LEGACY CNC 88

INSTALLATION MANUAL

FADAL MACHINING CENTERS, LLC

Corporate Office.....phone (818) 407-1400..... fax (818) 407-0020

Service / Parts.....phone (818) 727-2100..... fax (818)407-1004

Programming Support.....phone (818) 727-2100..... fax (818) 407-0061

support@fadal.com

20701 Plummer Street, Chatsworth, California 91311 USA

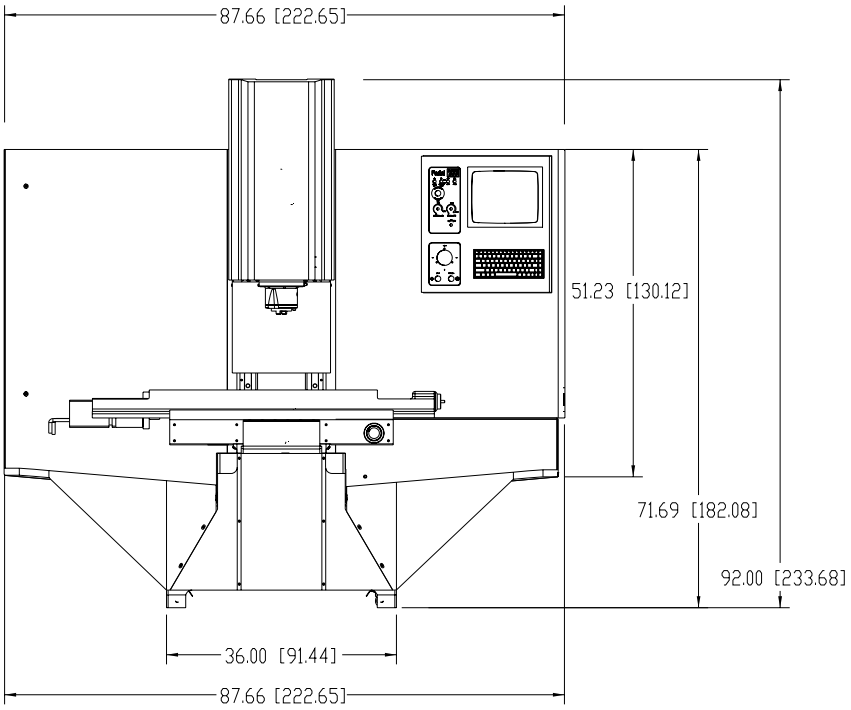
TABLE OF CONTENTS

1.0 SPECIFICATIONS

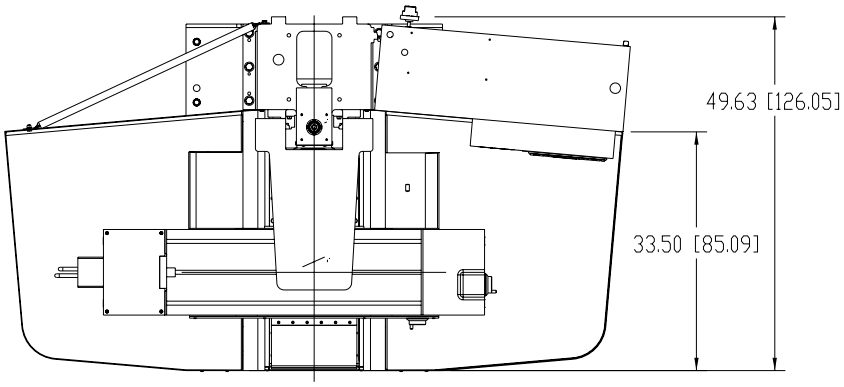
!	IMPORTANT Dimensions are represented in inches and centimeters.

1.1 TRM

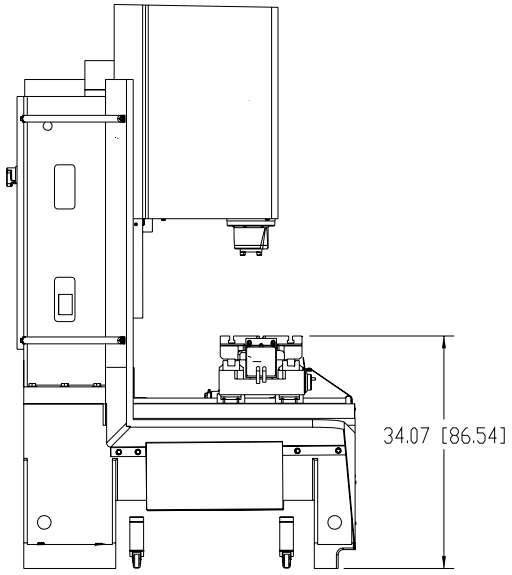
1.1.1 FRONT VIEW



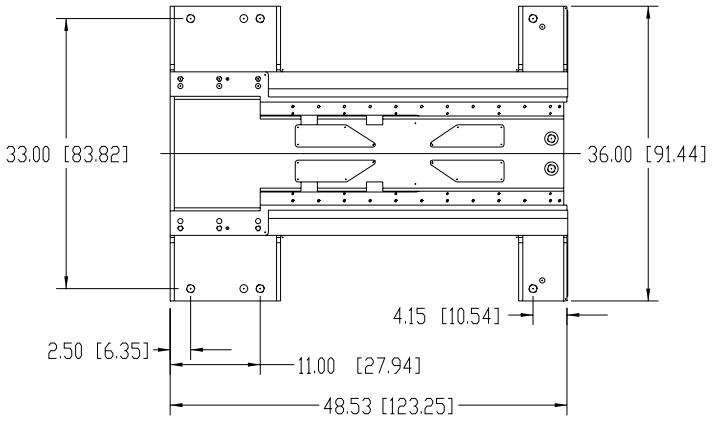
1.1.2 TOP VIEW



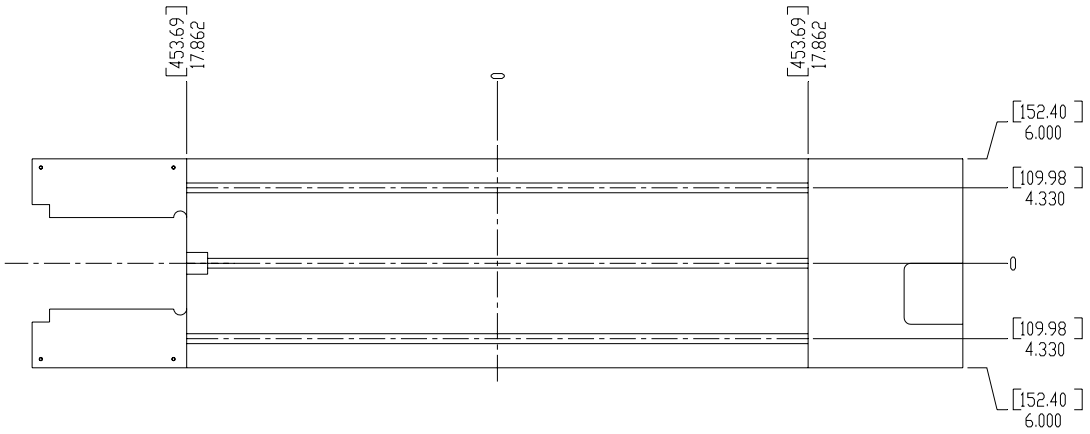
1.1.3 SIDE VIEW



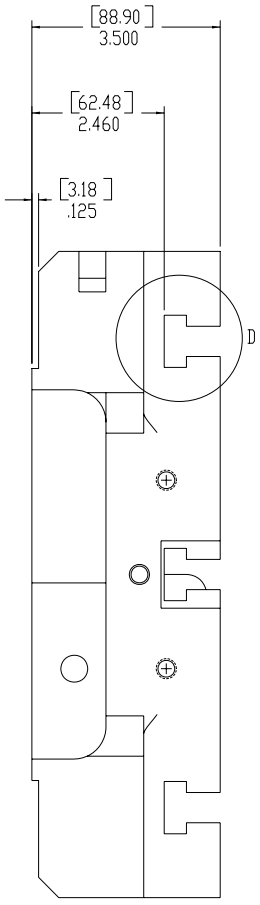
1.1.4 BASE

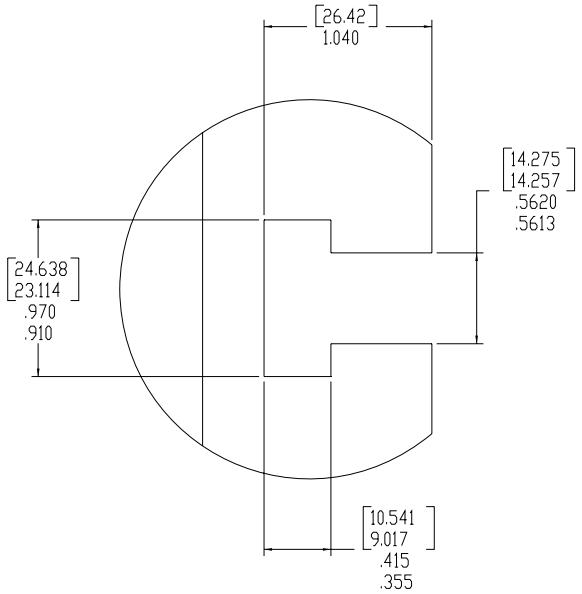


1.1.5 TABLE



1.1.6 T-SLOT





DETAIL D
SCALE 3 : 1

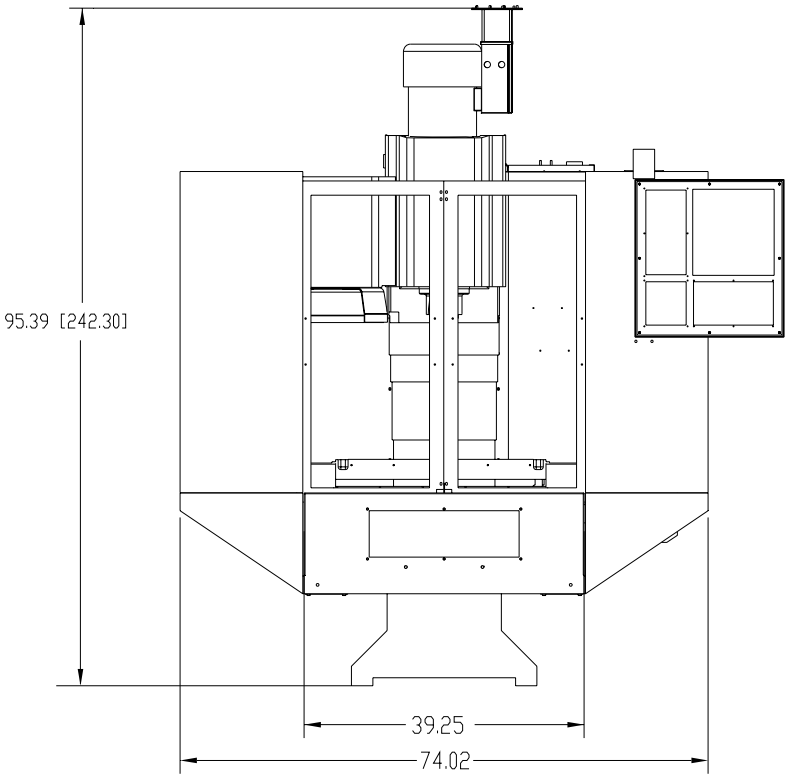
1.1.7 SPECIFICATIONS

Table 1-1: TRM Specifications

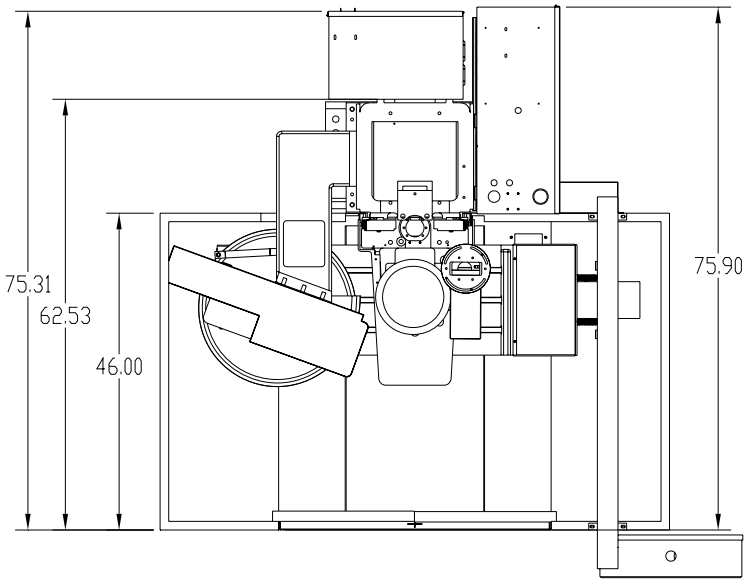
TRM SPECIFICATIONS	TRM STANDARD	TRM METRIC
Table Size	35" x 12"	889mm x 304.8mm
Floor to Table	34.5"	876.3mm
T-Slots (No. x Width x Span)	3 x .562" x 4.375"	3 x 14.3mm x 111mm
Cutting Feed Rate	.01-200" ipm	.25-5080 mm/min
Rapid Feed Rate (X/Y/Z)	200 ipm	5080 mm/min
Max. Weight on Table	500 lbs	226.8 kg.
Axis Drive Motor (X/Y/Z)	DC, 2,000 lbs*	
Ball Screw Size	32mm	
Longitudinal (X Axis)	30"	762mm
Cross (Y Axis)	14"	355.6mm
Vertical (Z Axis)	14”	355.6mm
Spindle Nose to Table	4"-18"	101.6mm-457.2mm
Spindle Center to Column Ways	19"	482.6mm
Main Motor HP	5 HP*	
Opt. HT Motor - Automatic 2 Speed Vector	N/A	
Torque	28 ft-lbs*	38Nm
Accuracy, Axis Positioning	± .0004"**	.0102mm
Accuracy, Axis Repeatability	± .0002"**	.0050mm
Glass Scales (X/Y/Z)	N/A	
Spindle Speed	4,000 rpm	
Spindle Orientation	N/A	
Spindle Taper	No. 40	
Max. Tool Diameter	4.5"	114.3mm
Max. Tool Length	10"	254mm
Max. Tool Weight	15 lbs.	6.8kg
Machine Width and Depth	88" W x 50" D	2235mm x 1270mm
Machine Maximum Height	92"	2336.8mm
Machine Weight	3,500 lbs.	1587kg
Air Pressure Reqs. (Momentary)	80-120 psi, 15 scfm	
Power Reqs. (3-phase)	22 amps, 220 VAC	
Single Phase (Optional)	45 amps, 220 VAC	

1.2 EMC

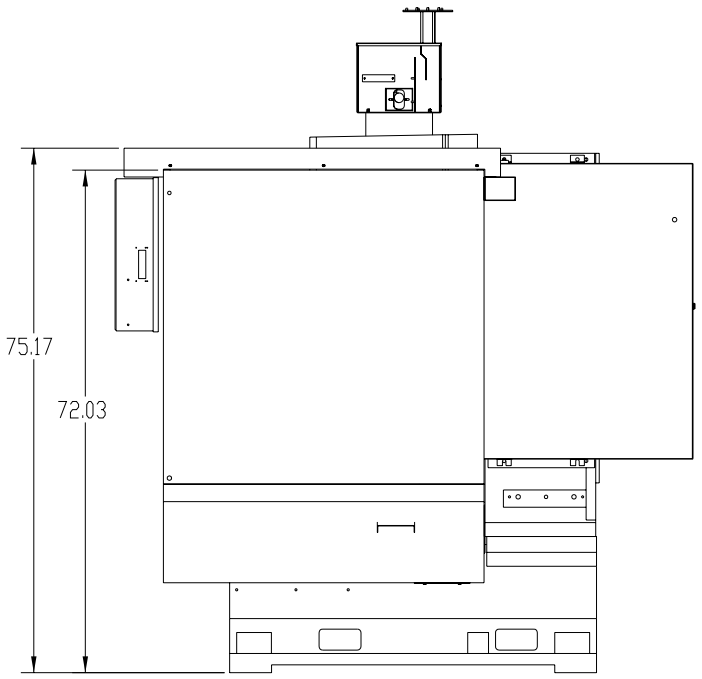
1.2.1 FRONT VIEW



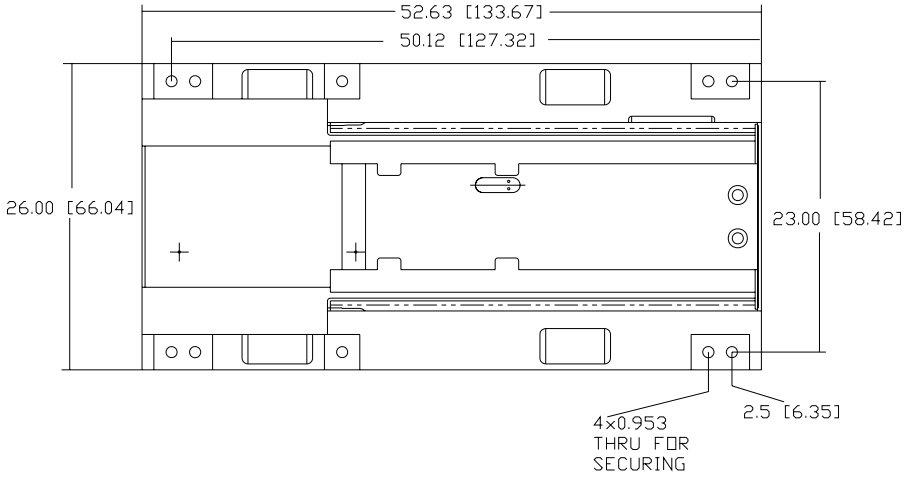
1.2.2 TOP VIEW



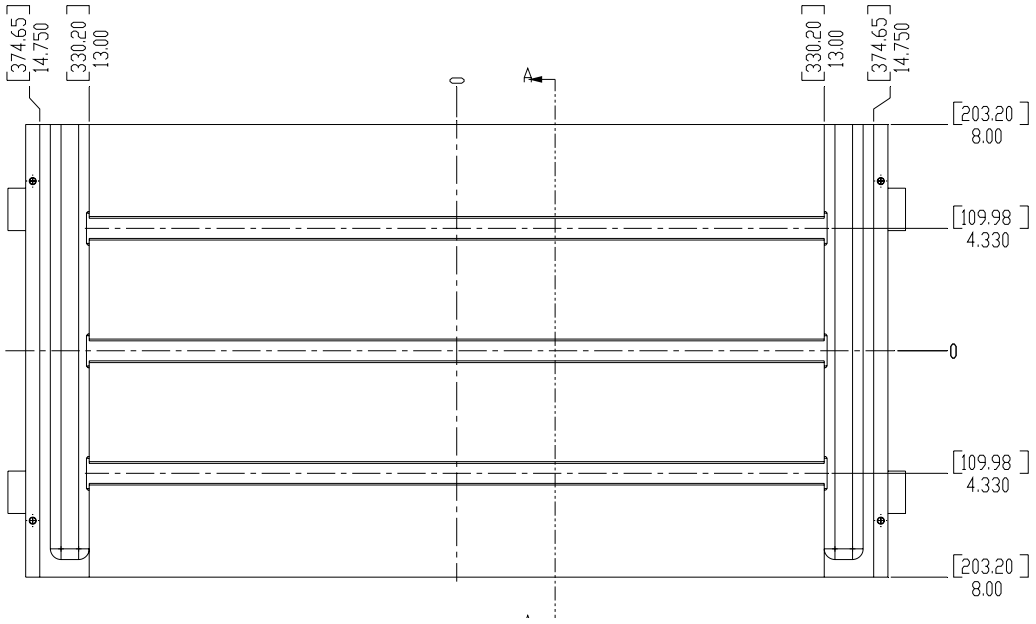
1.2.3 SIDE VIEW



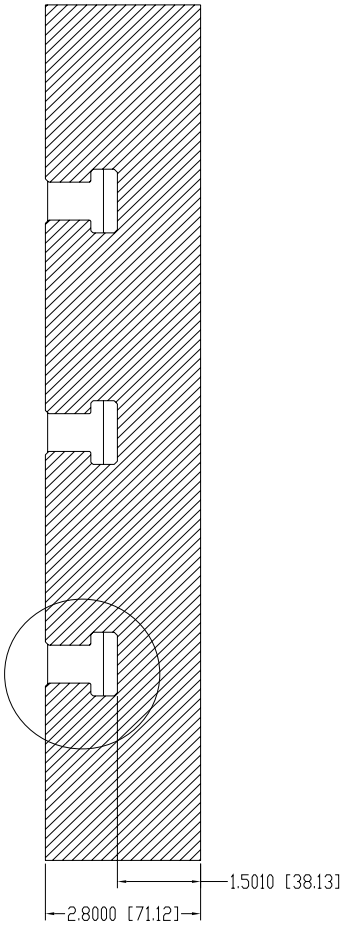
1.2.4 BASE

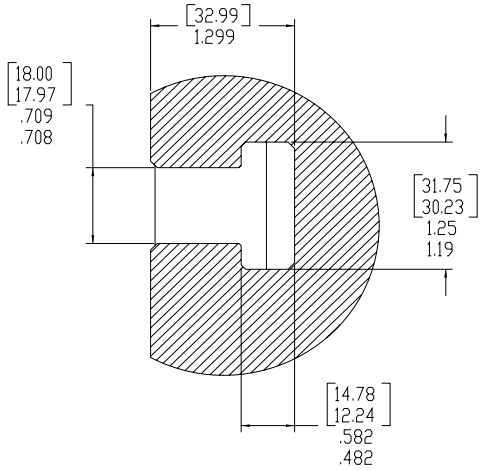


1.2.5 TABLE



1.2.6 T-SLOTS





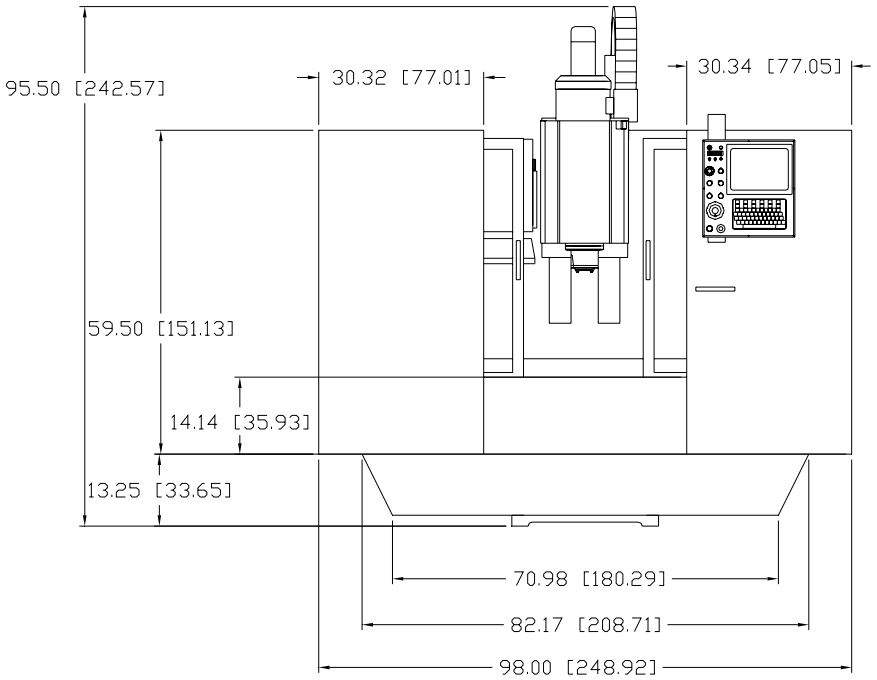
1.2.7 SPECIFICATIONS

Table 1-2: EMC Specifications

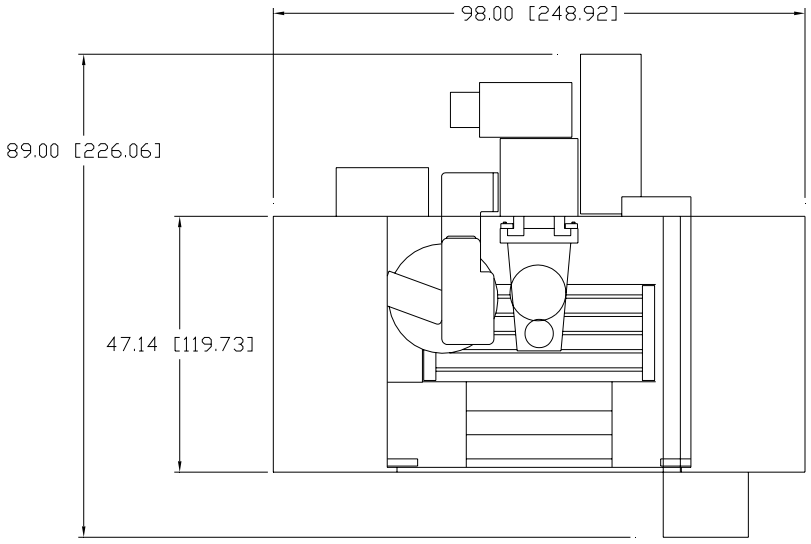
EMC SPECIFICATIONS	EMC STANDARD	EMC METRIC
Table Size	29.5" x 16"	749mm x 406mm
Floor to Table	33.25"	845mm
T-Slots (No. x Width x Span)	3 x .562" x 4.33"	3 x 14mm x 110mm
Cutting Feed Rate	.01-250" ipm (375 @ 150%)	.25-6,350 (9,525 at 150%) mm/min
Rapid Feed Rate (X/Y/Z)	700 ipm	17.8 m/min
Max. Weight on Table	1,000 lbs	453.6 kg
Axis Drive Motor (X/Y/Z)	DC, 2,500 lbs	AC, 11,250 N*thrust
Ball Screw Size		32 mm
Longitudinal (X Axis)	20"	508mm
Cross (Y Axis)	16"	406mm
Vertical (Z Axis)	14”	356mm
Spindle Nose to Table	4"-18"	102mm-457mm
Spindle Center to Column Ways	17"	431mm
Main Motor - Automatic 2 Speed Vector	12 HP*	
Opt. HT Motor - Automatic 2 Speed Vector	N/A	
Torque	36 ft-lbs	102Nm
Accuracy, Axis Positioning	± .0002"	.0050mm
Accuracy, Axis Repeatability	± .0001"	.0025mm
Glass Scales (X/Y/Z)	N/A	
Spindle Speed	7,500 rpm	
Spindle Orientation	Electromechanical	
Spindle Taper	No. 40	
ATC, Number of Tools	16	
ATC, Tool Selection	Random, Bi-directional	
Max. Tool Diameter	3"	76mm
Max. Tool Length	10"	381mm
Max. Tool Weight	15 lbs.	6.8kg
Machine Width and Depth	75" W x 77" D	1.9mm x 2.0mm
Machine Maximum Height	92"	2.6m
Machine Weight	4,800 lbs.	2495kg
Air Pressure Reqs. (Momentary)	80-120 psi, 15 scfm	5.5 Bar
Power Reqs. (3-phase)	40 amps, 230 VAC	
Single Phase (Optional)	60 amps, 230 VAC	
Cool Power System	N/A	
Ball Screw Supports (X/Y/Z)	dual	
No. of Ground Boxways per Axis (X/Y/Z)		

