

IPEC 472 Electrical Cabinet Variable Frequency Drive Upgrade for Primary & Final Platens (MC1 & MC11)

Document 472-880-10174

Revision C

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1.0 Purpose

This document provides instructions for the installation of the Variable Frequency Drive Upgrade Kit, Part Number 472-120-10168, for the Primary and/or Final Platen (MC1 and/or MC11 respectively) Induction Motors within the IPEC 472 Electrical Cabinet.

2.0 Responsibilities

- 2.1 **Engineering** – Engineering will ensure that this procedure remains up to date. No changes will be made to the process without first updating the procedure, either via a temporary change or a change order to the document.
- 2.2 **Manufacturing** – Manufacturing will ensure that all manufacturing personnel, both permanent and temporary, are trained according to this procedure. Manufacturing will support that only the current procedure is used, and that no changes in the official process of record will be made without a temporary change request or through training to a new process revision.
- 2.3 **Quality** – Quality will ensure that all material issues are understood. Any questions regarding the issue shall be handled by Quality Personnel.

3.0 Safety

- 3.1 **Type 1:** Equipment is fully de-energized.
- 3.2 **Type 2:** Equipment is energized but live circuits are covered or insulated to preclude accidental shock.

4.0 Materials Supplied (Per Kit # 472-120-10168)

DESCRIPTION	PART NUMBER	QUANTITY
VFD, 200/240V, 32A, 3PHASE, 10HP	P1-00460-LFUF	1
472 HITACHI INVERTER ADAPTER PANEL	472-130-10115	1
SCREW, SHCS, 1/4-28 X 3/8, 18-8SS	92196A315	4
WASHER, FLAT, SS, 1/4, REG	86-000-08200	4
RELAY, DPDT, 24VDC, 3A, 240VAC	44-0004-005	1
RELAY, SOCKET, 8PIN, DIN RAIL	44-0004-006	1
FERRULE, GRAY, 22-20AWG	7950K15	2
TERMINAL, RING, 1/4, 22-18AWG, INSULATED, RED	7113K612	1
ASSY, WIRE, SPINDLE ENABLE	472-140-10169	1
ASSY, WIRE, 24V RETURN	472-140-10170	1
ASSY, VFD, WIRE, COMMON	472-140-10171	1
ASSY, VFD, WIRE, START	472-140-10172	1
ASSY, VFD, WIRE, STOP	472-140-10173	1
DIN RAIL 35mm X 7.5mm X 24mm	340-140-10108	2"
SCREW, BHCS, 10-32 X 3/8, SS	92949A263	1
WASHER, FLAT, #10	1300-700770	1
END BRACKET, DIN RAIL, 35MM	ENT-140-10133	2

5.0 Tools Required

- 3/16" Hex Driver
- 1/8" Hex Driver
- Wire Stripper
- Ferrule Crimper
- Terminal Crimper
- Phillips Head Screwdriver
- Small Flathead Screwdriver (2.5mm or less)

6.0 Procedure

6.1 **Type 1 Safety Requirement: Switch Off** incoming power to the tool & switch CB1 (Main Power Disconnect) to the off position. See *Figure 1*.

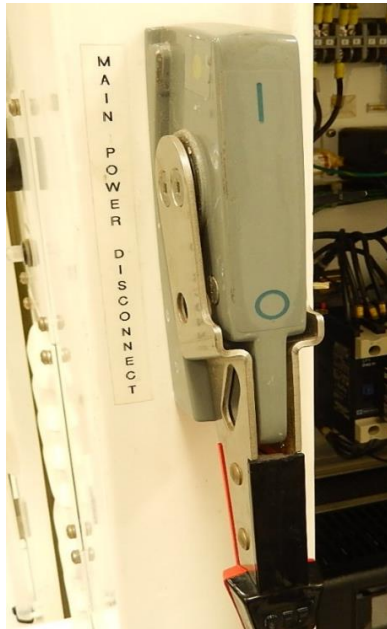


Figure 1: CB1 Switched Off

- 6.1.1 **Lock**, and **Tag out** the main power breaker handle with the approved lockout, tag out procedure.
- 6.1.2 Turn safety switch, SS1, to the override position.
- 6.1.3 Defeat LS20 interlock on the high voltage shelf.

6.2 Primary Platen Drive (MC1) / Final Platen Drive (MC11) Removal

6.2.1 **Remove** cover from GPD 503 driver in order to access conductors. See *Figure 2* for location of cover screws.

NOTE

Follow all steps outlined in Section 6.2 for removal of ALL driver types.

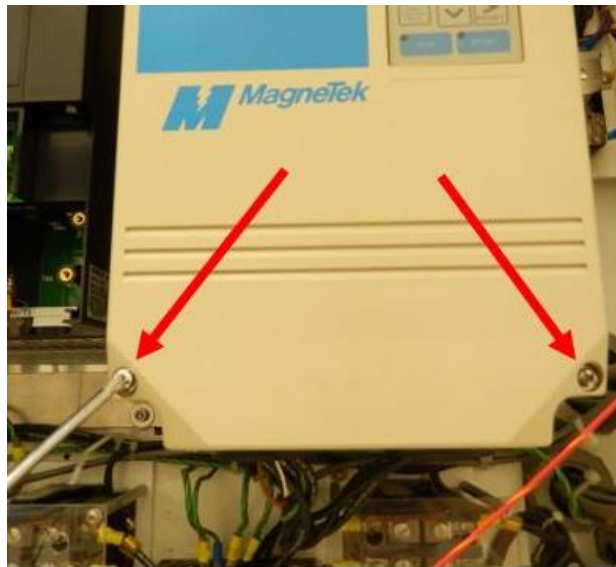


Figure 2: Location of Cover Screws

6.2.2 **Disconnect** all conductors affixed to the driver: 3-phase incoming power (4L1, 4L2, 4L3 for MC1 / 5L1, 5L2, 5L3 for MC11), motor output (1T1, 1T2, 1T3 for MC1 / 3T1, 3T2, 3T3 for MC11), Earth Ground (PE/G), and analog input (253, 70 for MC1 / 255, 70 for MC11) + shield conductor (BRN). Reference IPEC Schematic 472-17300 (Sheet 15 of 47), photograph original connections. See *Figure 3 & 4* below.

