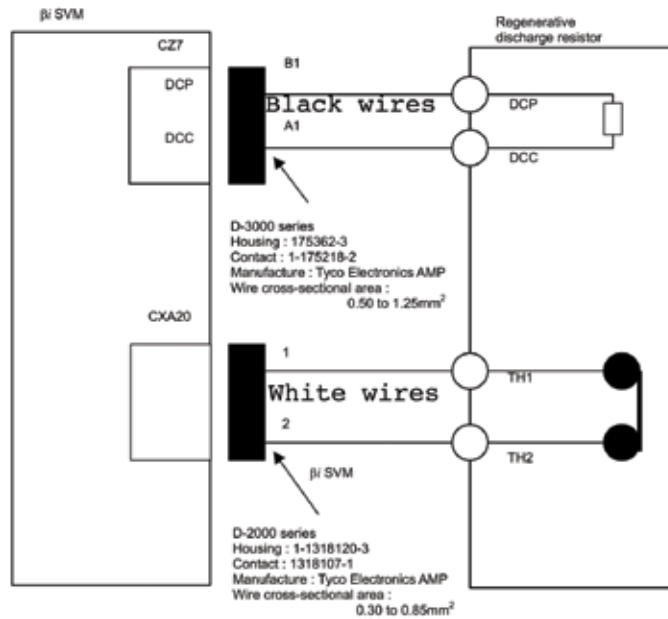
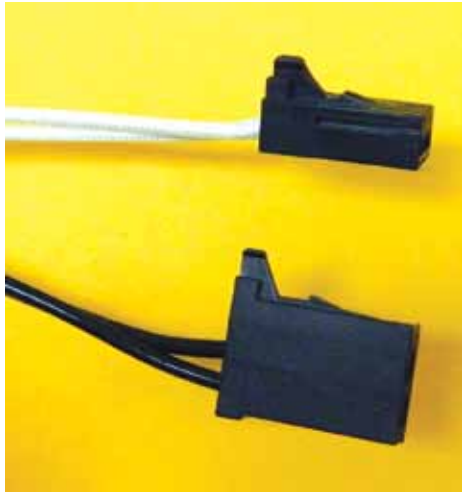
Beta-i Electrical Connection Diagram

No.	Name	Remarks
1		DC link charge LED
2	CZ7-1 CZ7-2	Main power input connector
3	CZ7-3	Discharge register connector
4	CZ7-4 CZ7-5 CZ7-6	Motor power connector
5	CX29	Connector for main power MCC control signal
6	CX30	ESP signal connection connector
7	CXA20	Regenerative resistor connector (for alarms)
8	CXA19B	24VDC power input
9	CXA19A	24VDC power input
10	COP10B	Servo FSSB I/F
11	COP10A	Servo FSSB I/F
12	ALM	Servo alarm status display LED
13	JX5	Connector for testing (Leave open)
14	LINK	FSSB communication status display LED
15	JF1	Pulsecoder
16	POWER	Control power status display LED
17	CX5X	Absolute Pulsecoder battery
18		Tapped hole for grounding the flange



Fourth-Axis Beta-i Drive Kit User Manual B-I 65A

Before mounting the resistor, you will have to crimp the supplied connectors to the wires of the resistor and then drill and tap two M4 holes to mount the resistor.