1.3 2216 & 3016

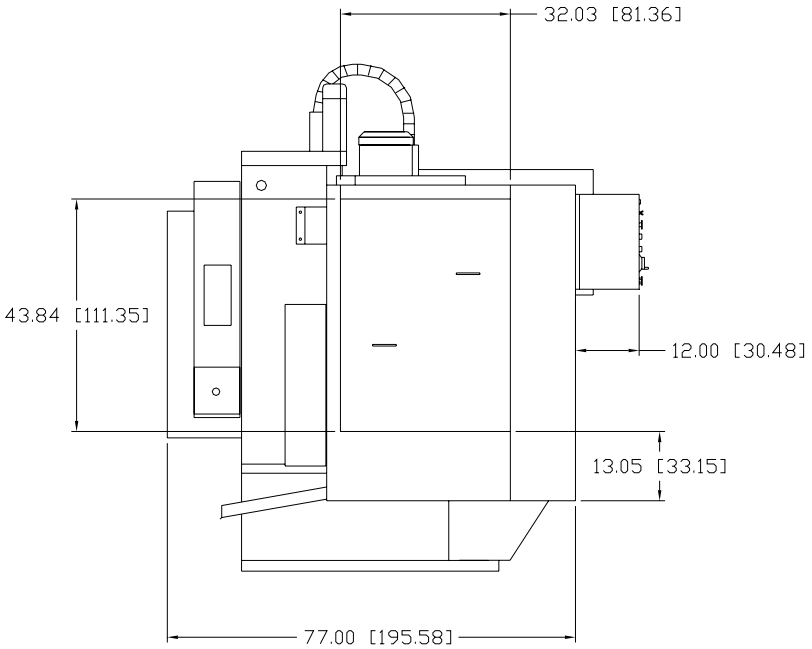
1.3.1 FRONT VIEW



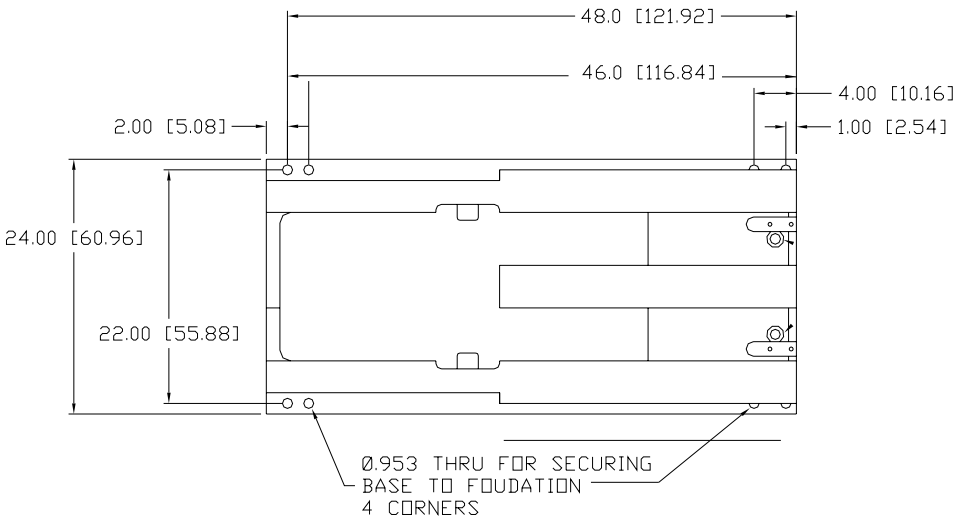
1.3.2 TOP VIEW



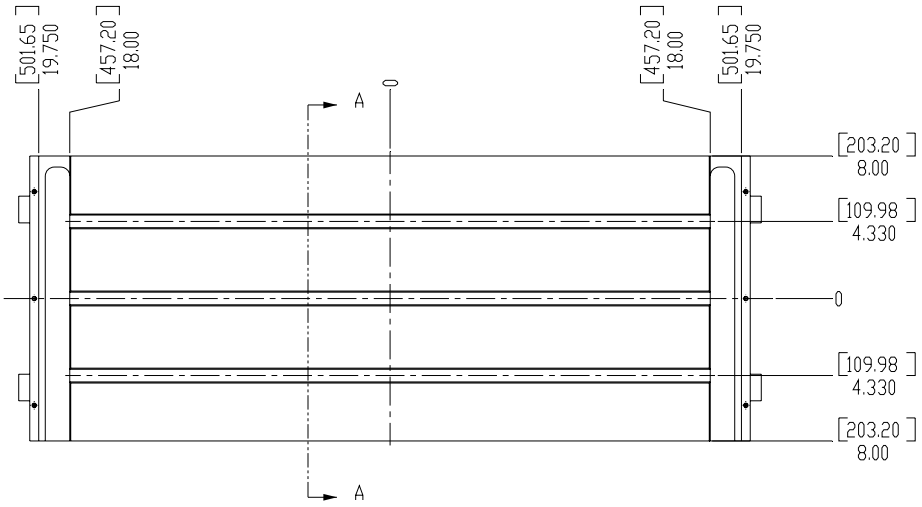
1.3.3 SIDE VIEW



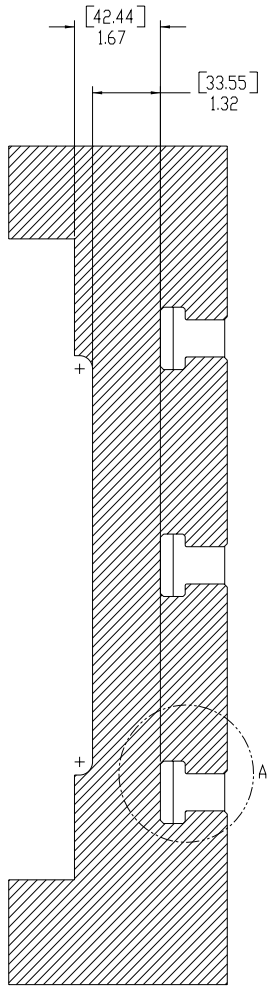
1.3.4 BASE

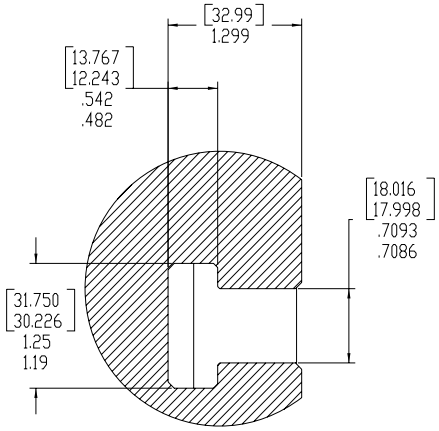


1.3.5 TABLE



1.3.6 T-SLOTS





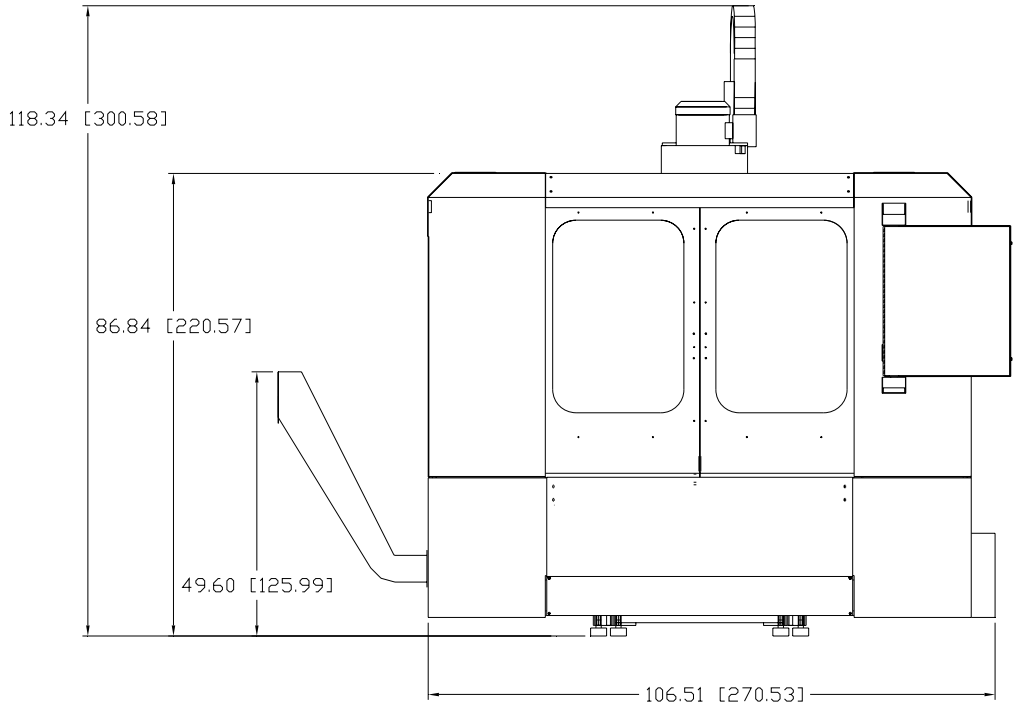
1.3.7 SPECIFICATIONS

Table 1-3: 2216 & 3016 Specifications

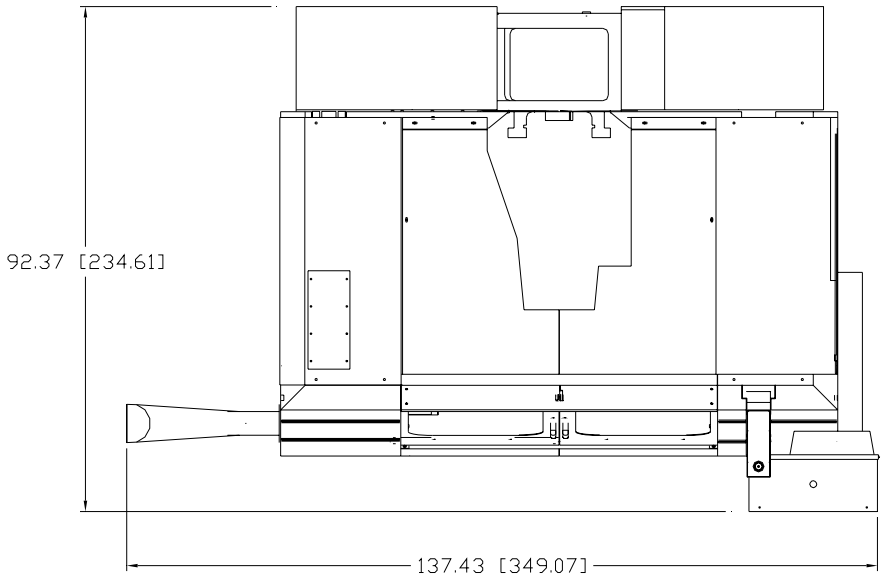
2216 SPECIFICATIONS	2216 STANDARD	2216 METRIC
Table Size	39" x 16"	750mm x 406mm
Floor to Table	31"	787mm
T-Slots (No. x Width x Span)	3 x .562" x 4.33"	3 x 14mm x 110mm
Cutting Feed Rate	.01-400 ipm (600 @ 150%)	.25-10,160 (15,240 at 150%)mm/min.
Rapid Feed Rate (X/Y/Z)	900 ipm (X/Y) 700 ipm (Z)	22.8 m/min. (X,Y) 17.7 m/min (Z)
Max. Weight on Table	2,006 lbs.	991 kg.
Axis Drive Motor (X/Y/Z)*	AC, 3,800 lbs	AC, 16.900 N* thrust
Ball Screw Size	40mm Dia. (X/Y/Z)	
Longitudinal (X Axis)	22"	559mm
Cross (Y Axis)	16"	406mm
Vertical (Z Axis)	20" (28" Opt.)	508mm (711mm Opt.)
Spindle Nose to Table	4"-24" (4"-32" Opt.)	102mm-610mm (102mm-813mm)
Spindle Center to Column Ways	16"	406mm
Main Motor - Automatic 2 Speed Vector	15 HP*, 11.2 KW	
Opt. HT Motor - Automatic 2 Speed Vector	22.5 HP*, 16.8 KW	
Torque	160 ft-lbs, 220 ft-lbs (HT)	220 Nm/300 Nm
Accuracy, Axis Positioning	± .0002"	.0050mm
Accuracy, Axis Repeatability	± .0001"	.0025mm
Glass Scales (X/Y/Z)	Optional	
Spindle Speed	10-10,000 rpm (15,000 Opt.)	
Spindle Orientation	Electromechanical	
Spindle Taper	No. 40	
ATC, Number of Tools	21	
ATC, Tool Selection	Random, Bi-directional	
Max. Tool Diameter	3" (4.5" w/o adjacent tools)	76mm (114mm w/o adjacent tools)
Max. Tool Length	15"	381
Max. Tool Weight	15 lbs.	6.8 kg
Machine Width and Depth	98" W x 77" D	2.5m W x 2m D
Machine Maximum Height	103"	2.6m
Machine Weight	8,300 lbs.	3,765 kg
Air Pressure Reqs. (Momentary)	120 psi, 15 scfm	5.5 Bar
Power Reqs. (3-phase)	40/45 amps, 230 VAC	
Single Phase (Optional)	60 amps, 230 VAC	
Cool Power System	Spindle, Headstock, Ballscrews	
Ball Screw Supports (X/Y/Z)	dual	
No. of Ground Boxways per Axis (X/Y/Z)	2	