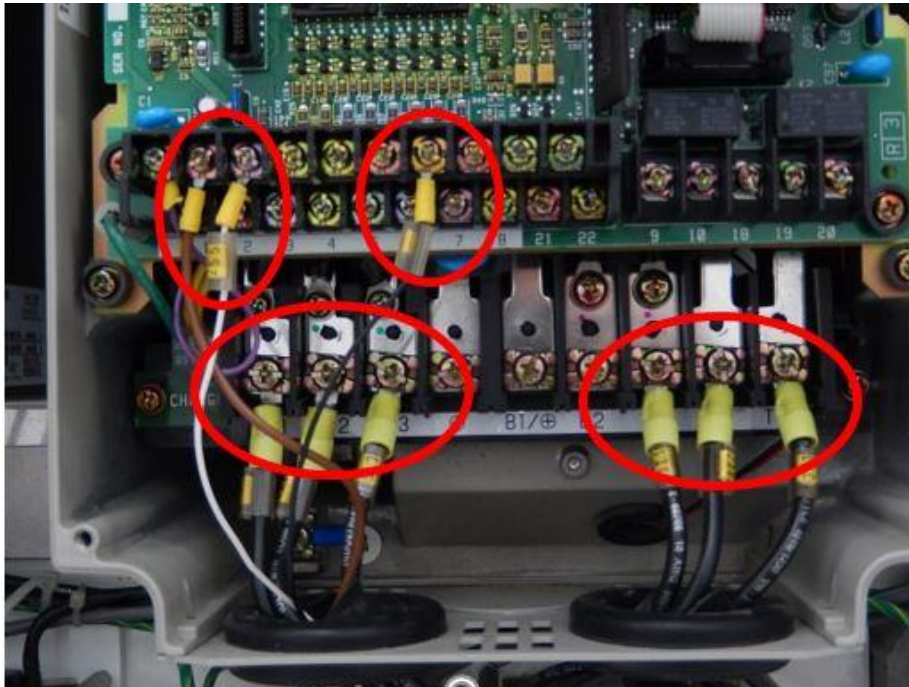


Figure 3: Conductors to be Removed

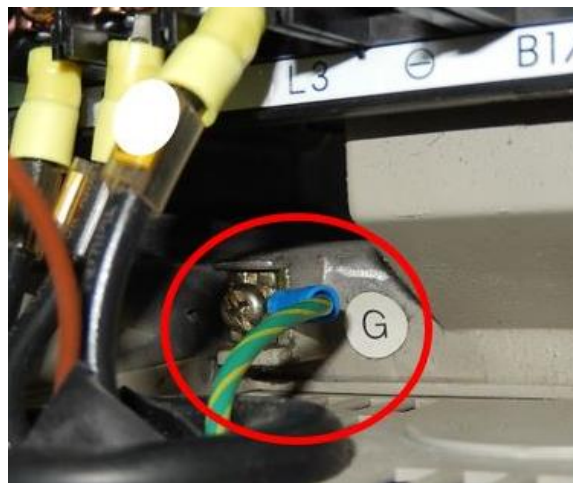


Figure 4: Earth Ground Location

6.2.3 **Remove** mounting screws from GPD 503 driver. See *Figure 5 & 6* below for mounting screw locations.

- Retain these screws for use in Step 6.3.2.

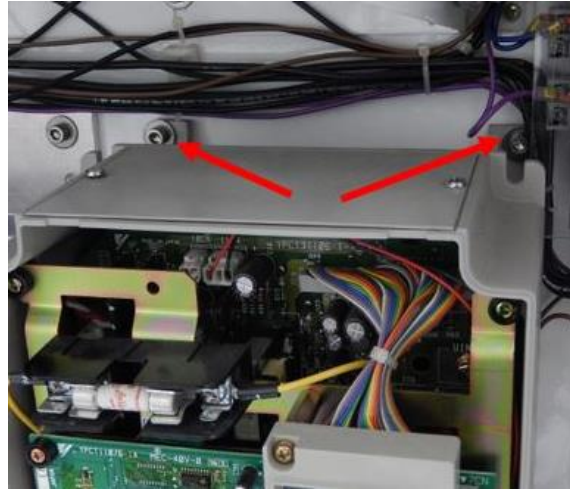


Figure 5: Upper Mounting Screw Locations

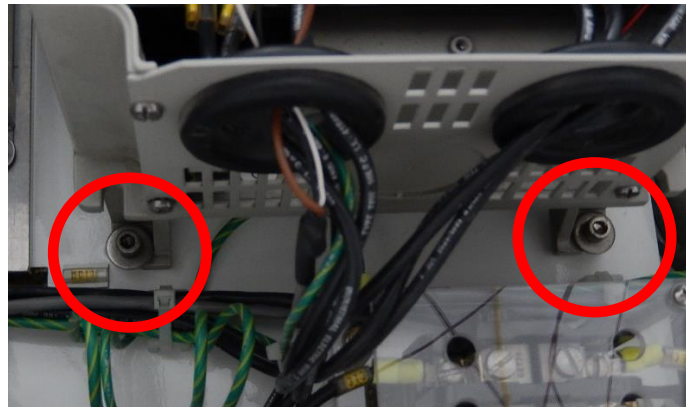


Figure 6: Lower Mounting Screw Locations

6.2.4 **Extract** driver from power cabinet and set aside.

6.3 Hitachi VFD, P1-00460-LFUF, Primary Platen Drive (MC1)/Final Platen Drive (MC11) & Relay (R1/R2) Install.

6.3.1 **Mount** the Hitachi VFD to the adapter panel, Part Number 472-130-10115, using the Four (4) supplied driver mounting screws, Part Number 92196A315.

6.3.2 **Mount** the 24VDC Relay & Socket (R1/R2), Part Numbers 44-0004-005 & 44-0004-006, using the supplied Din Rail (340-140-10108), 10-32 X 3/8" Screw (92949A263), Flat Washer (1300-700770), & Din Rail End Brackets (ENT-140-10133) to the Adapter Panel (472-130-10115). See *Figure 7* below for completed assembly of the Hitachi VFD, Din Rail, and Relay to the Adapter Panel.