- Crimp pins on the wires and mount them into the plugs



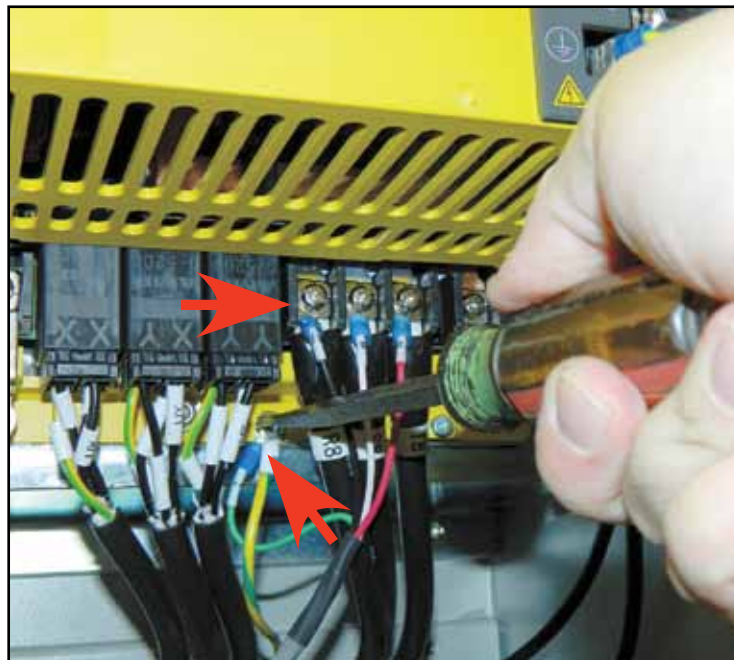
- Hold the resistor in the desired mounting position as shown.
- Mark the mounting hole locations for drilling.

CAUTION: Place a clean shop rag on the ledge below the panel before drilling to catch any metal filings.

- Punch indents in the panel on your two marks to aid in the drilling process.
- Drill each hole using a #30 tap drill size to thread for M4 x .7 SHCS screws.
- Tap each hole.
- Screw in the top M4 SHCS screw and slide the resistor into position.
- Screw in the bottom screw and hand tighten both screws using an M4 Allen wrench.
- Lift the wires and carefully remove the shop rag so that no metal filings are left on the ledge in the power panel.

NOTE: All connectors on the Fourth-Axis Beta-i Drive are keyed and will only plug in one way.

- Unscrew the earth terminal and screw in the E (green earth) wire connector to it.
- Continue connecting the R8 (black wire), S8 (white wire) and T8 (red wire).
- Snap the terminal cover back into position.



2.6 Connecting the Dynamic Brake Resistor and Fiber Optic Cable



- The wide connector (black wire) plugs into DCP port or slot 3 of connector CZ7 on the Beta-i fourth-axis drive.
- The thermostat wire connector (white wire) plugs into the bottom left connector labeled CXA20/DCOH on the Beta-i fourth-axis drive.



- Remove the (2) protective vinyl covers from each end of the fiber optic cable.
- Remove the COP10B port cover on the Beta-i fourth-axis drive and insert one end of the fiber optic cable (both ends of the cable are identical).



- Remove the COPI0A port cover on the SVMP3 drive package and connect the other end of the fiber optic cable into the COPI0A port.

2.7 Locating and connecting the machine's fourth-axis cables

The machine comes pre-wired with a motor power cable and a feedback cable for the fourth-axis Beta-i drive.

NOTE: Early GX production machine prewire kits came with a '40-amp drive' motor plug connector on them. This will have to be removed and replaced with the proper '20-amp drive' - motor plug connector. Contact your machine distributor for a plug replacement kit.

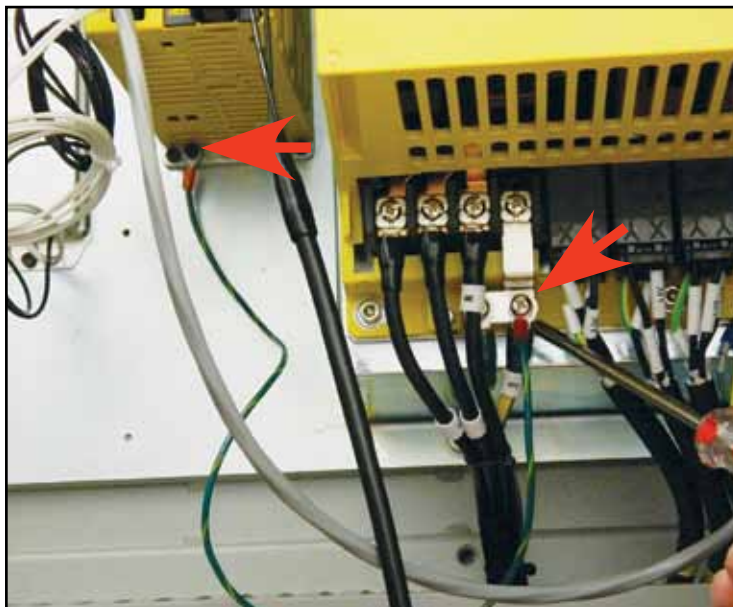


- Remove the central wire-way cover and open the plastic bag to locate the two fourth-axis cables.