1.4 3020

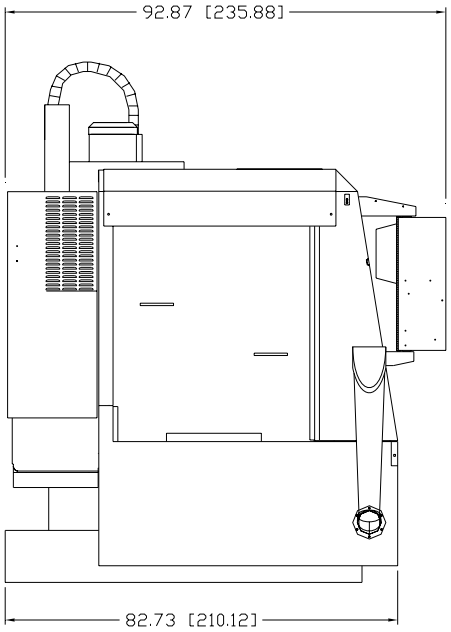
1.4.1 FRONT VIEW



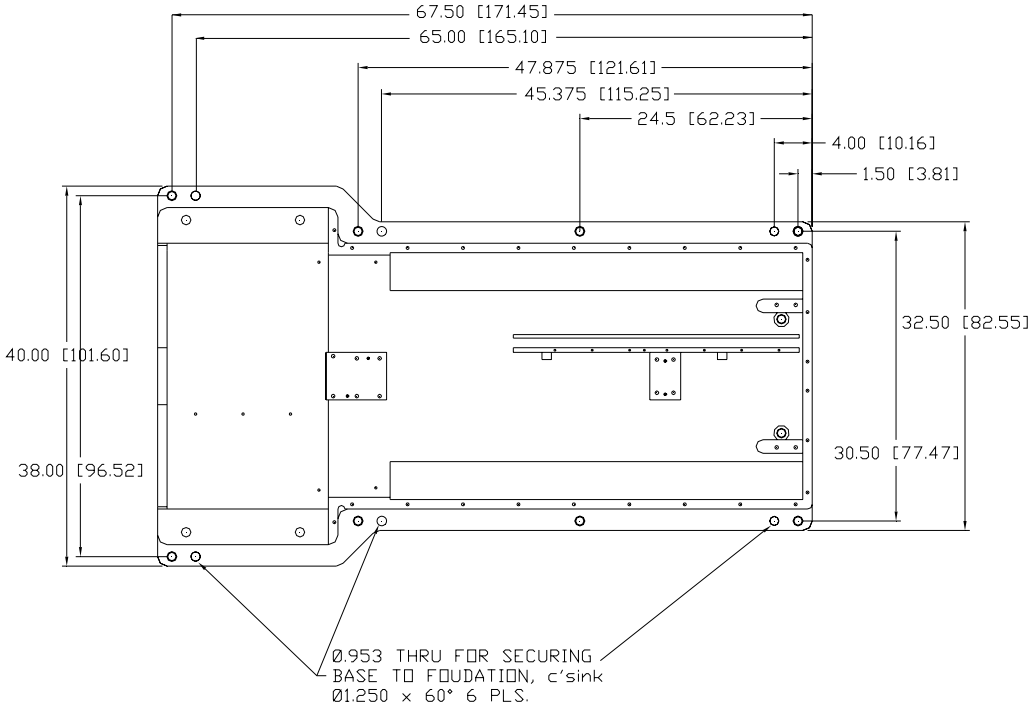
1.4.2 TOP VIEW



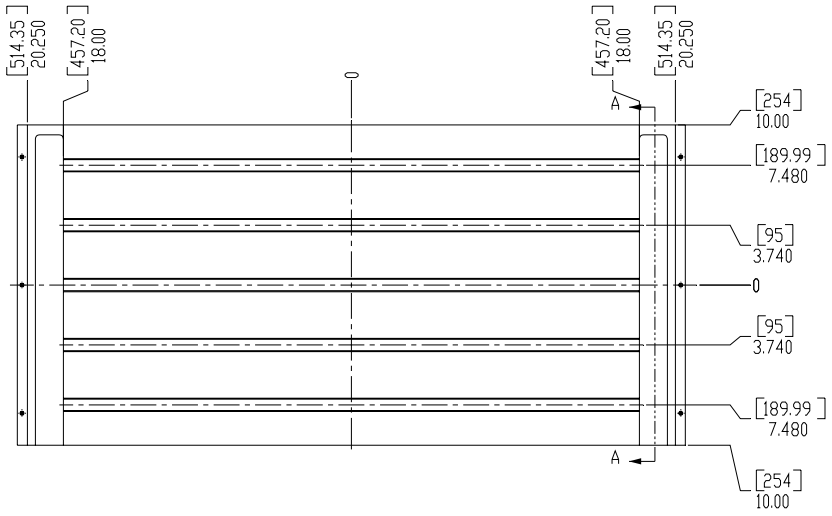
1.4.3 SIDE VIEW



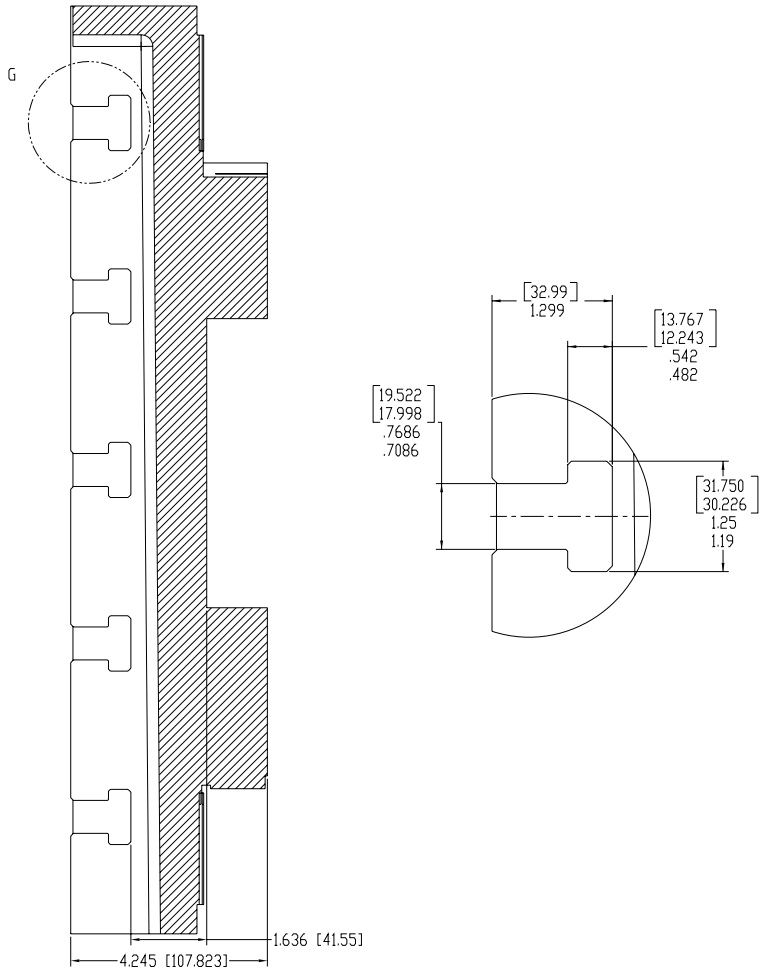
1.4.4 BASE



1.4.5 TABLE



1.4.6 T-SLOTS



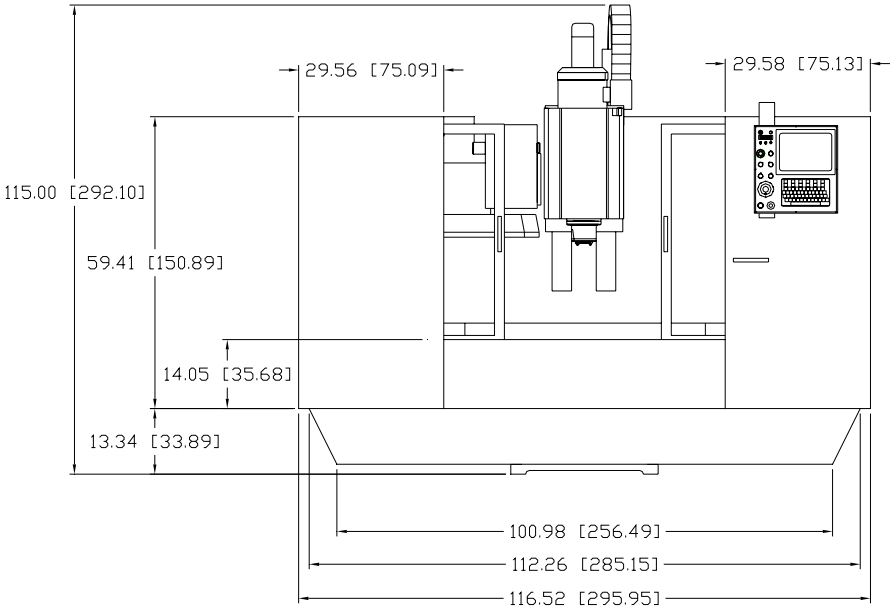
1.4.7 SPECIFICATIONS

Table 1-4: 3020 Specifications

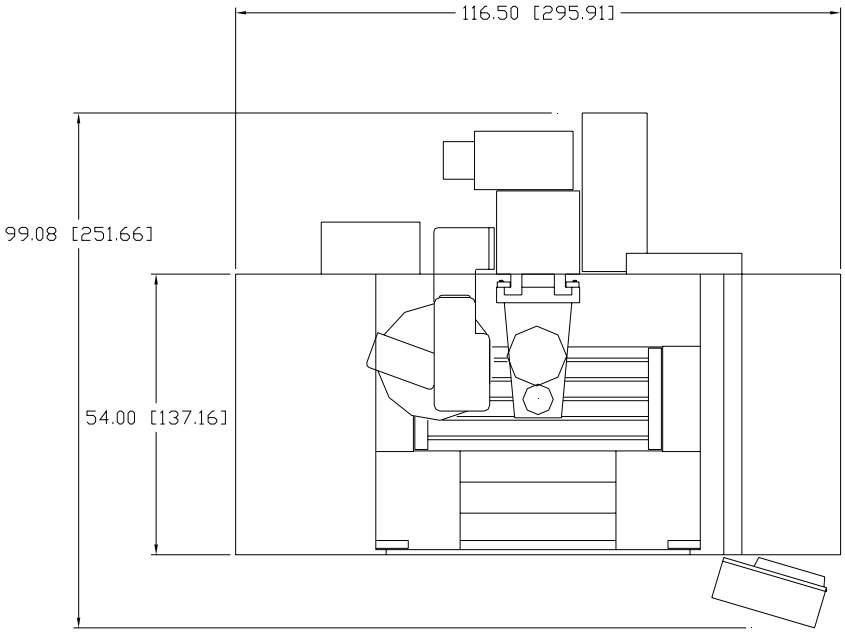
3020 SPECIFICATIONS	3020 STANDARD	3020 METRIC
Table Size	40.5" x 20"	1,029mm x 508mm
Floor to Table	31"	787mm
T-Slots (No. x Width x Span)	5 x .709" x 3.75"	5 x 18mm x 95.3mm
Cutting Feed Rate	.01-400 ipm (600 ipm @ 150%)	.25-10,160 (15,240 at 150%)
Rapid Feed Rate (X/Y/Z)	900 ipm (X/Y) 700 ipm (Z)	30.5(X,Y) 17.8(Z) m/min
Max. Weight on Table	4,250 lbs.	1,928 kg.
Axis Drive Motor (X/Y/Z)	AC 3,800 lbs peak thrust	AC, 16,903 N*thrust.
Ball Screw Size	40mm Dia. (X/Y/Z)	
Longitudinal (X Axis)	30"	762 mm
Cross (Y Axis)	20"	508mm
Vertical (Z Axis)	20" (24" Opt.)	508mm (610mm)
Spindle Nose to Table	4"-24" (28" Opt.)	102mm-610mm-(711mm Opt.)
Spindle Center to Column Ways	22.875"	581mm
Main Motor - Automatic 2 Speed Vector	15 HP*, 11.2 KW	
Opt. HT Motor - Automatic 2 Speed Vector	22.5 HP*, 16.8 KW	
Torque	160 ft-lbs, 290 ft-lbs (Opt.)	300 Nm/375Nm
Accuracy, Axis Positioning	± .0002"	±.004mm
Accuracy, Axis Repeatability	± .0001"	±.0015mm
Glass Scales (X/Y/Z)	Optional	
Spindle Speed	10-10,000 rpm (15,000 Opt.)	
Spindle Orientation	Electromechanical	
Spindle Taper	No. 40	
ATC, Number of Tools	21 (30 Opt.)	
ATC, Tool Selection	Random, Bi-directional	
Max. Tool Diameter	3" (4.5" w/o adjacent tools)	76.2mm (114.3mm)
Max. Tool Length	15"	381mm
Max. Tool Weight	15 lbs.	6.8 kg
Machine Width and Depth	106" W x 85" D	2.7m W x 2.16m D
Machine Maximum Height	96" (102" with 22.5 HP Opt.)	2.4m (2.6m with 22.5hp. Opt)
Machine Weight	12,400 lbs.	5,625 kg
Air Pressure Reqs. (Momentary)	120 psi, 15 scfm	5.5 Bar
Power Reqs. (3-phase)	45 amps, 230 VAC (20/25 amps, 480 VAC)	
Single Phase (Optional)	60 amps, 230 VAC	
Cool Power System	Spindle, Headstock, Ballscrews	
Ball Screw Supports (X/Y/Z)	dual	
No. of Ground Boxways per Axis (X/Y/Z)	2	

1.5 4020

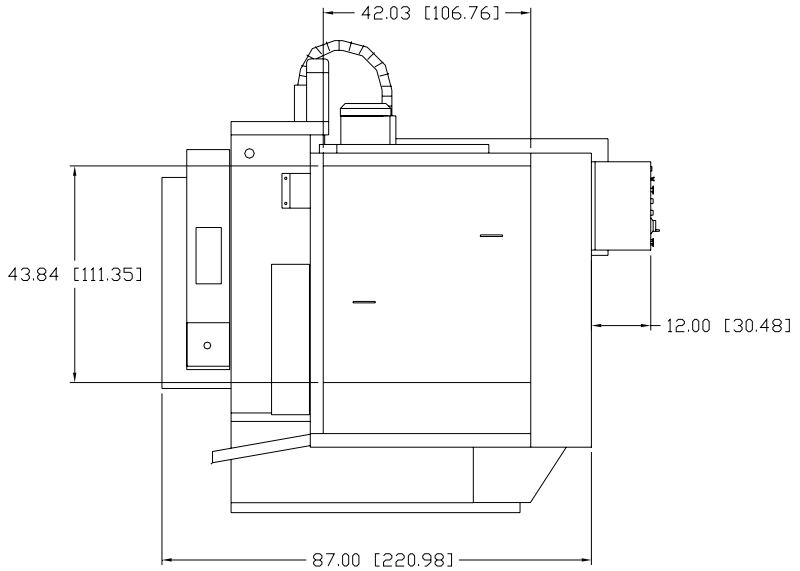
1.5.1 FRONT VIEW



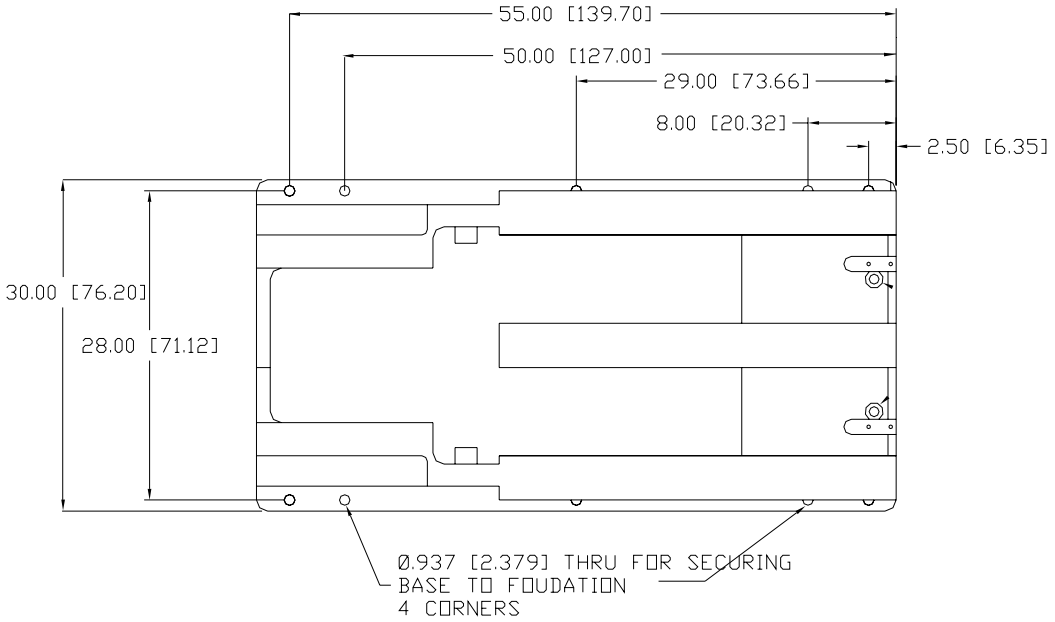
1.5.2 TOP VIEW



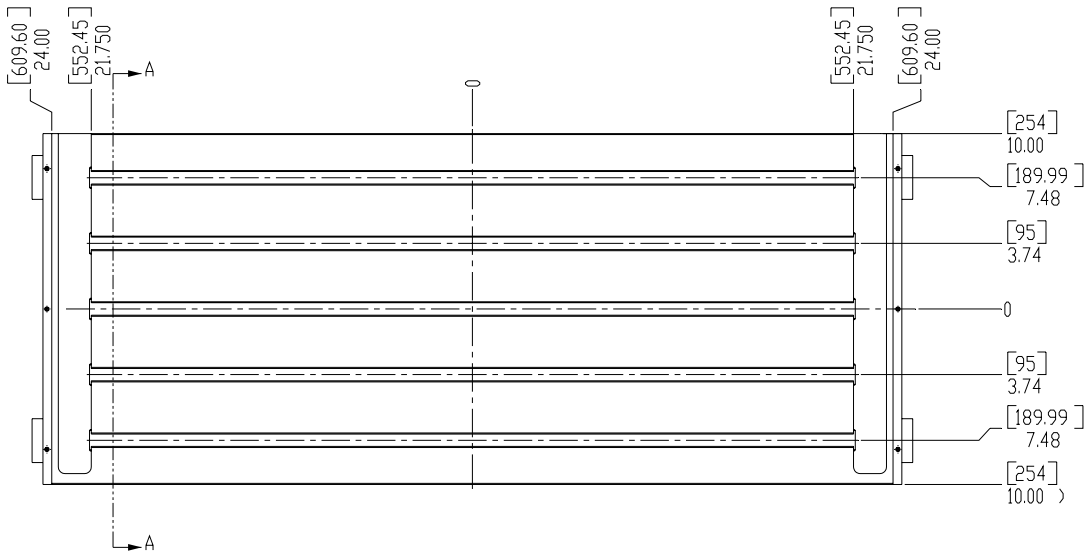
1.5.3 SIDE VIEW



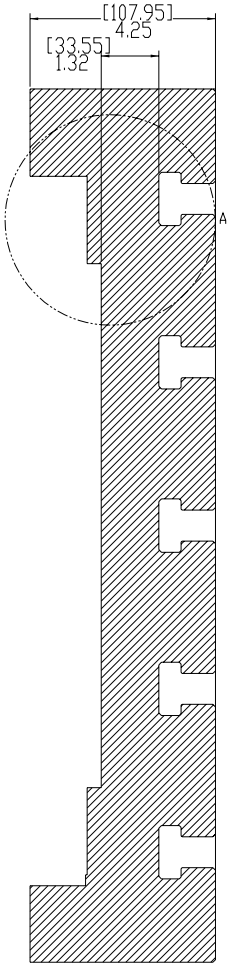
1.5.4 BASE

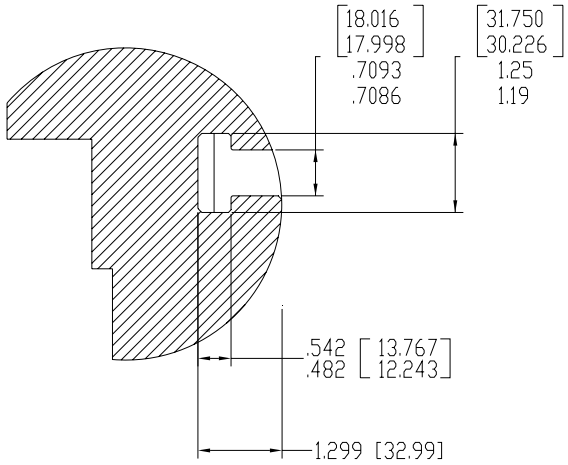


1.5.5 TABLE



1.5.6 T-SLOTS





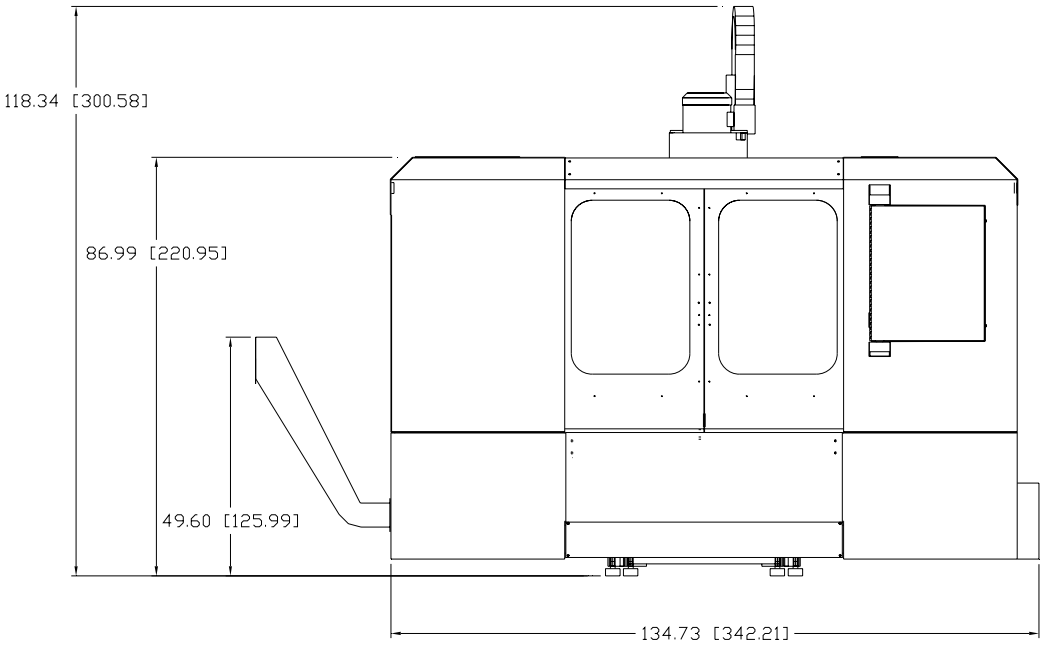
1.5.7 SPECIFICATIONS

Table 1-5: 4020 Specifications

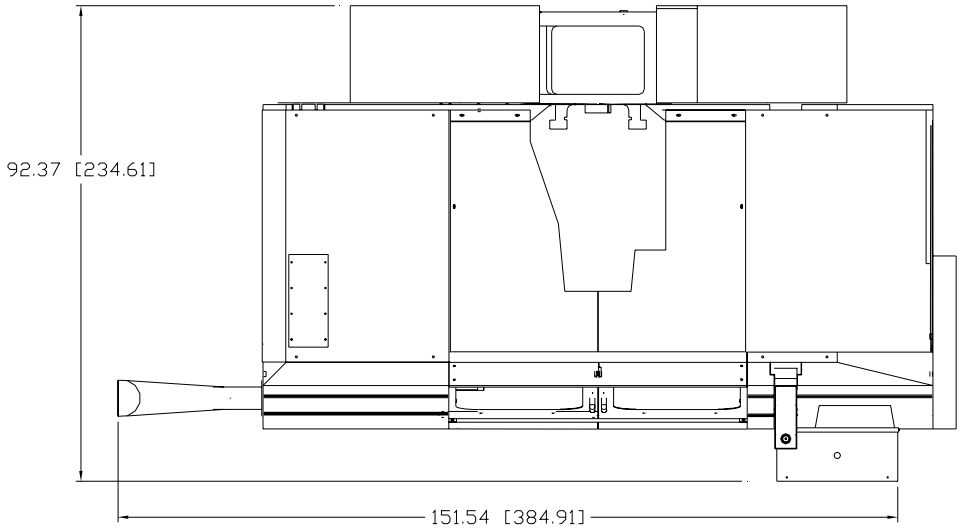
4020 SPECIFICATIONS	4020 STANDARD	4020 METRIC
Table Size	48" x 20"	1,219mm x 508mm
Floor to Table	32"	813mm
T-Slots (No. x Width x Span)	5 x .687" x 3.75"	5 x 17.5mm x 95.3mm
Cutting Feed Rate	.01-400 ipm (600 @ 150%)	.25-10,160 (15,240 at 150%)mm/min.
Rapid Feed Rate (X/Y/Z)	900 ipm (X/Y) 700 ipm (Z)	22.8 m/min (X,Y,Z)
Max. Weight on Table	3,641 lbs.	1,652 kg.
Axis Drive Motor (X/Y/Z)	AC, 3,800 lbs peak thrust	AC, 16,900 N* thrust
Ball Screw Size	40mm Dia. (X/Y/Z)	
Longitudinal (X Axis)	40"	1,016mm
Cross (Y Axis)	20"	508mm
Vertical (Z Axis)	20" (28" Opt.)	508mm (711mm Opt.)
Spindle Nose to Table	4"-24" (4"-32" Opt.)	102mm-610mm (102mm-813mm)
Spindle Center to Column Ways	20"	406mm
Main Motor - Automatic 2 Speed Vector	15 HP*, 11.2 KW	
Opt. HT Motor - Automatic 2 Speed Vector	22.5 HP*, 16.8 KW	
Torque	160 ft-lbs, 220 ft-lbs (Opt.)	220 Nm/300Nm/378Nm
Accuracy, Axis Positioning	± .0002"	.0050mm
Accuracy, Axis Repeatability	± .0001"	.0025mm
Glass Scales (X/Y/Z)	Optional	
Spindle Speed	10-10,000 rpm (15,000 Opt.)	
Spindle Orientation	Electromechanical	
Spindle Taper	No. 40	
ATC, Number of Tools	21 (30 Opt.)	
ATC, Tool Selection	Random, Bi-directional	
Max. Tool Diameter	3" (6" w/o adjacent tools)	76mm (114mm w/o adjacent tools)
Max. Tool Length	15"	381mm
Max. Tool Weight	15 lbs.	6.8 kg
Machine Width and Depth	116" W x 87" D	3m W x 2.21m D
Machine Maximum Height	104"	2.6m
Machine Weight	10,500 lbs.	4763 kg
Air Pressure Reqs. (Momentary)	120 psi, 15 scfm	5.5 Bar
Power Reqs. (3-phase)	40/45 amps, 230 VAC (20/25 480 VAC)	
Single Phase (Optional)	60 amps, 230 VAC	
Cool Power System	Spindle, Headstock, Ballscrews	
Ball Screw Supports (X/Y/Z)	dual	
No. of Ground Boxways per Axis (X/Y/Z)	2	

