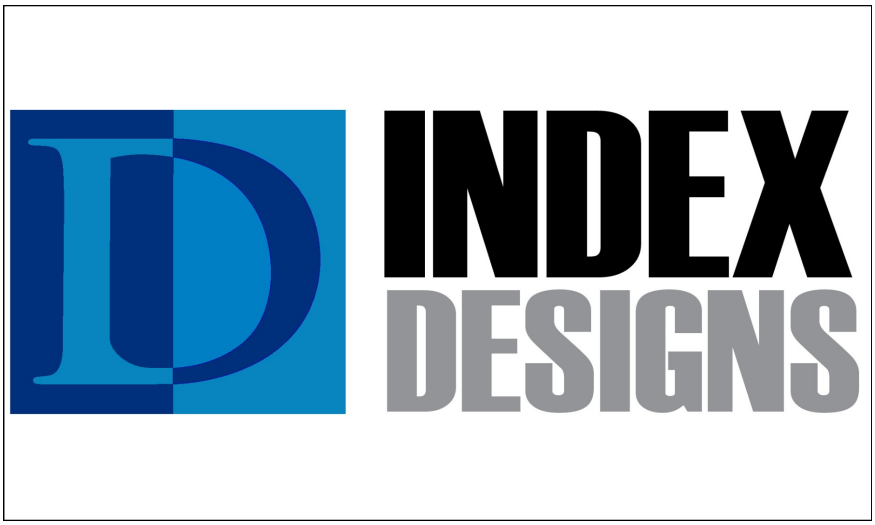


Installation (Reference) for Fanuc CNC

11-26-19

Index Designs LLC
21720 Marilla Street
Chatsworth, CA 91311
www.IndexDesignsCNC.com

Introduction

Please review the instruction manual thoroughly before beginning installation. In addition, the installer should verify that proper space and clearance has been taken into account prior to drilling holes in any part of the CNC cabinets. This includes cable bending radius and cable length.

Before beginning back-up the Parameters, Ladder, programs etc. in the Fanuc control.

This manual is intended to provide a description of the installation of the Index Designs Fanuc version rotary table. Knowledge of the types of Fanuc control CNC machines will be helpful and necessary to understand the descriptions. Installer must verify and confirm parameters described in this document are correct according to the Parameters manual that came with the machine.

You will need the Keep Relay list (if applicable) created by the Machine tool builder for a successful installation.

Requirements

Only service personnel with appropriate knowledge should install this device. Service personnel must have the appropriate tools to back up the CNC data before starting work on the machine. Service personnel must have knowledge of operation and changing parameters and Keep Relays within the Fanuc control and PLC.

Definitions/Descriptions of labels on the Schematics

SVMI = the Beta Amplifier, SVM1-20i, part number A06B-6130-H002/ A06B-6160-H002

CXA19B = incoming 24VDC power (cable FC0702019-10)

COP10B = incoming Fiber optic connection (existing)

COP10A = outgoing Fiber optic connection (A66L-6001-0026)

JF1/ENC = the encoder connection to the Beta amplifier (bulkhead cable FC0801001-15)

JX5 = not used

CXA20 = jumped since no regeneration resistor is being used (may already be installed at Factory, jumper FC0702023)

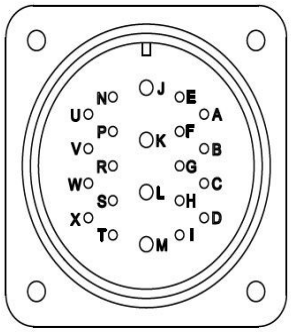
CZ7-1 = incoming 3 phase input, L1, L2, L3 and chassis ground (FC0702020-10 and if needed depending on the amplifier Adapter MIC-15-0209)

CZ7-1 & CZ7-3 = motor output U, V, W and chassis ground (bulkhead cable FC0802016-15 and if needed adapter MIC-15-0209)

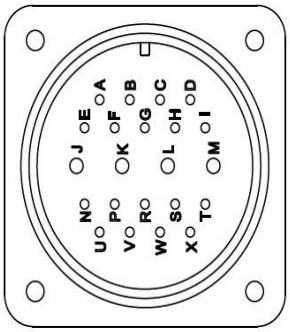
CX29 = Connector for main power MCC control signal (cable FC0702017-10)

CX30ESP = the emergency stop signal (cable FC0702018-10)

Fanuc cable pin layout	
A	Compact pressure switch 24 VDC red wire
B	Compact pressure switch clamp yellow wire
C	Compact pressure switch unclamp purple wire
D	+ over travle switch yellow wire
E	- over travle switch purple wire
F	spare-1
G	spare-2
H	N/A
I	N/A
J	Phase -U
K	Phase -V
L	Phase -W
M	Chassis ground
N	Air valve 0 VDC
P	Air valve solenoid
R	Hall switch +24 VDC Brown wire
S	Hall switch zero return Blue wire
T	N/A
U	N/A
V	N/A
W	N/A
X	N/A



A axis

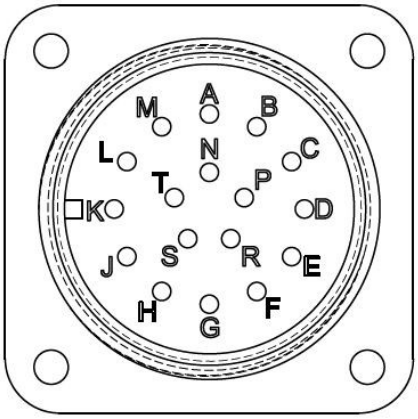


B axis

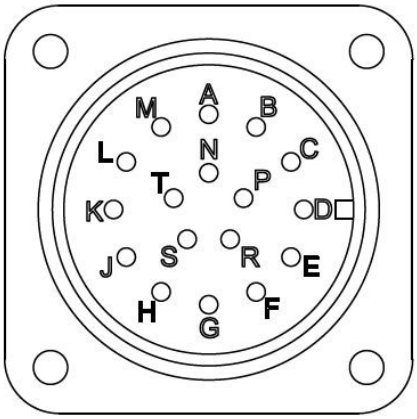
B axis	A axis
Internal	Internal
FC0806002	FC0806001
Extension	Extension
FC0804010	FC0804006
Bulkhead	Bulkhead
FC0802022	FC0802016

PROJECT
index designs
TITLE
Fanuc cable pin layout
Internal power and IO 2ft
part #FC0806008-2

APPROVED	Colton Wheeler 10/19/2017	SIZE	CODE	DWG NO / REV
CHECKED	Colton Wheeler 10/19/2017	B		
DRAWN	Colton Wheeler 10/19/2017	SCALE 3:1	WEIGHT	SHEET 1/1