- The motor power cable plugs into the remaining lower three slots of the CZ7 plug and the feedback cable plugs into the JF1 terminal on the Beta-i fourth-axis drive. The light green shield wire will be connected in the next section.
- Push the two cables in between the wireway fingers and snap the wireway cover back temporarily into position to prevent other cables and wires from falling out.

2.8 Installing the Chassis Ground Wire and connecting the Shield Wire of the Feedback Cable



Chassis Ground Wire (green)

- Attach one end of the ground wire to the ground screw connection under the base of the Beta-i Drive using an M4 SHCS screw.
- Attach the other end to the ground screw on the SVMP3 drive package as shown. The SVMP3 ground screw will have another ground wire with the E (earth) wire label.

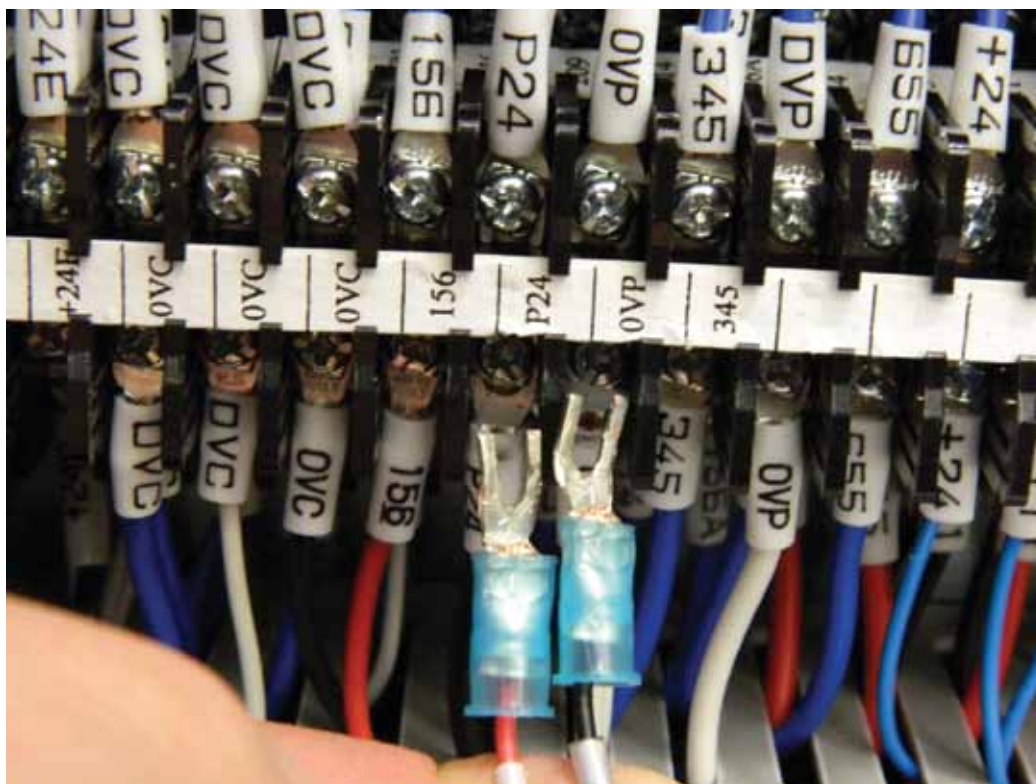


- Snip the nylon ty-wrap to release the light green shield cable from the feedback cable that is connected in the JF1 port of the Beta-i Drive. Wrap the wire around the feedback cable a couple of times and connect it to any available terminal on the ground terminal block located below the wireway cover to ground the shielding of the feedback cable.