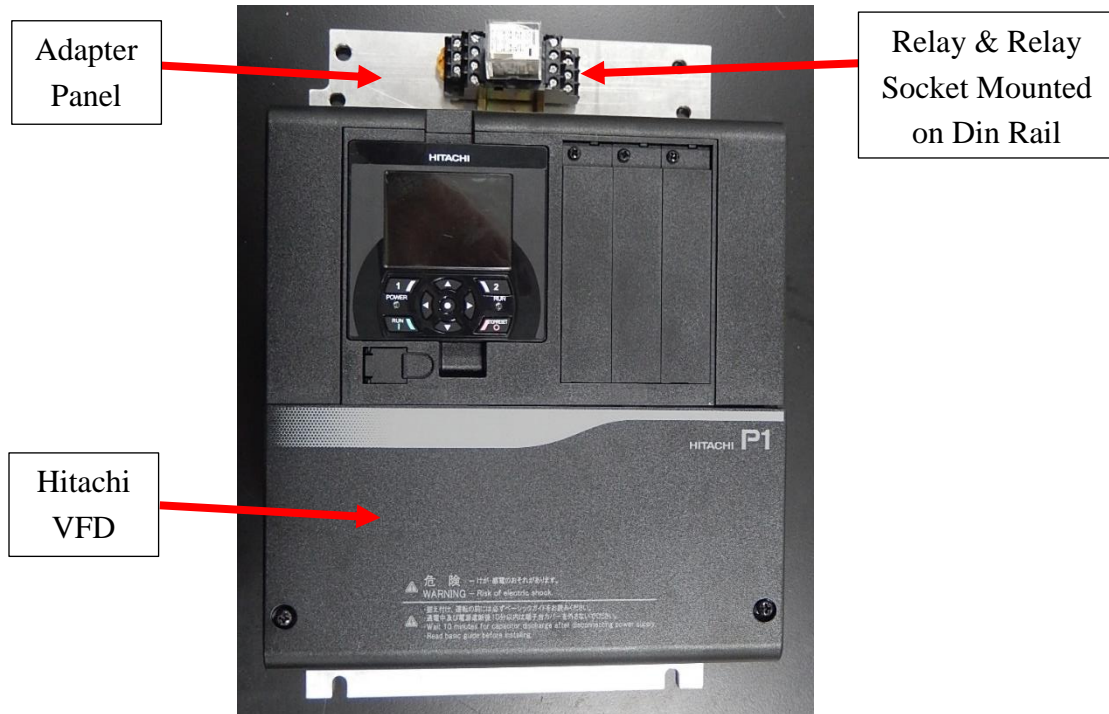


Figure 7: VFD, Relay & Adapter Plate

NOTE

Relay pictured in *Figure 7* may differ from that supplied in the kit. Din Rail End Brackets not pictured.

6.3.3 **Install** the Hitachi VFD & Relay with Adapter Panel into existing driver mounting holes inside the electrical cabinet using hardware removed in Step 6.2.3.

6.4 Hitachi VFD, P1-00460-LFUF, Primary Platen Drive (MC1)/Final Platen Drive (MC11) Existing Wiring Install.

WARNING: FAILURE TO CONNECT TO THE PROPER TERMINALS IN THIS SECTION WILL RESULT IN DAMAGE TO THE DRIVER AND SYSTEM CONTROLS.

6.4.1 See *Figure 8* below for reference of all power supply input, motor output, and ground locations.

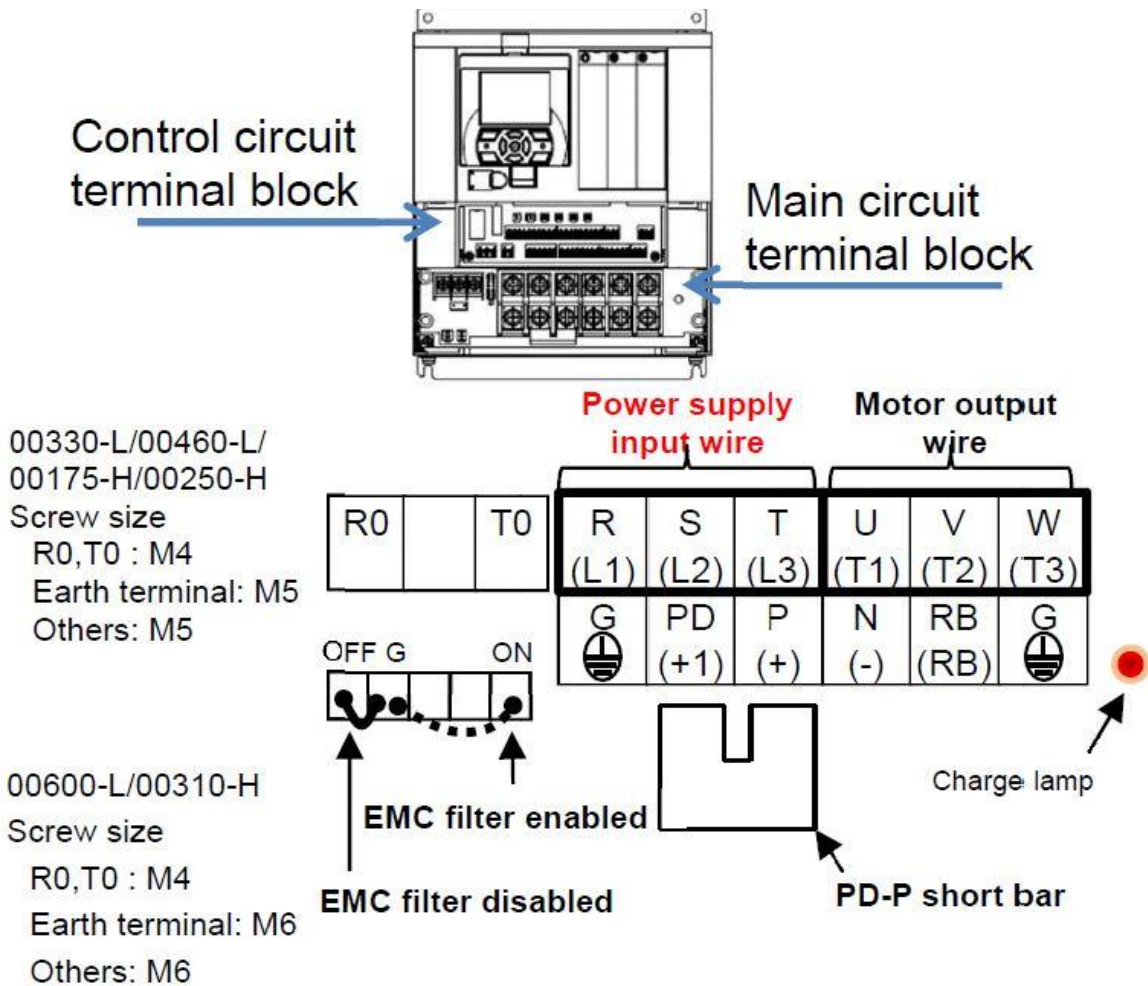


Figure 8: Hitachi VFD Power Supply Input, Motor Output & Ground Terminals

6.4.2 **Remove** wiring terminal covers from the VFD in order to access wiring terminals.