A axis

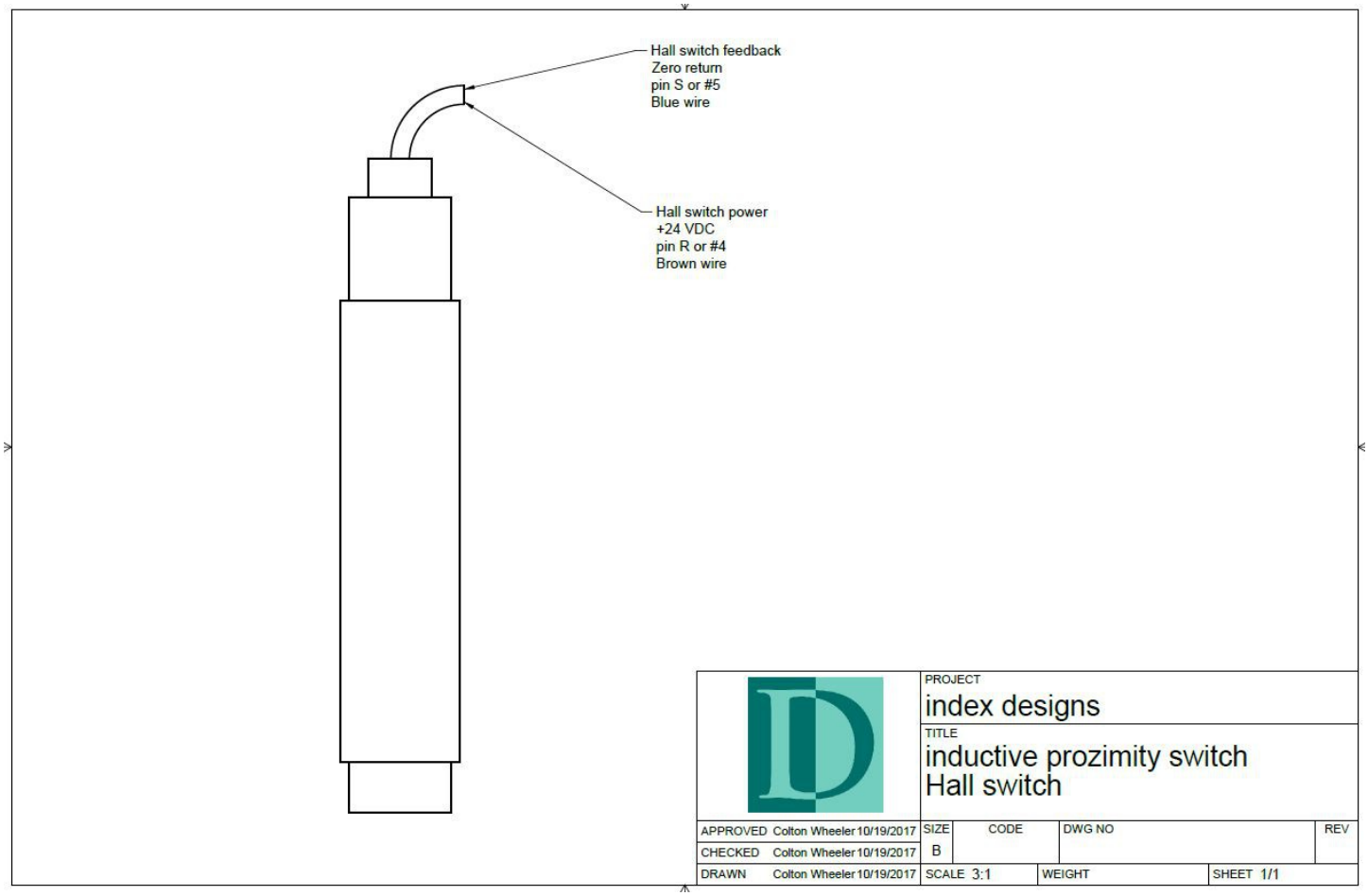


B axis

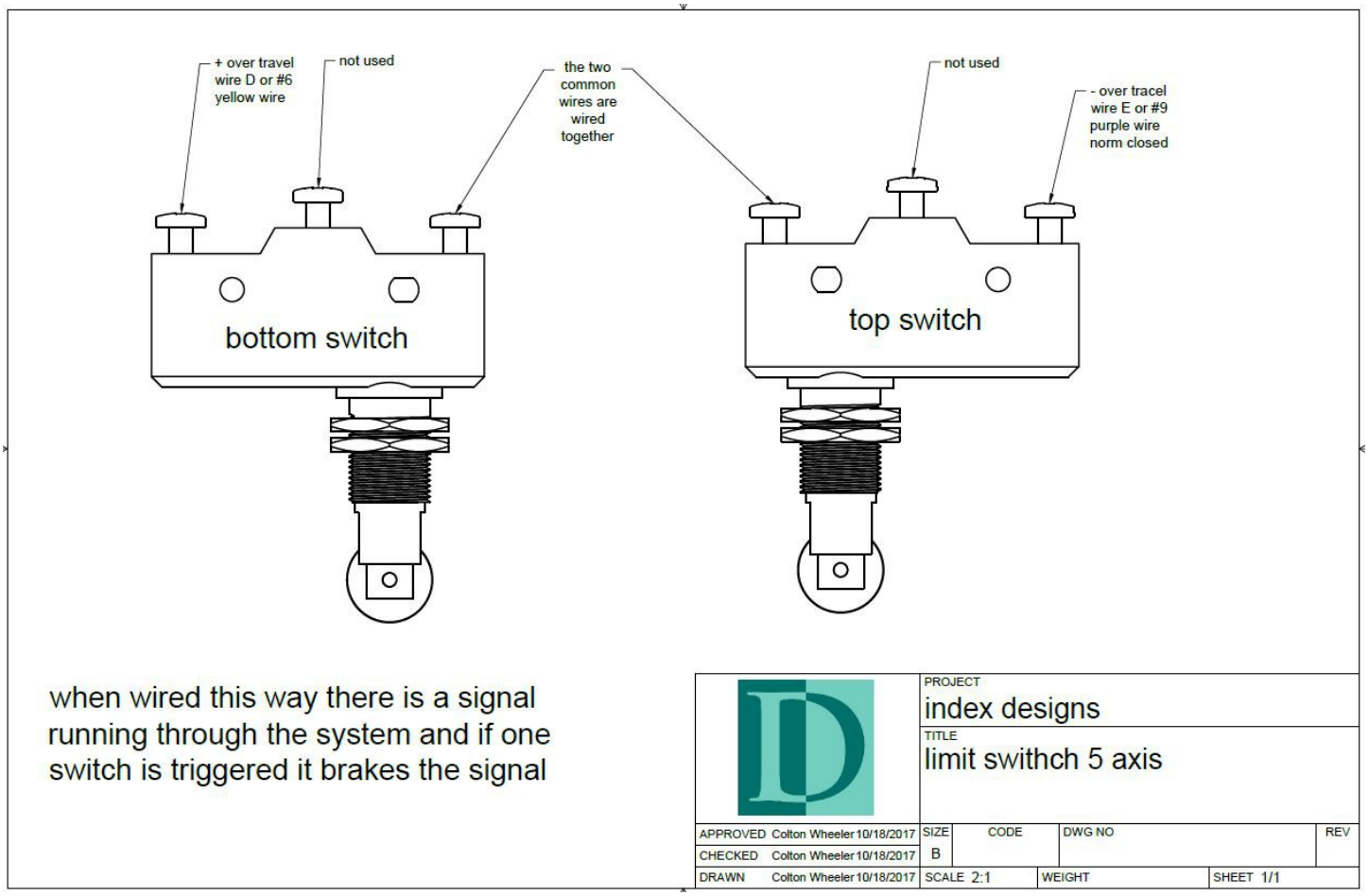
B axis	A axis
Internal	Internal
FC0803011	FC0805003
Extension	Extension
FC0803011	FC0803006
Bulkhead	Bulkhead
FC0801009	FC0801001