2.9 Installing the 24-Volt Power Cable



- Plug the single connector into the CXA19B connector on the upper right side of the Beta-i fourth-axis drive.
- Run the wire through the wireway fingers and run them down to the lower plastic covered terminal block in the bottom left area of the power panel. Remove the plastic terminal cover and the wireway cover.



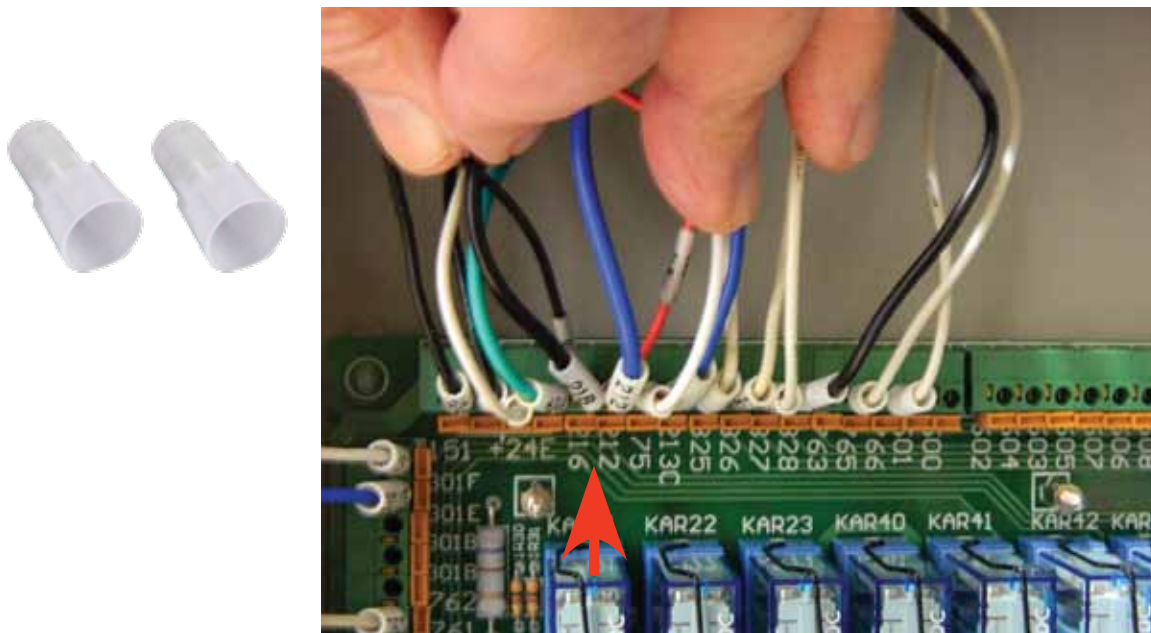
- Hook the red wire to the P24 terminal and the black wire to the 0VP terminal, and tighten them down with a screwdriver.

2.10 Installing the Drive Enable Cable

There are two cables in the kit that are supplied with wire joints to splice into the existing wiring of the machine. Use the cable whose wire labels match the wire labels on CX4 of the Fanuc SVMP3 drive package. One cable is for CE machines and the other would be used for non-CE machines.



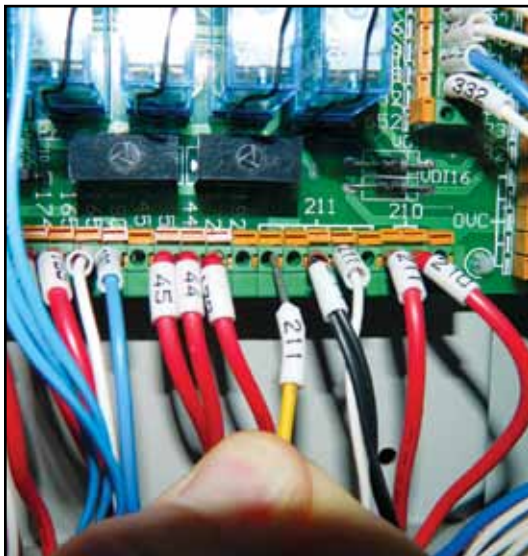
- Plug the appropriate drive enable cable into the CX30 connector on the lower left side of the Beta-i fourth-axis drive. Run the cable down through the wireway fingers and over to the top row of terminals on the relay module located on the left wall of the main enclosure.
- The red wire from the cable must be connected with a wire joint to either 212 (non-CE) or 225 (CE).
- The black wire from the cable must be connected with a wire joint to wire 216 in either the CE or non CE machine.