6.4.3 **Connect** earth ground wire (GRN or GRN/YEL) to G (\perp) terminal (Bottom Row) on the VFD. See *Figure 9*.

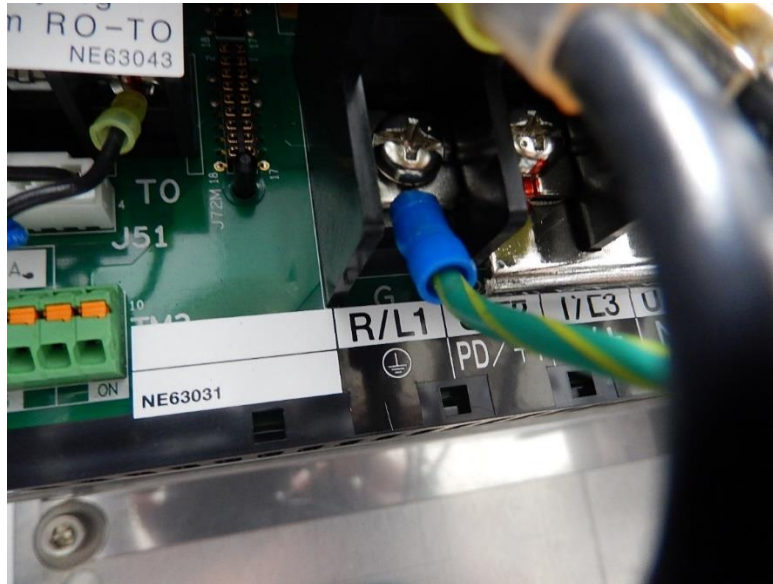


Figure 9: Earth Ground Connection

6.4.4 **Connect** incoming 3-phase power conductors (for MC1 connect: 4L1, 4L2, 4L3) (for MC11 connect: 5L1, 5L2, 5L3) to R, S, T terminals (Top Row) respectively. See *Figure 10*.



Figure 10: Incoming 3-Phase Power Connection

6.4.5 **Connect** analog input shield conductor to G (\perp) terminal (Bottom Row). See *Figure 11* below for grounding location.

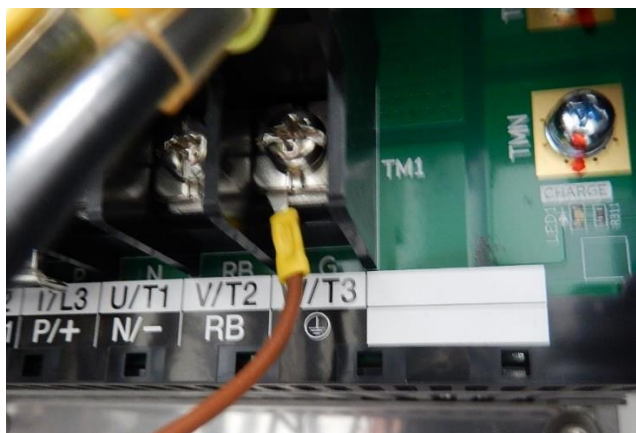


Figure 11: Analog Shield Connection Location

6.4.6 **Connect** 3-phase motor output conductors (for MC1 connect: 1T1, 1T2, 1T3) (for MC11 connect: 3T1, 3T2, 3T3) to U, V, W terminals (Top Row) respectively. See *Figure 12*.



Figure 12: 3-Phase Motor Output Connection

6.4.7 **Remove** existing connectors from analog input conductors (for MC1: 253 & 70; for MC11 255 & 70) and replace with Ferrules (7950K15). See *Figures 13 & 14* below.

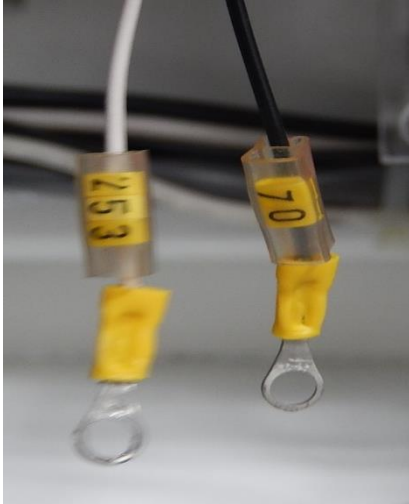


Figure 13: Existing Analog Terminals

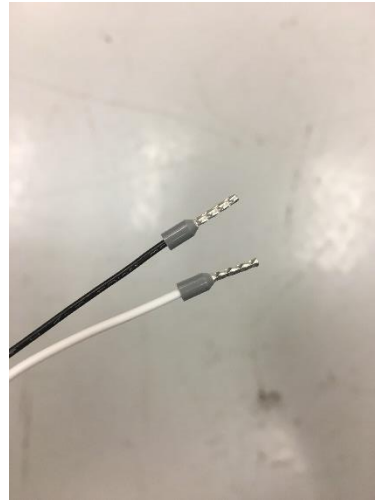


Figure 14: New Analog Terminals

6.4.8 **Connect** analog input conductors (for MC1: 253 & 70; for MC11: 255 & 70) to Ai1 & L respectively, on the control circuit terminal. See *Figure 14 & 15* below for method and location.



Method of wiring/detaching wires

1. Press in the orange portion on the control circuit terminal block using a slotted screwdriver (2.5mm or less in width).
(The wire insertion slot opens.)
2. While pressing the slotted screwdriver in the terminal block, insert the wire or rod terminal into the wire insertion slot (round hole).
3. Extract the slotted driver to fix the wire.



- Also when extracting the wire, extract it while the orange portion is pressed in with the slotted screwdriver (the wire insertion slot is open).

