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October 22, 2018

TO	:	All Bidders
FROM	:	Max I. Medina, Architect, AIA, Vice President, Principal
PROJECT	:	School of Engineering and Sciences Classroom - Building Addition 1724300.41
SUBJECT	:	Addendum 1
DSA	:	02-116765 / File 34-H7

The following changes, omissions, and/or additions to the Project Manual and/or Drawings shall apply to proposals made for and to the execution of the various parts of the work affected thereby, and all other conditions shall remain the same.

Careful note of the Addendum shall be taken by all parties of interest so that the proper allowances may be made in strict accordance with the Addendum, and that all trades shall be fully advised in the performance of the work which will be required of them.

Bidder shall acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject Bidder to disqualification.

In case of conflict between Drawings, Project Manual, and this Addendum, this Addendum shall govern.

1. PROJECT MANUAL

1.1 SPECIFICATION SECTION 00 11 16 -- NOTICE TO BIDDERS

A. Attached are the compiled responses to the Bid Request for Information (RFI).

B. Attached are the compiled product data of the Owner-Furnished, Contractor-Installed (OFCI) equipment for your information. All OFCI equipment shall be installed per manufacturer recommendations.

1.2 SPECIFICATION SECTION 00 41 13 - BID FORM AND PROPOSAL

A. Replace this specification section in its entirety with the attached revised Section 00 41 13 - Bid Form and Proposal.

1.3 SPECIFICATION SECTION 00 73 13 - SPECIAL CONDITIONS

A. Add this specification section in its entirety.

1.4 SPECIFICATION SECTION 03 35 10 - POLISHED CONCRETE FLOOR SYSTEM

A. Item 3.6.A.1 - Revise Polished Concrete Floor Location description to read:

"All rooms receiving polished concrete floor finish listed in the Finish Schedule (Drawing A8.1)"

1.5 SPECIFICATION SECTION 07 46 20 - FIBER CEMENT SOFFIT

A. Add this attached specification section in its entirety.

1.6 SECTION 08 71 00 - DOOR HARDWARE

A. Item 3.6.D - Revise the Door Hardware Schedule per the following descriptions:

1. Hardware Group HW-1 - add door hardware for card reader access:

a. Add: 1 Electric Strike 6300 630 VON

b. Add: Note: Access control system, door contacts, and wiring by Division 28

2. Hardware Group HW-4 - revise/add door hardware for card reader access:

a. Revise: Change Continuous Hinge quantity from "2" to "1"

b. Revise: Change Lockset model to "ND96PD-EU x RHO x K510-066"

c. Add: 1 Continuous Hinge SL24HD x EPT PREP 628 SEL

d. Add: 1 Power Transfer EPT-10 689 VON

e. Add: Note: Access control system, door contacts, and wiring by Division 28

1.7 SPECIFICATION SECTION 09 24 00 - CEMENT PLASTERING

A. Item 3.6.A - Revise plaster finish coat texture from "Medium Dash" to "Light Dash".

B. Item 2.6.C - Replace this item with:

"C. Factory-Prepared Portland Cement Finish Coats: Add water only; comply with finish coat manufacturer's directions."

1.8 SPECIFICATION SECTION 09 90 00 - PAINTING

A. Add this attached specification section in its entirety.

1.9 SPECIFICATION SECTION 11 90 00 - MISCELLANEOUS EQUIPMENT

A. Add Item 2.1.G to read:

"G. Skate Deterrents: Model San Marcos T by Skatestoppers, www.skatestoppers.com. Finish to be White Tomasil (white brass) with matte clear coat. Install 18" from end of concrete seat wall and approximately 36" centers on both sides of the concrete seat walls."

1.10 SPECIFICATION SECTION 12 24 13 - ROLLER SHADES

A. Add this attached specification section in its entirety.

1.11 SPECIFICATION SECTION 12 21 13 - HORIZONTAL LOUVER BLINDS

A. Replace louver slat width from "1-3/8 inch wide " to "1-3/8 or 2 inches wide".

B. Replace Item 3.6.A to read:

"All exterior and interior fixed windows shall receive horizontal louvers, with exception of all the Window Type B exterior windows on the north wall along Grid D. For Window Type C, mount the blinds on the Office G104 side. For Window Type D, mount the blinds on the Computer Lab G101 side."

1.12 SPECIFICATION SECTION 27 13 43 - COMPUTER NETWORKING SYSTEM

A. Replace this section in its entirety with the attached Specification Section 27 13 43.

1.13 SPECIFICATION SECTION 28 13 00 - CARD ACCESS SYSTEM

A. Add this specification section in its entirety.

1.14 SPECIFICATION SECTION 28 23 00 - VIDEO SURVEILLANCE SYSTEM

A. Add this specification section in its entirety.

DRAWINGS

Architectural

1.15 DRAWING A0.1 - GENERAL NOTES, DRAWING INDEX & VICINITY MAP

A. Scope of Work Description -- Revise the Bid Deductive Alternate 1 description to read:

"Bid Deductive Alternate #1 - Revised scope of work for concrete paving, subgrade preparation, fencing and vegetative swale on the east side of the new classroom building as shown on the Architectural, Civil and Landscape Drawings."

B. Add Bid (Additive)Alternate #2 description to read:

"Bid (Additive) Alternate #2 - Install new pullboxes in the existing play field, and install underground power and data conduits between the existing Boxes C-1 and P-1 to the new pullboxes. See Addendum 1 for more information."

1.16 DRAWING A1.1 - DEMOLITION PLAN / ENLARGED SITE PLAN / DETAILS

A. Detail 20 - Add Note 4 to read:

"4. Furnish and install skate deterrents, equivalent to Model San Marcos T by Skatestoppers, www.skatestoppers.com. Finish to be White Tomasil (white brass) with matte clear coat. Install 18" from end of concrete seat wall and approximately 36" centers on both sides of the concrete seat walls."

1.17 DRAWING A2.1 - CLASSROOM BLDG. FLOOR PLAN / EQUIPMENT PLAN

A. Classroom Building Equipment Plan - The equipment in between owner-furnished, contractor-installed waterjet (Ref Note 1106) and laser (Ref Note 1105) is an owner-furnished, contractor-installed small water jet. See attached OFCI cutsheets for more information.

1.18 DRAWING A5.1 - CLASSROOM BUILDING ELEVATIONS & SECTIONS

A. Elevations 5, 6, 23, and 24: Added plaster color patterns as shown on the attached Addendum Drawing AD-A5.1-1.

B. Revise description for Reference Note 1112 to read:

"(N) PROJECTOR, SEE 11/A10.2"

C. Revise description for Reference Note 1113 to read:

"(N) PROJECTOR SCREEN, SEE 7/A10.2"

1.19 DRAWING A8.1 - FINISH, DOOR, WINDOW & SIGNAGE SCHEDULE

A. Window Schedule Window Types & Notes / Glazing Types- Revise glazing type for Type A windows from Type A to Type F glazing. Add description for Type F glazing to read:

"Type F Obscure glazing: 1" insulated glazing equivalent to Guardian SunGuard glazing assembly as follows - 1/4" clear tempered glass SNX 62/27 (#2), ½" mill spacer, 1/4" clear satin etch #3 tempered glazing."

B. Material Legend - Change the floor material description for "CONC" to read:

"CONC- Polished Concrete with 400-grit grind, see specs"

1.20 DRAWING A9.1 - EXTERIOR DETAILS

A. Details 13, 17, 21 - Revised details as shown on the attached Addendum Drawings AD-A9.1-1, AD-A9.1-2, and AD-A9.1-3.

B. Detail 2 - Add downspout size to be "4 inches diameter".

1.21 DRAWING A10.2 - EXTERIOR DETAILS

A. Details 7 and 11 - Added projector and projector screen mounting details as shown on the attached Addendum Drawings AD-A10.2-1 and AD-A10.2-2.

B. Detail 13 - Change the FRP height to "8'-0"".

1.22 DRAWING A10.3 - INTERIOR DETAILS

A. Details 14, 18, 21, and 22 - Add these anchorage details for the OFCI and CFCI equipment as shown on the attached Addendum Drawings AD-A10.3-1, AD-A10.3-2, AD-A10.3-3, and AD-A10.3-4.

Electrical

1.23 DRAWING E1.1 - POWER SITE PLAN

A. Bid Alternate #2 (Additive) - In lieu of using the existing spare conduits, the contractor shall provide new (2) 4"C. (feeder "MS-1") between existing pull box P-1 and the "Point Of Intercept" indicated on plan. Wire/cable as indicated on the Single Line Diagram.

1.24 DRAWING E1.2 - SIGNAL SITE PLAN

A. Bid Alternate #2 (Additive) - In lieu of using the existing spare conduits, the contractor shall provide new four (4) 2"C. and (1) 1"C. between existing pull box C-1 and the new pull box C-2 indicated on plan. Wire/cable as indicated on the Signal Block Diagram.

1.25 DRAWING E2.2 - POWER PLAN

A. Additive Locate the Card Access System Controller in the Office, adjacent to the IDF. Home-run circuit 34 to panel LD. See attached revised Drawing E2.2.

B. Locate a power supply (PS) at each exterior door to provide power to the electric strike. See attached revised Drawing E2.2.

1.26 DRAWING E2.3 - SIGNAL PLAN

A. Locate a door controller, card reader, request to exit sensor and magnetic door switch at each exterior door. Run required cable from each controller to the main controller in the Office. See attached revised Drawing E2.3.

B. Run a Cat 6 cable from the Card Access System Controller in the Office to the IDF as shown on the attached revised Drawing E2.3.

END OF ADDENDUM 1

Submitted by,

MAX I. MEDINA
Architect, AIA
Vice President, Principal

MIA:JY:dr
P41724300x1-a

Attachments: Compiled Responses to the Bid Request for Information
Compiled Owner-Furnished, Contractor-Installed (OFCI) Equipment Product Data
Section 00 41 13 - Bid Form and Proposal
Section 00 73 13 - Special Conditions
Sections 07 46 20 - Fiber Cement Soffit
Section 09 90 00 - Painting
Section 12 24 13 - Roller Shades
Section 27 13 43 - Computer Networking System
Section 28 13 00 - Card Access System
Section 28 23 00 - Video Surveillance System
Architectural Drawings AD-A5.1-1, AD-A9.1-1, AD-A9.1-2, AD-A9.1-3, AD-A10.2-1, AD-A10.2-2, AD-A10.3-1, AD-A10.3-2, AD-A10.3-3, and AD-A10.3-4
Electrical Drawings E2.2 and E2.3