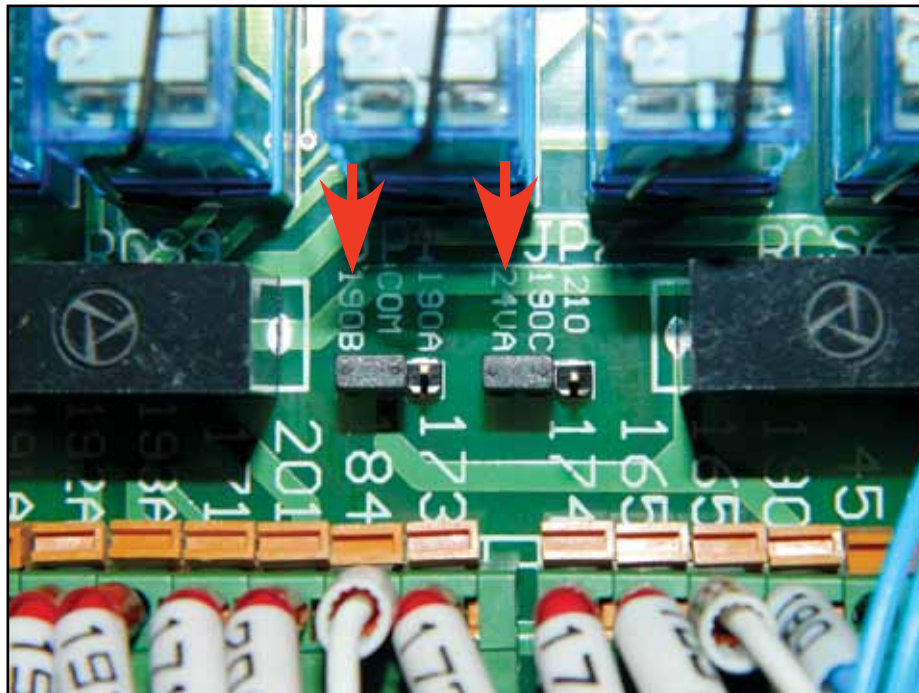
2.11 Preparing the machine for a fourth-axis Hardinge Rotary with 24vdc clamp solenoid (skip this section if installing a 5C rotary indexer with no clamp)



- Remove the wireway cover of the vertical wireway located on the left wall of the power panel.
- Fish out the cable labeled **4 Axis Power** and trace the wire that is plugged into the #211 terminal on the bottom row of terminals on the relay module.



- Remove the wire from terminal #211 and move it to the 0VC terminal to the left of the original position.
Hardinge geared tables other than the 5C use a 24vdc clamp solenoid.



There are two jumpers on the relay module that must be set.

- Set JP1 to 190B for geared rotary tables.
- Set JP7 for +24VA.

Clean up all wire routing.

3. Modifying the Parameters

3.1 Modify the parameters according to the setup sheet provided

Example: To go to parameter 1005

Push the System key, Parameter, type in 1005, push Number Search, cursor down to A (fourth-axis), cursor to bit 5 (the third* data field) and change to 0.

*The bit locations run from left-to-right 7, 6, 5, 4, 3, 2, 1, 0

Set all of the parameters according to the following setup sheet.

3.2 Single-axis Setup Sheet for the Bridgeport GX 480 with Fanuc 0iMD Control

A separate setup sheet is included that applies to GX 480 machine and your specific rotary table model.

Record your serial numbers for future reference:

GX 480 Bridgeport machine	_____
Hardinge rotary Model number	_____
Hardinge rotary Serial number	_____

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