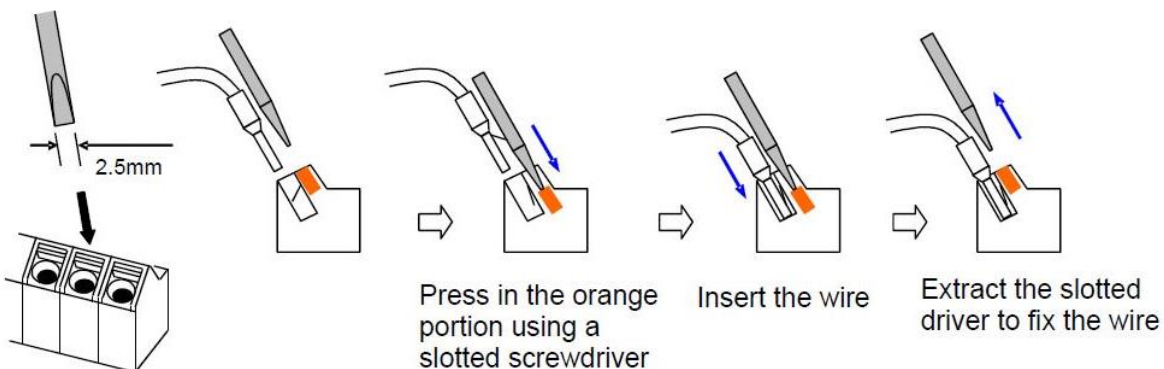


Figure 15: Method of Wiring/Detaching Wires to Control Circuit

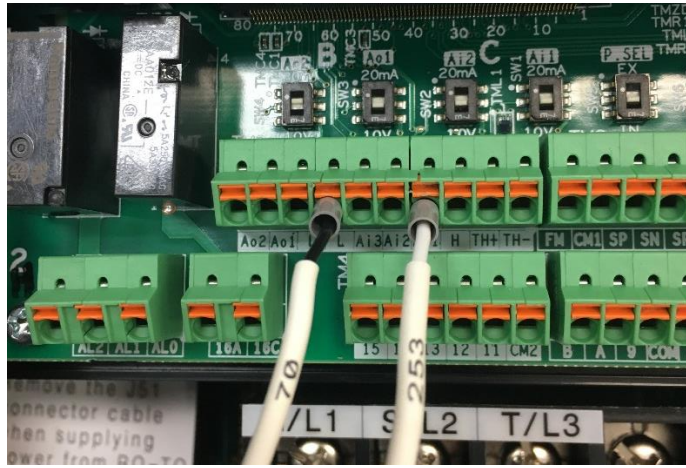


Figure 16: Analog Input Connection Location

6.4.9 **Remove** existing ring terminal from brown shield conductor and replace with Ring Terminal (7113K612).

6.4.10 See *Figure 17* to confirm correct wiring configuration.

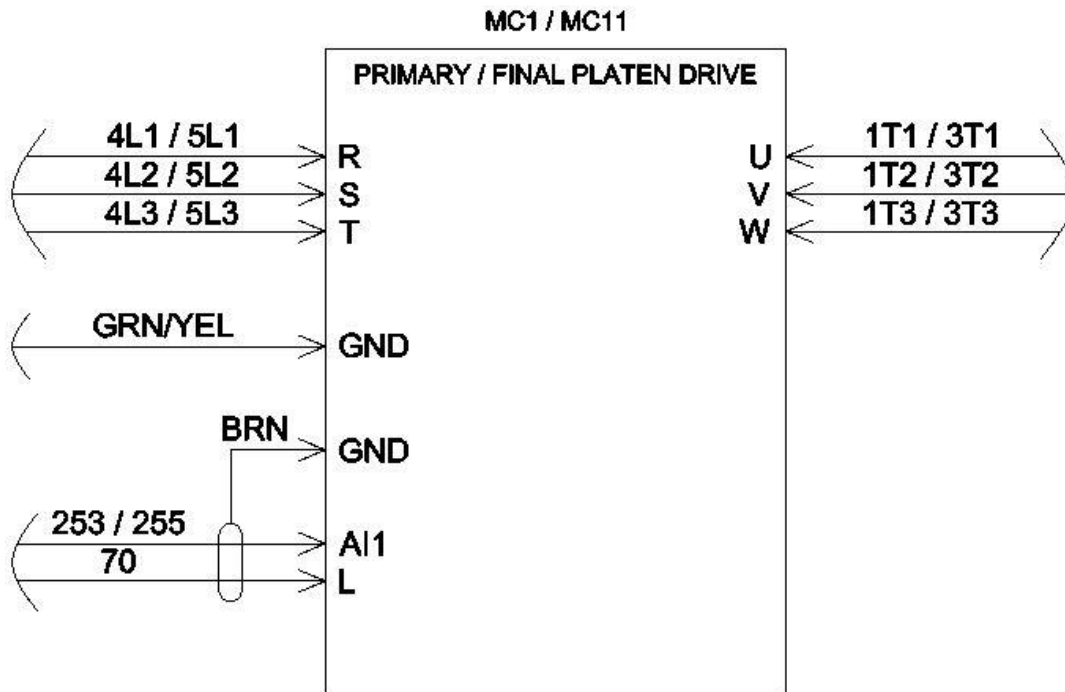


Figure 17: Existing Wiring Connection Diagram

6.5 MC1 / MC11 Control Circuit Setup

6.5.1 **Verify/Set** switch settings. See *Figure 18* below for reference.

- SW1: 10V
- SW5: IN
- SW6: SINK

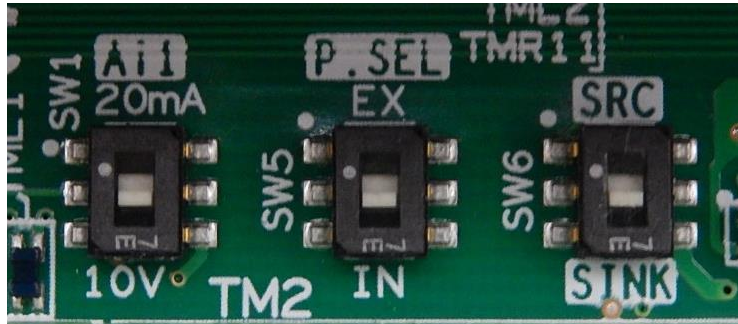


Figure 18: Proper Switch Settings

6.5.2 **Connect** wiring to Relay R1 and/or R2 coil utilizing the supplied pre-fabricated wires (472-140-10169 & 472-140-10170) according to the diagram below.

NOTE

Trim wires to length as needed. Replace removed ferrules and labels with items supplied in wire kit.