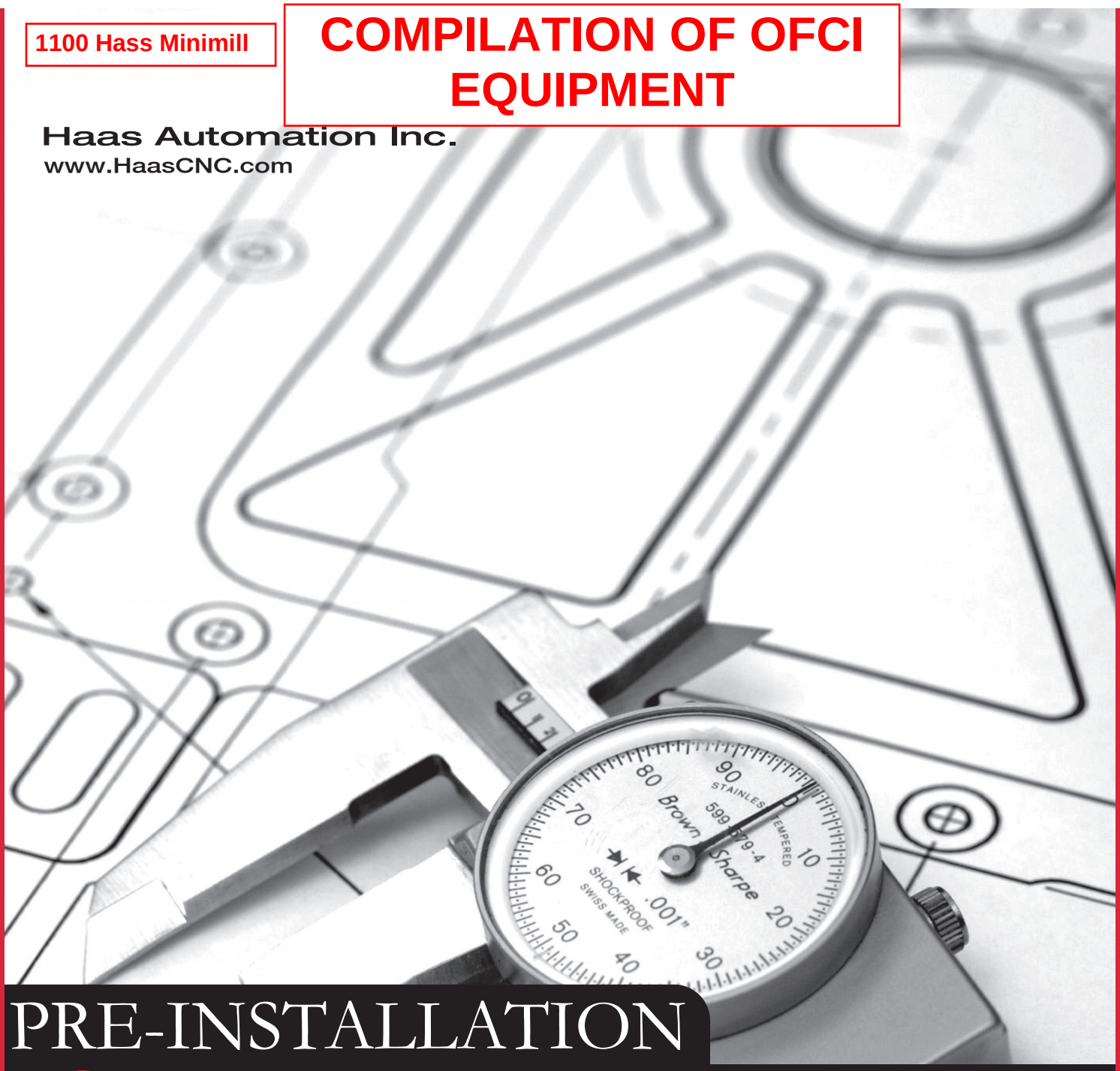
Bid Request For Information

Bidder Name	Date Asked	Subject	Question	Response
Otto Construction	10/10/2018	Engineering Building Painting	It does not appear to be a paint specification or painting shown in the drawings. Is there no painting in the project? Will a specification be issued?	See attached Painting Specifications.
Otto Construction	10/4/2018	Engineering Bldg OFCI Equipment	Sheet A2.1 indicates several equipment items that will be provided by the owner and installed by the contractor. Are specifications on the equipment available (sizes, weights, any installation procedures, anchoring details, etc)?	See attached product data and anchoring details for the OFCI & CFCI items.
Quality Sound	10/10/2018	CCTV Cameras	Sheet E2.3 shows (10) camera locations, however there's no specification as to what type of cameras or cabling needs to be provided to these locations. Please provide clarification as to whether these are rough in only camera locations or actual cameras and cabling need to be provided?	Added Spec Section 28 23 00 for camera information. See Addendum 1.
Quality Sound	10/10/2018	AV Projector Screens & Projectors	Sheet E2.3 makes reference to a projector, however no projector specification is provided. Is a projector or a projection screen to be provided as part of this project, or are these OFCI items?	See Spec Section 11 90 00 for the projector and projector screen info.
Quality Sound	10/10/2018	Network Cabling	Reference Section 27 13 43, The District standard for network cabling is Ortronics with Superior Essex Cabling. However these manufacturers are not listed within the specification as acceptable manufacturers. Please clarify with District IT whether or not Ortronics / Superior Essex is still the District Standard.	Revised Spec Section 27 13 43. See Addendum 1.
Hangtown Electric	10/10/2018	Communication and Power Site Plan	Sheet E1.1, E1.2: Point of intercept is shown on the plans but could not be found on the job walk. Please verify the point of intercept location is accurate. Please provide elevation or detail of existing point of intercept and all intercept points. I.E. Junction Box or Vault?	Added Bid (Additive) Alternate #2 to run conduits from the existing C-1 & P-1 pullboxes. See Addendum 1 for revised bid form and Bid Alternate #2 description.
Hangtown Electric	10/10/2018	Fire Alarms	Please provide information on the existing Fire Alarm monitoring company or vendor for the school	Firelite
Hangtown Electric	10/10/2018	Single Line Diagram	Sheet E0.2: Single Line Diagram calls for Feeder MS-1 to be (2) 4" conduits with 8 #350KCMIL an 1 #1/0 GND wire in each conduit. Please confirm we are to install (16) total #350KCMIL wires and (2) total 1/0 Grounds to feed Panel DP.	Wire size and quantity is correct and based off voltage drop calculations
Landmark	10/16/2018	Section 08 33 23 Overhead Coiling Doors	Specs call out for a Coiling Door, Elevations 5/A5.1 show Coiling Door, & Details 21/A9.1, 17/A9.1, & 13/A9.1 shows sectional door details. Please Confirm what type of door is to be used & provide applicable plans and specs.	See revised details that show the coiling doors.
Otto Construction	10/16/2018	Window Blinds	Can you please clarify which windows will receive window blinds? All exterior? Interior? Doors? Also Spec calls for a slat at 1 3/8" wide. This is not an option. They can be 1" or 2" wide. Please clarify.	See attached addendum for clarification.

1100 Hass Minimill

COMPILATION OF OFCI EQUIPMENT

Haas Automation Inc.
www.HaasCNC.com



PRE-INSTALLATION INFORMATION

AFFIX DEALER INFORMATION LABEL HERE

Contents

PRE-INSTALLATION CHECKLIST

DEALER RESPONSIBILITY

1. Ensure the customer is provided with the correct electrical and air requirements.

2. Verify that the correct anchoring kit has been shipped from the Haas factory.

3. Verify that the customer has drilled and set the anchors for both the machine and the side-mount tool changer, if applicable. The machine anchors must be set in accordance with the Installation Guide instructions (do not set the tool changer anchors until the tool changer is installed).

4. Tell the customer the date the machine will be shipped from the factory and the date it is expected to arrive at his facility.

5. Inform the Haas Automation Service Coordinator of the date and time of installation agreed to by the customer and riggers. Please notify Haas at least 3 weeks prior to the installation date to allow time for travel arrangements to be made and tools to be shipped.

6. Schedule a dealer service technician to be on site for the duration of the installation.

7. Provide enough dry nitrogen to fully charge the counterbalance system. The HS-3(R)/4(R)/6(R)/7(R) require 250 cu ft. The VS-1/3 require 500 cu ft.

CUSTOMER RESPONSIBILITY

1. Ensure a proper machine foundation is present and fully cured by the scheduled time of installation (see “Site Preparation” section for details). Anchor holes must be drilled and the anchors set before machine arrives. For HS-3/4/6 & 7 series, **Do not** set the tool changer anchors until the tool changer is installed.

2. Ensure that all the electrical and air requirements are met.

3. Inspect and verify that all of the anchors and related hardware were received (refer to anchoring instructions, Haas document ES0095).

4. Schedule the installation date and time with the riggers and notify the dealer of the schedule.

Before your new Haas machine arrives, you should review the machine dimensions and site requirements, and prepare your shop for the machine delivery.

When your machine is on site and positioned, you need to supply electricity and air to the machine. Once this is accomplished, a Haas service technician can finalize your machine installation.

Please contact your Haas Factory Outlet (HFO) Customer Advocate when you have completed all of the requirements for final installation. We will then schedule a Haas service technician to complete your machine installation process. The Factory Technicians need to be present to ensure no damage is done to the machine during the rigging process and to supervise the placement of the machine.

If after reading the guide, you have any questions or you are unsure in any way what is required, please contact the Haas Automation Service Department at (805) 278-1800.

Placement and Preparation Checklist

Foundation Requirements

Machines must be set on a solid, sound and stable, steel bar-reinforced concrete slab poured directly on the grade. In general, the 6" (152mm) concrete floor of industrial buildings is suitable for machine placement.

Before the machine arrives it will be necessary to have the foundation poured and fully cured. It may also be necessary to install the anchors. Refer to the anchoring instructions, Haas document # ES-0095, for details.

For HS 3-7(including R), EC-1600-3000, VS, VR, and GR series machines, when cutting metal, anchor holes must be drilled and set before machine arrives. Tool changer anchor holes must be drilled before the machine is set in place. However, do not pour epoxy for the tool changer until the tool changer is in place. Anchoring all other machines is optional. If opting for optional anchoring, contact the Haas Service Department (800-331-6746) prior to machine delivery for foundation requirements, the correct anchoring kit (if not included with the machine) and complete anchoring instructions.

Avoid placing the machine across two different slabs; they may shift and affect the geometry of the machine. Avoid slabs with vibrating machinery nearby; the vibration may affect performance. Do not place the machine on unstable surfaces such as asphalt, brick, wood or dirt.

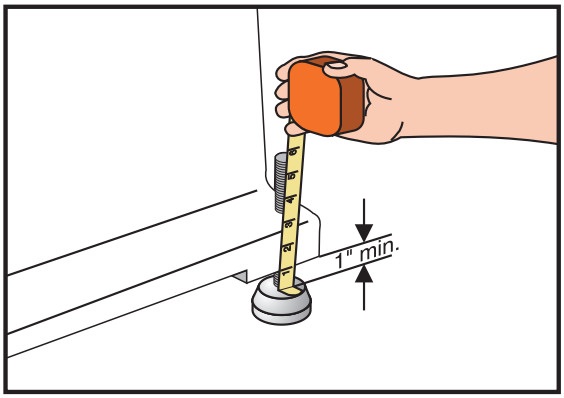
Check with your building engineer if you are placing the machine on floors other than the ground level.

Machine Placement

Access to the electrical control cabinet needs to be available at all times. A minimum of three (3) feet (.91 meter) of space is required between the control cabinet and any obstacle. It is recommended to have this unobstructed area (3 feet) (.91 meter) surrounding the machine for ease of daily operations.

A forklift will be needed to safely move the machine. For the HS, VS and VR machines it is necessary to schedule capable riggers with the proper equipment for lifting up to 40,000 lb. (1814kg). The weights of the machines are listed in their respective sections towards the end of this manual.

Additionally, a Tote Kit is included with each machine which includes the leveling pads the machine is to be placed upon. To set up for initial leveling the leveling screws should extend one inch from the bottom of the base casting.



Chip Conveyor Placement

A machine equipped with a chip conveyor requires room in which to install the conveyor and to remove it (once installed) for maintenance. The following table lists the minimum install/remove length requirements for machines equipped with chip conveyors.

Lathes

ST-10	ST-20	ST/DS 30	ST-40	ST-40L
81" (2057 mm)	115" (2921 mm)	122" (3099)	153" (3886)	189" (4801)

SL-20L	SL-30	SL-30L	SL-40	SL-40L
126.7" (3218mm)	119.6" (3038mm)	156.6" (3978mm)	145" (3683mm)	183" (4648mm)

Mills

EC-300/MDC-500/ES-5	EC-400/EC-400PP	EC-500	EC-550	EC-630
102" (2589mm)	112.5" (2856mm)	126.5" (3213mm)	156.5" (3988mm)	78.5" (1994mm)

Preparation For Installation Day

Have qualified personnel ensure that the machine is properly grounded, then connect the specified power to the machine (see electrical requirements in the following sections).

You should complete the air supply connection to the machine (see air requirements in the following sections).

Final leveling will be completed by an HFO service technician at the time of installation.