1.6 4525

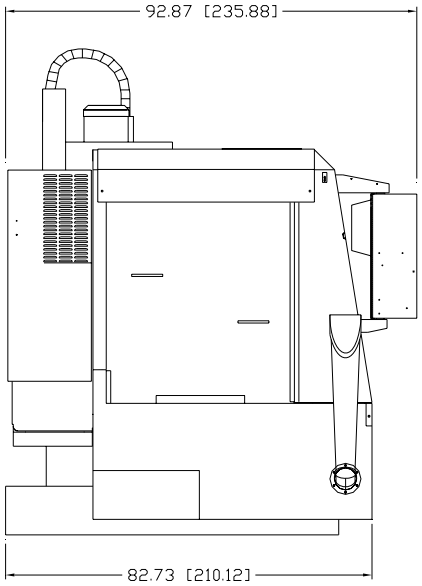
1.6.1 FRONT VIEW



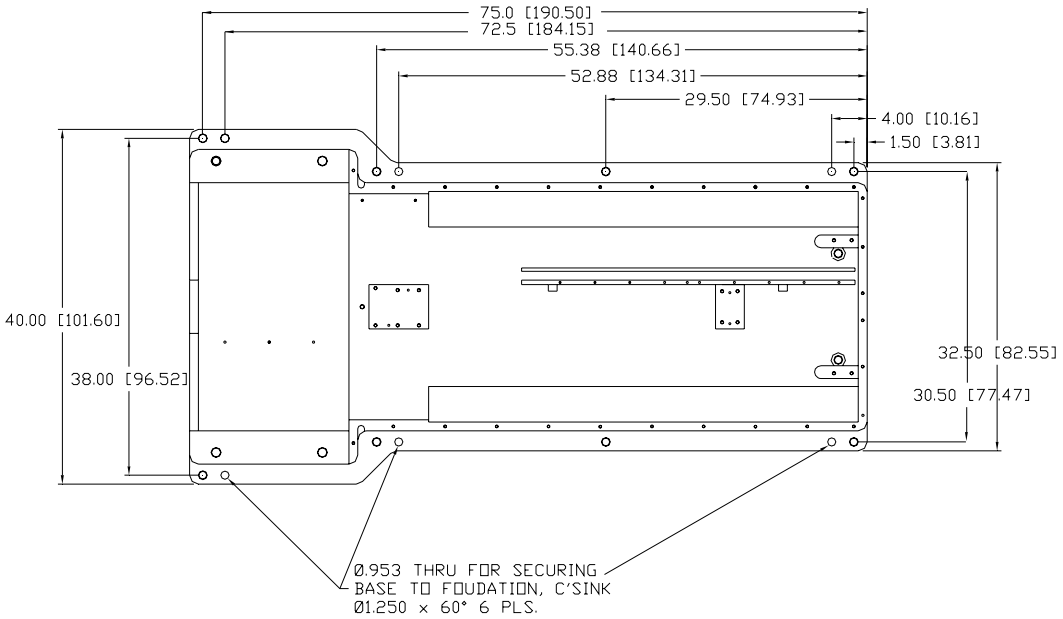
1.6.2 TOP VIEW



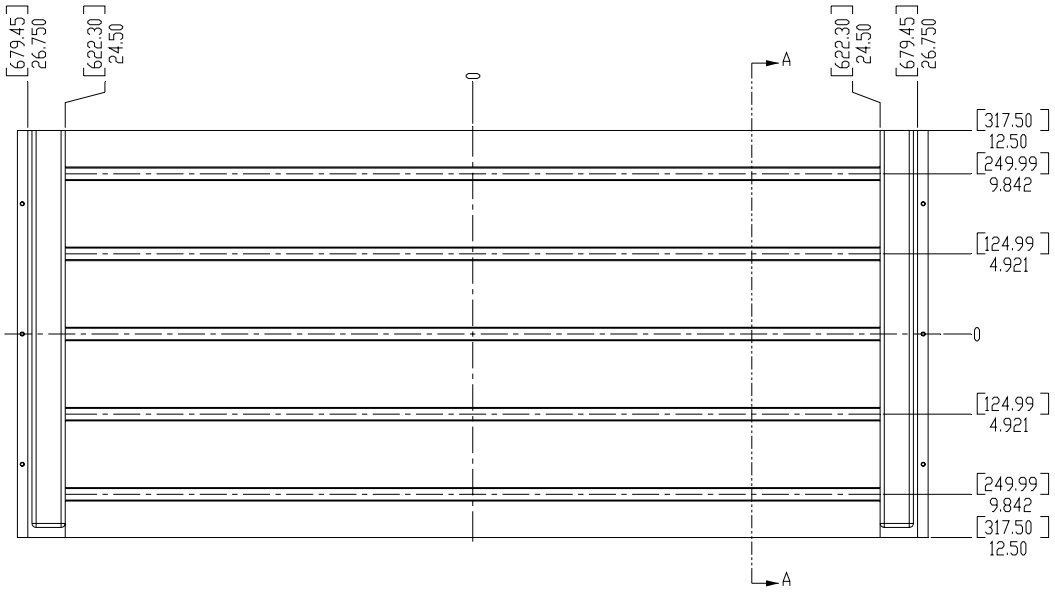
1.6.3 SIDE VIEW



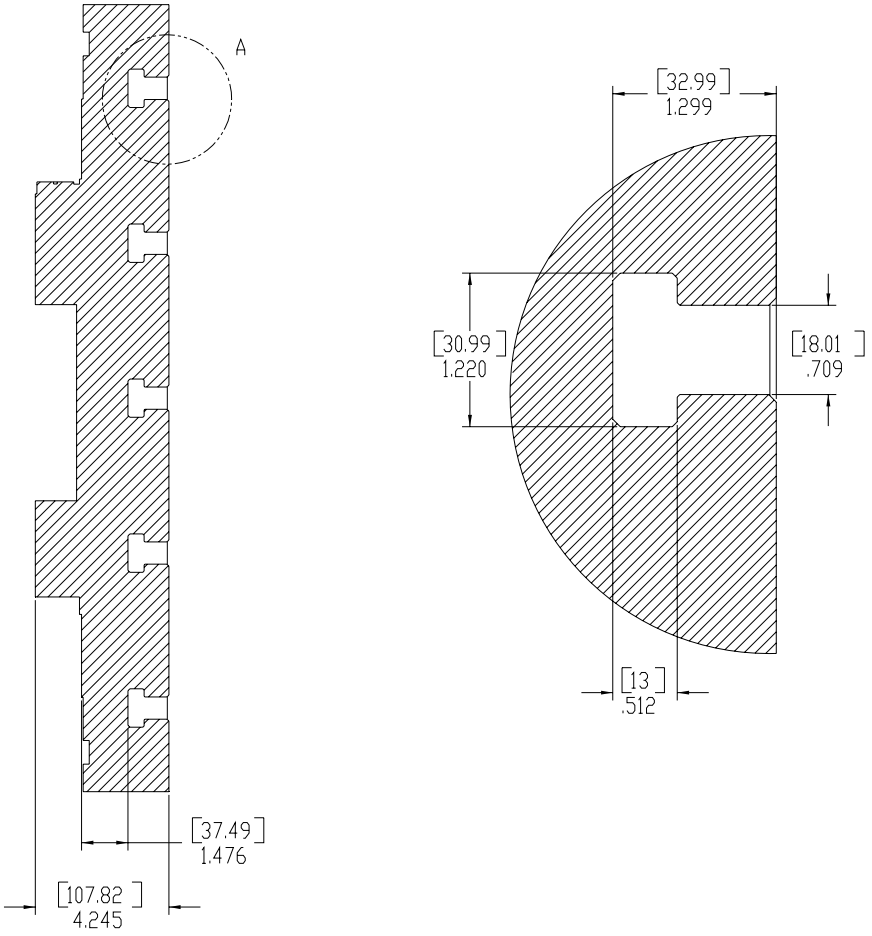
1.6.4 BASE



1.6.5 TABLE



1.6.6 T-SLOTS



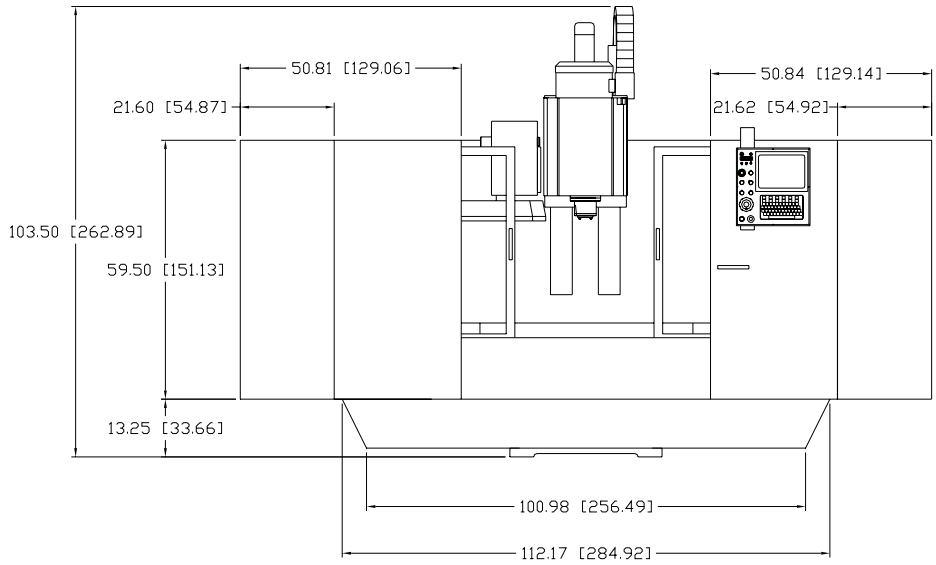
1.6.7 SPECIFICATIONS

Table 1-6: 4525 Specifications

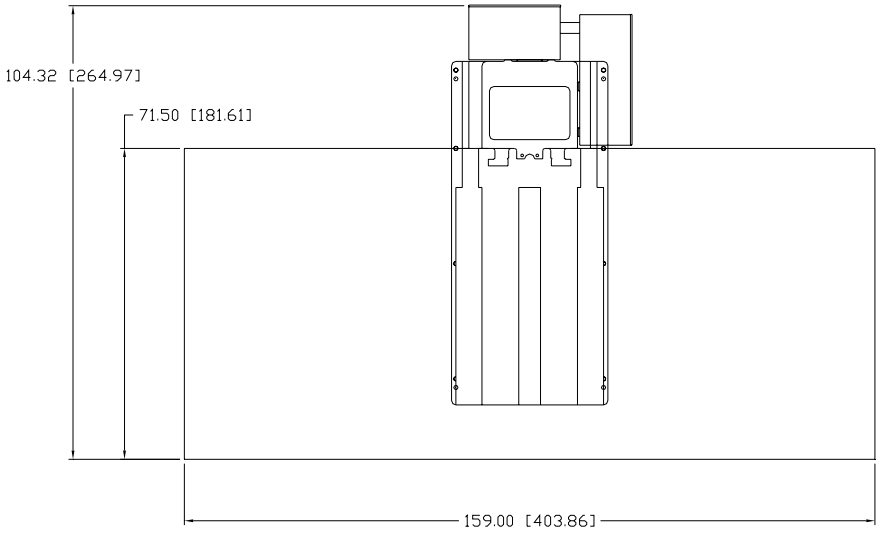
4525 SPECIFICATIONS	4525 STANDARD	4525 METRIC
Table Size	53.5" x 25"	1,359mm x 635mm
Floor to Table	31"	787mm
T-Slots (No. x Width x Span)	5 x .709" x 4.92"	5 x 18mm x 125mm
Cutting Feed Rate	.01-400 ipm (600 ipm @ 150%)	.25-10,160 (15,240 at 150%)
Rapid Feed Rate (X/Y/Z)	900 ipm (X/Y) 700 ipm (Z)	30.5(X,Y) 17.8(Z) m/min
Max. Weight on Table	4,250 lbs.	1,928 kg.
Axis Drive Motor (X/Y/Z)	AC 3,800 lbs peak thrust	AC, 16,903 N*thrust.
Ball Screw Size	40mm Dia. (X/Y/Z)	
Longitudinal (X Axis)	45"	1,143 mm
Cross (Y Axis)	25"	635mm
Vertical (Z Axis)	24"	610
Spindle Nose to Table	4"-24"	102mm-610mm
Spindle Center to Column Ways	27.87"	708mm
Main Motor - Automatic 2 Speed Vector	22.5 HP*, 16.8 KW	
Opt. HT Motor - Automatic 2 Speed Vector	30 HP*, 22.4 KW	
Torque	220 ft-lbs, 270 ft-lbs (Opt.)	300 Nm/375Nm
Accuracy, Axis Positioning	± .00016"	±.004mm
Accuracy, Axis Repeatability	± .00006"	±.0015mm
Glass Scales (X/Y/Z)	Optional	
Spindle Speed	10-10,000 rpm (15,000 Opt.)	
Spindle Orientation	Electromechanical	
Spindle Taper	No. 40	
ATC, Number of Tools	1.9 sec dual arm / 24 tools	
ATC, Tool Selection	Random, Bi-directional	
Max. Tool Diameter	4" (4.5" w/o adjacent tools)	101.6mm (114.3mm)
Max. Tool Length	15"	381mm
Max. Tool Weight	15 lbs.	6.8 kg
Machine Width and Depth	128" W x90" D	3.25m W x 2.3m D
Machine Maximum Height	120"	3m
Machine Weight	13,600 lbs.	6,169 kg
Air Pressure Reqs. (Momentary)	120 psi, 15 scfm	5.5 Bar
Power Reqs. (3-phase)	40/60 amps, 230 VAC (20/25 amps, 480 VAC)	
Single Phase (Optional)	60 amps, 230 VAC	
Cool Power System	Spindle, Headstock, Ballscrews	
Ball Screw Supports (X/Y/Z)	dual	
No. of Ground Boxways per Axis (X/Y/Z)	2	

1.7 6030

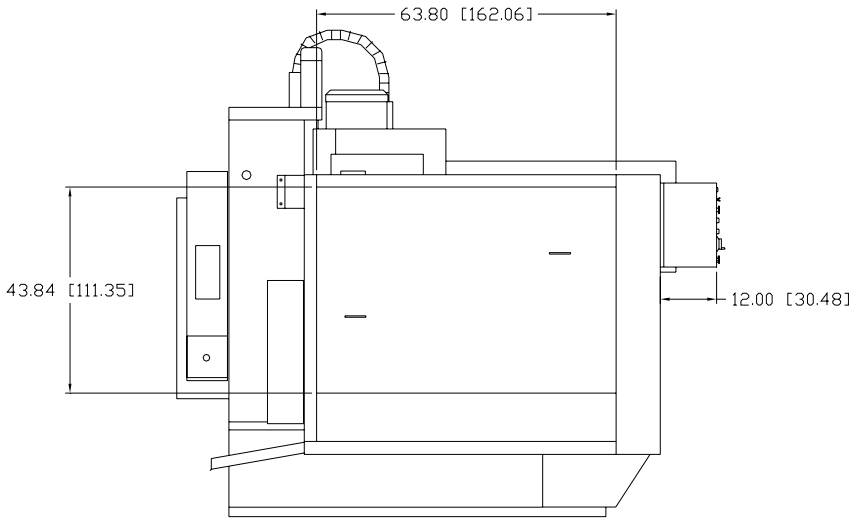
1.7.1 FRONT VIEW



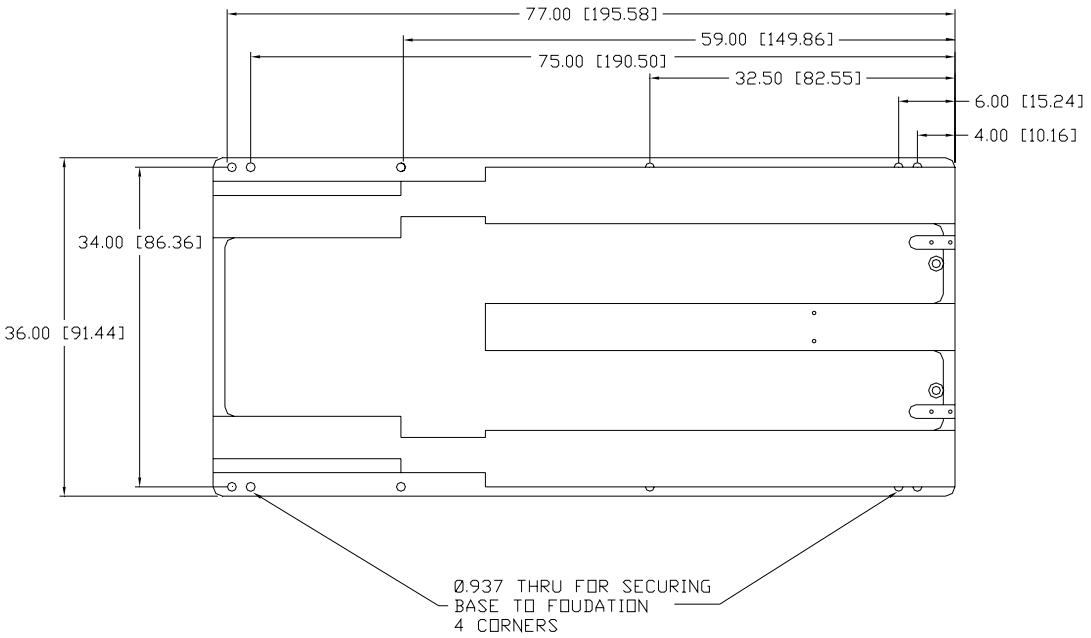
1.7.2 TOP VIEW



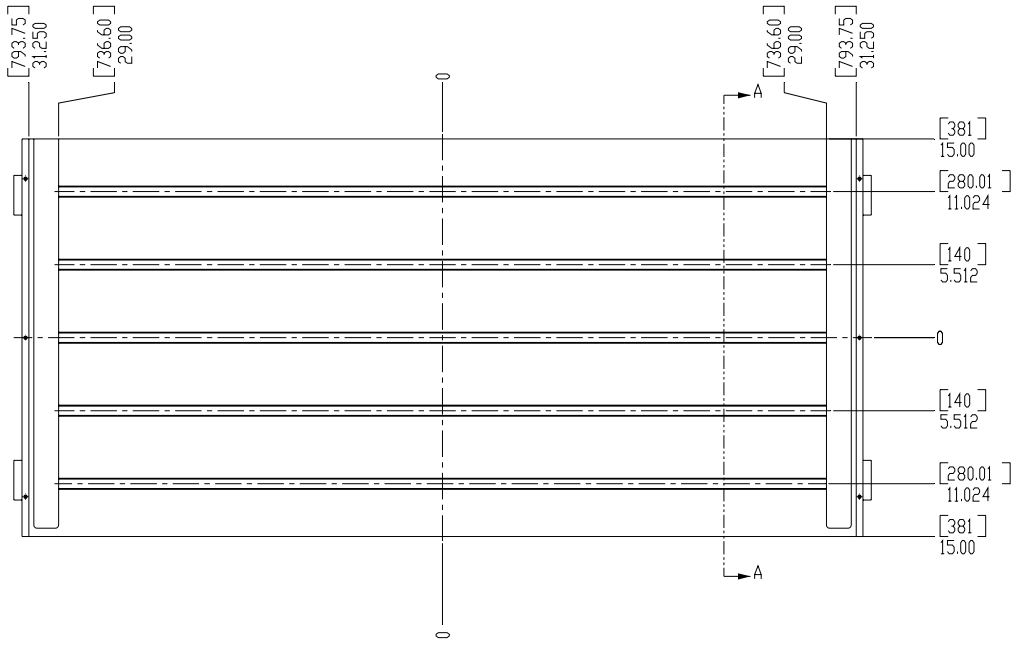
1.7.3 SIDE VIEW



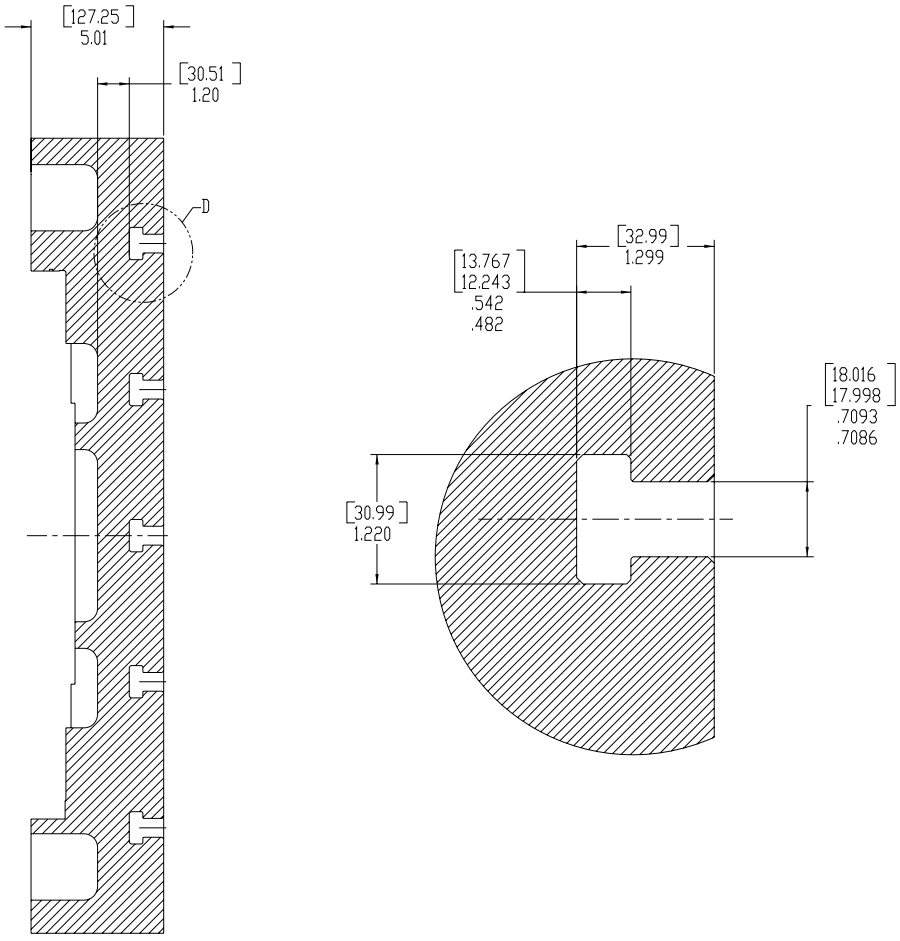
1.7.4 BASE



1.7.5 TABLE



1.7.6 T-SLOTS



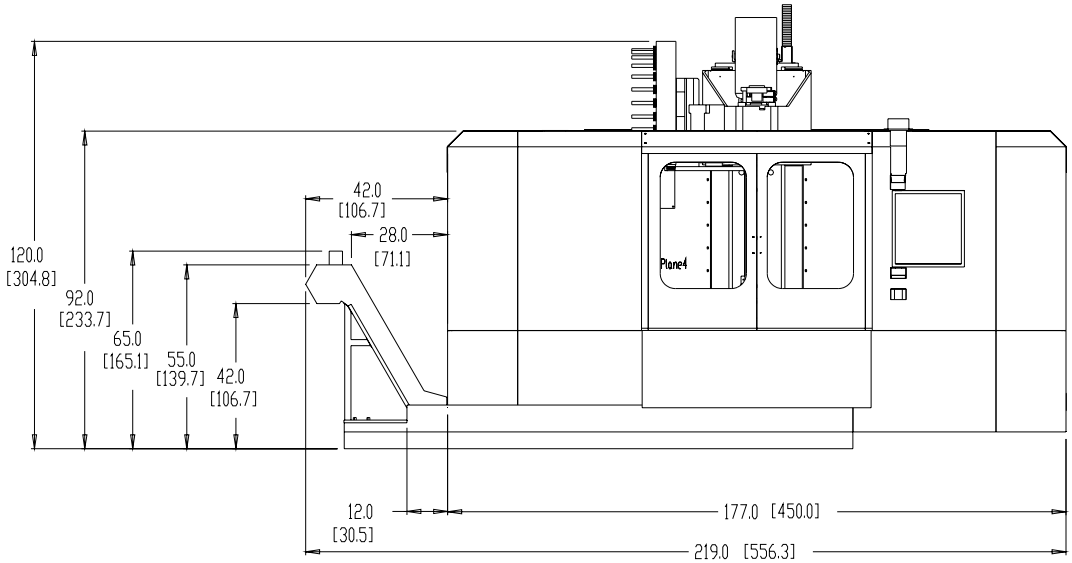
1.7.7 SPECIFICATIONS

Table 1-7: 6030 Specifications

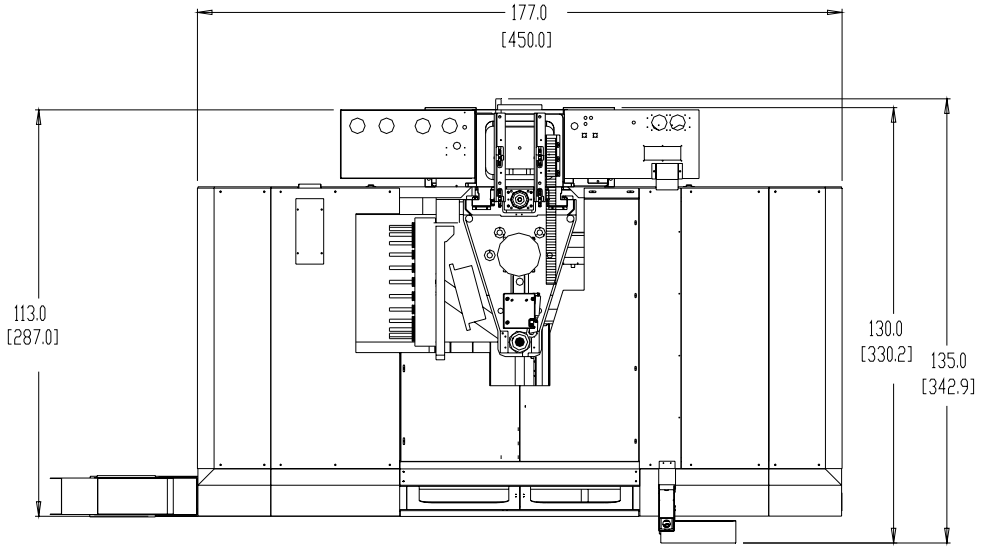
6030 SPECIFICATIONS	6030 STANDARD	6030 METRIC
Table Size	62.5 x 30"	1,588mm x 762mm
Floor to Table	36"	914mm
T-Slots (No. x Width x Span)	5 x .687" x 5.5"	5 x 17.5mm x 139.7mm
Cutting Feed Rate	.01-250 ipm (375 @ 150%)	.25-6,350 (9,525 at 150%)mm/min.
Rapid Feed Rate (X/Y/Z)	400 ipm (X/Y/Z)	10.1 m/min (X,Y,Z)
Max. Weight on Table	4,120 lbs.	1,869 kg.
Axis Drive Motor (X/Y/Z)	AC, 5,000 lbs peak thrust	AC, 22,420 N* thrust
Ball Screw Size	1.75" Dia. (X/Y) 1.50" Dia. (Z)	44.45mm Dia (X,Y) 38.1mm Dia. (Z)
Longitudinal (X Axis)	60"	1,524 mm
Cross (Y Axis)	30"	762mm
Vertical (Z Axis)	30"	762mm
Spindle Nose to Table	5.5"-35.5"	140mm-902mm
Spindle Center to Column Ways	16"	406mm
Main Motor - Automatic 2 Speed Vector	15 HP*, 11.2 KW	
Opt. HT Motor - Automatic 2 Speed Vector	22.5 HP*, 16.8 KW	
Torque	160 ft-lbs, 220 ft-lbs (Opt.)	300 Nm/375Nm
Accuracy, Axis Positioning	± .0004"	.0076mm
Accuracy, Axis Repeatability	± .0002"	.0038mm
Glass Scales (X/Y/Z)	Optional	
Spindle Speed	10-10,000 rpm	
Spindle Orientation	Electromechanical	
Spindle Taper	No. 40	
ATC, Number of Tools	21 (30 Opt.)	
ATC, Tool Selection	Random, Bi-directional	
Max. Tool Diameter	3" (4.5" w/o adjacent tools)	76mm (114mm w/o adjacent tools)
Max. Tool Length	15"	381mm
Max. Tool Weight	15 lbs.	6.8 kg
Machine Width and Depth	158" W x 103" D	4m W x 2.6m D
Machine Maximum Height	122"	3.1m
Machine Weight	17,000 lbs.	7,711 kg
Air Pressure Reqs. (Momentary)	120 psi, 15 scfm	5.5 Bar
Power Reqs. (3-phase)	40/45, 230 VAC (20/25, 480 VAC)	
Single Phase (Optional)	60 amps, 230 VAC	
Cool Power System	Spindle, Headstock, Ballscrew (Y)	
Ball Screw Supports (X/Y/Z)	dual	
No. of Ground Boxways per Axis (X/Y/Z)	2	