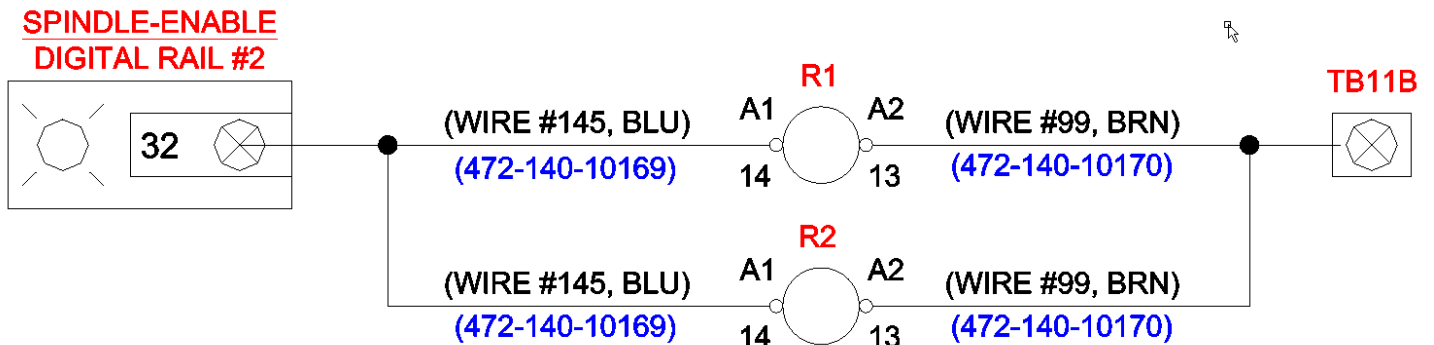


Figure 19: Relay Coil Diagram

NOTE

Skip step 6.5.3 if not installing MC1

6.5.3 **Connect** pre-fabricated wiring (472-140-10171, 472-140-10172, & 472-140-10173) to Relay R1 contacts from MC1 Control Terminal for Start and Stop signaling. See *Figure 20* for MC1 wiring diagram.

NOTE

Trim wires to length as needed. Replace removed ferrules and labels with items supplied in wire kit.

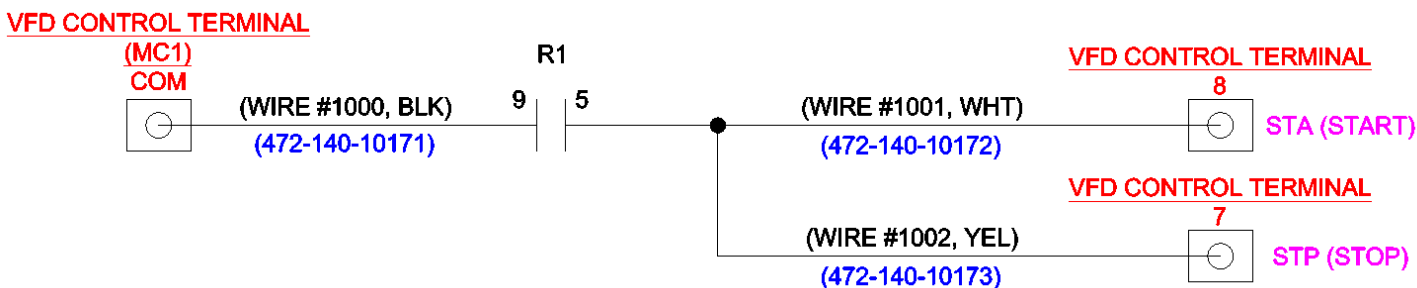


Figure 20: MC1 Relay (R1) Contact diagram

NOTE

See *Figure 21* for VFD Control Terminal Locations.

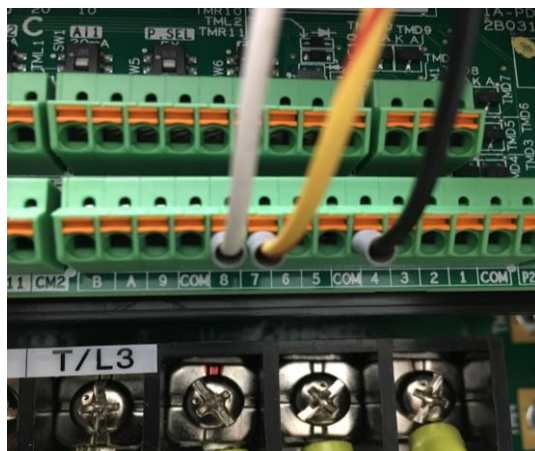


Figure 21: VFD Control Terminal

NOTE

Skip step 6.5.4 if not installing MC11

6.5.4 **Connect** pre-fabricated wiring (472-140-10171, 472-140-10172, & 472-140-10173) to Relay R2 contacts from MC11 Control Terminal for Start and Stop signals. See *Figure 22* for MC11 wiring diagram.

NOTE

Trim wires to length as needed. Replace removed ferrules and labels with items supplied in wire kit.

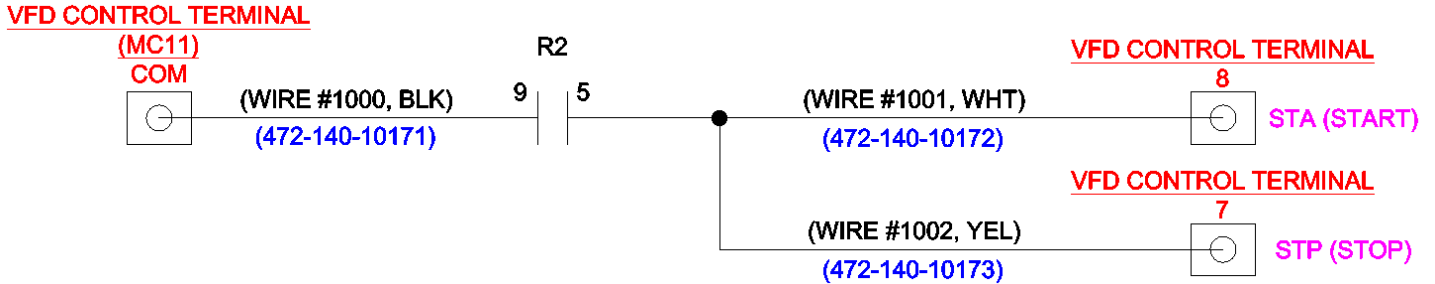


Figure 22: MC11 Relay (R2) Contact diagram

NOTE

See *Figure 23* for VFD Control Terminal Locations.