Electrical Power Requirements

	Machine Model	Selection	HP	Continuous Kva (Peak)	Machine Breaker P/N	Machine Breaker (Amps)	Voltage range or fixed tap	Recommended Service (Amps)	Recommended Service Wire AWG	XFRMR KIT
Office Mills	OM-1A / -2A	30K-20T	5	4(7)	61-7328	20	195-254	30	10	
Tool Room Mills	TM-1/-2 TM-3	4K-BELT-10HP/6K-BELT-10HP	7.5	9(14)	61-7312	40	195-250	50	8	
		High Volt USA only								EXTRN480C
		High Volt Non USA			61-7319	15	366-425	20	12	32-0551
		Region HE/CE/China/India/Russia								
	TM-1P/-2P TM-3P	6K-BELT-10HP	7.5	9(14)	61-7312	40	195-250	50	8	
		High Volt USA only								EXTRN480C
		High Volt Non USA			61-7319	15	366-425	20	12	32-0551
		Region HE/CE/China/India/Russia								
	Mini Mill	6K-BELT-10HP	7.5	9(14)	61-7312	40	195-250	50	8	
		High Volt USA only								EXTRN480C
		High Volt Non USA			61-7319	15	366-425	20	12	32-0551
		Region HE/CE/China/India/Russia								
MiniMill VMCs	MiniMill2	6K-BELT-10HP	7.5	9(14)	61-7312	40	195-250	50	8	
		High Volt USA only								EXTRN480C
		High Volt Non USA			61-7319	15	366-425	20	12	32-0551
		Region HE / CE/China/India/Russia								
		W/SMTC-24	7.5	9(14)	61-7312	40	195-250	50	8	
		High Volt USA only								INTRN
		High Volt Non USA			61-7315	20	366-425	30	10	32-05221
		Region HE/CE/China/India/Russia								
	Super MiniMill Super MiniMill2	10K-BELT-20HP	15	14(20)	61-7312	40	195-260	50	8	
		High Volt USA only								INTRN
		High Volt Non USA			61-7315	20	354-488	30	10	32-05221
		Region HE/CE/China/India/Russia								
40- Taper Standard VMCs	VF-1/-2 VF-1YT/-2YT	**8K-GB-20HP** **10K-GB-20HP** **15K-BELT-20HP** **30K-BELT-20HP**	20	14(20)	61-7312	40	195-260	50	8	
		High Volt USA only			61-7315	20	354-488	30	10	INTRN
		High Volt Non USA								32-05221
		Region HE/CE/China/India/Russia								
	VF-3/-4 VF-3YT VF-3APC/-4APC	**8K-INLINE-40HP/10K-INLINE-40HP**	30	28(40)	61-7314	80	195-260	100	4	32-15500
		High Volt USA only + (INLINE)								EXTRN480A
		High Volt Non USA + (INLINE)			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia+(INLINE)								
	VF-5/-5XT VF-6 VF-7 VF-8 VF-9	**8K-GB-20HP** **10K-GB-20HP** **15K-BELT-20HP**	20	14(20)	61-7312	40	195-260	50	8	
		High Volt USA only			61-7315	20	354-488	30	10	INTRN
		High Volt Non USA								32-05221
		Region HE/CE/China/India/Russia								
	VF-10 VF-11 VF-12 VF-2TR VF-5TR VF-6TR	**8K-INLINE-40HP/10K-INLINE-40HP**	30	28(40)	61-7314	80	195-260	100	4	32-15500
		High Volt USA only + (INLINE)								EXTRN480A
		High Volt Non USA + (INLINE)			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia+(INLINE)								

	Machine Model	Selection	HP	Continuous Kva (Peak)	Machine Breaker P/N	Machine Breaker (Amps)	Voltage range or fixed tap	Recommended Service (Amps)	Recommended Service Wire AWG	XFRMR KIT
50-Taper Standard VMCs	VF-3YT/-5/-5XT VF-6/-7 VF-5TR VF-6TR VF-8/-9 VF-10/-12 VF-11	**7.5K-50T** **10K-50T-GB**	30	28(40)	61-7314	80	195-260	100	4	
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-5500
		Region HE/CE/China/India/Russia								
		10KINLINE	45	37(68)	61-7326A	150	195-260	200	1/0	
		High Volt USA only + (10KINLINE)								EXTRN480B
		Region HE/CE/China/India/Russia + (10KINLINE)								32-5820F & NEED TO BUY EXTERNAL TRANSFORMER LOCALLY
Large Capacity VMCs	VS-1 VS-3 **NOTE: For open frame CE/HE machines see ES-0336**	**7.5K-50T** **10K-50T-GB**	30	28(40)	61-7324	100	195-260	125	2	
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-5500
		Region HE/CE/China/India/Russia								
5-Axis VMCs	VR-8 VR-11B	**15K-BELT-40HP**	30	28(40)	61-7314	80	195-260	100	4	
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia								
Super Speed VMCs	VF-2SS VF-2SSYT VF-6SS VF-3SSYT VF-3SS/-4SS/-5SS VF-3SSAPC/-4SSAPC	**12K-40T-IN**	30	28(40)	61-7314	80	195-260	100	4	
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-5500
		Region HE/CE/China/India/Russia								
Gantry	SR-100 **NOTE: For open frame CE/HE machines see ES-0336**	24K-30T	8.9	9(14)	61-7329	40	195-254	50	8	
		Region HE/CE/China/India/Russia								
	NOTE: For open frame CE/HE machines see ES-0336	**10K-BELT-20HP**	15	14(20)	61-7312	40	195-260	50	8	
		High Volt USA only								INTRN
	GR-510	High Volt Non USA			61-7315	20	354-488	30	10	32-05221
		Region HE/CE/China/India/Russia								
	GR-712 **NOTE: For open frame CE/HE machines see ES-0336**	**5K-BELT-20HP**	20	14(20)	61-7312	40	195-260	50	8	
		High Volt USA only								INTRN
		High Volt Non USA			61-7315	20	354-488	30	10	32-05221
		Region HE/CE/China/India/Russia								
Mold machines	VM-2 VM-3 VM-6	**12K-40T-IN**	30	28(40)	61-7314	80	195-260	100	4	
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-5500
		Region HE/CE/China/India/Russia								
Mill Drill Center	MDC-500	**15K-BELT-20HP**	20	14(20)	61-7312	40	195-260	50	8	32-5800F
		High Volt USA only								INTRN
		High Volt Non USA			61-7315	20	354-488	30	10	32-05221
		Region HE/CE/China/India/Russia								
		8K-INLINE-40HP/10K-INLINE-40HP	30	28(40)	61-7314	80	195-260	100	4	32-15500
		High Volt USA only + (INLINE)								EXTRN480A
		High Volt Non USA + (INLINE)			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia+(INLINE)								

	Machine Model	Selection	HP	Continuous Kva (Peak)	Machine Breaker		Voltage range or fixed tap	Recommended Service		XFRMR KIT
					P/N	(Amps)		(Amps)	Wire AWG	
Drill/Tap Center	DT-1	**15K-30T**	15	28(40)	61-7314	80	195-260	100	4	
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-5500
		Region HE/CE/China/India/Russia								
EC & ES	EC-300 EC-400 EC-400PP EC-500	**8K-40T**	20	14(20)	61-7312	40	195-260	50	8	
		High Volt USA only			61-7315	20	354-488	30	10	INTRN
		High Volt Non USA								32-05221
		Region HE/CE/China/India/Russia								
		12K-40T-IN	30	28(40)	61-7314	80	195-260	100	4	32-15500
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia								
	EC-550	**10KINLINE**	45	37(68)	61-7326A	150	195-260	200	1/0	
		High Volt USA only								EXTRN480B
		Region HE/CE/China/India/Russia								32-5820F & NEED TO BUY EXTERNAL TRANSFORMER LOCALLY
	EC-630	**6K-50T**	30	28(40)	61-7314	80	195-260	100	4	
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia								
	EC-1600 EC-1600YZT EC-2000	**6K-50T** **10K-50T-GB**	30	28(40)	61-7314	80	195-260	100	4	
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia								
	ES-5-T ES-5-4AX ES-5-4T ES-5-TR	**8K-40T**	20	14(20)	61-7312	40	195-260	50	8	
		High Volt USA only			61-7315	20	354-488	30	10	INTRN
		High Volt Non USA								32-05221
		Region HE/CE/China/India/Russia								
		12K-40T-IN	30	28(40)	61-7314	80	195-260	100	4	32-15500
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia								
HS	HS-3/-4/-6/-7 HS-3R/-4R/-6R/-7R **NOTE:** For open frame CE/HE machines see ES-0336	**5K-50T**	30	28(40)	61-7324	100	195-260	125	2	
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia								

	Machine Model	Selection	HP	Continuous Kva (Peak)	Machine Breaker P/N	Machine Breaker (Amps)	Voltage range or fixed tap	Recommended Service (Amps)	Recommended Service Wire AWG	XFRMR KIT
Tool Room CNC TURNING CENTER	TL-1	2K-7.5HP-A2-5	7.5	9(14)	61-7312	40	195-250	50	8	
		High Volt USA only								EXTRN480C
		High Volt Non USA			61-7319	15	366-425	20	12	32-0551
		Region HE/CE/China/India/Russia								
		HSTL-1	7.5	9(14)	61-7312	40	195-250	50	8	
		High Volt USA only								EXTRN480C
		High Volt Non USA			61-7319	15	366-425	20	12	32-0551
		Region HE/CE/China/India/Russia								
	TL-2	2K-12HP-A2-6 HSTL-2	10	9(14)	61-7312	40	195-250	50	8	
		High Volt USA only								EXTRN480C
		High Volt Non USA			61-7319	15	366-425	20	12	32-0551
		Region HE/CE/China/India/Russia								
	TL-3	1.8K-10HP-A2-6	18	14(20)	61-7312	40	195-260	50	8	
		High Volt USA only			61-7315	20	354-488	30	10	INTRN
		High Volt Non USA								32-05221
		Region HE/CE/China/India/Russia								
		HSTL-3	30	28(40)	61-7314	80	195-260	100	4	32-15500
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia								
	TL-3B	0.65K-30HP-A2-15	30	28(40)	61-7314	80	195-260	100	4	32-15500
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia								
	TL-3W	1.8K-30HP-A2-6	30	28(40)	61-7314	80	195-260	100	4	32-15500
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia								
	TL-4 TL-4L	0.5K-55HP-A1-20	55	37(68)	61-7326A	150	195-260	200	1/0	
		High Volt USA only								EXTRN480B
		Region HE/CE/China/India/Russia								32-5820F & NEED TO BUY EXTERNAL TRANSFORMER LOCALLY
CHUCKER LATHE TURNING CENTER	GT-10	3K-7.5HP-A2-5	7.5	9(14)	61-7312	40	195-250	50	8	
		High Volt USA only								EXTRN480C
		High Volt Non USA			61-7319	15	366-425	20	12	32-0551
		Region HE/CE/China/India/Russia								
		PC5-KIT	7.5	9(14)	61-7312	40	195-250	50	8	
		High Volt USA only								INTRN
		High Volt Non USA			61-7315	20	354-488	30	10	32-05221
		Region HE/CE/China/India/Russia								
	GT-20	3K-20HP-A2-6	20	14(20)	61-7312	40	195-260	50	8	
		High Volt USA only								INTRN
		High Volt Non USA			61-7315	20	354-488	30	10	32-05221
		Region HE/CE/China/India/Russia								

	Machine Model	Selection	HP	Continuous Kva (Peak)	Machine Breaker		Voltage range or fixed tap	Recommended Service		XFRMR KIT
					P/N	(Amps)		(Amps)	Wire AWG	
TURNING CENTER CNC	ST-20SS ST-20SSY	5K-30HP-A2-6	30	28(40)	61-7314	80	195-260	100	4	
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia								
	ST-20Y	4K-20HP-A2-6	20	14(20)	61-7312	40	195-260	50	8	
		High Volt USA only			61-7315	20	354-488	30	10	INTRN
		High Volt Non USA								32-05221
		Region HE/CE/China/India/Russia								
		BB-20	30	28(40)	61-7314	80	195-260	100	4	32-15500
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia								
	ST-30 ST-30Y	3.4K-30HP-A2-6 BB GEARBOX	30	28(40)	61-7314	80	195-260	100	4	
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia								
	ST-30SS ST-30SSY	4.8K-30HP-A2-6	30	28(40)	61-7314	80	195-260	100	4	
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia								
	ST-10 ST-10Y	6K-15HP-A2-5	15	14(20)	61-7312	40	195-250	50	8	
		High Volt USA only			61-7315	20	354-488	30	10	INTRN
		High Volt Non USA								32-05221
		Region HE/CE/China/India/Russia								
	ST-40	2.4K-40HP-A2-8 BB-40	40	28(40)	61-7314	80	195-260	100	4	
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia								
		XP XP + BB	55	37(68)	61-7326A	150	195-260	200	1/0	
		High Volt USA only								EXTRN480B
		Region HE/CE/China/India/Russia								32-5820F & NEED TO BUY EXTERNAL TRANSFORMER LOCALLY
	ST-40L	2.4K-40HP-A2-8 BB-40	40	28(40)	61-7314	80	195-260	100	4	
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia								
		XP XP + BB	55	37(68)	61-7326A	150	195-260	200	1/0	
		High Volt USA only								EXTRN480B
		Region HE/CE/China/India/Russia								32-5820F & NEED TO BUY EXTERNAL TRANSFORMER LOCALLY