PROJECT
index designs
TITLE
fanuc cable pin layout
internal Feedback Cable 2FT
FC0806001-2

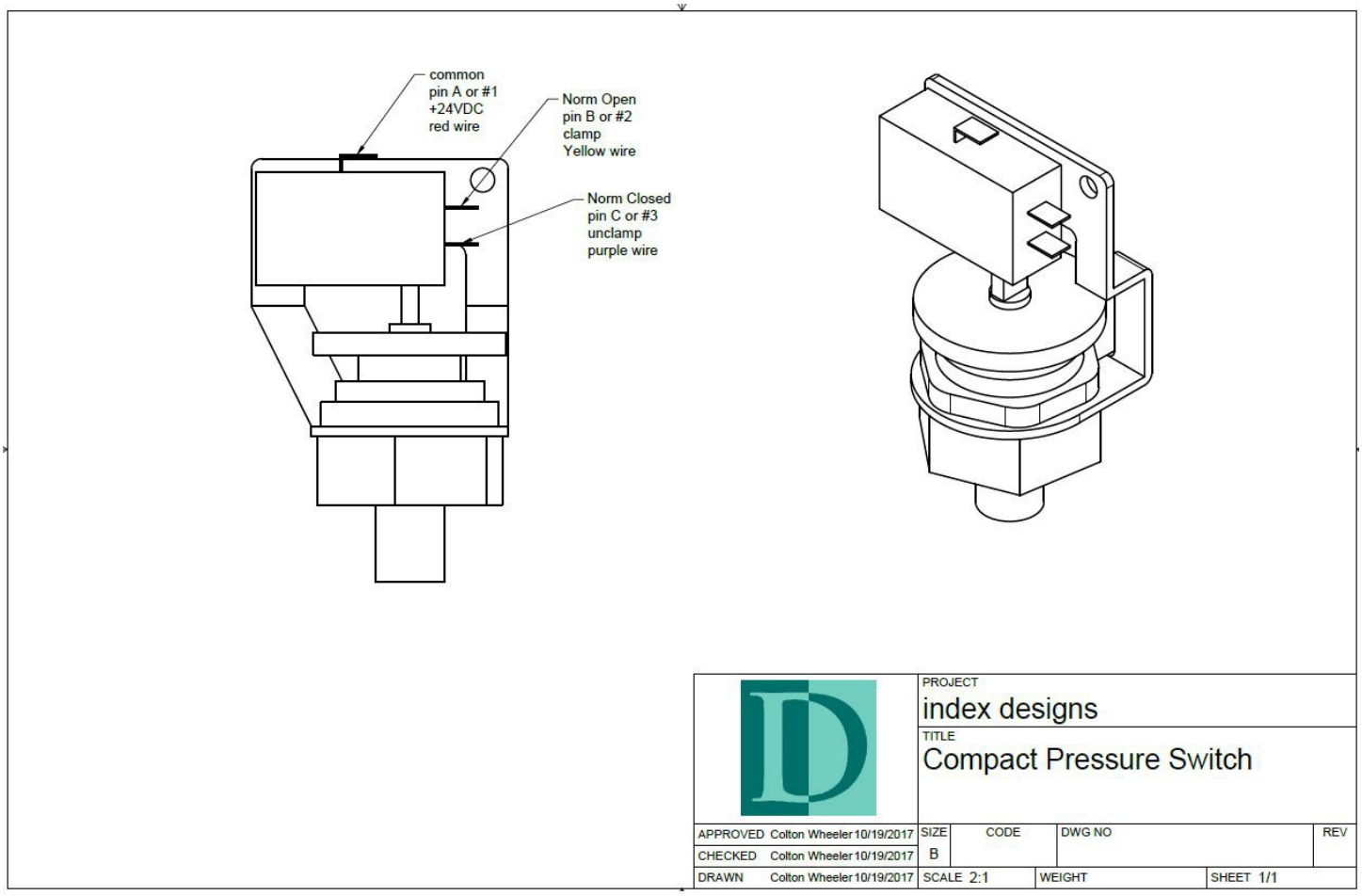
APPROVED	Colton Wheeler 10/27/2017	SIZE	CODE	DWG NO / REV
CHECKED	Colton Wheeler 10/27/2017	B		
DRAWN	Colton Wheeler 10/27/2017	SCALE 3:1	WEIGHT	SHEET 1/1