1.8 6535

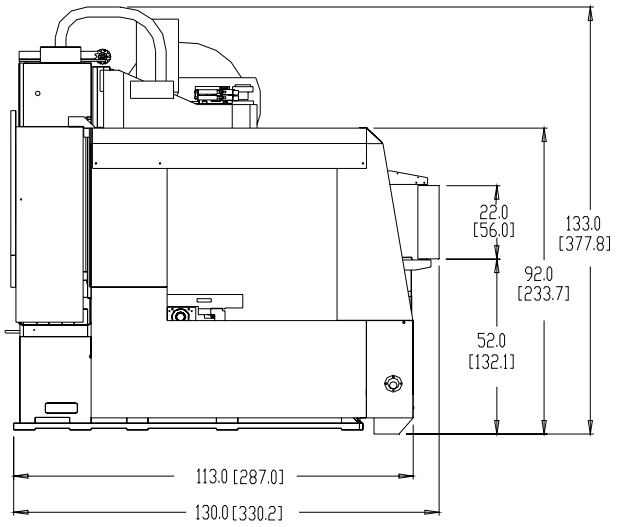
1.8.1 FRONT VIEW



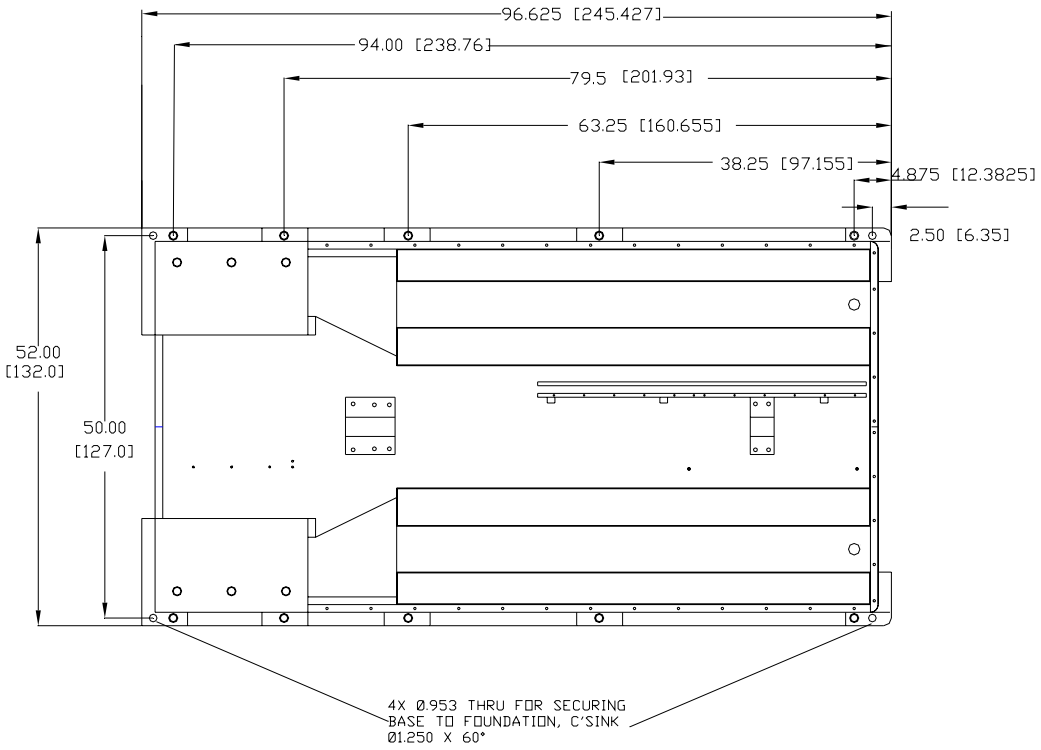
1.8.2 TOP VIEW



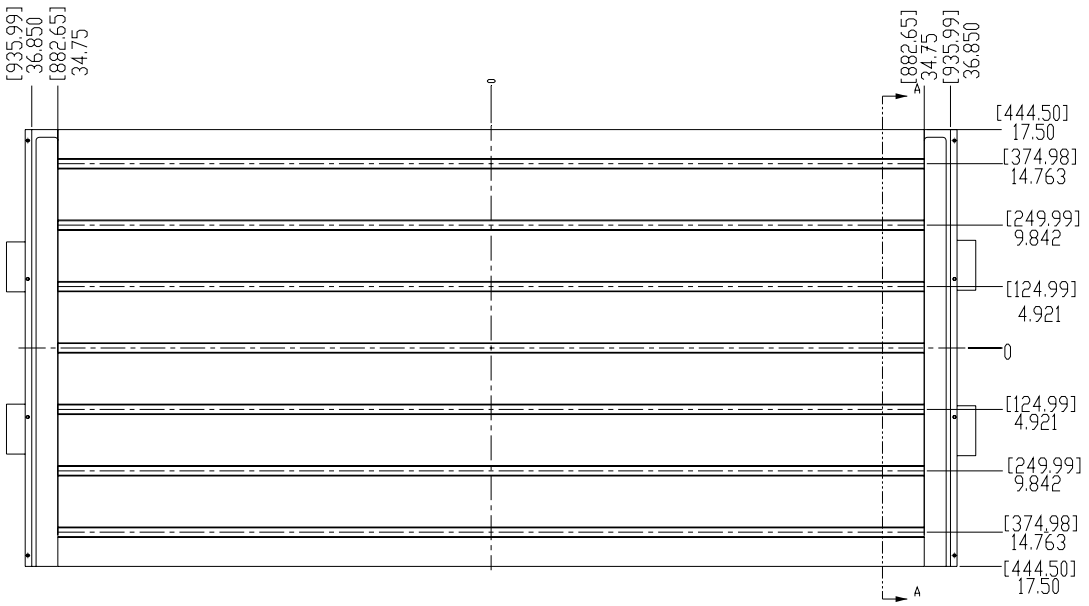
1.8.3 SIDE VIEW



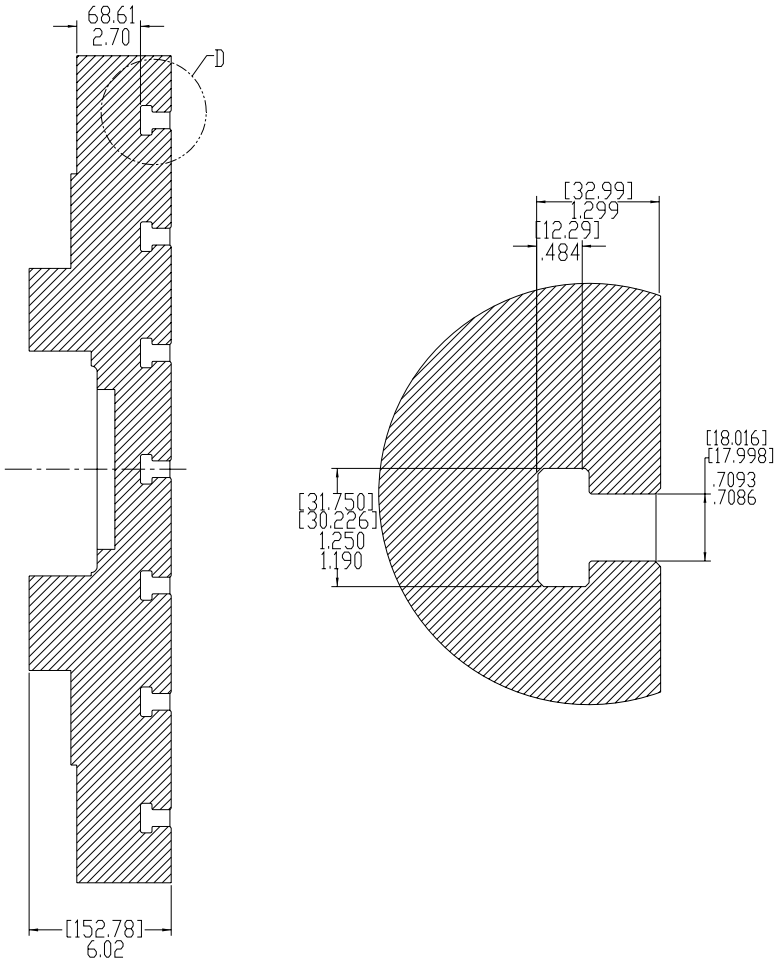
1.8.4 BASE



1.8.5 TABLE



1.8.6 T-SLOTS



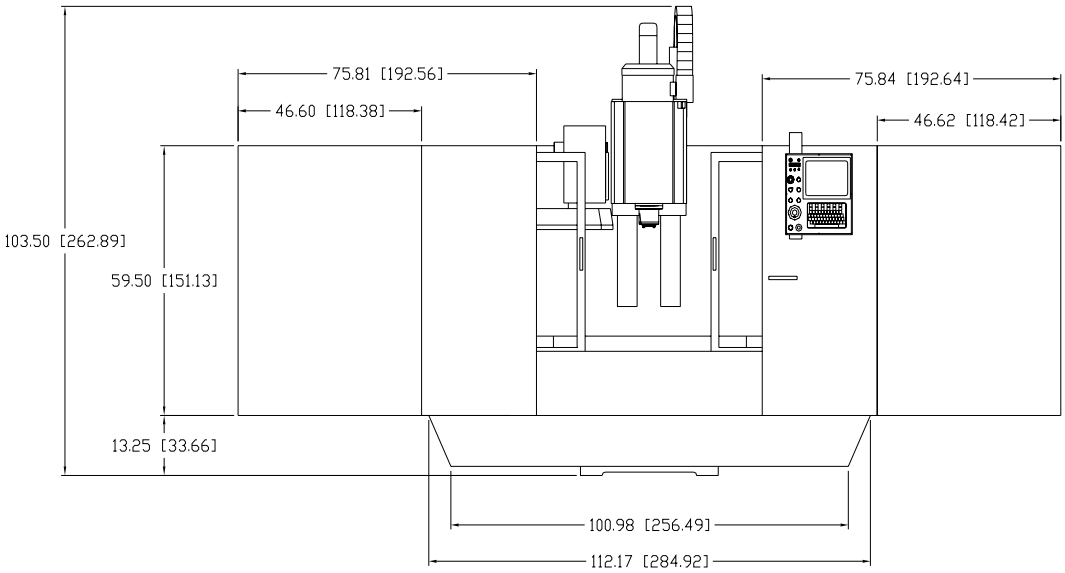
1.8.7 SPECIFICATIONS

Table 1-8: 6535 Specifications

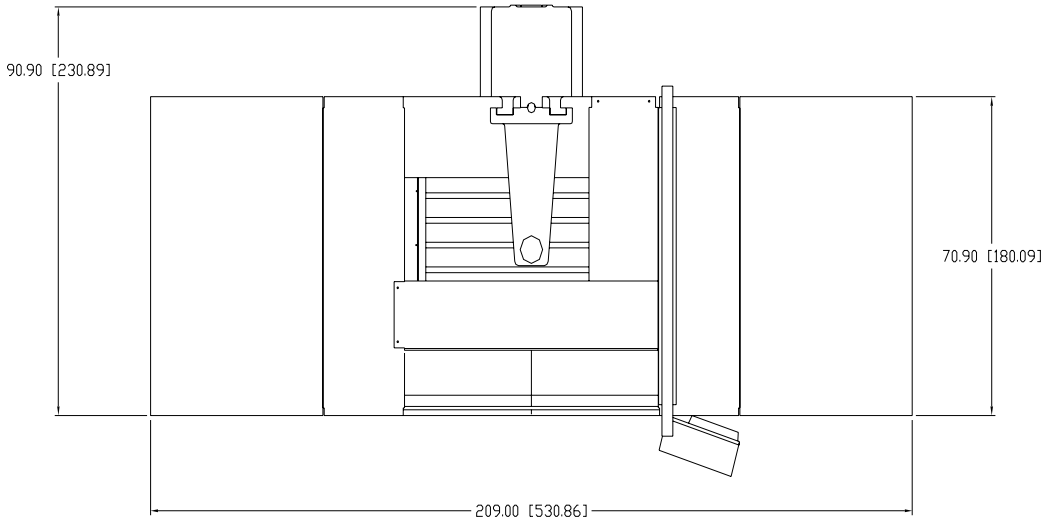
6535 SPECIFICATIONS	6535 STANDARD	6535 METRIC
Table Size	74.8" x 26.5"	1,899mm x 673.1mm
Floor to Table	40.3"	1024mm
T-Slots (No. x Width x Span)	5 x .709" x 4.92"	5 x 18mm x 125mm
Cutting Feed Rate	.01-400 ipm (600 ipm @ 150%)	.25-10,160 (15,240 at 150%)
Rapid Feed Rate (X/Y/Z)	900 ipm (X/Y) 700 ipm (Z)	30.5(X,Y) 17.8(Z) m/min
Max. Weight on Table	4,250 lbs.	1,928 kg.
Axis Drive Motor (X/Y/Z)	AC 3,800 lbs peak thrust	AC, 16,903 N*thrust.
Ball Screw Size	62.2mm Dia. (X/Y/Z)	
Longitudinal (X Axis)	65"	1,651mm
Cross (Y Axis)	35"	889mm
Vertical (Z Axis)	34"	864mm
Spindle Nose to Table	5"-39"	127mm-991mm
Spindle Center to Column Ways	37.4"	950mm
Main Motor - Automatic 2 Speed Vector	22.5 HP*, 16.8 KW	
Opt. HT Motor - Automatic 2 Speed Vector	30 HP*, 22.4 KW	
Torque	220 ft-lbs, 270 ft-lbs (Opt.)	300 Nm/375Nm
Accuracy, Axis Positioning	± .00016"	±.004mm
Accuracy, Axis Repeatability	± .00006"	±.0015mm
Glass Scales (X/Y/Z)	Optional	
Spindle Speed	10-10,000 rpm (15,000 Opt.),(7,500, 50 tpr.Opt.)	
Spindle Orientation	Electromechanical	
Spindle Taper	No. 40 (50 Opt.)	
ATC, Number of Tools	1.9 sec dual arm / 24 tools (32, 50 tpr.opt.)	
ATC, Tool Selection	Random, Bi-directional	
Max. Tool Diameter	Ø9.85”	Ø250mm
Max. Tool Length	15.75"	400mm
Max. Tool Weight	40 lbs.	18 kg
Machine Width and Depth	219" W x130" D	5.56m W x 3.3m D
Machine Maximum Height	133"	3.4m
Machine Weight	29,000 lbs.	6,169 kg
Air Pressure Reqs. (Momentary)	120 psi, 15 scfm	5.5 Bar
Power Reqs. (3-phase)	40/60 amps, 230 VAC (20/25 amps, 480 VAC)	
Power Reqs. (3-phase) 50 taper	70 amps, 480 VAC	
Cool Power System	Spindle, Ballscrews	
Ball Screw Supports (X/Y/Z)	dual	
No. of Ground Boxways per Axis (X/Y/Z)	2	

1.9 8030

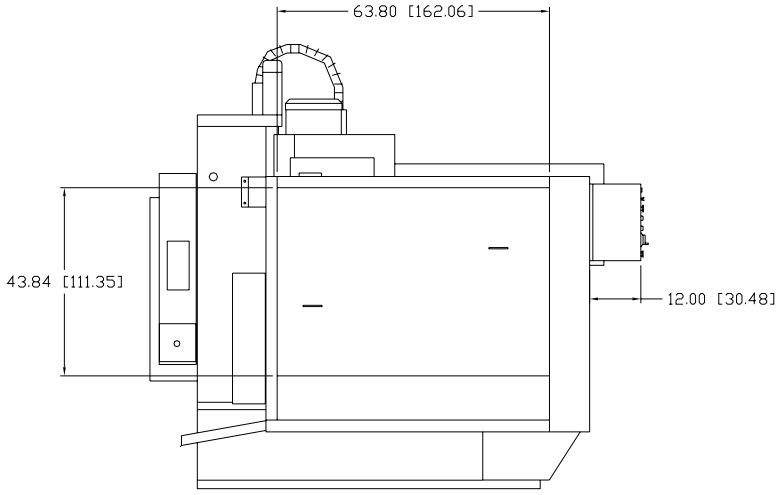
1.9.1 FRONT VIEW



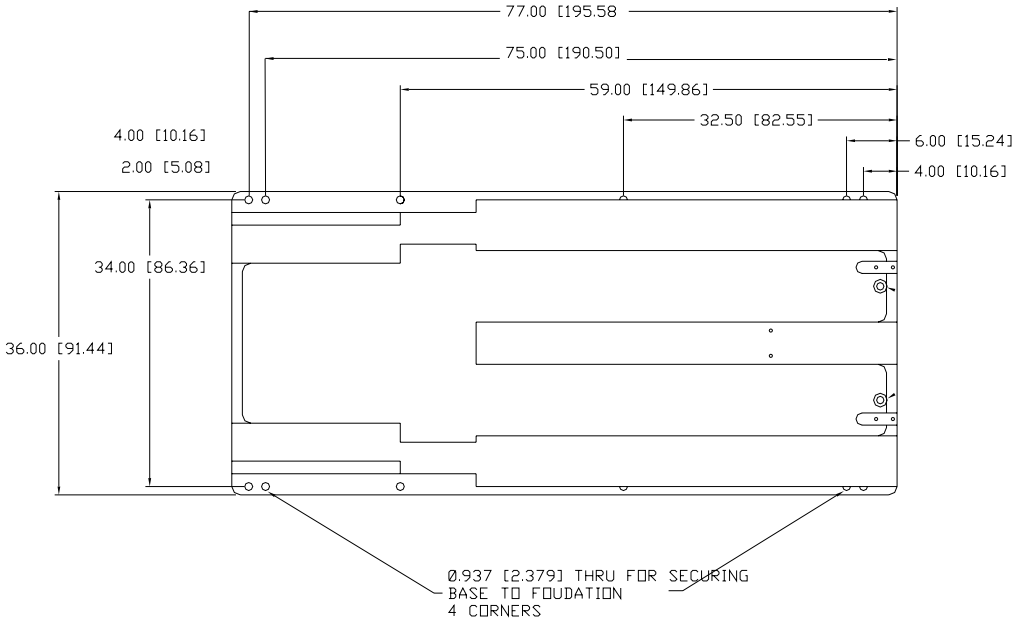
1.9.2 TOP VIEW



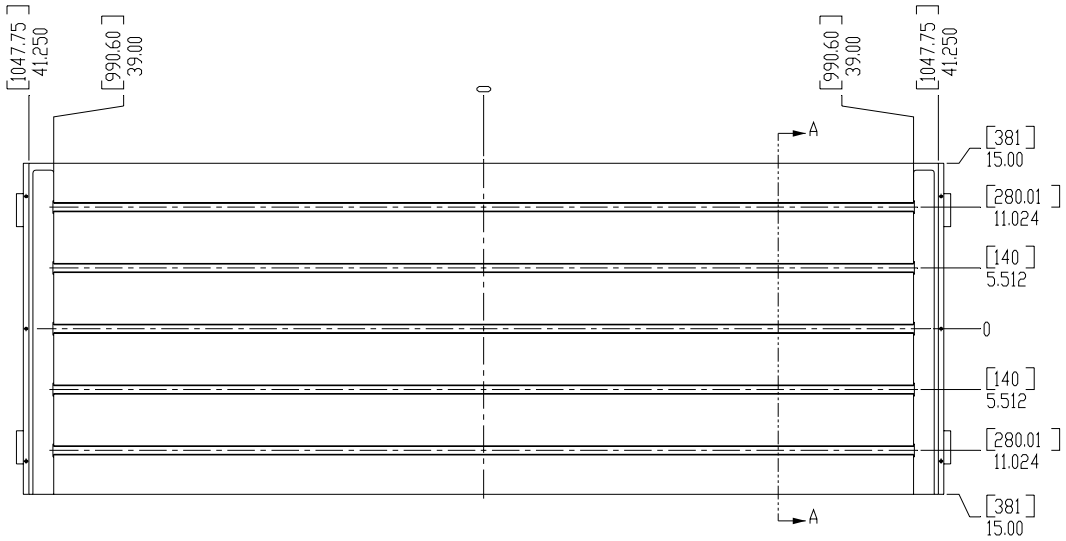
1.9.3 SIDE VIEW



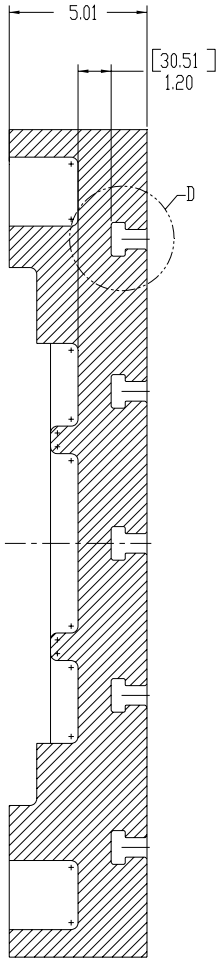
1.9.4 BASE

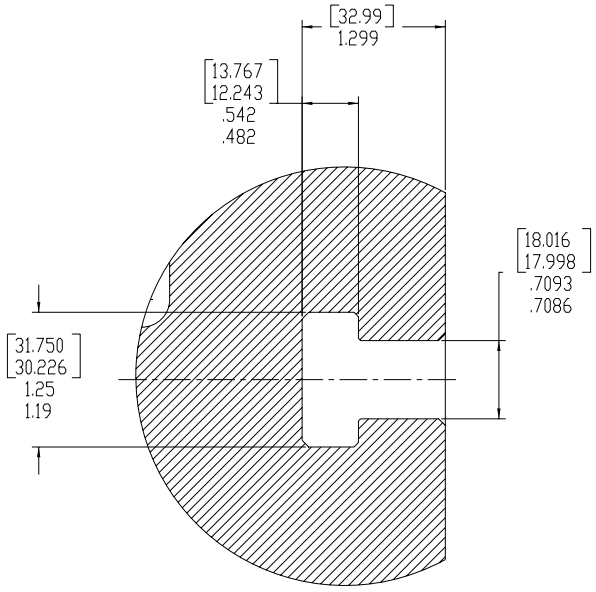


1.9.5 TABLE



1.9.6 T-SLOTS





1.9.7 SPECIFICATIONS

Table 1-9: 8030 Specifications

8030 SPECIFICATIONS	8030 STANDARD	8030 METRIC
Table Size	82.5" x 30"	2,096mm x 762mm
Floor to Table	36"	914mm
T-Slots (No. x Width x Span)	5 x .687" x 5.5"	5 x 17.5mm x 139.7mm
Cutting Feed Rate	.01-250 ipm (3765 @ 150%)	.25-6,350 (9,525 at 150%)mm/min.
Rapid Feed Rate (X/Y/Z)	400 ipm (X/Y/Z)	10.1 m/min (X,Y,Z)
Max. Weight on Table	3,751 lbs.	1,701 kg.
Axis Drive Motor (X/Y/Z)	AC, 5,000 lbs peak thrust	AC, 22,420 N* thrust
Ball Screw Size	1.75" Dia. (X/Y) 1.50" Dia. (Z)	44.45mm Dia (X,Y) 38.1mm Dia. (Z)
Longitudinal (X Axis)	80"	2,032 mm
Cross (Y Axis)	30"	762mm
Vertical (Z Axis)	30"	762mm
Spindle Nose to Table	5.5"-35.5"	140mm-902mm
Spindle Center to Column Ways	16"	406mm
Main Motor - Automatic 2 Speed Vector	15 HP*, 11.2 KW	
Opt. HT Motor - Automatic 2 Speed Vector	22.5 HP*, 16.8 KW	
Torque	160 ft-lbs, 220 ft-lbs (Opt.)	300 Nm/375Nm
Accuracy, Axis Positioning	± .0004"	.0076mm
Accuracy, Axis Repeatability	± .0002"	.0038mm
Glass Scales (X/Y/Z)	Optional	
Spindle Speed	10-10,000 rpm (15,000 Opt.)	
Spindle Orientation	Electromechanical	
Spindle Taper	No. 40	
ATC, Number of Tools	21 (30 Opt.)	
ATC, Tool Selection	Random, Bi-directional	
Max. Tool Diameter	6"	152mm
Max. Tool Length	15"	381
Max. Tool Weight	15 lbs.	6.8 kg
Machine Width and Depth	209" W x 103" D	5.3m W x 2.6m D
Machine Maximum Height	119"	3m
Machine Weight	18,000 lbs.	8,165 kg
Air Pressure Reqs. (Momentary)	120 psi, 15 scfm	5.5 Bar
Power Reqs. (3-phase)	45 amps, 230 VAC (20/25 amps, 480 VAC)	
Single Phase (Optional)	60 amps, 230 VAC	
Cool Power System	Spindle, Headstock, Ballscrew (Y)	
Ball Screw Supports (X/Y/Z)	dual	
No. of Ground Boxways per Axis (X/Y/Z)	2	