	Machine Model	Selection	HP	Continuous Kva (Peak)	Machine Breaker P/N	Machine Breaker (Amps)	Voltage range or fixed tap	Recommended Service (Amps)	Recommended Service Wire AWG	XFRMR KIT
TURNING CENTER CNC CONTINUED	SL-10	6K-15HP-A2-5 BB-10	15	14(20)	61-7312	40	195-260	50	8	
		High Volt USA only			61-7315	20	354-488	30	10	INTRN
		High Volt Non USA								32-05221
		Region HE/CE/China/India/Russia								
	SL-20 / TL-15 SL-20L	4K-20HP-A2-6 7K	20	14(20)	61-7312	40	195-260	50	8	
		High Volt USA only			61-7315	20	354-488	30	10	INTRN
		High Volt Non USA								32-05221
		Region HE/CE/China/India/Russia								
		5K	30	28(40)	61-7314	80	195-260	100	4	32-15500
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia								
		BB-20	30	28(40)	61-7314	80	195-260	100	4	32-15500
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia								
	SL-40L	2.4K-40HP-A2-8 BB-40	40	28(40)	61-7314	80	195-260	100	4	
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia								
		XP XP + BB	55	37(68)	61-7326A	150	195-260	200	1/0	
		High Volt USA only								EXTRN480B
		Region HE/CE/China/India/Russia								32-5820F & NEED TO BUY EXTERNAL TRANSFORMER LOCALLY
SUB SPINDLE	DS-30 DS-30Y	4K-30HP-A2-6-2.0"	30	28(40)	61-7314	80	195-260	100	4	
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia								
	DS-30SS DS-30SSY	4.8K-30HP-A2-6-2.0"	30	28(40)	61-7314	80	195-260	100	4	
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia								
	SL-30 / TL-25	3.4K-30HP-A2-6 BB-30	30	28(40)	61-7314	80	195-260	100	4	
		High Volt USA only								EXTRN480A
		High Volt Non USA			61-7317	40	354-488	50	8	32-05500
		Region HE/CE/China/India/Russia								
OFFICE LATHE	OL-1	6K-7.5HP-A2-5	5	4(7)	61-7328	20	195-254	30	10	

Wire Size (Gauge) Requirements

For 7.5 HP std voltage systems: less than 100' (30.48 meters) of wire, use 10 AWG (if high voltage use 12 AWG and an internal transformer); greater than 100' use 8 AWG (if high voltage use 10 AWG).

For 15- to 20-HP std voltage systems: less than 100' (30.48 meters) of wire, use 8 AWG (if high voltage use 12 AWG wire); greater than 100' use 6 AWG (if high voltage use 10 AWG).

For 30- to 40-HP std voltage systems: less than 100' (30.48m) of wire, use 4 AWG; greater than 100' use 2 AWG.

These are recommended minimum wire diameters (maximum AWG number). Always consult local electrical codes.

AC Input Power

• Most domestic machines require three-phase power, which may be either wye or delta type. The power source must be grounded: leg or center leg for delta; neutral for wye.

• A separate earth ground is required for three-phase power. Conduit type ground will not be sufficient.

• All phases must be balanced, and voltages must be within ±10%.

• Low-voltage power (208 or 240 VAC) can be set up on the standard machine.

• High-voltage power (480 VAC) requires a high-voltage option to be purchased with the machine.

• The exact supply voltage will be matched at the time of installation by the service technician, who will adjust the internal transformer taps.

• Some machines alternately allow single-phase power to be utilized (see previous page). In these instances, the supplied power must be 240 VAC ±6%.

WARNING!

A separate earth ground wire of the same conductor size as the input power must be connected to the chassis of the machine. This ground wire is required for operator safety and proper operation. This ground must be supplied from the main plant ground. A local cold-water pipe or ground rod cannot be used to supply this ground.

The current requirements shown reflect the circuit-breaker size internal to the machine. This breaker has an extremely slow trip-time. It may be necessary to increase the external service breaker size by 20-25% for proper operation. (See electrical requirements in this document.)

External 480 VAC (High Voltage) Transformer Option

The external transformer adds to the overall reliability and performance of the machine; however, it also requires extra wiring and floor space. The external transformer provides electrostatically shielded isolation. This type of transformer acts to isolate all common-mode line transients and reduce EMI conducted emissions.

When the high-voltage (HV) option is ordered, machines with 7.5 hp systems will get 15 kVA external transformers. Machines with 20-hp systems will get an internal isolation transformer, and machines with 30- or 40-hp systems will get a 45-kVA external transformer (see chart on previous page). The 55 hp option for SL-40 lathes requires a 75 kVA external transformer.

The external 480 VAC auxiliary transformer is floor-mounted. Please allow extra clearance for the transformer next to the machine. The transformer needs to be placed as close to the control cabinet as possible. The models and dimensions are listed in the following table.

Transformer	Height	Width	Depth
15 kVA	23" (584mm)	19" (483mm)	13.5" (343mm)
45 kVA	30" (762mm)	25" (635mm)	20" (508mm)
75 kVA	34" (867mm)	28" (711mm)	22" (559mm)

External 480 VAC (High Voltage) Transformer Installation

The transformer should be located as close as possible to the machine. The input and output wiring of the transformer must conform to local electrical codes and should be performed by a licensed electrician. The following information is for guidance only, and should not be construed as altering the requirements of local regulations.

The input wire should not be smaller than 6 AWG for the 45-kVA transformer. Cable longer than 100' (30.48 meters) requires at least one size larger-diameter wire (one size smaller AWG number).

The transformer is a 480 VAC to 240 VAC isolation transformer with delta-wound primary and secondary windings. The primary windings offer 7 tap positions, 2 above and 4 below the nominal input voltage of 480 VAC. The output wire for the external transformer should conform to the following:

Acceptable Voltage Ranges

208 VAC 1-phase (Office Models)	195-245 VAC RMS 50-60 Hz
208 VAC 3-phase (Mini Mill/Mini Lathe/Toolroom Mills/Toolroom Lathes 1-3)	195-245 VAC RMS 50-60 Hz
230 VAC 3-phase (15/20/30/40 hp machines)	195-260 VAC RMS 50-60 Hz
240 VAC 1--phase (Mini Mill/Toolroom Mills/Toolroom Lathes)	224-250 VAC RMS 50-60 Hz
480 VAC 3-phase (Internal Transformer, 15/20 hp machines)	354-488 VAC RMS 50-60Hz
480 VAC 3-phase (External Transformer)	420-510 VAC RMS 60Hz

While the standard internal transformers all accept either 50 or 60 Hz power, the external transformers are designed to operate only on 480 VAC 60 Hz power. For this reason, there are internal HV options available for 400 VAC 50 Hz applications. These internal HV options use a non-isolated internal transformer (isolation not required because of
4-wire grounded power used in 50 Hz applications). They can only be used on 400 VAC power.

7.5 to 20 hp (5.6 to 14.9 kW) machines:	Voltage range 366-425 VAC RMS	50-60Hz
30/40/55 hp (22.4 to 30 kW) machines:	Voltage range 354-428 VAC RMS	50-60Hz

Certification

All Haas CNC machine tools carry the *ETL Listed* mark, certifying that they conform to NFPA 79 Electrical Standards for Industrial Machinery, and the Canadian equivalent, CAN/CSA C22.2 No. 73.

Compressed Air Requirements

Air Pressure

Haas CNC machines require a minimum air pressure of 100 psi (6.90 bar) at the input to the pressure regulator on the back of the machine.

The required input air line size is 1/2" ID (12.7mm) for most machines. The exceptions are the 40-taper VF-1 thru VF-11 machines, which require a 3/8" ID (9.5mm) air line.

The recommended method for attaching the air hose is directly to the barb fitting on the back of the machine, secured with a hose clamp. If a quick coupler is desired, use a 3/8" (9.5mm) coupler for the 3/8" air hose, or a 1/2" (12.7mm) coupler for the 1/2" air hose.

NOTE: Auxiliary connections must be made on the input (unregulated) side of the air filter/regulator.

Air Flow (minimum requirements)

All VF, VM, MM, GR, TM, VR, VS models require 4 scfm (1.89 liters per second). For mills equipped with the auto air gun option, 10 scfm (4.72 liters/sec.) will be required for the machine. The auto air gun consumes an additional 6 scfm (2.83 liters/sec.).

Office models - OM: 1 scfm at 40-70 psi, OL: 2 scfm at 45 psi. All EC, HS, and MDC models: 9 scfm (4.25 liters per second). All SL, GT and TL models: 4 scfm

NOTE: Add 2 scfm to the above minimum requirements if the operator will be using the air nozzle during pneumatic operations.

The air requirements should be supplied by at least a 2-HP compressor with a minimum 20-gallon tank. Remember, In order to operate the machine properly if the air nozzle is used during pneumatic operations, the air flow will need to be increased as outlined in the previous note.

NOTE: For multiple machine installations, there is a 2-HP requirement per machine (i.e., an installation of 5 machines requires a 10-HP compressor).

Use copper pipe; galvanized piping or steel will rust and clog the orifices in the regulators.

Machine Lubricant & Coolant Capacities

Vertical Mills (Toolroom machines are grease lubricated and require general purpose lithium grease)

	Capacity	Lubricant Type
Way Lube	72 cu in (1.17 liters)*	Mobilith SHC 007
Spindle Lube	1 gal (3.8 liters)	Mobil SHC 625
Transmission (if equipped)		
40 Taper	51 oz (1.5 liters)	Mobil SHC 625
50 Taper	34 oz (1 liter)	Mobil SHC 625
Coolant		
OM	13 gal (49 liters)	All - Water-soluble synthetic-oil based or
MiniMill	24 gal (91 liters)	Synthetic - based coolant/lubricant †
TM-1P - 3P	5 gal (19 liters)	**No flammable liquids!**
VF-1 - 5, VM-2/3, MDC-500	95 gal (360 liters)	
VF-6 - 11, VM-6, VR, VS, GR Series	95 gal (360 liters)	
Cam Boxes		
SS	2 gal (7.5 liters)	Mobil SHC 627
40/50 Taper	2 gal (7.5 liters)	Mobil SHC 627

Horizontal Mills

	Capacity	Lubricant Type
Way Lube	72 cu in (1.17 liters)*	Mobilith SHC 007
Spindle Lube	1 gal (3.8 liters)	Mobil SHC 625
Transmission (if equipped)		
40 Taper	34 oz (1 liter)	Mobil SHC 625
50 Taper	85 oz (2.5 liters)	Mobil SHC 625
Coolant		
EC-300	55 gal (208 liters)	All - Water-soluble synthetic-oil based or
EC-400	80 gal (303 liters)	synthetic - based coolant/lubricant †
EC-500	80 gal (303 liters)	**No flammable liquids!**
EC-1600/2000/3000 incl/Chip Conv	95 gal (360 liters)	
ES-5	55 gal (208 liters)	
HS Series	95 gal (360 liters)	

Turning Centers (Toolroom machines are grease lubricated and require general purpose lithium grease)

	Capacity	Lubricant Type
Way Lube	72 cu in (1.17 liters)*	Mobilith SHC 007
Spindle Lube	1 gal (3.8 liters)	Mobil SHC 625
Transmission (if equipped)		
	76 oz (2.25 liters)	Mobil SHC 625
Coolant		
OL-1	13 gal (49 liters)	
TL-1/2/3	5 gal (19 liters	
TL-4	100 gal (379 liters)	
SL-40, SL-40L	77 gal (291 liters)	
ST-10	30 gal (114 liters)	
ST-20	48 gal (182 liters)	
ST-30, DS-30	55 gal (208 liters	

* Grease Replacement Kit: 93-1933

† Mineral cutting oils will damage rubber components throughout the machine. The use of coolants with extremely low lubricity can damage the TSC coolant tip and pump. Do not use pure water as a coolant: machine components will rust.