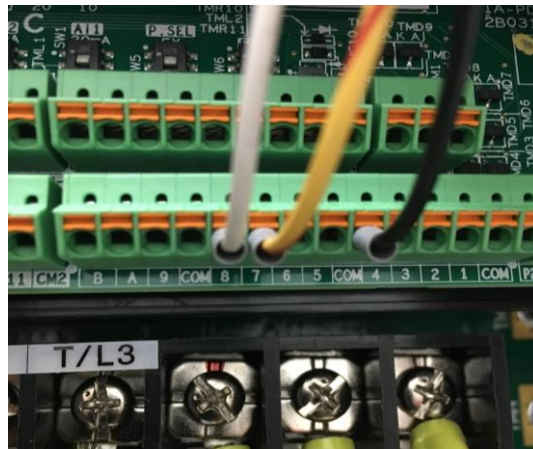


Figure 23: VFD Control Terminal

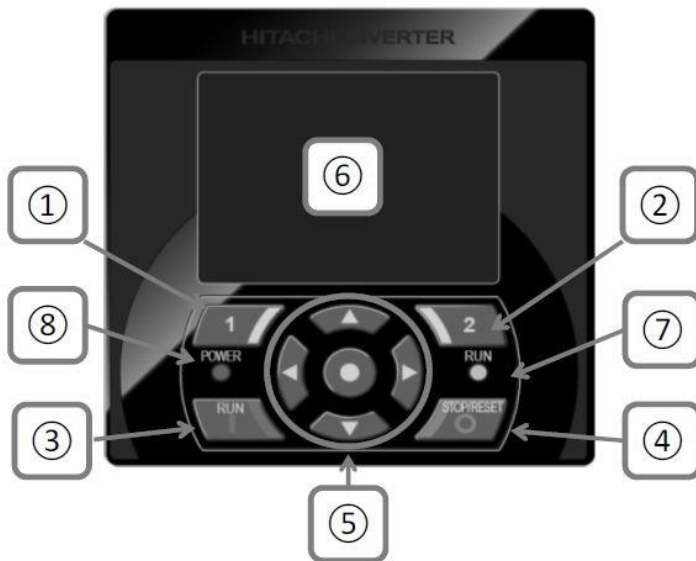
6.5.5 **Replace** wiring terminal covers removed in Step 6.4.2.

6.6 Hitachi VFD, P1-00460-LFUF, Parameter Configuration for Primary Platen (MC1) & Final Platen (MC11) Drives.

6.6.1 Adjust VFD Control Parameters.

6.6.1.1 After VFD has been installed and all conductors are in the appropriate locations, power up and initialize the 472. See *Figure 24* below for Hitachi Keypad functions and locations.

How to use the keypad



Number	Name	Description
①	F1 key	Transition to home, cancel, etc. Function of the key is indicated at the bottom left of the screen.
②	F2 key	Save data, etc. Function of the key is indicated at the bottom right of the screen.
③	RUN key	Motor motion starts when this key is pressed.
④	STOP/RESET keys	Decelerate to stop or reset the tripping.
⑤	UP/DOWN/LEFT/RIGHT keys & SEL key (centre)	To move between the screen/data use UP/DOWN/LEFT/RIGHT. To select the data, press the SEL key.
⑥	Monitor screen	Display parameters and data.
⑦	RUN LED	Turns ON while RUN command is in execution.
⑧	POWER LED	Turns ON while the keypad is powered-on.

Figure 24: Hitachi Keypad

6.6.1.2 From the Main Menu, shown in *Figure 25 below*, Select **Menu** (F1).



Figure 25: Main Menu

6.6.1.3 Select 01: Scroll Mode, shown in *Figure 26 below*.



Figure 26: Menu Selection

6.6.1.4 **Select A: Standard Functions**, shown in *Figure 27* below, in order to access the standard functions screen.



Figure 27: Parameter Selection Screen

6.6.1.5 **Select AA101 and Set to 01: Term. [Ai1] then Save (F2)**, shown in *Figures 28 & 29* below.



Figure 28: Main Speed Source



Figure 29: AA101 Adjustment

6.6.1.6 **Select** AA111 Run-cmd. Source and **Set** to 01: 3 Wire and **Save** (F2). Shown in *Figure 30* below.



Figure 30: Run Command Source

6.6.1.7 **Select** and **Set** AA121 to 00: VFC-VC and **Save** (F2). Shown in *Figure 31* below.



Figure 31: Motor Control Mode

6.6.1.8 **Select** and **Set** AC120 & AC122 to 5.00s and select **Save** (F2). Shown in *Figure 32* below.



Figure 32: Motor Acceleration & Deceleration Time

6.6.1.9 This completes the Standard Function configuration. Return **back** (F1) to parameter selection screen shown in *Figure 27*.

6.6.1.10 **Select** b: Fine Tuning Functions in order to adjust fine tuning control parameters. See *Figure 33* below for reference.



Figure 33: Fine Tuning Screen Selection

6.6.1.11 **Select** and **Set** bA102 & bA103 to 60.00Hz and 0.00Hz respectively. See *Figure 34* below for confirmation.



Figure 34: Upper & Lower Frequency Limits

6.6.1.12 **Select** and **Set** bA-70 to 01: While inverter operates, in order to set the cooling fan to operate only while the inverter is in operation. See *Figure 35* below for confirmation.

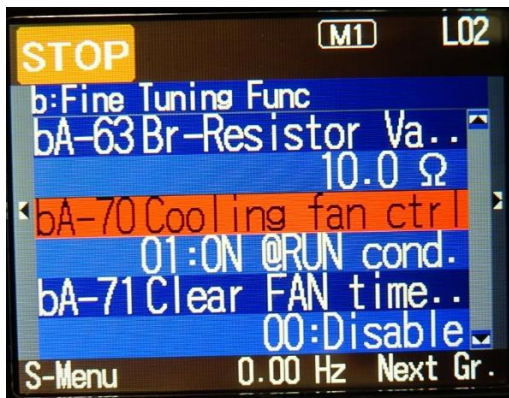


Figure 35: Cooling Fan Operation Modification

6.6.1.13 This completes the Fine Tuning Function configuration. Return **back** (F1) to parameter selection screen shown in *Figure 27*.

6.6.1.14 From the Selection Menu, **Select C: I/O Terminal, RS485.**

6.6.1.15 **Select and Set CA-07: Input [7] Function to 016: STA (Start) and Save (F2).**

6.6.1.16 **Select and Set CA-08: Input [8] Function to 017: STP (Stop) and Save (F2).** See *Figure 36* below for confirmation.