1.10 FADAL BOLT TORQUE SPECIFICATIONS

Table 1-10: Fadal Bolt Torque Specifications

COLUMN	ALL	COLUMN TO BASE	5/8"-11 X X.50 HHB	175	FT-LBS
COLUMN	ALL	COUPLER SET SCREW	1/4"-20 X 0.50 SHSS	70	IN-LBS
COLUMN	ALL	Z B/S MOUNT IN BACK	3/8"-16 X X.XX HHB	45	FT-LBS
COLUMN	ALL	Z B/S MOUNT IN FRONT	1/2"-13 X 2.XX HHB	75	FT-LBS
COLUMN	ALL	Z B/S NUT	5/16"-18 X 1.25 HHB	30	FT-LBS
COLUMN	ALL	Z MOTOR	3/8"-16 X 1.25 SHCS	40	FT-LBS
COLUMN	ALL	Z XT B/S BEARING MOUNT	5/16"-18 X 1.50 HHB	25	FT-LBS
COLUMN	ALL	Z XT B/S BEARING SUPPORT (60/8030)	3/8"-18 X X.XX HHB	40	FT-LBS
COLUMN	ALL	Z XT B/S SUPPORT ADAPTER	5/16"-18 X 1.50 SHCS	15	FT-LBS
HEAD	ALL	SPINDLE	3/8"-16 X 1.00 SHCS	45	FT-LBS
HEAD	ALL	SPINDLE RETAINING RING	3/8"-16 X 1.00 HHB	25	FT-LBS
HEAD	7.5K RPM	DRAWBAR PISTON	1/4"-20 X 2.00 HHB	15	FT-LBS
HEAD	7.5K RPM	ORIENTATION BRIDGE (7.5K)	3/8"-16 X 6.00 SHCS	45	FT-LBS
HEAD	10K RPM	BACK BELT GUIDE	1/2"-13 X 4.00 HHB	70	FT-LBS
HEAD	10K RPM	HYDRAULIC PISTON	1/4"-20 X 2.00 HHB	15	FT-LBS
HEAD	10K RPM	ORIENTATION BRIDGE (10K)	5/16"-18 X 6.00 HHB	30	FT-LBS
HEAD	10K RPM	SPINDLE MOTOR	1/2"-13 X X.XX HHB	65	FT-LBS
HEAD	10K RPM	SPINDLE MOTOR MOUNT	1/2"-13 X X.XX SHCS	70	FT-LBS
HEAD	10K RPM	VIBRATION MOUNTS	1/2"-13 X 0.75 SHCS	70	FT-LBS
HEAD	10K RPM	Z STRAP	3/8"-16 X 1.75 HHB	45	FT-LBS
X-Y AXIS	ALL	SADDLE STRAP	3/8"-16 X 1.75 HHB	45	FT-LBS
X-Y AXIS	ALL	TABLE STRAP	3/8"-16 X 0.75 HHB	45	FT-LBS
X-Y AXIS	ALL	X B/S NUT	5/16"-18 X 1.XX HHB	25	FT-LBS
X-Y AXIS	ALL	X-Y MOTOR	3/8"-16 X 1.XX SHSC	40	FT-LBS
X-Y AXIS	ALL	Y B/S NUT	5/16"-18 X 1.XX SHCS	30	FT-LBS
X-Y AXIS	60/8030	TABLE B/S BLOCK MOUNT (60/8030)	3/8"-16 X 3.50 SHCS	40	FT-LBS
X-Y AXIS	60/8030	X B/S SUPPORT MOUNT (60/8030)	1/2"-13 X 4.50 HHB	80	FT-LBS
X-Y AXIS	60/8030	X MOTOR MOUNT (60/8030)	1/2"-13 X 3.50 HHB	80	FT-LBS
X-Y AXIS	60/8030	Y MOTOR MOUNT (60/8030)	3/8"-16 X 1.50 HHB	40	FT-LBS
X-Y AXIS	22/30/4020	TABLE B/S BLOCK MOUNT (22/3016)	5/16"-18 X 2.75 SHCS	25	FT-LBS
X-Y AXIS	22/30/4020	X B/S SUPPORT MOUNT (22/30/4020)	3/8"-16 X 1.75 HHB	40	FT-LBS
X-Y AXIS	22/30/4020	X-Y MOTOR MOUNT (22/30/4020)	1/2"-13 X 3.XX HHB	80	FT-LBS

2.0 PRE-INSTALLATION PROCEDURES

2.1 FOUNDATION

> **WARNING**
> The VMC *MUST* be placed on a surface that will support the combined weight of the VMC, options, fixtures, and tooling, etc. (refer to the VMC Specifications section at the beginning of this manual for VMC weights).

1. It is recommended that all models be placed on a isolated concrete pad 8-12 inches thick (Figure 2-1, Dimension C). For A and B dimensions, see Table 2-1.

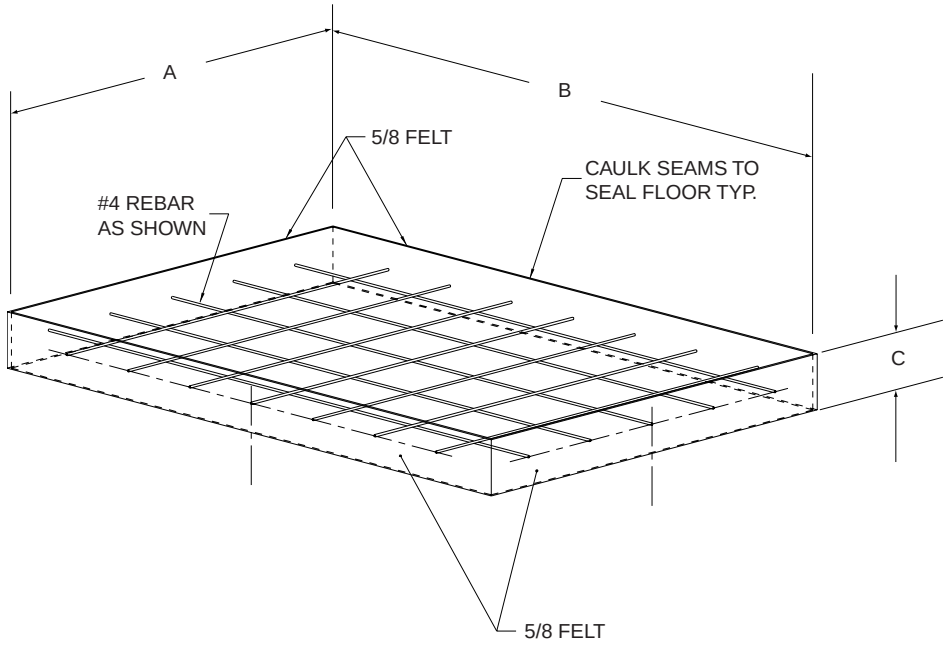
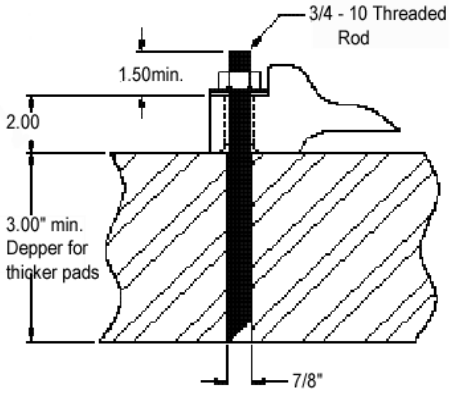


Figure 2-1: Typical Pad Construction

2. The VMC should be positioned on a single slab. Placing the VMC over an expansion joint may cause the VMC to shift when each individual slab moves.

3. The surface below the leveling pads should be free from cracks. Placing the VMC over a crack may cause the VMC to shift during use. *Inadequate flooring could result in mechanical degradation.*

4. Bolt the VMC directly to the pad through the holes that are provided in the base casting.The dimensions for the base mounting holes of all machines are in the section 1.0 Specifications. Anchors are to be installed as shown below in Figure 2-2. For high performance machines, the machine must be bolted to achieve maximum performance.



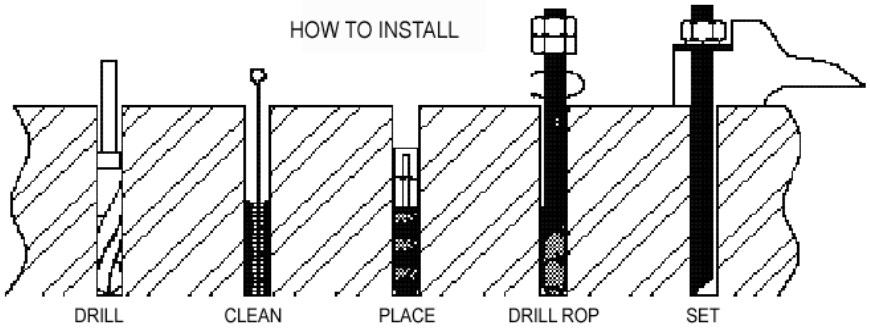


Figure 2-2: Anchor Stud Installation

Table 2-1: Isolation Pad Dimensions

MACHINE	A	B
EMC	7ft 9in.	7ft. 7in.
2216/ 3016	7ft 9in	9ft 6in
3020	8ft 5in	10ft 2in
4525	8ft 10in	12ft
4020	8ft 7in	11ft
6030	9ft 11in	14ft 6in
6535	9ft 11in	15ft 10in
8030	9ft 11in	18ft 9in
TRM	Not Required	Not Required

Anchor stud installation:

1. Wear safety goggles.
2. Use 7/8 carbide tipped drill for the anchor you are using.

3. Use a rotary-hammer drill and drill the base material to depth.
4. Use proper eye and hearing protection while performing this step. Remove dust and rubble from the hole with compressed air and brush.
5. Insert capsule in the hole, either end first.
6. Select proper 1/2" SQ. drive socket and attach to sup-r-setter.
7. Jam nut on stud as per illustration.
8. Using a 1 1/8" socket insert the stud into the hole to break the capsule.
9. Under rotary power, push the stud to full depth, maintaining power for two or three seconds after the stud bottoms.
10. Promptly and carefully release the installation tool from the stud, leaving it undisturbed right through the prescribed curing time consistent with on-site temperature.

Recommended curing time

58ºF to 68ºF	30 MIN
50ºF to 58ºF	1 HR
41ºF to 50ºF	2 HRs
32ºF to 41ºF	4 HRs
23ºF to 32ºF	8 HRs
14ºF to 23ºF	24 HRs

Ground should be compacted to 90%. A layer of 3/4" (1"nominal) crushed rock can be applied at 6" thickness for added support.

For rebar in all pads, use #4 rebar 18" on center, three inches off the ground.

For vibration dampening, 5/8 or thicker felt on all sides is sufficient. If the customer wants to have a larger pad to support several machines, the pads should be 10-12" or thicker with # 4 rebar 18" on center three inches off the ground.

For stress lines in the concrete make sure they are such that they do not go under any of the machines. (If they do, this will eventually defeat the purpose of the pad.)

The top of the felt, if used, should be sealed with a caulking compound to prevent oils and coolants from penetrating the ground. (Compound must be resistant to oils and coolants of course). A recommended product is Volcum.

Concrete to use for the pad should be rated at least 3000 psi. It should also contain 3/4" (1" nominal) crushed rock. Curing time should be at least 7 days. The longer foundation

is allowed to cure, the better. If accelerants are used to cure the concrete in less time, cracking is more likely to occur.

2.2 SHIPPING DIMENSIONS

Table 2-2: VMC Shipping Dimensions

VMC	LENGTH	WIDTH	HEIGHT	WEIGHT	Z MTR DWN
8030	17ft 8in	8ft 8in	10ft 2in	19,000lbs	8ft 8in
6535	14ft 9in	9ft 8in	11ft 3in	32,000lbs	11ft 3in
6030	13ft 2in	8ft 8in	10ft 2in	17,000lbs	8ft 8in
4525	8ft 10in	7ft 10in	10ft	13,600lbs	8ft 5in
4525	8ft 10in	7ft 10in	10ft 8in ext column	13,600lbs	9ft 3in
4020	9ft 7in	7ft	8ft 3in	10,500lbs	6ft 8in
4020	9ft 7in	7ft	9ft 1in ext column	10,500lbs	7ft 5in
3020	8ft 10in	6ft 10in	10ft	12,400lbs	8ft 5in
3020	8ft 10in	6ft 10in	10ft 8in ext column	12,400lbs	9ft 3in
3016	8ft 3in	6ft 5in	8ft 2in	9,500lbs	6ft 8in
3016	8ft 3in	6ft 5in	8ft 8in ext column	9,500lbs	7ft 4in
2216	8ft 3in	6ft 5in	8ft 2in	9,100lbs	6ft 8in
2216	8ft 3in	6ft 5in	8ft 8in ext column	9,100lbs	7ft 4in
EMC	6ft 2in	6ft 5in	7ft 7in	5,500lbs	6ft 6in
TRM	7ft 8in	4ft 7in	6ft 5in	3,500lbs	6ft 5in

Table 2-3: VMC Crated Dimensions and Weights (estimated)

VMC	LENGTH	WIDTH	HEIGHT	WEIGHT
8030	17ft 8in	8ft 8in	10ft 2in	20,500lbs est
6535	17ft	10ft	12ft 3in	34,000lbs est
6030	14ft	8ft 8in	10ft 2in	18,500lbs est
4525	10ft 5in	8ft	8ft 7in	12,000lbs est
4020	10ft 5in	8ft	8ft 7in	11,800lbs est
3020	9ft	8ft	8ft 7in	14,000lbs est
3016	9ft	7ft	8ft 7in	10,300lbs est
2216	9ft	7ft	8ft 7in	10,300lbs est
EMC	6ft 5in	7ft	8ft 2in	6,000lbs est
TRM	7ft 8in	5ft 5in	7ft	4.000lbs est

NOTE

VMCs -TRM, 6535 and 8030 do not get crated. They are placed on pallets and vacuum sealed.

2.3 POSITIONING

1. Ensure the place for the VMC so that skylights or air vents are NOT directly overhead. Do not expose the machine to direct sunlight, or any other heat source. Do not place the machine in an area that will expose the machine to moisture, standing water, liquid or rain.

2. Ensure there is adequate room behind the VMC to fully open the rear cabinet door. Minimum clearance behind the machine is two feet (24"/ 60.96 cm.) (See Figure 2-3).

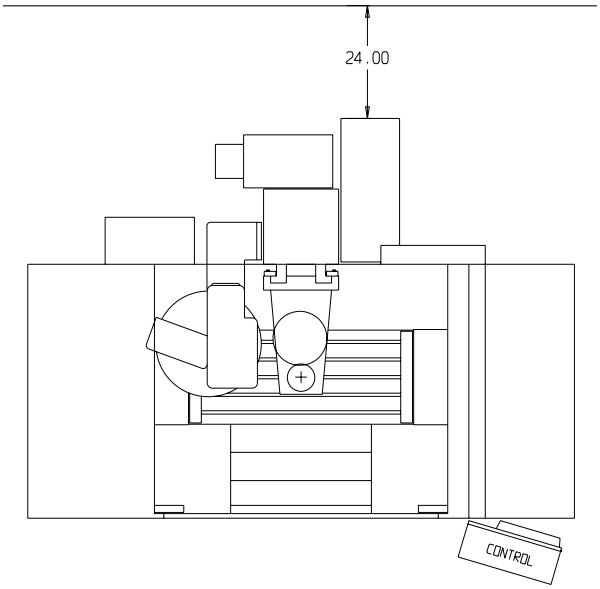


Figure 2-3: 24" Minimum Clearance Behind VMC

3. Ensure adequate ceiling clearance for the Z axis conduit with the Z axis in the Z+4.0" position. VMCs with the Extended Travel option require an additional 8.0" vertical clearance. (See Table 2-4).

Table 2-4: Minimum Ceiling Clearances (inches)

	EMC, TRM	2216, 3016	4020	6030, 8030	3020, 4525	6535
Regular Column (Z+4.0")	95.00	97.00	98.00	126.00	127.00	140.00
Extended Column 28.0"	103.00	105.00	106.00	N/A	135.00	N/A

2.4 AIR SUPPLY

! IMPORTANT
Air pressure required: 120psi before regulator, 80 psi after regulator, 15 scfm (standard cubic feet per minute) momentary.

1. From the main air supply line attach a 3/8” air supply line for the VMC. The distance from the air compressor and number of machines attached should be taken into consideration when determining the size of piping for the main air supply line.

2. Piping may consist of one or more of the following: galvanized pipe, PVC pipe or high pressure hose. Do not use quick disconnects; quick disconnects will restrict air flow.

3. A ”T” riser should be used to connect the main air supply line with the air supply line to the VMC (see figure 2-4).

4. To prevent moisture from entering the VMC’s air system, attach a drain to the lowest point of the air supply line. (See figure 2-4). The drain could be a self-relieving moisture separator, a simple petcock, or a gate valve opened occasionally to release the water build-up. An air dryer is preferred where higher moisture levels exist.

5. To help prevent contaminants from entering the air system on the VMC, place a filter in-line on the main air supply line.

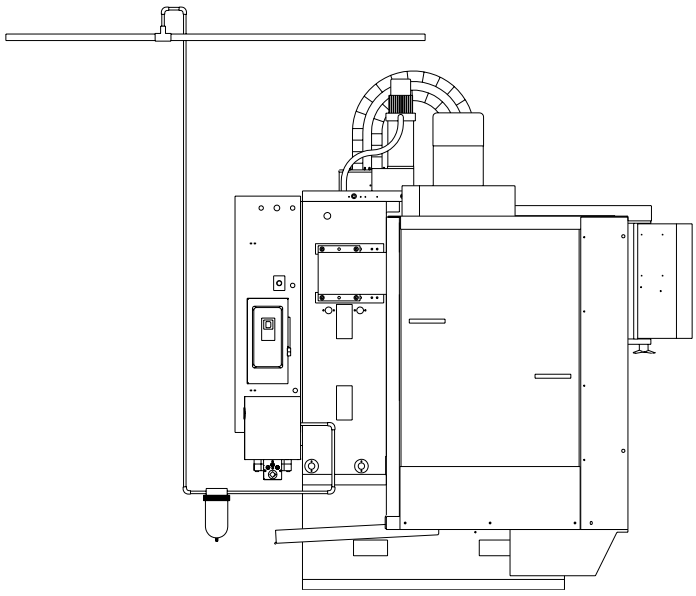


Figure 2-4: Attach Drain to Lowest Point of Air Supply Line

2.5 ELECTRICAL GROUNDING

IMPORTANT
The importance of proper grounding CANNOT be over-emphasized! Improper grounding will result in a wide range of hard-to-diagnose problems in communications, positioning, spindle motion, etc.

2.5.1 PRIMARY GROUNDING

1. The grounding conductor shall be of copper. The material selected shall be resistant to any corrosive condition existing at the installation or shall be suitably protected against corrosion.

2. The grounding conductor shall be a No. 8 AWG (10 mm^2) or larger equipment ground conductor, and must be:

   - solid or stranded
   - insulated, covered, or bare
   - installed in one continuous length without a splice or joint.

3. Individually covered or insulated grounding conductors shall have a continuous outer finish that is either green, or green with one or more yellow stripes.

4. A No. 8 AWG (10 mm^2) or larger equipment ground conductor and 3 phase conductors must be contained within one of the following:

   - rigid metal conduit
   - intermediate metal conduit
   - electrical metallic tubing

5. The ground conductor shall be connected between the VMC's ground bus and the approved ground bus contained within the voltage supply panel board or enclosure.

6. The VMC branch supply conduit, phase conductors and ground conductors must be dedicated to a single VMC. They cannot be used to supply any other loads.

2.6 SUPPLEMENTAL GROUNDING

1. Supplementary grounding electrodes shall be permitted to augment the equipment grounding conductor; however, the earth shall not be used as the sole equipment grounding conductor.

2. The supplemental grounding conductor shall be a No. 6 (16 mm^2) or larger copper conductor in the form of a wire, and must be:

   - solid or stranded
   - insulated, covered or bare
   - installed in one continuous length without splice or joint

3. A No. 6 (16 mm^2) or larger grounding conductor shall be run in one of the following:

   - rigid metal conduit
   - intermediate metal conduit
   - electrical metallic tubing or cable armor

4. One end of the supplemental grounding conductor shall be attached to the VMC's ground bus. The other end shall be effectively bonded to a copper cold water pipe that is in direct contact with the earth for 10 feet or more (see figure 2-5).

5. Connections shall be made so that they are electrically continuous.

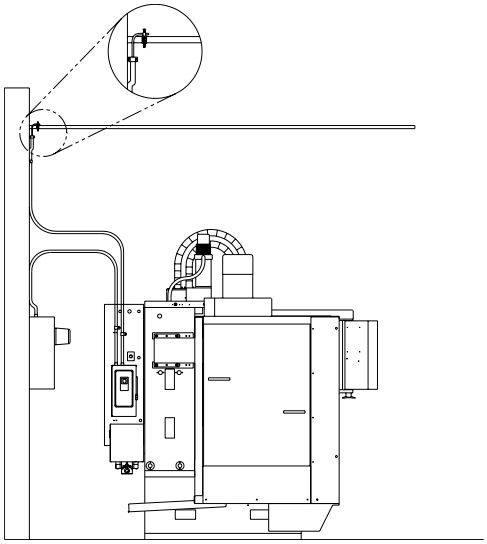


Figure 2-5: Bond Grounding Conductor to Copper Cold Water Pipe

Many problems that are difficult to diagnose can occur if the VMC is not properly grounded. Proper grounding cannot be overemphasized.