Machine Dimensions for Site and Floor Requirements

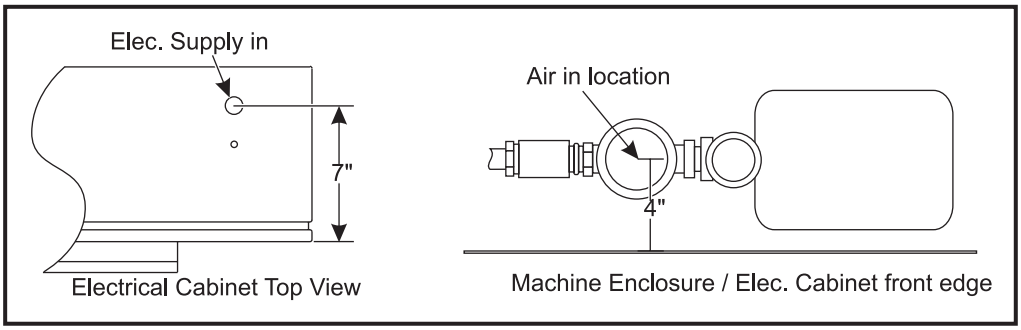
NOTE: A minimum clearance of 36 inches (914mm) is required around all machine.

NOTE: The operating dimensions are the maximum dimensions of the machine during operation, with the spindle head at its highest point, the control at its most forward position and the discharge tube, if equipped, installed.

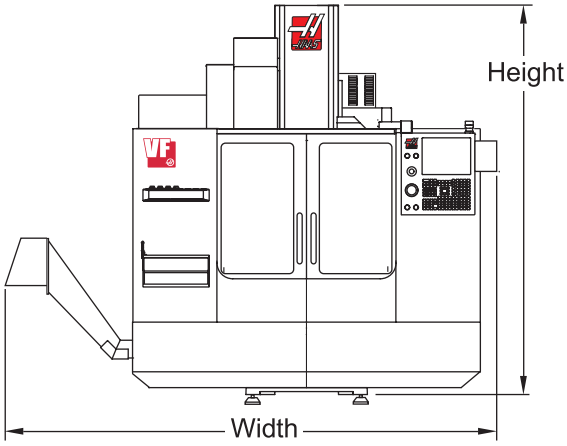
The optional 480V external transformer may require additional floor space. See electrical requirements for details.

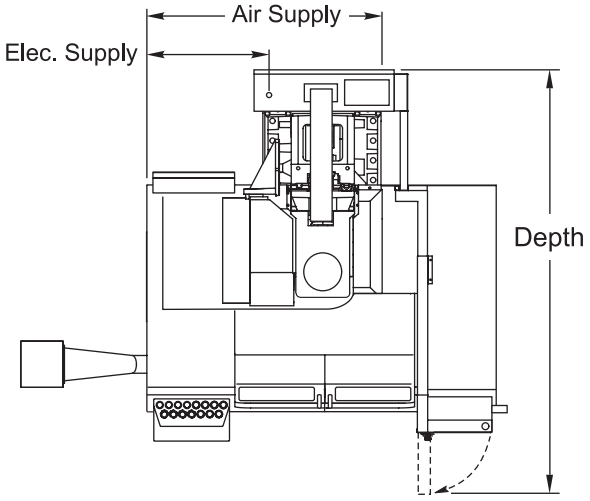
Electric / Air supply measurements are included to help determine the necessary lengths of electrical cable and air hose from their respective shop supplies to the machine. Electric supply measurements are taken from the point at the top of the electrical cabinet where the electric cable enters to the nearest vertical edge of the machine. Air supply measurements are taken from the point at which air connects to the machine to the same edge as the electrical measurement.

When determining necessary lengths for electrical cable and air hose, include the depth measurements shown in the following diagrams:



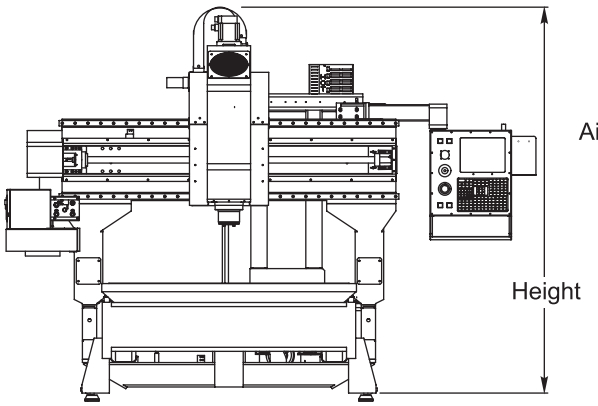
VF / VM / VR Series Operating Dimensions

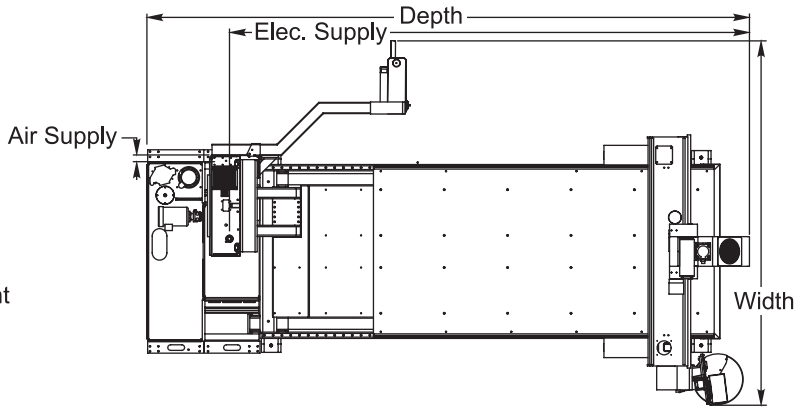




Machine	Height (in/mm)	Width (in/mm)	Depth (in/mm)	Elec. (in/mm)	Air (in/mm)	Weight (lb/kg)
VF-1	105 / 2667	125 / 3175	98 / 2489	28 / 711	57 / 1448	7100 / 3221
VF-1YT	105 / 2667	125 / 3175	109 / 2769	28 / 711	57 / 1448	7400 / 3357
VF-2(SS,TR)	105 / 2667	125 / 3175	98 / 2489	28 / 711	57 / 1448	7300 / 3311
VF-2YT(SS)	105 / 2667	125 / 3175	109 / 2769	28 / 711	57 / 1448	7500 / 3402
VF-3(SS)	118 / 2997	153 / 3887	105 / 2667	83 / 2109	107 / 2718	12500 / 5670
VF-3YT(SS)	118 / 3023	153 / 3887	106 / 2692	83 / 2109	107 / 2718	14000 / 6350
VF-3YT/50	130 / 3200	153 / 3887	106 / 2692	83 / 2109	107 / 1718	15900 / 7212
VF-4(SS)	118 / 2997	153 / 3887	105 / 2667	83 / 2109	107 / 2718	13300 / 6033

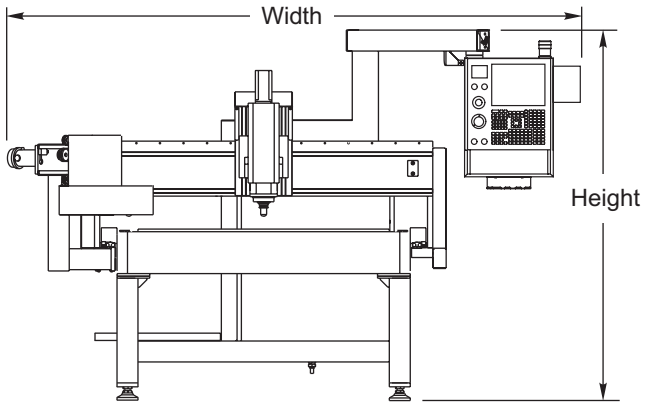
GR Series Operating Dimensions

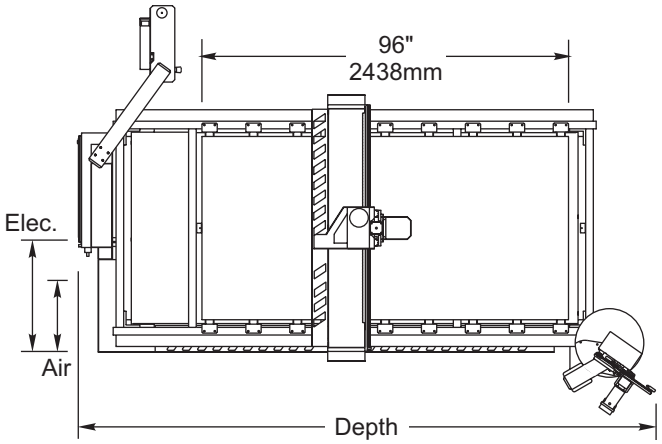




Machine	Height (in/mm)	Width (in/mm)	Depth (in/mm)	Elec. (in/mm)	Air (in/mm)	Weight (lb/kg)
GR-408	108 / 2743	123 / 3124	188 / 4775	39 / 991	39 / 991	10,000 / 4,536
GR-510	99 / 2515	137 / 3480	216 / 5486	33 / 838	0	15,000 / 6,804
GR-512	99 / 2515	137 / 3480	240 / 6096	33 / 838	0	18,000 / 8,165
GR-710	99 / 2515	164 / 4166	216/ 5486	33 / 838	0	16,500 / 7,484
GR-712	99 / 2515	164 / 4166	240 / 6096	33 / 838	0	19,500 / 8,845

SR Series Operating Dimensions



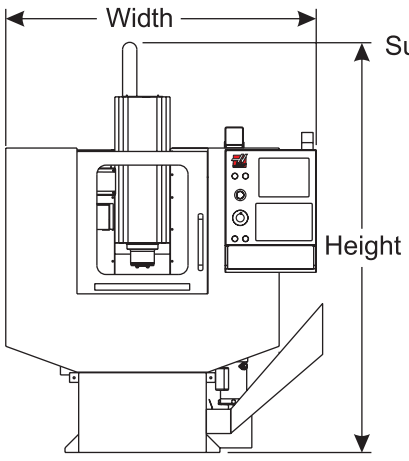


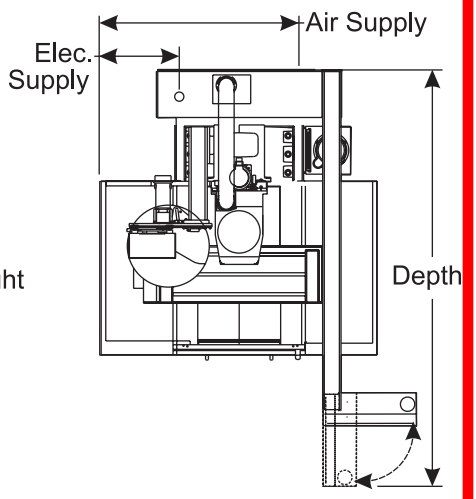
Machine	Height (in/mm)	Width (in/mm)	Depth (in/mm)	Elec. (in/mm)	Air (in/mm)	Weight (lb/kg)
SR-100	69 / 1753	118 / 2997	159 / 1499	29 / 737	20 / 508	2,800 / 1,272
SR-200	71 / 1803	142 / 3607	207 / 5258	29 / 737	20 / 508	3,200 / 1,455

Mini Mills Operating Dimensions

	MM/SMM	MM2/SMM2
Height (in/mm)	98 / 2489	99 / 2515
Width (in/mm)	70 / 1778	82 / 2083
Depth (in/mm)	98 / 2489	93 / 2362
Electric (in/mm)	12 / 305	24 / 607
Air (in/mm)	36 / 915	48 / 1219
Weight (lb/Kg)	3400 / 1542	4000 / 1814

NOTE: A fully opened operator's door increases the width by 10" (254mm).





Important Notes about Machine Installation

Once the machine is installed and incoming voltage is wired to the main circuit breaker, a service technician will adjust the internal transformer taps to match the incoming voltage exactly. This procedure is outlined in the Operator's manual. Machines installed with an external transformer may require additional steps to correctly set the voltage. The steps needed are described in the following paragraph:

External High Voltage Transformer Installation

Verify the transformer has been initially installed properly before final wiring to the machine (see the Electrical Power Requirements section). At the machine, connect the input of the internal 230 VAC transformer to the 227-243 VAC taps. Apply power to the machine and verify that the DC voltage between pins 2 and 3 of the vector drive (2nd and 3rd pins from the left) is 329-345 VDC. If not, return to the 480 VAC isolation transformer and readjust the taps as required. Do not use the internal 230 VAC transformer to adjust the voltage.