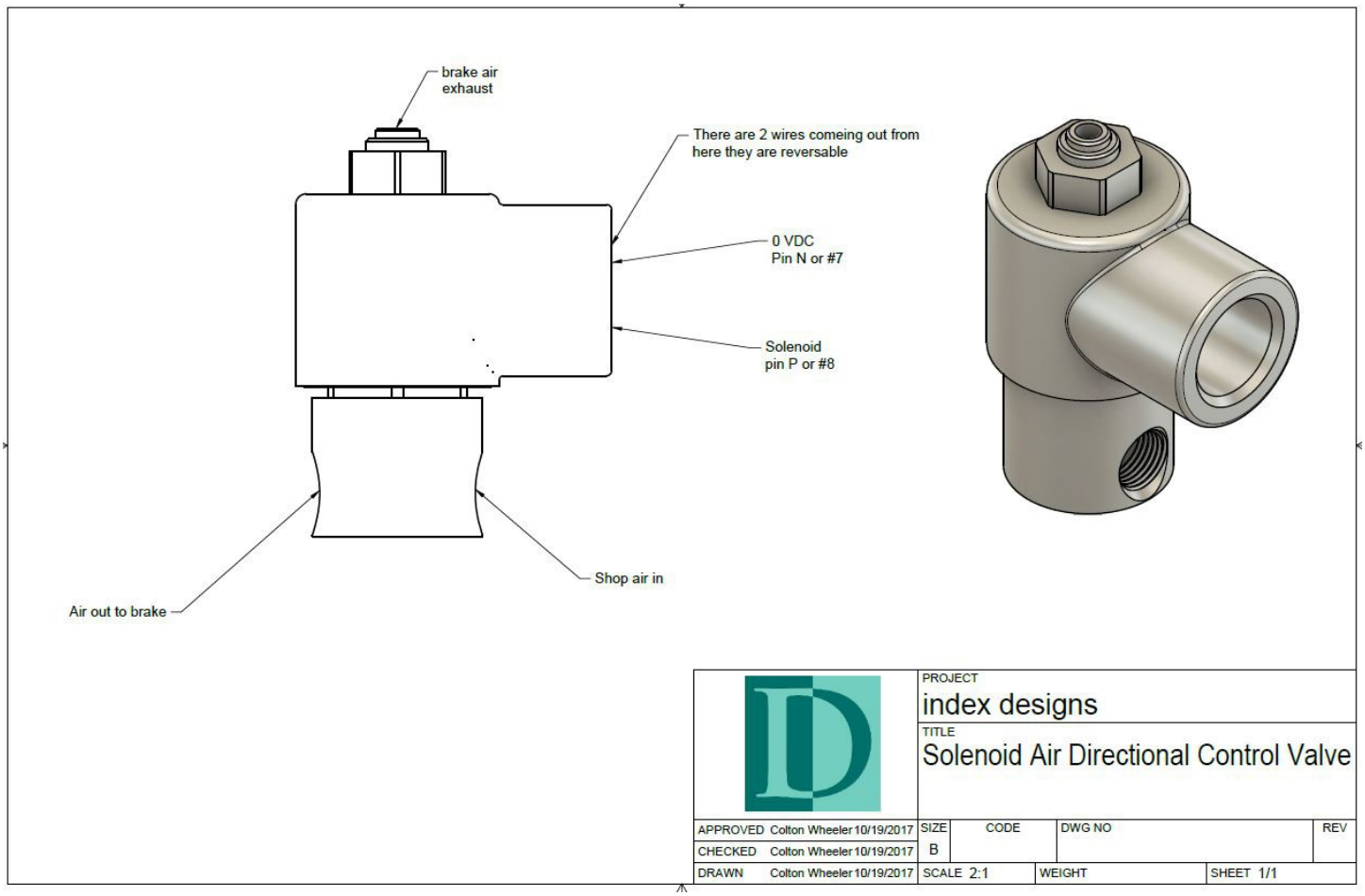
Drawing 1: AM1-A0-2A : 24 VDC Inductive proximity sensor, tubular, 12mm diameter x 60mm body, nickel-plated brass housing, NPN/PNP, N.O. output, 4mm sensing distance, unshielded, 1.5 kHz switching frequency, IP67, pigtail.



Drawing 2: Only used with the B-axis on a 4th and 5th rotary table



Drawing 3: 24 VDC Pressure switch pins A,B,C used to verify pressure at the brake



Drawing 4: 24 VDC solenoid air valve Brake Clamp Energized BRAKE IS ON. uses pins N and P

Installation

1. **Make Backups of all data, programs, PLC ladder, and parameters before doing anything on the Fanuc control.**
2. Enable the Parameter Write Enable on the Fanuc control.
3. Reference XYZ to zero position.
4. **AFTER BACKING UP THE CURRENT PARAMETER'S IN THE FANUC CNC.** Modify/change parameters according to the list provided(depending on control version there may be differences consult the parameter manual that came with the machine).
    a. If applicable you will need the List of the KEEP RELAYS from the Machine tool builder and set them active for the A and or B Axis. (ex. Keep relay for 24V Air-valve energize for break on or off)
        i. [System] [PMC] [PMCPRM] [KEEPRL]
    b. For Ref. Some of the common parameter that will be different depending on the Rotary being installed are Parameters 1020 (axis) , 1821(Reference counter size)60:1=6000, 90:1=4000, 120:1=3000 etc. . Param 1850 (reference point grid shift) 2020 (**motor ID number**) 2084and2085=N/M (ex. 90:1 is 1 over 250)(60:1 = 3/500)(120:1 = 3/1000) (180:1 = 1/500)
        i. [SYSTEM] [PARAM] number [NO. SRCH] make changes

5. **Power off and lockout the breaker to the CNC machine before starting the A-axis installation.**
6. Locate position to mount the Beta amplifier. The location must be within reach of the Fiber Optic cable.
   Note the SVMI beta amplifier will be inserted between the SVM and the SEP units. The SVM unit for the XYZ will connect the fiber optical cable to the beta amplifier and then the beta amplifier will then pass on the fiber optic to the SEP detector unit.
7. Mount the Beta amplifier.
8. Move the outgoing fiber optic from the COP10A on the XYZ power chassis into the COP10B on the Beta Amplifier.
9. Connect the included Fiber optic cable from the Beta amplifier's COP10A to the COP10B on the SEP detector unit.
10. Connect the +24VDC, 0VDC cable (FC0702019) to CXA19B on beta amp. Locate the Fanuc 24v Power supply for 24VDC.
11. Connect the ESP (FC0702018) cable (emergency stop) to the CX30 on beta amp. Connect the other end into the Fanuc daisy chain. Test emergency stop functionality to verify.
12. Connect the 3 phase power to the L1, L2 and L3 inputs on the CZ7-1. If the AC reactor is installed then connect to the reactor, otherwise connect to the incoming power. Make sure the incoming power is within range of the specification given on the placard on the Beta amplifier.
    a. Connect the Green wire to the appropriate chassis ground of the machine.
13. Connect the motor power connector into the appropriate spot on the CZ7-3 connector. The motor wires should correspond to the V, U, W, and ground connections on the Beta amplifier.
14. Connect the encoder cable to JFY connection on the Beta Amplifier.
15. Connect the battery to the CX5X connector on the Beta Amplifier.
16. Connect the **24VDC** air valve to the brake relay (you will have to consult the Machine tool builder keep relay list. for the proper Keep relay used) This relay controls the brake on the rotary when the M60/M61 codes are used.
    a. **DO NOT CONNECT AIR UNLESS YO ARE READY TO TEST THE** functionality of the M60/M61 (M62/M63 used for B-axis)
    b. M60 the valve will open and the brake is ON
    c. M61 the valve should close and release the air and the brake will be Off.

d. **WARNING!!** if this is not correct and is reversed motor will overheat and damage motor and possibly the Servo Amplifier.