2.7 CHECKING GROUNDING INTEGRITY

2.7.1 SPECIFICATION - GROUNDING

1. MUST conform to NEC (national electric code).
2. MUST be a continuous wire 8 AWG or larger between the VMC's ground bus and the building power distribution panel serving the VMC.
3. MUST be dedicated to a single VMC. (The ground and phase conductors cannot be shared with any other equipment.)
4. Ground rods and other supplemental grounding may be used in addition to the ground specified above but not instead of it.

2.7.2 INSPECTION

Check ground wire coming into VMC according the following steps:

1. The ground wire coming into the VMC and going to the building power distribution panel must be 8AWG or larger.

2. The ground wire must be connected to the ground bar in the back cabinet of the VMC. (It does not go to a screw in the disconnect box.)

3. The ground wire is to be a continuous wire from the VMC to the building power distribution panel serving the VMC. The conduit is not to be used as the grounding conductor. Ground rods and other supplemental grounding may be used in addition to the ground specified above but not instead of it. Servicemen are not the appropriate people to be inspecting power distribution panels or building wiring. The serviceman is not expected to physically verify the routing of the ground conductor, but should look for any indications that grounding is not as specified.

2.7.3 VERIFICATION

Check grounding integrity with fluke meter according the following steps:

1. Measure the resistance (ohms) of a length of 16AWG or larger wire that is long enough to reach from the VMC to the building power distribution panel that supplies the VMC. Record reading.

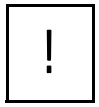
2. Attach the wire of step 1 (test wire) to the ground bus of VMC. The other end will be used for measurement at the power distribution enclosure. (Do not open the enclosure. Use a bare screw or bare metal on the enclosure for measurements.)

3. Set meter to AC Volts; with VMC on, measure and record voltage between the test wire and the power distribution enclosure. Set meter to DC Volts; measure and record voltage. Voltages should be OV with machine on but not operating, but up to .O1OV is OK.

4. Turn off the VMC and measure the ground voltages (AC and DC) again. Record these readings. Voltages should be OV to .005V.

5. Voltages (AC or DC) across the ground wire will cause false resistance readings. If the ground voltages with VMC off are 0 (.005VAC max.), set meter to ohms and measure resistance between VMC ground bus and power distribution enclosure. Resistance measurement should be less than twice the resistance measured in step 1. (If resistance is negative (due to a ground current), reverse meter leads and average the two readings.)

2.8 ELECTRICAL SERVICE



IMPORTANT
Electrical installation of machine must be done by a qualified electrician.

1. The total connected load should not exceed 75% of the panel rating, allowing for the VMC load. Refer to the Electrical Rating Plaque for full load current.

2. If other CNC equipment, motor controllers, motors or electric-discharge lighting (fluorescent, mercury vapor, metal-halide, high and low pressure sodium) are connected to the same panel, the connected load should not exceed 50% of the panels rated capacity.

3. Prior to the installation of the VMC, the panel should be measured for average and peak loads across the three phases.

> **WARNING**
> The VMC must NOT be installed on a panel where the measured surge demand current exceeds the panel's supply amplitude.

Preferred Service

The VMC should be supplied by a dedicated circuit connected directly to the Service Entrance panel.

Alternate Service

The VMC may be supplied by a dedicated circuit connected directly to the local branch panel.

Wiring

Table 2-5: Wiring Requirements

40 Taper	240 VAC 3 Ø	8 AWG (10 mm^2) stranded THHN copper within 100 ft. of panel. For VHT 4AWG	6 AWG (16 mm^2) stranded THHN copper 100 ft. or more from panel. For VHT 3 AWG
40 Taper	480 VAC 3 Ø	10 AWG (6 mm^2) stranded THHN copper within 100 ft. of panel. For VHT 6 AWG	8 AWG (10 mm^2) stranded THHN copper 100 ft. or more from panel. For VHT 4 AWG
40 Taper	240 VAC Single Ø	6 AWG (16 mm^2) stranded THHN copper within 50 ft. of panel.	4 AWG (25 mm^2) stranded THHN copper from 50 to 100 ft. from panel.
50 Taper	480 VAC 3 Ø	8 AWG (10 mm^2) stranded THHN copper within 100 ft. of panel. For VHT 4AWG	6 AWG (16 mm^2) stranded THHN copper 100 ft. or more from panel. For VHT 3AWG

Conduit

1. The number and size of conductors in any raceway shall not be more than will permit dissipation of the heat.

2. The conduit must allow ready installation or withdrawal of the conductors without damage to the conductors or to their insulation.

Table 2-6: Conduit Selection

# OF CONDUCTORS	CONDUCTOR SIZE	MINIMUM SIZE OF CONDUIT
4	10 AWG THHN (6 mm^2)	1/2”
4	8 AWG THHN (10 mm^2)	3/4”
4	6 AWG THHN (16 mm^2)	3/4”
3	4 AWG THHN (25 mm^2)	1.0”

3.0 UNPACKING AND INSTALLATION

WARNING
Before beginning the Machine Installation & Hook-Up it is important to review the entire Unpacking and Installation section.

3.1 MOVING THE VMC

3.1.1 CRANE

1. Remove the crate from around the machine.
2. Remove the bolts securing the machine to the shipping pallet.

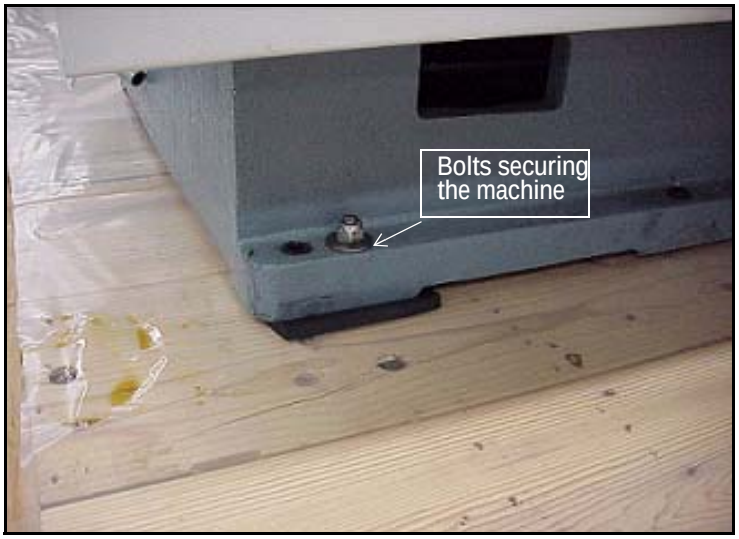


Figure 3-1: Bolts

3. *The top cover (option) is shipped disassembled and needs to be re-assembled after machine is placed as shown on the picture.

Figure 3-2: Top Cover (opt)

4. Locate installed two large eyebolts at the extreme front of the base of the machine. (Remove way cover if not removed.)

Figure 3-3: Eyebolts on the Base

5. For the next step, there are two different locations at the rear of the machine for lifting pins that will be used. A visual inspection of the machine will easily determine what the next step is.

6. There are holes on both sides of the column.

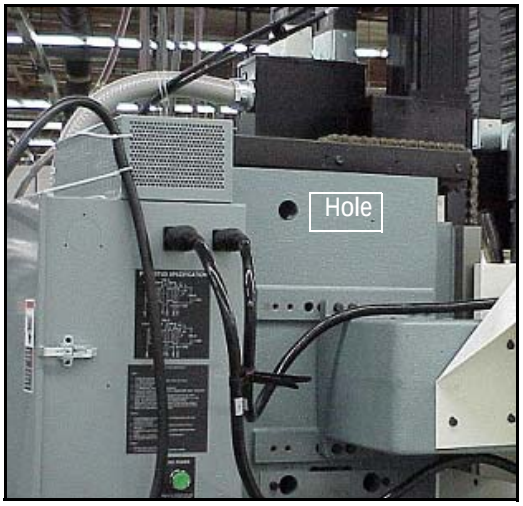


Figure 3-4: Holes on the column

7. Insert A Ø1.25” (or Ø31.71mm max.) x 36" (915mm min.) length steel bar (not provided) through the holes in the column.

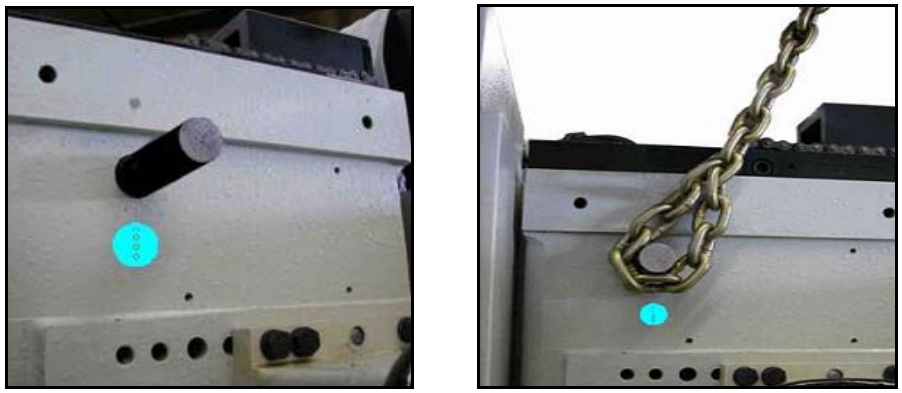


Figure 3-5: Steel Bar

> **WARNING**
> Do not use shorter length of the steel bar than specified above.

8. A sling or chain can now be slipped around the bar on the outside of both sides of the column and placed in the hook of the hoist.

> **NOTE**
> On the high performance models, pins are already in the counterweight when shipped from the factory that can be used for lifting the machine. Looking in the top of the column they are easily seen on all models.

9. Slide the counterweight all the way forward and slip the sling around both pins and up into the hook of the hoist.

Figure 3-6: Counterweight

10. Now machine can be lifted by crane.

3.1.2 FORKLIFT

> **WARNING**
> The head and the counterweight must be secured before lifting the VMC. Since the TRM and EMC do not have a counterweight, only secure the head on the TRM.

VMCs EMC and TRM have fork lift access supports as part of the base. On the TRM it is recommended that the machine is picked up from the front.

1. Remove the crate from around the machine.
2. Remove the bolts securing the machine to the shipping pallet.
3. Use two lifting steel bars for each machine: part # SHP-0125, 4x2x1/4 - 72" (102mmX51mmX6.4mm-1829mm) or part # SHP-0126, 4x2x1/4 - 60" (102mmX51mmX6.4mm-1525mm).
4. Place two bars through two holes on the side of the base.
5. To lift and move crated machines look for stencil marked places.
6. Now machine can be lifted by forklift.

.

Figure 3-7: Lifted machine

3.2 PLACING THE VMC

1. Place the leveling pads (countersink side up) under the leveling bolts. Be sure leveling bolts go into countersink on leveling pads.
2. Leveling bolts go into countersink on leveling pads.

> NOTE
> Use leveling pad for placing the machine. (Any other pad may cause damage to the machine.)

3. Remove the fork lift bars or the eye bolts and the steel bar from the column.
4. At this point the VMC is ready for power and air connections.

Remove the crate and/or protective material from around the VMC.

3.3 FRONT DOORS

The front doors are secured with strap tie for protection. (Except CE.)
Cut the tie to be able to open the doors.

Figure 3-8: Front Doors

CE Door Locks (Except TRM.)

Unlock the CE front doors with small screwdriver:

1. Release the screw.

2. Turn to override door lock.

Figure 3-9: CE Door Locks

3. Re-install cap of the front door frame.

3.4 UNPACKING

Tools Required

Hammer, 15/16” socket or wrench and knife.

Unload the boxes from the inside and/or around the VMC. Place these boxes around the machine. Open the boxes to get familiar with materials.

3.5 CONTROL PANEL

VMCs 6030, 8030, and 6535.

For VMCs 6030, 8030, and 6535 the control panel is disassembled for shipping protection. Control panel is placed inside of machine in the special box. Control upper and lower mounts come in a smaller box located, also, inside of machine.

1. Remove control panel and the control mounts.

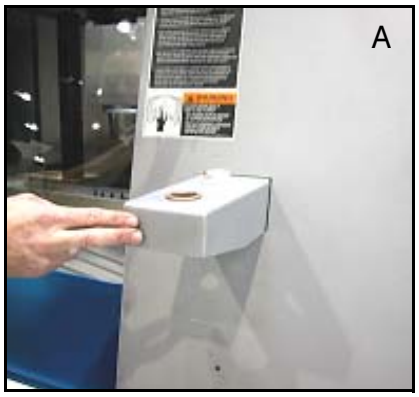
Figure 3-10: Disassembled Control Panel

2. Re-install the control panel according to the following steps:

NOTE
For safe installation two people are required.

a. Install lower mount using screws from the box. (See picture A of Figure 3-11.)

b. Remove the cover from the upper control mount and install it using screws from the box. (See picture B of Figure 3-11.)



NOTE
Tighten the screws from inside of machine. Do not tighten upper mount very tight until control panel is placed.

c. Carefully place the control panel and tighten all the screws completely.

Once control panel is installed:

3. Insert the lock pad (from the smaller box) into lower control mount.
4. Open the back control panel sheet.
5. Run all the cables through the upper control mount and the hole on the top of the control panel.
6. Connect all the cables and wires.
7. Close the control back panel.

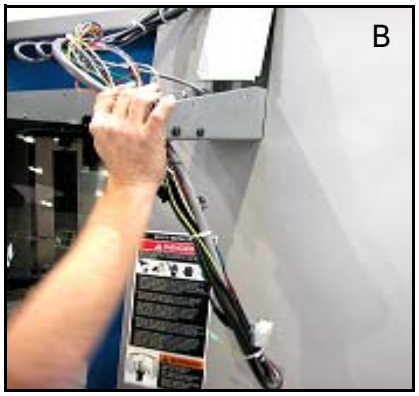


Figure 3-11: Pendant Installation

WARNING
Be sure the control panel is safely installed before completing the steps 3-7.

Smaller VMCs

Smaller VMC's control is secured with strap tie and foam for protection.

Figure 3-12: Secured Control Panel

3.6 WASH-DOWN SYSTEM (6535 ONLY)

.

For VMC 6535 the wash-down control box is disassembled for shipping protection.

1. Remove the screws located below control box.
2. Remove the top cover plate from the wash-down control box.
3. Install the empty box and connect six (6) MOLEX connector. (See picture A of Figure 3-13.)

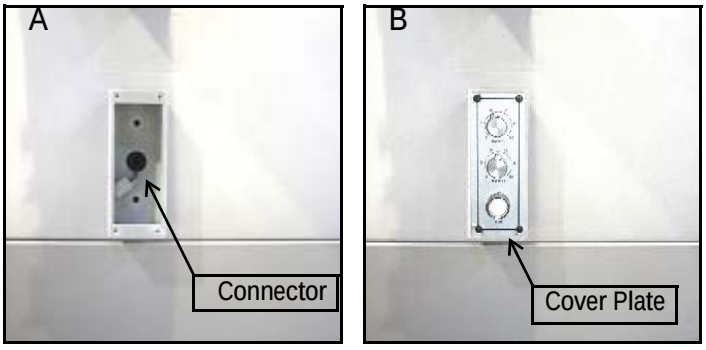


Figure 3-13: Wash-down control box

4. Re-install the wash-down control box cover plate. (See picture B of Figure 3-13.)

3.7 Z-AXIS MOTOR / FLEX CONDUIT

Re-install Z-axis motor and/or flex conduit if disassembled. The Z-axis motor and flex conduit, usually, are disassembled for shipping protection.

1. Place the cable carrier (black flexible arc on top of the machine) onto appropriate screws and tight them with nuts.

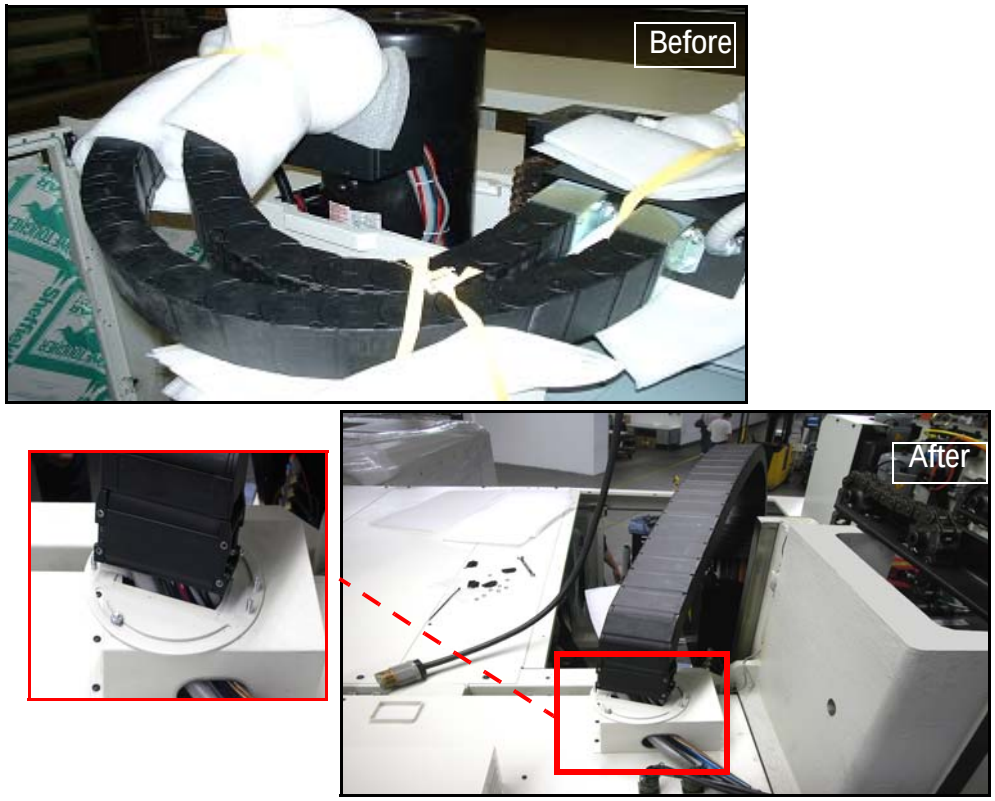


Figure 3-14: Flex Conduit

2. Reinstall the Z-axis motor located on the top of the column. (Sometimes Z--axis motor is located in the machine previously placed in the box.) To re-attach the motor use four (4) screws from the plastic bag attached to the motor.

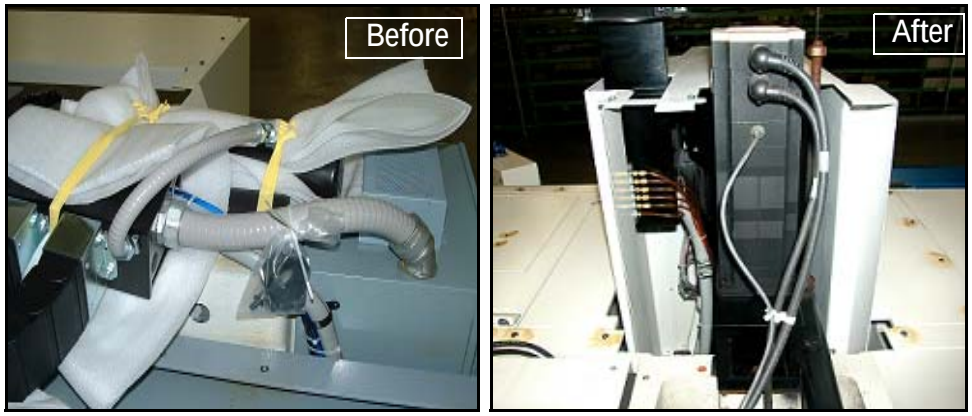


Figure 3-15: Z-axis Motor

3.8 COOLANT TANK AND CHIP CONVEYOR

On standard VMC models coolant tank is placed and installed on the back side of the machine close to the column.

3.8.1 VMC 6535

> NOTE
> Please note that one side of coolant tank and chip conveyor is heavier than another.

1. Slowly lift (forklift or crane) the coolant tank and place it close to the machine.
2. Slowly lift (forklift or crane) the chip conveyor and place it close to the coolant tank.
3. Remove the bolts securing the chip conveyor to the shipping wooden frame.
4. Install two chain shackles with pins or bolts 1 inch min. diameter.
5. Slide the sling through two chain shackles and lift conveyor slowly with the forklift (crane) holding one side for balance.
6. Slowly place the chip conveyor in the coolant tank.

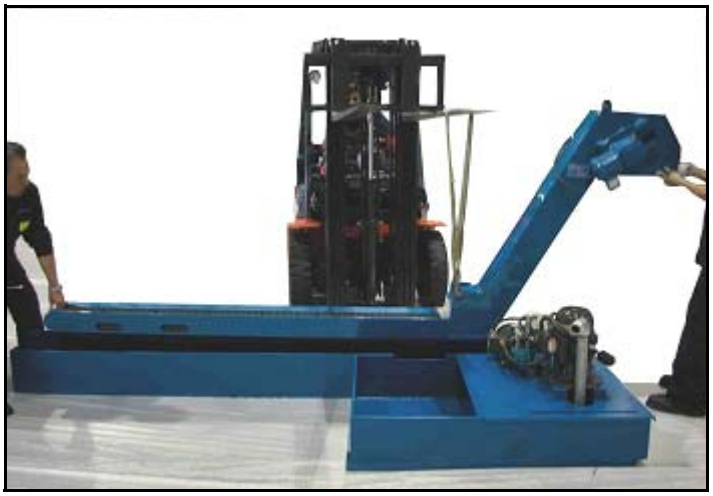


Figure 3-16: Coolant tank and conveyor

7. Measure the height to the top of the conveyor sheet metal (should be approximately the height of the coolant tank).
8. Set the machine height (the machine should be on the small leveling pads) to slightly above the height established in step 2 above.
9. Slide the coolant tank/conveyor underneath the machine.
10. Slide the coolant tank/conveyor so that conveyor is against the left side of the sheet metal.

11. Slide the coolant tank/conveyor so that the face of the sheet metal coolant tank is slightly in front of the machine sheet metal. It should overlap the machine sheet metal.

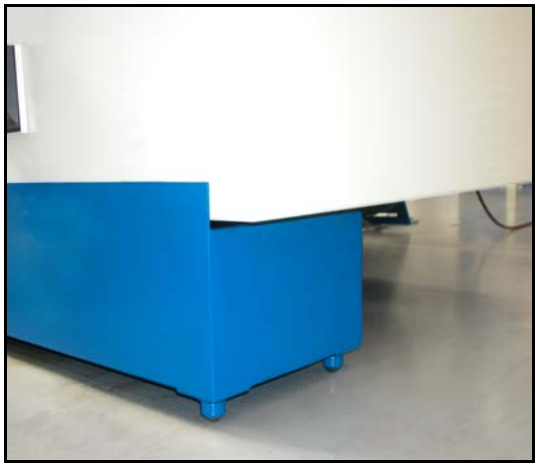


Figure 3-17: Place Sheet Metal Coolant Tank Slightly in Front of Machine Sheet Metal

12. Adjust the machine height (during leveling and installation) to minimize the gap (or overlap) between the coolant tank face and the machine sheet metal.

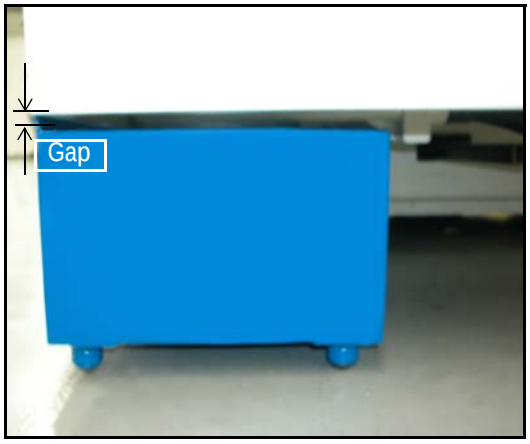


Figure 3-18: Minimize Gap or Overlap

Coolant, wash down and flood pump are connected per normal installation/setup. A standard 55 gallon drum can be positioned underneath the conveyor discharge to collect the chips.