Insufficient Air Supply

When the machine is operating, if the pressure reading on the machine's regulator drops by more than 10 psi (.69 bar) during a tool change, the air supply volume is insufficient. A number of variables can cause this (i.e., compressor output, hose diameter, restrictions caused by fittings, etc.); refer to the Compressed Air Requirements section for the proper requirements and installation techniques.

Peak Performance

The rated horsepower of the machine may not be achieved if the imbalance of the incoming voltage is beyond an acceptable limit. The machine may function properly, yet may not deliver the advertised power. This is noticed more often when using phase converters. A phase converter should only be used if all other methods cannot be used.

1101 Intelitek Lathe

BENCHTURN 7000 CNC TURNING CENTER

ADVANCED MANUFACTURING PRODUCT CATEGORIES

- Advanced Manufacturing Overview
- CNC Machining
- CNC Routers
- CAD/CAM/Design
- Foundation Skills
- Introduction to Welding
- Design and Manufacturing Projects
- Thermoforming
- CIM/FMS

DESCRIPTION COURSE OUTLINE SPECIFICATIONS DATA SHEET

Specifications

Axis Travel

X Axis: max 75 mm / 2.96”

Z Axis: 250 mm / 9.84”

Work Area

Swing over bed: 200 mm / 7.87″

Swing over cross slide: 100 mm / 3.94″

Max dist. between centers: 360 mm / 14.17″

Bed width: 100 mm / 3.94″

Spindle

Motor Type: Brushless

Motor power: 500 W / 0.67 HP

Spindle speed: 100-3000 RPM

Spindle taper: MT3

Tooling

Automatic tool position: 4

Tool post angle: 360 deg.

Tailstock taper: MT2

Tailstock travel: 50 mm / 1.97″

Accuracy

Position accuracy: 0.015 mm / 0.0006″

Repeatability: 0.010 mm / 0.0004″

Dimensions

Machine size

Width: 1000 mm / 39.38″

Depth: 780 mm / 30.75″

Height: 565 mm / 22.25″

Shipping size

Width: 1435 mm / 56.50″

Depth: 1020 mm / 40.15″

Height: 960 mm / 37.75″

Weight (approximate)

Machine weight: 170 Kg / 353 lbs

Shipping weight: 220 Kg / 485 lbs

Axis Drive Motors

Axis motor type: Stepper

X axis: 1.35 N-m / 192 oz-in

Z axis: 1.35 N-m / 192 oz-in

Rapid feed rate: 2000 mm/min 79 ipm

Feed rate: 500 mm/min 20 ipm

Air Supply*

*Only required for optional pneumatic accessories

620 kPa (90 psi)

1/4” NPT female connection provided

Control Software

EIA RS274-D standard G & M code compatible

FANUC® compatible

CAD/CAM compatible

Advanced NC code editing

Real–time or simulated graphic tool path verification

Power Requirements

United States

115 VAC (+5%/-10%) 60 Hz, 20A

International

230 VAC (+5%/-10%) 50 Hz, 8A

Table

A table or bench capable of supporting 400 lbs.

1101 Intelitek Lathe

intelitek

BenchTurn 7000 CNC Turning Center

The BenchTurn 7000 is a benchtop CNC turning machine for learning environments. The 7000 comes equipped with 2-axis stepper motors, ball screws, a variable speed brushless spindle motor, limit/home switches, and an MT3 taper spindle with MT2 taper tailstock. This system requires no assembly, arriving at your facility ready to run on an Ethernet port on a standard PC, and fits comfortably into any classroom without sacrificing features. Like larger industrial machines, the BenchTurn 7000 uses EIA, ISO, and FANUC™-compatible G&M code programs to cut parts in a variety of materials.

Standard Features

- Ethernet-based control
- Brushless spindle motor
- Full enclosure with automatic safety door lock
- Tailstock
- Automatic diagnostics and power cut off protection
- PC-based CNC software
- Coolant-ready
- Jog pendant-ready
- Robotic integration-ready with 6 inputs, 6 outputs
- No assembly required

Included Accessories

- 4" 3-jaw chuck with key
- 4-station automatic tool turret
- One shot lubrication system
- Internal work light

Accessory kit includes:

- (1) Chuck key
- (1) Chuck jaw set
- (2) Dead centers
- (1) 4-pc. Allen wrench set
- (1) 2-pc. Open-end wrench set
- (1) 2M Ethernet cable
- (1) Storage box
- Misc. accessories

Specifications

Axis Travel

X Axis, max	75 mm	2.96"
Z Axis	250 mm	9.84"

Work Area

Swing over bed	200 mm	7.87"
Swing over cross slide	100 mm	3.94"
Max dist. between centers	360 mm	14.17"
Bed width	100 mm	3.94"

Spindle

Motor Type	Brushless
Motor power	500 W / 0.67 HP
Spindle speed	100-3000 RPM
Spindle taper	MT3

Tooling

Automatic tool position		4
Tool post angle		360 deg.
Tailstock taper		MT2
Tailstock travel	50 mm	1.97"

Accuracy

Position accuracy	0.015 mm	0.0006"
Repeatability	0.010 mm	0.0004"

Dimensions

Machine size

Width	1093 mm	43.00"
Depth	864 mm	34.00"
Height	565 mm	22.25"

Shipping size

Width	1435 mm	56.50"
Depth	1020 mm	40.15"
Height	960 mm	37.75"

Weight (approximate)

Machine weight	170 Kg	353 lbs
Shipping weight	220 Kg	485 lbs

Axis Drive Motors

Axis motor type	Stepper	
X axis	1.35 N-m	192 oz-in
Z axis	1.35 N-m	192 oz-in
Rapid feed rate	2000 mm/min	79 ipm
Feed rate	500 mm/min	20 ipm

Air Supply*

*Only required for optional pneumatic accessories:
620 kPa (90 psi)
1/4" NPT female connection provided

Control Software

EIA RS274-D standard G & M code compatible
FANUC® compatible
CAD/CAM compatible
Advanced NC code editing
Real–time or simulated graphic tool path verification

Computer System Requirements

Intel / AMD Single Core 1.6GHz
512MB RAM
300MB Available Disk Space
Windows XP SP3 / Vista / 7 - 32 or 64bit
1 available LAN port*

*Additional LAN port required if your computer requires wired network access

Power Requirements

United States
115 VAC (+5%/-10%) 60 Hz, 20A

International
230 VAC (+5%/-10%) 50 Hz, 8A

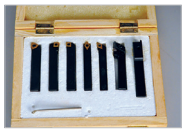
BenchTurn 7000 CNC Turning Center

Options and Accessories

Coolant System

Air Chuck for BenchTurn 7000

TiN-coated Cutter, 7-pc set, 10mm x 10mm



Jog Pendant Handwheel

MT2 Tailstock Chuck

4-Jaw Chuck with Flange (3.9")

3-drawer mobile workbench 60"

Rolling Center, Tailstock MT2

Ordering Information

Hardware

BenchTurn 7000 - 110 VAC	00-5504-0110
BenchTurn 7000 - 220 VAC	00-5504-0220
Starter Bundle, 110/220 VAC, Imp/Met	**CNC-7000-STRT**

Includes:

- CNC BenchTurn 7000
- 10 x 10mm Cutter Tool Holder
- TiN-coated Tip
- Drill Chuck for Tailstock
- Rolling Center
- LM7 Content, Vir, CNC Turning w/BenchTurn 7000

Advanced Bundle, 110/220 VAC, Imp/Met	**CNC-7000-ADV**

Includes all Starter Bundle items, plus:

- 4-jaw Chuck
- Handwheel - Manual Control
- Coolant System

Software

CNCMotion® Simulation Software	63-6789-1000
FANUC™ 21i Emulator	63-6789-2000-FA
SpectraCAM Turning	10-6743-0000

Curriculum

CNC Turning with BenchTurn 7000, LearnMate course, Lab	
Imperial	77-8141-0001
Metric	77-8141-0002
CNC Turning with BenchTurn 7000, LearnMate course, Virtual	
Imperial	77-3141-0001
Metric	77-3141-0002

Accessories

4-Jaw Chuck with 3.9" (100mm) Flange	10-1106-7000
Pneumatic Air Chuck	10-1110-9000
TiN-coated Cutter w/Inserts, 10 mm, 7-Pc Set	10-1110-1000
Cutter Insert Replacements 7-pc Set,	10-1110-2000
Pneumatic Shield Opener with Sensors	10-1110-5000
Tailstock Chuck MT2 Taper 1/2" (13mm)	10-1105-7000
Rolling Center, Tailstock MT2 Taper	10-1106-6000
Basic Air Compressor and Conditioning System	10-4526-0000
Quiet Operation Air Compressor / Cond. System	10-4527-0000
Jog Pendant Handwheel	10-1111-1000
Coolant System - 110 VAC	10-1108-1110
Coolant System - 220 VAC	10-1108-1220
Mobile Workbench 6Ft, Desk Style, Wood Top	10-5594-0000
Mobile Workbench with Storage Cabinet, 60"	10-5590-0000
Mobile Workbench with 3-Drawer Cabinet, 60"	10-5591-0000
Mobile Workbench with 3-Drawer Cabinet, 96"	10-5592-0000
Project Kit, Brass Cannon	10-9307-0000
Project Kit, Sterling Engine	10-9603-0000
Project Kit, Chess Set	10-7551-0000

Contact Us:

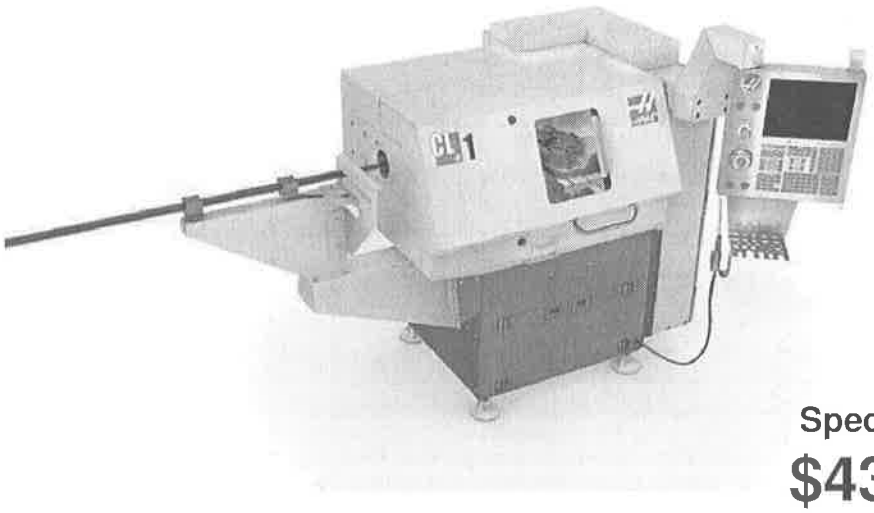
intelitek

Toll Free: 800-221-2763
Phone: 603-413-2600
Fax: 603-437-2137

Email:
info@intelitek.com
www.intelitek.com

1102 Hass Chucker Lathe

CL-1
CUSTOM QUOTE: 0000006301



Special Price

$43,481

(Original Price: ~~$46,480~~)

DATE: DEC 19, 2017

PREPARED FOR:
KENNETH DAVIS
9255255049
KEN-DAVIS@SCUSD.EDU
SACRAMENTO CITY
UNIFIED SCHOOL DISTRICT
7345 GLORIA DR
SACRAMENTO, CA 95831-4580
US

LOCAL DISTRIBUTOR:
HFO/UNION CITY-CA
DIV. OF SELWAY MACH
29250 UNION CITY BLVD.
UNION CITY CA 94587
USA
TEL: 888-735-9290
FAX: 510-489-7204
E-MAIL:
SALES@SELWAYTOOL.COM

QUOTE SUMMARY:

Base Price	$39,995
7.5% Discount	-$2,999
OPTIONS	$4,990
TOOLING	$1,495
TOTAL QUOTE	$43,481

PRODUCT OVERVIEW

Chucker Lathe; 1" (25 mm) bar, 4.95" (126 mm) swing over table, 12" x 8" (305 x 203 mm) travels (xz), 5 hp (3.7 kW) 6000 rpm, 5C collet spindle, auto air collet closer, spindle orientation, coolant pump, 15" color LCD monitor, USB port, memory lock keyswitch, and rigid tapping.