17. If the machine has knockouts for the bulk head connectors, remove the knock out and install. If there are no knockouts, find a suitable location for the bulk head cables. (either the inside the work area or on the rear electrical cabinet). Punch a 1-3/4" and 1-1/4" hole and mount the bulk heads. See Figure 7.
18. Install spring so that cable will be held up out of the chip trays for the complete XY table motion of the machine, see figure 9 and 10.
19. Verify all connections and voltages before powering on the machine.
20. Power on the machine.
    a. The rotary amplifier (axis 4) should show up as the first amplifier as a SVM1-20i amplifier in system display of the amplifiers installed.
    b. See the Parameters page for common Fanuc parameter settings depending on the control.
    c. For Ref. Some of the common parameter that will be different depending on the Rotary being installed are Parameters 1020 (axis) , 1821(Reference counter size)60:1=6000, 90:1=4000, 120:1=3000 etc. . Param 1850 (reference point grid shift) 2020 (**motor ID number**) 2084and2085=N/M (90:1 = 1/250)(60:1 = 3/500)(120:1 = 3/1000)(180:1 = 1/500)
        i. [SYSTEM] [PARAM] number [NO. SRCH] make changes
21. Test the Emergency Stop button operation. Press the Emergency Stop button, verify Fanuc control acknowledges E.S. And the amplifiers are disabled
22. Verify the emergency stop can be cleared after releasing the E.S. Button.
23. Repeat emergency stop tests for all interlocks installed on the machine.
24. Reference XYZ axis to zero position.
    a. Close the front door
    b. Execute the M85 in MDI mode to enable the A-axis (Keep relay K18.4 enables and disables the option). Use M86 when disconnecting the rotary table from machine.
25. Power off the machine and then power it on.
26. Verify operation of the A-axis rotary table by jogging it.
    a. Check that the direction of the rotary is correct.
    b. Check that the distance displayed matches the distance moved.
    c. Before referencing the A axis, the rotary table will need to be within a couple of degrees of the 0 degree mark. Start on the negative side of the mark, and move the positive direction to within a couple of degrees of the mark.
    d. If not already done Test the air brake by executing a M60 and then M61. If the air valve actuates, connect the air valve hose to the rotary table's air fitting.
27. Test the Emergency Stop button operation. Press the Emergency Stop button and verify the Fanuc control acknowledges E.S. Verify that the amplifiers are disabled including the newly added A-axis amplifier.
28. Verify the emergency stop can be cleared after releasing the E.S. Button.

To Reference XYZ and A axis:

1. Reference XYZ axis
2. Move the A axis off the reference mark at least 30 degrees in the negative direction
3. Press "REF RETURN" push button on the operator panel
4. Press the "A+" push button on the operator panel (Manual A axis zero return).
5. Make sure the A axis stops at reference mark.
    1. Note, the parameter 1240 can be modified to adjust the Reference zero position for the A axis.

General Parameter Setup

(Can vary with control version, consult builder manual)

Model	VH-8	Date : 7/9/19			
Gear Ratio	90:1	Brake Type	Pneumatic	Motor Type:	Bis4/3000

Parameter			Description	Setting Value
OMC	Oi 16/18	Actual (edits)		
007	1816		Refer to counter capacity and sensor magnification for setting value	00010001
103	1820		Function magnification	2
503	1827		Homotopy Width	20
507	1828		The limit value of deviation during the movement	8000
511	1850		The shifted grillage value setting (zero point compensation)	995
521	1420		Rapid traverse speed	8000
525	1620		Time constant of accelerate and decelerate	50
538	1851		Setting backlash value	5
566	1423		Manual feed value setting	360
567	1422		The high limit value of cutting infeed speed	2000
568	1421		The low limit speed of rapid movement adjustment	200
569	1425		The low infeed rate for zero point return	200
573	1821		Reference counter	4000
596	1829		The limit value of deviation during stop	500
8401	2001		According to the pulse of motor encoder parameter setting the value	0
8420	2020		Motor type number	156
8421	2021		Loading Inertia ratio	128
8422	2022		Motor rotation direction	111
8423	2023		Use the sensor pulse value to supply the feedback speed	8192
8424	2024		Use the sensor pulse value to supply the position locking	12500

System Parameter				
Parameter			Description	Setting Value
OMC	16/18MB	0i		
8400	2000			0
8401	2001			0
8420	2020		Motor model	156
After parameters above are set : 1. Power cycle control 2. Turn control on then set gear ratio below				
8484	2084		Gear ratio	1
8485	2085		Gear ratio	90