3.8.2 CHIP CONVEYOR POWER AND CONTROLS

NOTE
The conveyor must be plugged into the provided outlet on the VMC which is dedicated for the chip conveyor.

1. The control has 3 operating positions:

Forward - Controls the forward motion of the conveyor belt

Stop/Reset - Shuts off the conveyor

Reverse - Reverses direction of the conveyor belt (for clearing jams)

2. The control also has a variable speed control for the belt speed. The belt speed can be controlled from 2.60 ft./min. to 10.80ft/min.

Figure 3-19: Control Operating Positions

Figure 3-20: Emergency Stop (CE machines only)

3.8.3 TRM TANK

Slide the tank under the machine.

Figure 3-21: TRM Tank

3.9 AIR SUPPLY

> **WARNING**
> AIR PRESSURE REQUIRED: 120 psi before regulator, 80 psi after regulator, 15 scfm (standard cubic feet per minute) momentary.

1. Connect the 3/8" air hose to the VMC.
2. Check the pressure gauge for 120 psi line pressure and adjust the regulator on the VMC for 80-90 psi pressure if necessary.
3. Check for air leaks at the fitting and around the air regulator.
4. It is important that the air compressor turns on when the pressure drops to approximately 120 PSI. This assures the VMC a constant 80 PSI.

Figure 3-22: Air Supply regulator

3.10 POWER

Power connection must be performed by certified electrician only. In order to complete the next section, power must be connected to the machine.

Figure 3-23: Power connected to the machine.

3.10.1 POWER CHECK

WARNING
Do NOT power on the VMC before completing this section.

Tools Required

Fluke DMM, screwdriver or Wago tool 210-141
(ST-26), 5/16" hex bit socket and 3/4" open or box wrench.

1. Verify that the power is OFF. (Old style VMCs - the main disconnect switch in the off (down) position, and New style VMCs - power on/off switch in the OFF position.
2. Measure and record the incoming voltage across the terminal block of the main disconnect.
3. Using fuse list (Table 3-1) or circuit breaker list (Table 3-2) verify they match the voltage.

Table 3-1: Recommended Fuses

SPINDLE TYPE	208 V 3 PHASE	240 V 3 PHASE	380-415 V 3 PHASE	480 V 3 PHASE	240 V SINGLE PHASE
5 HP	30A	30A	30A	30A	50A
10 HP	50A	50A	35A	25A	70A
HT	70A	70A	35A	35A	90A
VHT	N/A	90A	N/A	N/A	N/A
50 Taper	N/A	N/A	70A	70A	N/A

Table 3-2: Circuit Breakers for the New Style VMCs

SPINDLE TYPE	208 V 3 PHASE	240 V 3 PHASE	380-415 V 3 PHASE	480 V 3 PHASE	240 V SINGLE PHASE
5 HP	30A	30A	30A	30A	50A
10 HP	50A	50A	35A	25A	70A
HT	70A	70A	35A	35A	90A
VHT	N/A	90A	70A	N/A	N/A
50 Taper	N/A	N/A	70A	70 A	N/A
3 HP	N/A	30A	N/A	N/A	30A

NOTE
VHT runs only on 220-240V. External transformer required for any other voltage.

Verify the MOV Surge Suppressor Board

1. Locate the MOV Surge Suppressor Board (see figure 3-24).

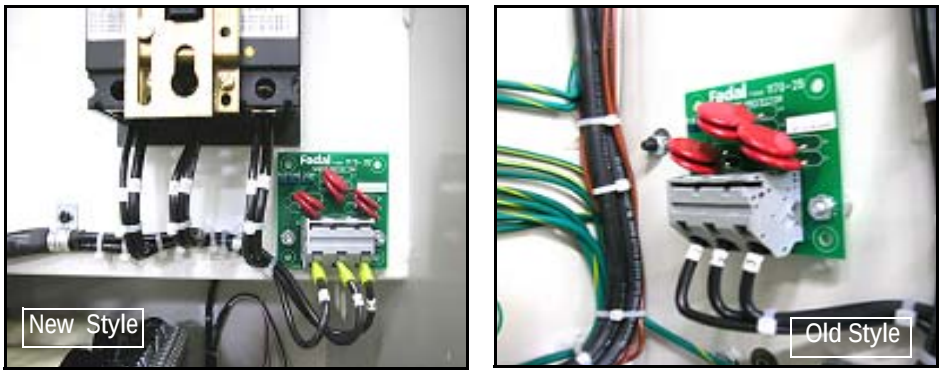


Figure 3-24: MOV Surge Suppressor Board

2. Find the part number on the board.
   a. If your incoming voltage is *under* 250 VAC, then an 1170-0 (PCB-0145) should be installed.
   b. If your incoming voltage is *over* 250 VAC, then an 1170-1 (PCB-0146) should be installed.

Electrical cabinet has the current and the proper label of the wiring diagram located on the transformer cabinet door.The wiring diagrams are different depending on VMC model and transformer type.

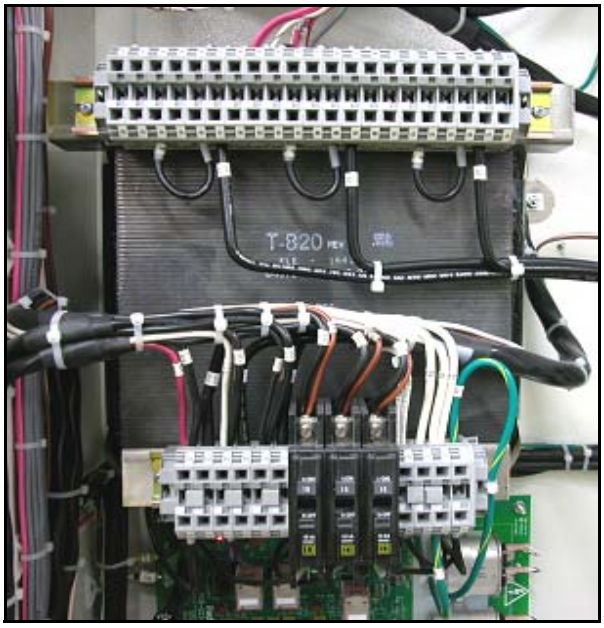


Figure 3-25: Transformer

The figure 3-26 shows an example of a wiring diagram labeled on the transformer cabinet door.

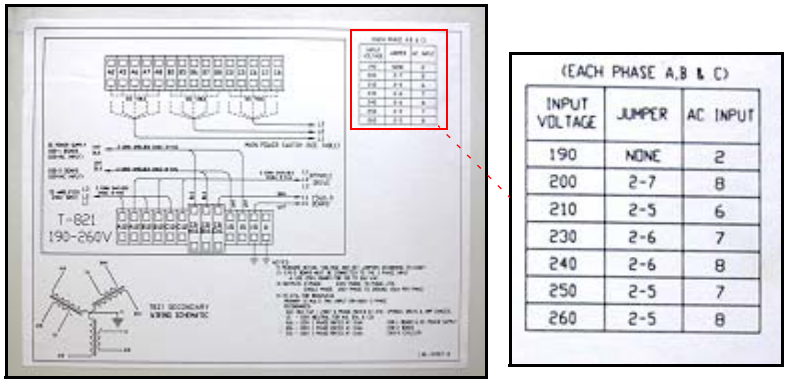


Figure 3-26: “Each Phase” chart

Use the “each phase” chart on the upper right corner of the wiring diagram to complete the following steps. “Each Phase” chart is different depending on transformer type.

3. Identify the jumpers and AC INPUT (L1, L2, L3) locations.

Figure 3-27: Jumpers and AC Input Locations.

4. With the jumpers and AC input locations, locate the voltage setting of the transformer table of the wiring diagram.

Table 3-3: Example of power adjustment

MEASURED VOLTAGE	VOLTAGE SETTINGS	VOLTAGE DIFFERENCE
240V phase L1-L2	240A	0
245V phase L1-L3	240B	5
242V phase L2-L3	240C	2

Formula: *VOLTAGE DIFFERENCE = MEASURED VOLTAGE - VOLTAGE SETTINGS*

a. If the voltage difference is less then 10V, continue from step 5.
b. If the voltage difference is greater than 10V, adjust the voltage settings using the “each phase” chart. (Do not start step 5 without adjusting the voltage first.)

The VMC is Ready for the Initial Power on Procedure

5. Move the main disconnect switch to the ON (up) position. DO NOT PRESS THE GREEN CNC POWER BUTTON.

6. Measure the voltage between the secondary transformer connections:

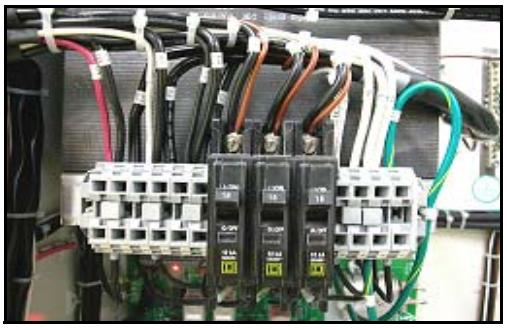


Figure 3-28: Secondary Transformer Connections

a. connections:

- on three phase transformer - A12, B12, and C12 connections. Voltage should be 240V.
- on single phase transformer - A12 and B12 connections. Voltage should be 240V.

b. connections (A16, B16, C16, and 15(neutral)). Voltage should be 120V.

> NOTE
> Use the notes on the transformer label.

7. Push the EMERGENCY STOP switch to disable the axes, then push the CNC POWER button.
8. Check the voltages on the D.C. power supply (+5V, -12V, and +12V).
9. Reset the EMERGENCY STOP switch.

3.10.2 SINGLE PHASE INPUT POWER

The Fadal VMC line is designed for three phase input power. However, three-phase power is not always available. If this is the case, Fadal offers a single-phase input power option. All Fadal machines are capable of operating on single-phase line input. The torque ratings will be at 60% of the published performance. The rapid traverse rate is reduced to not more than 700 IPM for machines with higher speed capability. This is because as the DC bus capacitors are drained and the bus voltage drops, the single-phase input can not recharge the capacitors as fast as the three-phase. Lower bus voltage equals lower speed and more current. Single-phase requires 73% more current to maintain the same performance (square root of 3). The main limitation is the spindle drive. It will not draw more than its rated current. The current rise is steeper in single-phase and will therefore trip sooner.

Fadal does not recommend single-phase power for the High torque or the 6535, 6030 and 8030 machines and cannot be used with VHT. This option can be ordered on a new machine and can be installed in the field. Some wiring changes are also necessary. Please see the single-phase transformer charts and wiring instructions.

3.10.3 PHASE CONVERTER ROTARY

The Normal Fadal VMC requires three phase-input power. The machines are also configured in a single-phase power configuration when requested. Some customers prefer to use rotary phase converters, however Fadal does not recommend the use of rotary phase converters.

Rotary phase converters input single-phase 208 to 230 VAC and output three phase 230 VAC. For a VMC close to a 5% voltage balance between legs would be desired, in reference to the voltage differences of each phase. Most CNC machines would require the output power to be 1-1/2 to 2 times larger than the spindle motor (for a Fadal output

must be at or higher than the minimum of the required input; see section 1.0 SPECIFICATIONS). A Voltage Stabilizer may also be required. The stabilizer's function is to maintain a consistent voltage level of the three phases during light or no load conditions.

3.10.4 TRANSFORMER SENSOR

An improvement to transformer design has been developed and it can be retrofitted to existing machines originally fitted with T820, T821, or T822 transformers. This improvement is designed to interrupt the Emergency Stop circuit when the machine is used beyond its designed peak performance for an extended period of time, and transformer temperature approaches its rated limits.

To determine if the machine has this circuit, look on the left side of the transformer connector rail for a mechanical relay. If the transformer sensor circuit is installed and an Emergency Stop occurs, check the mechanical relay. If the relay is activated (LED lit) then this circuit is not involved but if the relay is not activated then the transformer is overheated. In this case power down the machine and allow the transformer to cool. If the condition persists, then there is a problem that requires investigation.

3.11 COUNTERWEIGHT

The following instructions are for VMCs with counterweight only.

There are two (2) rods pushed through the column wall and counterweight to pin counterweight. These rods secure counterweight during shipping and/or moving process.

The location of the rods depends on the VMC model. Old style VMC models have these rods on the side of the column. New style Slant VMC model has these rods on the back of the column. If rods are on the back of the column they are covered with cover plate that should be removed first.

1. Remove rod flanges from the column.
2. Remove two (2) rods from the column wall and counterweight.

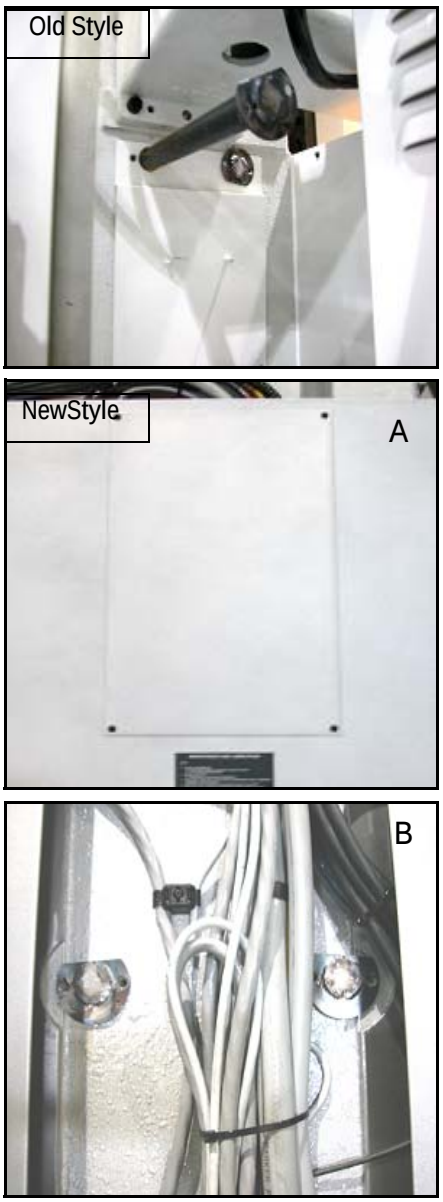


Figure 3-29: Counterweight rods

3.12 SPINDLE HEAD/ DUAL ARM TOOL CHANGER

Spindle head and the dual arm tool changer are supported with iron column brackets bolted into T-slot of the table.
Detach column brackets from spindle head and dual arm tool changer.

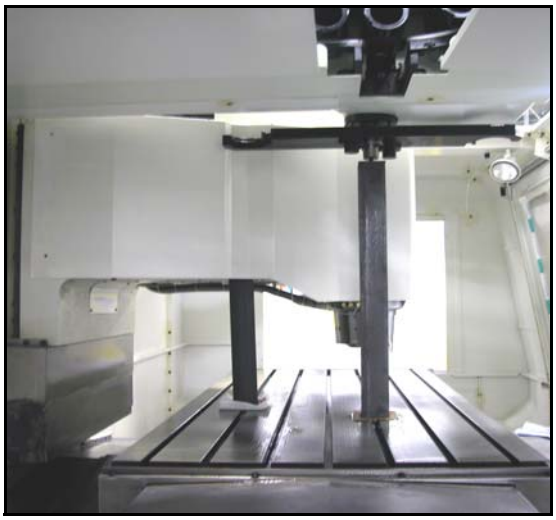


Figure 3-30: Column brackets

3.13 LEVELING

Leveling is an important first step in setting up the VMC. All calibration and squareness performed on the assembly line is done with the machine leveled. It is important to follow the sequence below precisely to ensure proper results.

Tools Required

Precision Level, such as the Starrett 12", P/N 199Z

> **WARNING**
> Verify that the scale reads the same when rotated 180 degrees. If using a flashlight to see the bubble, do not place the flashlight on the level, as it will warm the bubble and give an incorrect reading.

1. The VMC should be positioned on one solid concrete slab (see section 2.0 PRE-INSTALLATION). Do not straddle any cracks or seams.
2. Center the leveling pads under the leveling screws.

> **NOTE**
> Use leveling pad SHP-0002 (PLC-0063 for slant sheet metal machines, or machines equipped with the Conveyor option) for placing the machine. Quantity of the leveling pads depends on the VMC model.

Table 3-4: Leveling Pads

VMC	QNT
2216, 3016	4
4020, EMC, TRM	6
6030, 8030, 3020, 4525	8
6535	10

3. Level the VMC as close as possible to the leveling pads. The leveling screws should be extended as little as possible to reduce vibration through the sheet metal.

> NOTE
> Make sure that machines with the chip conveyor option are raised high enough so that the chip conveyor tank fits under the sheet metal of the VMC.

4. Verify the Cold Start indicators, then cold start the VMC.
5. Clean the level with alcohol.

3.13.1 BOX WAY VMCS

1. Jog the Y axis to the Y+ limit.
2. Remove the back way-cover if not removed.
3. Clean the outer base ways with alcohol.
4. Place the level on the right hand way (the outer right hand way on the 6535) of the base with the small bubble towards the column. Take an accurate reading. See figure 3-31.

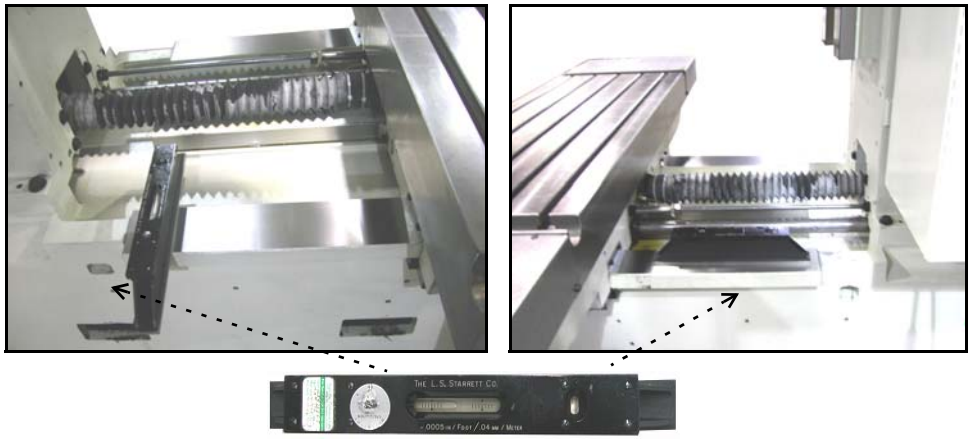


Figure 3-31: Leveling Box way (6535 on right)

5. Now put the level on the left hand way (the outer left hand way on the 6535) of the base with the level pointing in the same direction as on the right hand way.

6. Using the outer four (4) leveling pads, adjust the leveling screws on the machine until the left hand way and the right hand way are level and even.

7. Allow approximately three minutes before adjusting the level to ensure that the level is at the same temperature as the machine. Adjust the base using the leveling screws. Adjust the screws until the bubble is at the center of the large leveling gauge. Use care to avoid shining the flashlight onto the bubble or otherwise adding heat to the bubble fluid which will distort the results.

8. The level will have a front to back bubble and a side to side bubble. Level the machine from front to back first and then from side to side. When adjusting the side to side, adjust both leveling screws of one side only.

9. If leveling larger machines, such as the 6535, 6030 or 8030 models, the center four (4) leveling screws must not be touching the leveling pads during the leveling procedure. After the machine has been leveled, lower the four screws to the pad, then check the level and tram readings to ensure they have not changed.

10. Verify the spindle tram and, if necessary, adjust by slightly changing *only* the two front leveling screws.

3.13.2 LINEAR WAY VMCS (EMC AND TRM)

1. Place leveling pads beneath the six leveling screws.

> NOTE
>
> Use only leveling pad for placing the machine. Any other pad may cause damage to the machine.

2. Drive down the four corner leveling screws to create a minimum of 1/2” gap between the bottom of the base and the top of the leveling pads.

> NOTE
>
> Verify that the leveling pads are seated properly on the pad center depressions.

3. Jog the saddle to its maximum positive Y position. Disconnect the rear Y axis way cover from the saddle and slide it back to the vertical column.

4. Using a clean lint free rag and solvent, wipe the four level tabs and the way base clean of oil and grime. Wipe the bottom of the level clean.

5. Place the level on the leveling tabs .500” away from the linear guide way. Situate the level so that the small level gauge is towards the column. All leveling measurements will be taken with the level in this orientation.

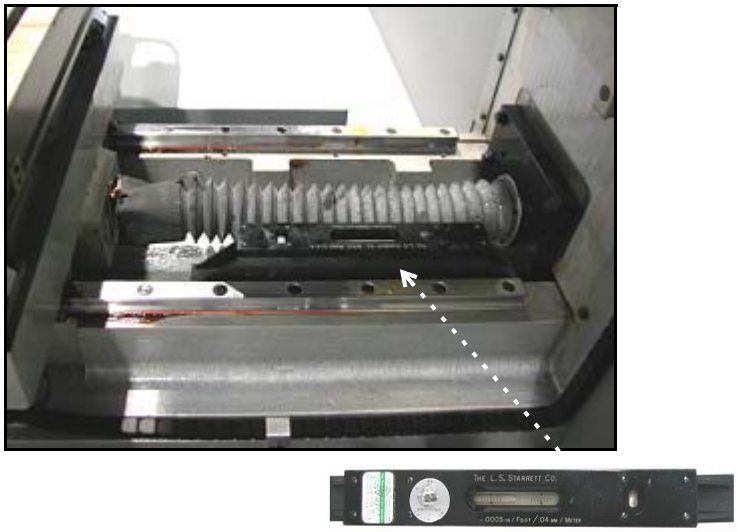


Figure 3-32: Linear Way Leveling

> NOTE
> Verify that the level is firmly seated by trying to rock it from side to side. Rough in the level by applying pressure to the screws until the level on both gauges is even.

6. Allow approximately three minutes before adjusting the level to ensure that the level is at the same temperature as the machine. Adjust the base using the leveling screws. Adjust the screws until the bubble is at the center of the large leveling gauge. Use care to avoid shining the flashlight onto the bubble or otherwise adding heat to the bubble fluid which will distort the results.

7. Repeat the above steps for the opposite way.

> NOTE
> Maintaining the same orientation is important when setting the level on a base way.

8. After the large bubble is centered on both ways, level the small bubble on both ways using both leveling screws on one side only.

9. Both ways will have the same reading when the machine is leveled.

10. After the base leveling is completed, seat the two middle leveling screws on the leveling pads.

11. Recheck the level of the base to verify that it has not been disturbed, after the middle screws are seated.

WARNING
The level of the machine should be checked periodically until the concrete supporting the machine has settled.

3.14 HOLD DOWN CLAMPS

Larger machines may vibrate, bump on reversals, and degrade floor finish.
This may indicate that the base casting needs to be clamped to floor.

Larger machines need to be clamped to the floor to prevent movement between the machine and the floor, and clamping holes are provided on all base castings for this purpose. In the Parts Manuals, there are drawings indicating the locations of these holes so that machines may be moved, studs installed in the concrete floor, and machines reinstalled onto them.

The kit has been developed to mount the machine to the floor without moving it.

1. The Clamp is first mounted into the clamping hole in the base.
2. The position is marked on the floor for drilling a ½" hole into the concrete.
3. The RedHead stud is mounted in the floor with one nut and washer on it.
4. The Clamp is mounted over the stud and then the two ½ inch Socket Cap screws are tightened, pinching the flange of the base casting.
5. The second washer and nut are tightened onto the stud, inhibiting any flexing up or down of the base casting.
6. Recheck machine level.

Hilti (mfg in Liechtenstein) makes a Right-Angle Hammer Drill, model TE-5, with a model TE-AC Right Angle Head attachment, that works very well in this application.

INDEX