STANDARD FEATURES

6000-RPM SPINDLE, 5 HP (3.7 KW)
6000-rpm Spindle, 5 hp (3.7 kW), 5C spindle nose, 1" (25 mm) bar capacity, belt drive ..... INCLUDED

8-STATION TOOL TURRET
8-Station Tool Turret; uses gang-style tooling with 1/2" (12.7 mm) centers. Standard toolholder kit included.
..... INCLUDED

13-GALLON (49 LITER) COOLANT TANK WITH 1/4 HP (186 W) PUMP
13-Gallon (49 liter) Coolant Tank with 1/4 hp (186 W) pump ..... INCLUDED

RIGID TAPPING
Rigid Tapping ..... INCLUDED

SPINDLE ORIENTATION
Spindle Orientation ..... INCLUDED

1-YEAR STANDARD WARRANTY
1-Year Standard Warranty ..... INCLUDED

VISUAL QUICK CODE
Visual Quick Code ..... INCLUDED

SELECTED OPTIONS

OPTIONS

BAR FEEDER FOR THE CL-1
Bar Feeder for the CL-1; 0.250" (6.35 mm) to 1.00" (25.4 mm) diameter bar by 40" (1 meter) length.
Spindle speed is limited to 3000 rpm when feeding bar. $3,495

PARTS CATCHER SYSTEM

Parts Catcher System $1,495

TOOLING

GANG-STYLE TOOLING KIT WITH 1/2" CENTER HEIGHT

Gang-style tooling kit with 1/2" centers; includes 1 each single position 3/4" ID holders, 2 each double-position 3/4" ID holders, 2 each turn/face holders for 1/2" square turning tools, 2 each axial turn/face holders for 1/2" square turning tools, 1 set of 3 reducer bushings: 3/4" to 5/8", 1/2", and 3/8". $1,495

ORIGINAL PRICE $46,480

7.5% Off Machine Base Price ..... -$2,999†

Special Price Quote $43,481

† The 7.5% discount applies only to the base price of the CL-1. Additional savings may be available from your HFO.

** Not available for field installation*

Haas Build & Price is for example only. Your Haas Factory Outlet can provide a formal price quotation. Price, specifications, availability, and specific configurations may change without notice. Despite our best efforts, some items may contain pricing, typography, or photography errors.

Shipping, delivery, transportation, and rigging charges are not included in this quote.

Caution: Federal, State, and Local taxes are not included in the quote price.

This quote is valid only for customers in the U.S. and Canada.

Print date: December 19, 2017

LOCAL DISTRIBUTOR:
HFO/Union City-CA
Div. of Selway Mach
29250 Union City Blvd.
UNION CITY CA 94587
USA
TEL: 888-735-9290
FAX: 510-489-7204
E-Mail: sales@selwaytool.com

DATE: DEC 19, 2017

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TOOLING	$1,495
TOTAL QUOTE	**$43,481**

CL-1

CNC Chucker Lathe with 1" bar capacity

5C Spindle Nose	/ 1.0"	/ 6k	/ 5 hp
CHUCK SIZE	BAR CAPACITY	RPM	POWER

Starting Price: $39,995

Over Cross Slide	11.0 in	279 mm
Over Table	4.95 in	126 mm

CAPACITIES	S.A.E	METRIC
Chuck Size (max)	4.0 in	102 mm
Max Cutting Diameter	5.0 in	126 mm
Bar Capacity	1.00 in	25 mm

TRAVELS	S.A.E	METRIC
X Axis	12.0 in	305 mm
Z Axis	8.0 in	203 mm

FEEDRATES	S.A.E	METRIC
Max Cutting	500 ipm	12.7 m/min
Rapids on X	757 ipm	19.2 m/min
Rapids on Z	757 ipm	19.2 m/min

CONTACT HAAS

AXIS MOTORS	S.A.E	METRIC
Max Thrust X	1149 lbf	5111 N
Max Thrust Z	1149 lbf	5111 N

SPINDLE	S.A.E	METRIC
Spindle Nose	5C (collet) Type Nose	5C (collet) Type Nose
Drive System	Direct Speed, Belt Drive	Direct Speed, Belt Drive
Max Rating	5.0 hp	3.7 kW
Max Speed	6000 rpm	6000 rpm
Spindle Bore ø	1.25 in	31.8 mm

TOOLING	S.A.E	METRIC
Tooling	Gang Style-Any Combination	Gang Style-Any Combination

GENERAL	S.A.E	METRIC
Coolant Capacity	13 gal	49 L

CONTACT HAAS

AIR REQUIREMENTS	S.A.E	METRIC
Air Required	1 scfm @ 70 psi	28 L/min @ 4.8 bar
Inline Air Hose	3/8 in	3/8 in
Coupler (Air)	3/8 in	3/8 in
Air Pressure Min	40 psi	2.8 bar

ELECTRICAL SPECIFICATION	S.A.E	METRIC
Spindle Speed	6000 rpm	6000 rpm
Drive System	Direct Speed, Belt Drive	Direct Speed, Belt Drive
Spindle Power	5.0 hp	3.7 kW
Input AC Voltage (1 Phase)	220 VAC	220 VAC
Full Load Amps (1 Phase)	16 A	16 A
Input AC Voltage (3 Phase) - Low	220 VAC	220 VAC
Full Load Amps (3 Phase) - Low	12 A	12 A

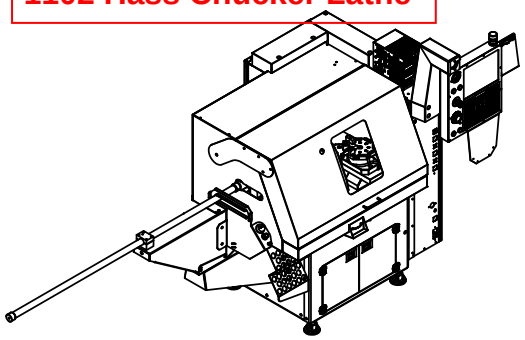
CONTACT HAAS

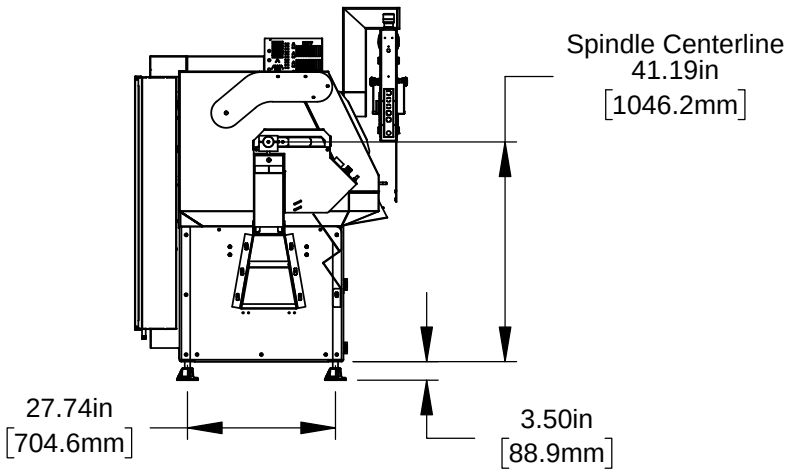
DIMENSIONS - SHIPPING S.A.E		METRIC
Domestic Pallet Dimensions	79 in x 58 in x 86 in	201 cm x 148 cm x 218 cm
Export Pallet Dimensions	79 in x 58 in x 86 in	201 cm x 148 cm x 218 cm
Weight	2020 lb	920.0 kg