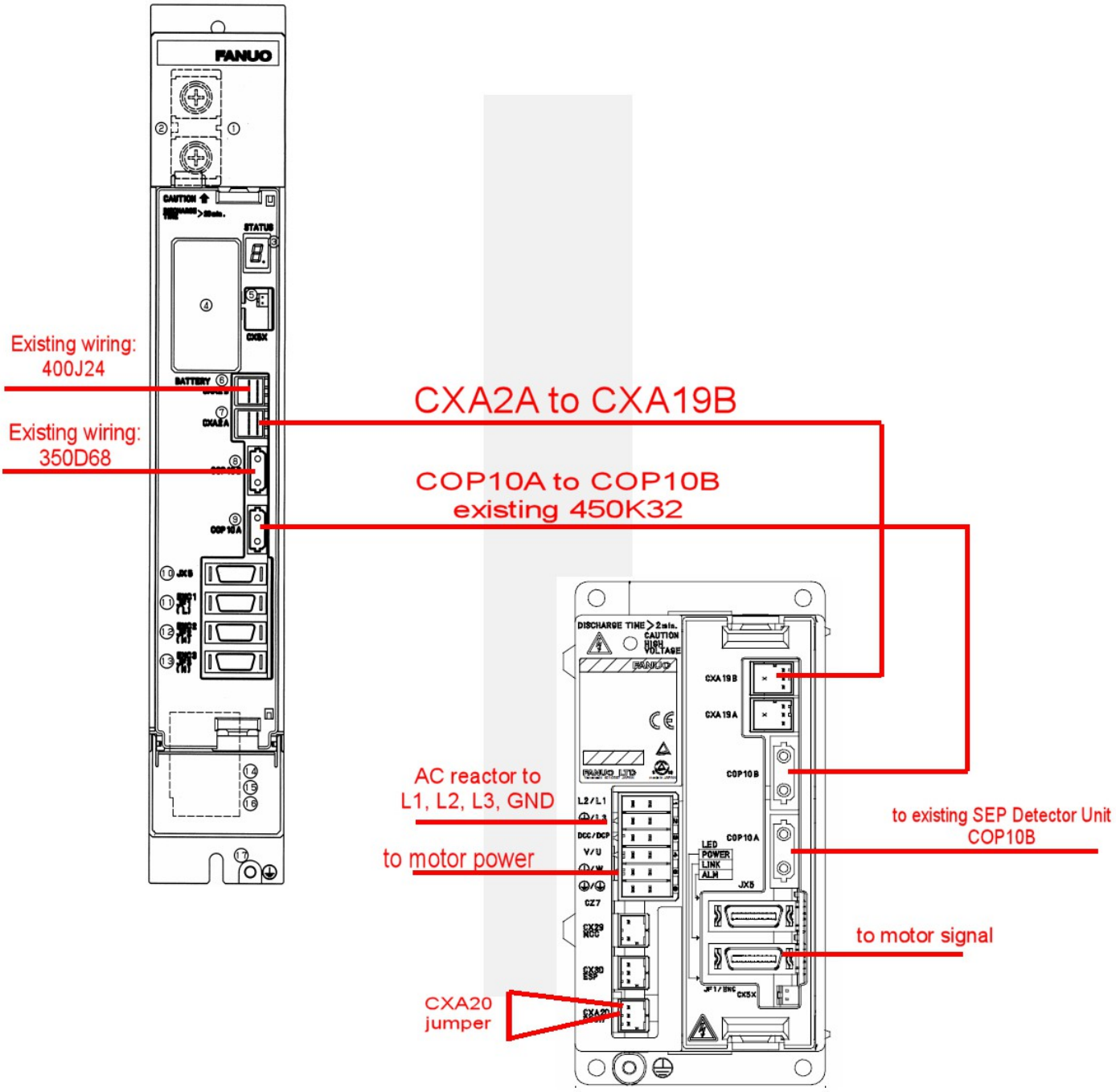


Figure 1: Integration of the a-axis beta amplifier into the Fanuc control.

5.2 CONNECTOR LOCATION

5.2.1 SVM1-4*i* and SVM1-20*i*

No.	Name	Remarks
1		DC link charge LED
2	CZ7-1	Main power input connector
3	CZ7-2	Discharge register connector
4	CZ7-3	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 signal check
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

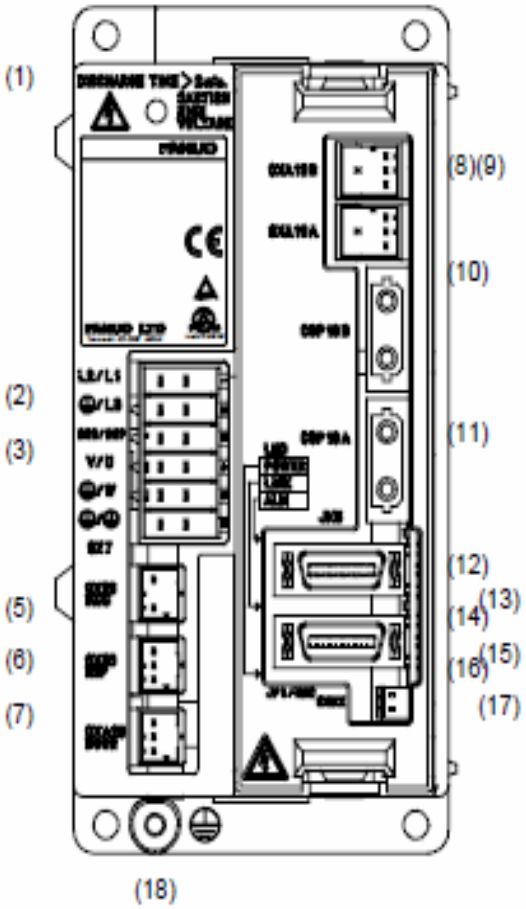


Figure 2: Description of the SVM1-20i Beta amplifier from the Fanuc manual 65322EN