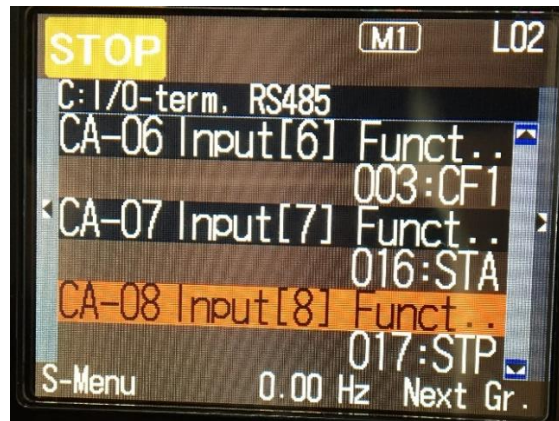


Figure 36: Input Terminal Configuration

6.6.1.17 This completes the Input Terminal Configuration for Start and Stop Signaling.

6.6.2 Auto-Tune motor parameters.

6.6.2.1 From the Selection Menu, shown in *Figure 37*, **Select H: Motor Control**.



Figure 37: Motor Parameters Selection

NOTE

Jump through parameter subsets by pressing Next-Gr. (F2).

6.6.2.2 **Select** and **Set** Hb102: Asynchronous Motor Capacity to 7.50kW and **Save** (F2).

6.6.2.3 **Select** and **Set** Hb103: Asynchronous Motor Poles to 1: 4P (4-poles) and **Save** (F2).

6.6.2.4 **Select** and **Set** Hb104: Asynchronous Motor Base Frequency to 60.00Hz and **Save** (F2).

6.6.2.5 **Select** and **Set** Hb105: Asynchronous Motor Max Frequency to 60.00Hz and **Save** (F2).

6.6.2.6 **Select** and **Set** Hb106: Asynch. M. Constant (Rated Voltage) to 230V and **Save** (F2).

6.6.2.7 **Select** and **Set** Hb108: Asynch. M. Constant (Rated Current) to 18.8A and **Save** (F2).

6.6.2.8 **Select** and **Set** HA-01: Auto-Tuning Selection to 02: Rotation and **Save** (F2).

6.6.2.9 **Select** and **Set** HA-02: Run-cmd at tuning to 00: RUN key (keypad) and **Save** (F2).

6.6.2.10 The Auto-Tune process will begin in the next step.

Warning

During the Auto-Tune Process with Rotation, the platen will rotate at high speeds. Remove any obstructions and ensure the platen is able to rotate without binding.

NOTE

If desired, the Platen Induction Motor can be Auto-Tuned without Rotation by setting HA-01 to 01: No Rotation. Parameters unable to be acquired due to non-rotation will remain in the factory default state.

6.6.2.11 **Press** the RUN key on the operator keypad in order to start the Auto-Tune process.

6.6.2.12 **Auto-tune** is complete when the screen shown in *Figure 38* below is displayed. **Press** the SEL key to confirm parameter acquisition.

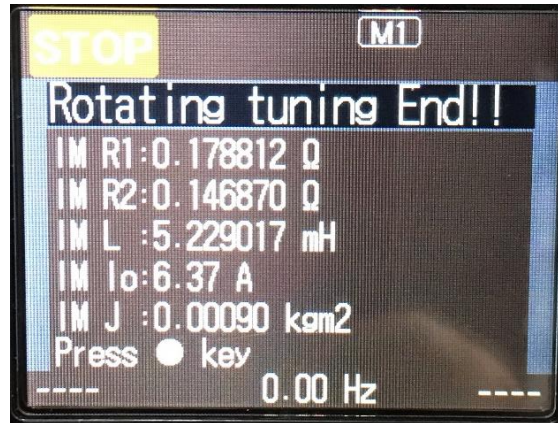


Figure 38: Auto-Tune End

6.6.2.13 **Power off** the system by pressing Machine Off and Switching off CB1 (Knife Switch). **Wait** until charge lamp indicator on the VFD is no longer illuminated.

6.6.2.14 **Power on** the system by pressing Machine On.

6.6.3 **Parameter** configuration and **Auto-Tuning** is now complete.

6.7 **Perform** Platen Inverter Drive Calibration for MC1 and/or MC11 (Similar to CAP-14, Calibration and Alignment Procedures in 472 Maintenance Manual Chapter 16)

6.7.1 **Enable** Spindles

6.7.2 From Polish Station Control, **select** which platen to calibrate (primary or final), then choose Calibrate. Choose Software Calibration: Platen.

6.7.3 When the software calibration is complete, observe the value that is displayed on the upper right portion of the screen in black and white. This is the software theoretical maximum RPM available at 10VDC input to the inverter. It should be greater than 175 RPM.

6.7.4 From the Polish Station Control screen, select the Platen Motor Test Screen, enter 10 RPM for the platen and listen for knocking noises. If knocking is present. Reduce the Carrier Frequency (bb101) by 0.5kHz and repeat 6.7.4 until quiet. And noise has been eliminated repeat 6.7.1 through 6.7.3, then continue to 6.7.5.

6.7.5 **Turn Off** platen motor.

6.7.6 **Select** the Calibration Status Screen.

6.7.7 **Press** Save to store the calibrations.

6.7.8 On the Hitachi VFD, **Press** Menu (F1), **Select** 01: Scroll Mode, **Select** A: Standard Functions, **Select** and **Set** AC120 to 1.0s & AC122 to 5.00s and select **Save** (F2). Shown in *Figure 39* below.



Figure 39: Motor Acceleration & Deceleration Time

7.0 This completes the installation and setup of the Hitachi Variable Frequency Drive Upgrade.

8.0 Set the tool pad wet speed

8.1 From the Home Screen go to the Standby Setup Screen

8.2 Select Pad Wet Setup

8.3 Follow prompts until arrive at the platen speed input screen

8.4 Set platen speed to 15RPM

8.5 Press Save

8.6 **Note:** This setting affects both the primary and final platen pad wet speed

9.0 Prepare tool for normal operation

9.1 Power down the tool by pressing Machine-Off.

9.2 Turn the safety switch, SS1, to the non-override position.

9.3 Close all tool doors.

9.4 Remove the Lock out and Tag out from the main power breaker.

9.5 Switch CB1 (Main Power Disconnect) to the ON position.

9.6 Switch ON incoming power to the tool.