Figure 3: Beta amplifier with out any connections

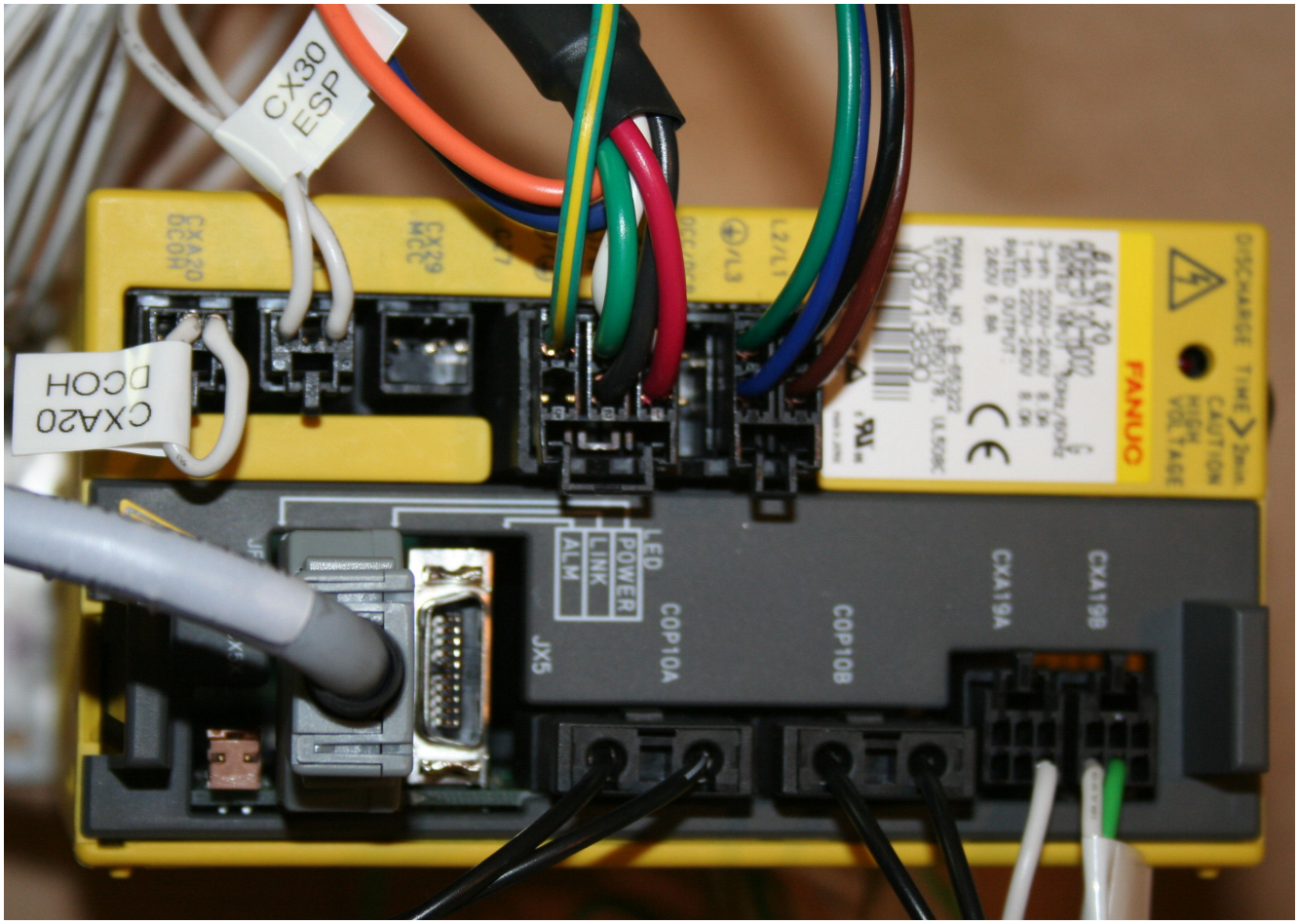


Figure 4: Beta amplifier wired. Note CX29 not shown

60/90mm-wide SVM

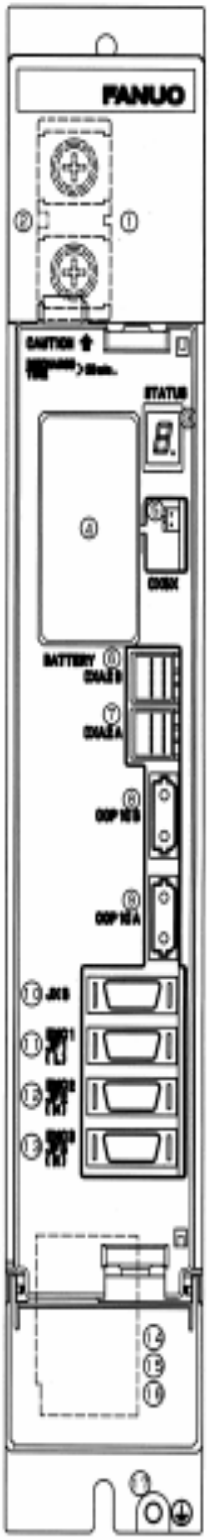


Table.9.2.2(a) Names of connectors and terminal blocks

No.	Names	Display	Remarks
1	DC link terminal block		Display the terminal block TB1
2	DC link charge LED		(Warning)
3	Status LED	STATUS	
4	Location of the batteries for the SVM built-in-type absolute Pulsecoder	BATTERY	
5	Battery connector for the SVM built-in-type absolute Pulsecoder	CX5X	
6	Input connector for PSM interface	CXA2B	24VDC power supply The interface for the absolute Pulsecoder batteries is included.
7	Output connector for PSM interface	CXA2A	
8	FSSB optical input connector	COP10B	
9	FSSB optical output connector	COP10A	
10	Signal check connector	JX5	Unused
11	Pulsecoder connector : L axis	ENC1/JF1	
12	Pulsecoder connector : M axis	ENC2/JF2	
13	Pulsecoder connector : N axis	ENC3/JF3	
14	Connector for motor power line: L axis	CZ2L	For SVM1, CZ2
15	Connector for motor power line: M axis	CZ2M	
16	Connector for motor power line: N axis	CZ2N	
17	Tapped hole for grounding the flange	⏚	

⚠ WARNING
Do not touch module components or connected cables while this LED is lit. There is a danger of electric shock.

Figure 5: This is the SVM that is the XYZ unit that is used in the Fadal Fanuc control cabinet. The power supply module PSM-26 will power this SVM unit. The PSM unit will also monitor the Emergency stop for the Fanuc control. Verify that the Emergency stop is connected and operating.

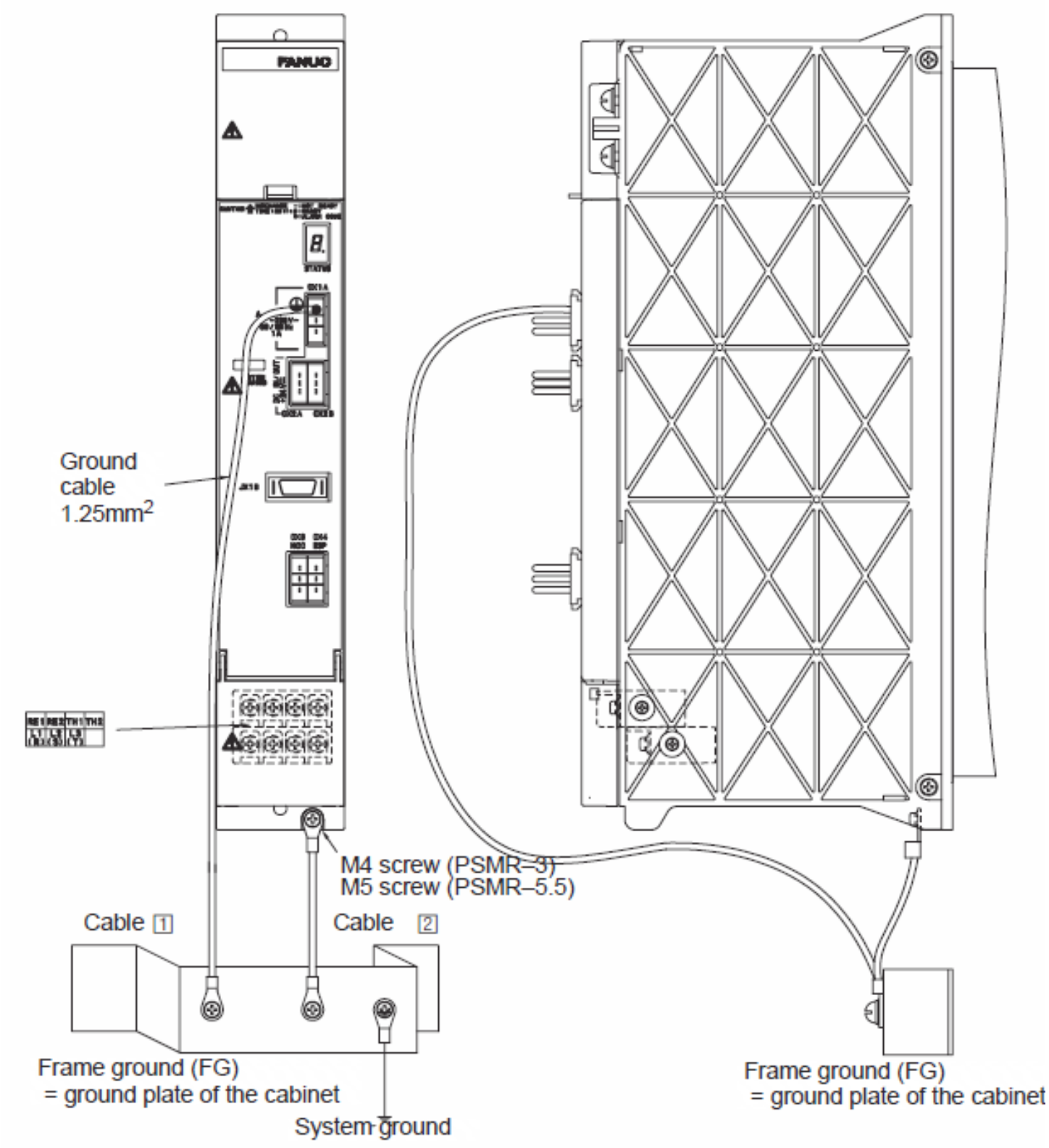


Figure 6: Power Supply module

Figure 7. There are two ways to mount the bulk head connectors for the signal and power wires, either inside the work area of the machine or on the electrical cabinet outside the work area. If the electrical cabinet already has knock outs, use those holes. Otherwise, for the power bulkhead you will need a 1-3/4” punch, and for the Signal a 1-1/4” punch to allow the cables to enter the cabinet. The panel mount disconnects can be put either into the work area or on the rear electrical cabinet.

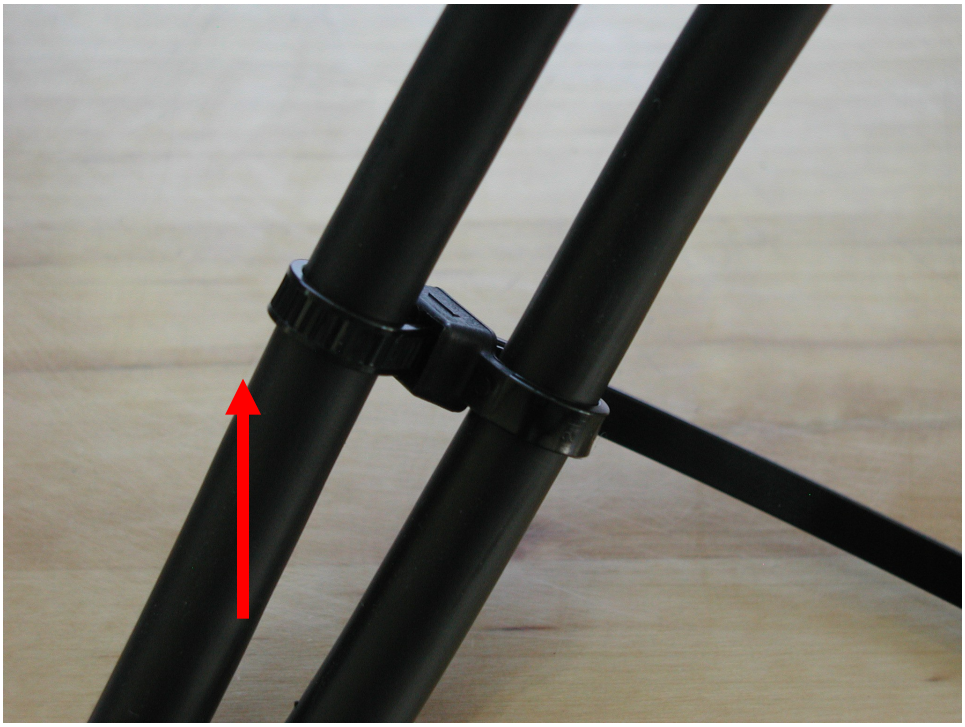


Figure 8, Use the provided double cable tie wraps to organize the rotary table cabling in the work area.

Figure 9, Spring to hold cables slack up off the table

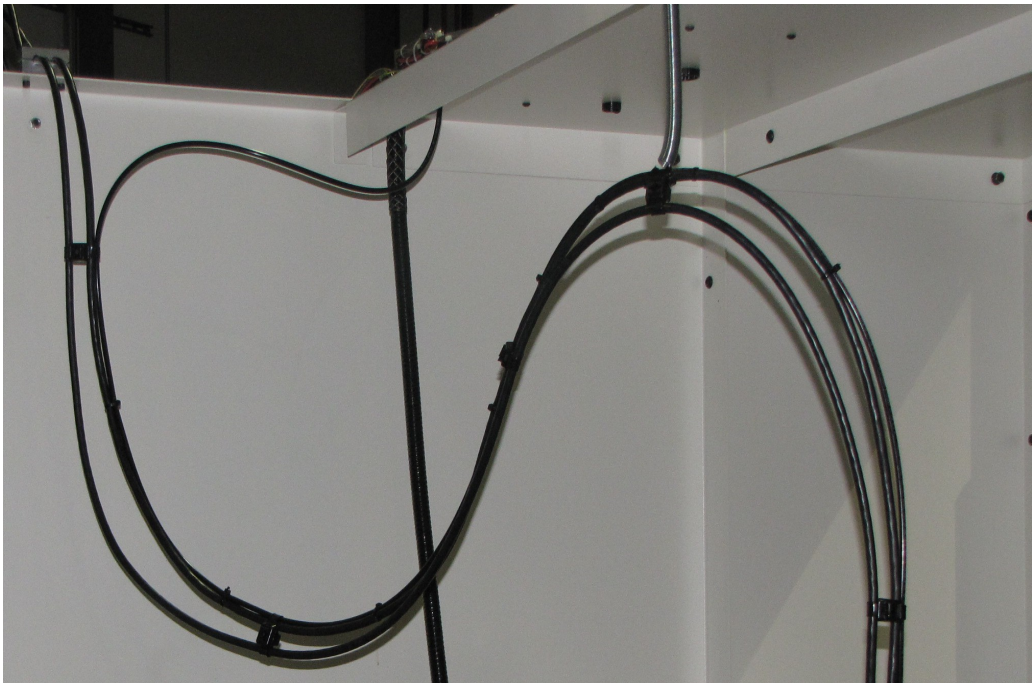


Figure 10, Ensure there is enough slack for machines table to move it's complete travel with the rotary tables cables held up and out of the chip trays