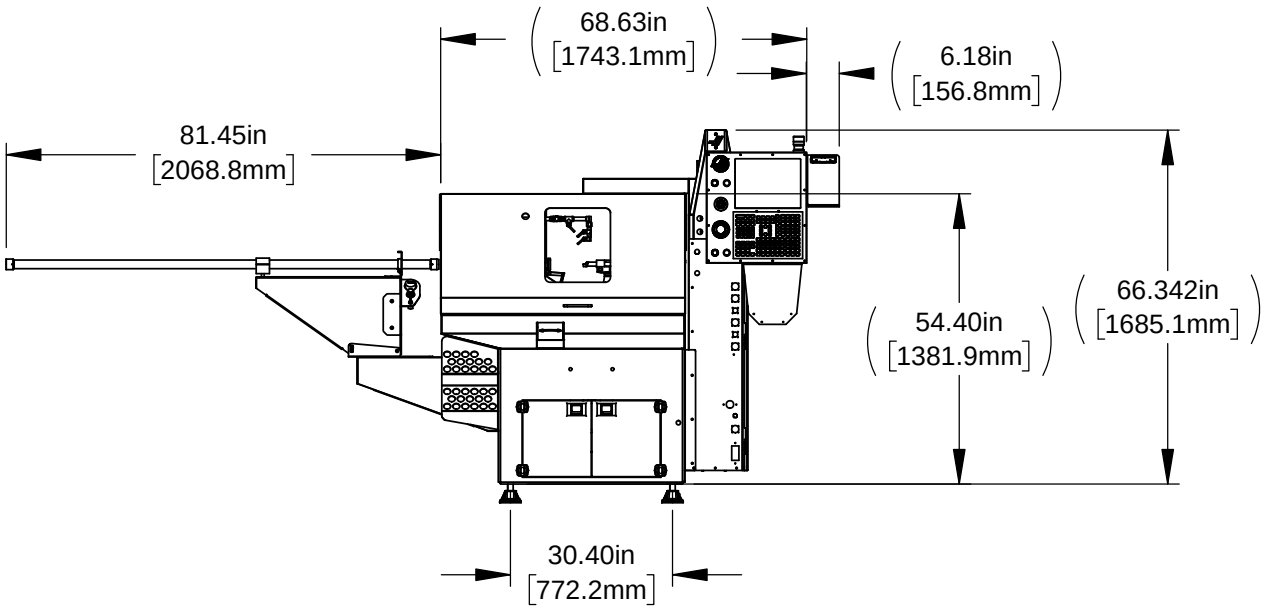
See the Chucker Lathe in Action

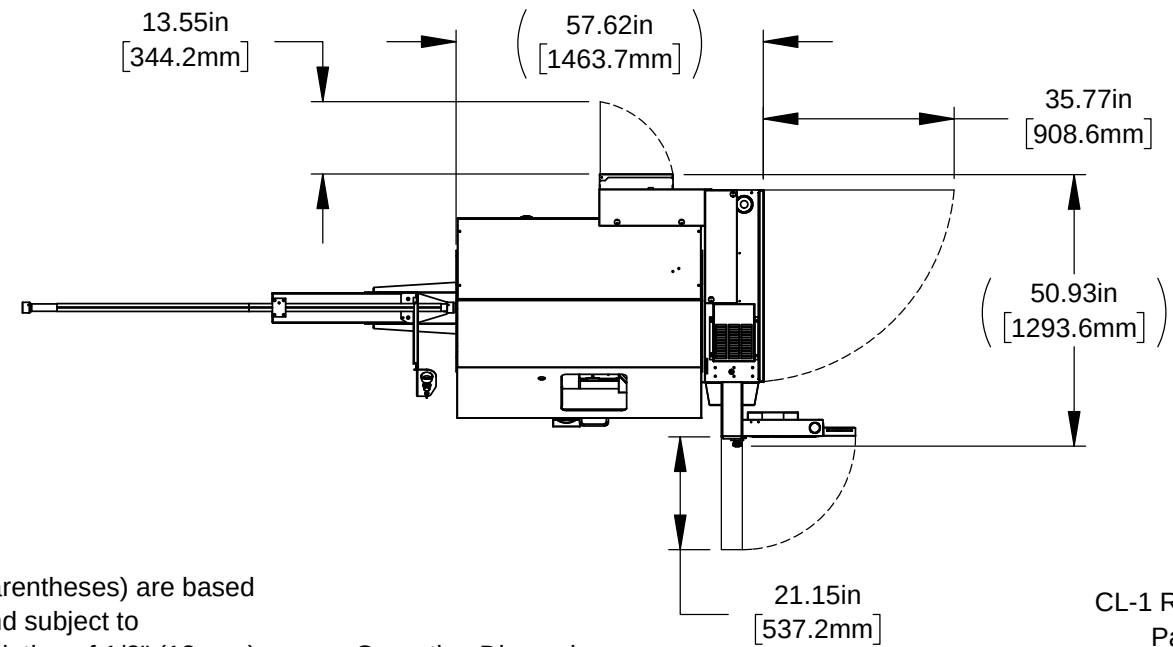
CONTACT HAAS

1102 Hass Chucker Lathe



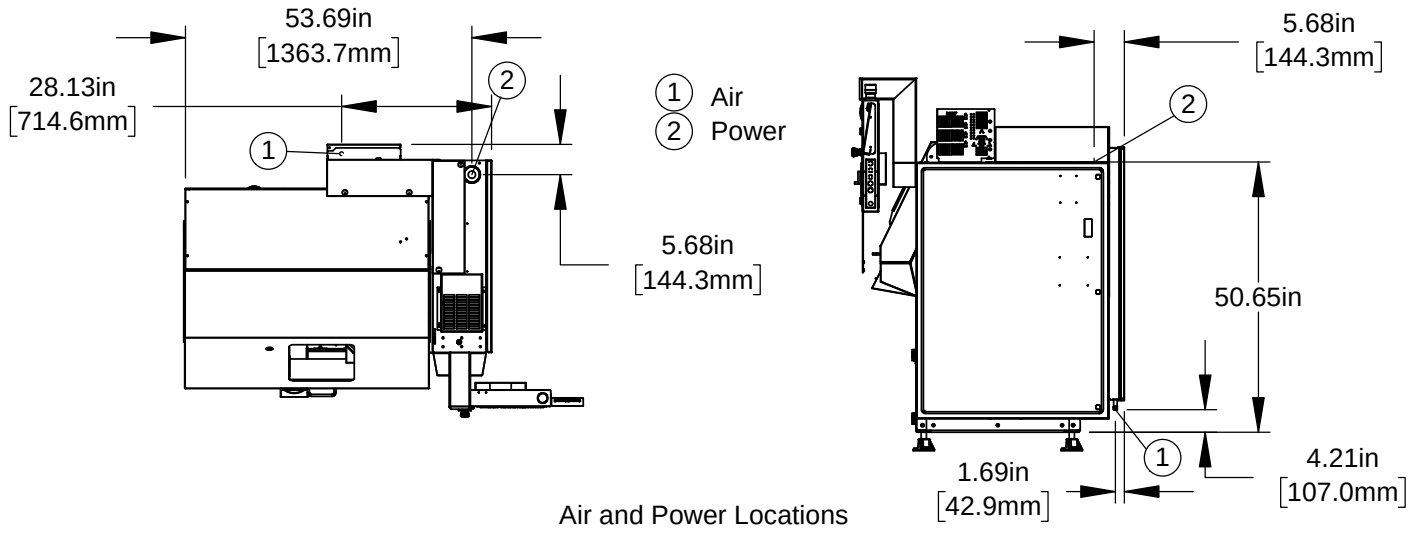




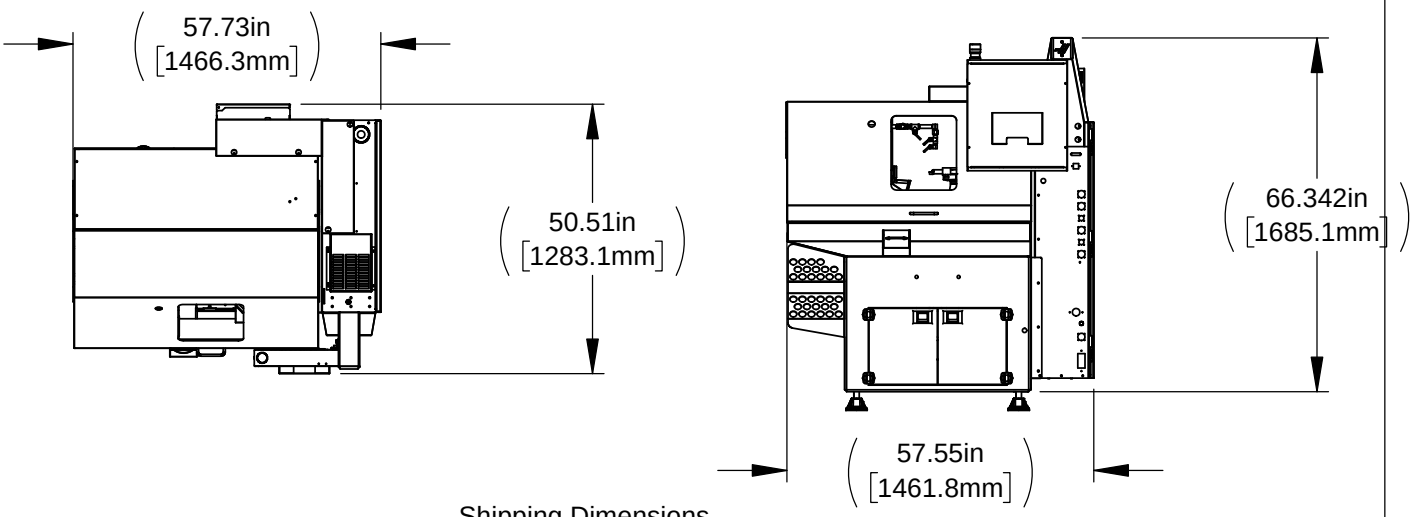


Dimensions in (parentheses) are based on sheet-metal and subject to manufacturing variation of 1/2" (12 mm)

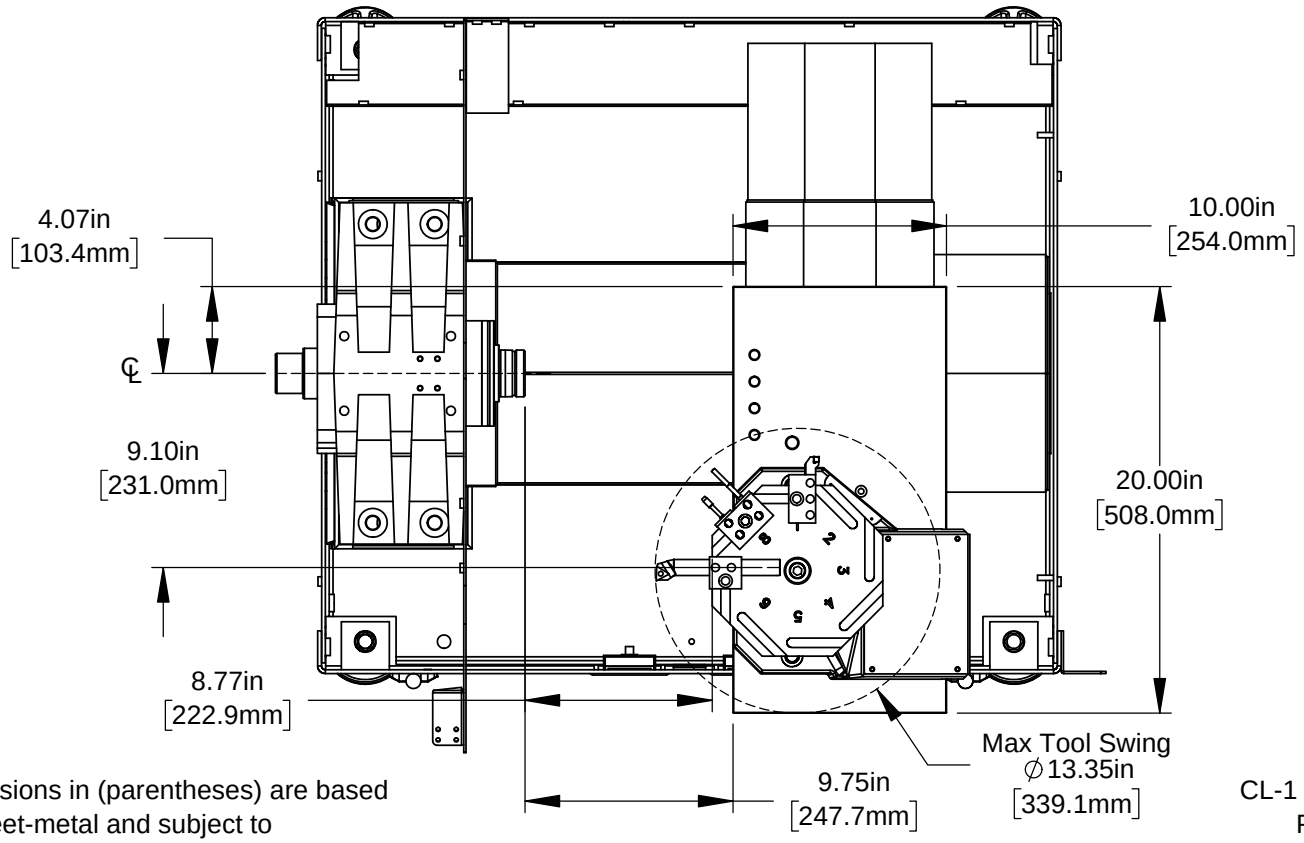
Operating Dimensions



Air and Power Locations



Shipping Dimensions



Dimensions in (parentheses) are based on sheet-metal and subject to manufacturing variation of 1/2" (12 mm)

Machine Travels

LATHE INSTALLATION INSTRUCTIONS

Machine footprints and operating dimensions are available in the brochure and Pre-Installation Guide

General Requirements

Operating Temperature Range 41°F to 104°F (5 to 40°C)
Storage Temperature Range -4°F to 158°F (-20 to 70°C)
Ambient Humidity: 20% – 95% relative humidity, non-condensing
Altitude: 0-6000 ft. (Do not operate machine in explosive atmospheres (explosive vapors and/or particulate matter)

Electricity Requirements

IMPORTANT! REFER TO LOCAL CODE REQUIREMENTS BEFORE WIRING MACHINES.
All machines require:
Three phase 50 or 60Hz power supply.
Line voltage that does not fluctuate more than +/-5%

15 HP System	Voltage Requirements	High Voltage Requirements
SL-10	(195-260V)	(354-488V)
Power Supply	50 AMP	25 AMP
Haas Circuit Breaker	40 AMP	20 AMP
If service run from elec. panel is less than 100' use:	8 GA. WIRE	12 GA. WIRE
If service run from elec. panel is more than 100' use:	6 GA. WIRE	10 GA. WIRE

20 HP System	Voltage Requirements	High Voltage Requirements
[1]SL-20, TL-15, GT-20	(195-260V)	(354-488V)
Power Supply	50 AMP	25 AMP
Haas Circuit Breaker	40 AMP	20 AMP
If service run from elec. panel is less than 100' use:	8 GA. WIRE	12 GA. WIRE
If service run from elec. panel is more than 100' use:	6 GA. WIRE	10 GA. WIRE

30-40 HP System	Voltage Requirements	High Voltage Requirements[2]
TL-15BB, SL-20BB, SL-30, SL-30BB, [1]SL-40, SL-40BB	(195-260V)	(354-488V)
Power Supply	100 AMP	50 AMP
Haas Circuit Breaker	80 AMP	40 AMP
If service run from elec. panel is less than 100' use:	4 GA. WIRE	8 GA. WIRE
If service run from elec. panel is more than 100' use:	2 GA. WIRE	6 GA. WIRE

55HP System	Voltage Requirements	High Voltage Requirements
[1]SL-40, SL-40BB, SL-40L	(195-260V)	(354-488V)
Power Supply	170 AMP	**Must use an external transformer**
Haas Circuit Breaker	150 AMP	
If service run from elec. panel is less than 100' use:	1 GA. WIRE	
If service run from elec. panel is more than 100' use:	1/0 GA. WIRE	

WARNING!
A separate earth ground wire of the same conductor size as the input power is required to be connected to the chassis of the machine. This ground wire is required for operator safety and for proper operation. This ground must be supplied from the main plant ground at the service entrance, and should be routed in the same conduit as the input power to the machine. A local cold water pipe, or ground rod adjacent to the machine cannot be used for this purpose.

Input power to the machine must be grounded. For wye power, the neutral must be grounded. For delta power, a central leg ground or one leg ground should be used. The machine will not function properly on ungrounded power. (This is not a factor with the External 480V Option)

The rated horsepower of the machine may not be achieved if the imbalance of the incoming voltage is beyond an acceptable limit. The machine may function properly, yet may not deliver the advertised power. This is noticed more often when using phase converters. A phase converter should only be used if all other methods cannot be used.

The maximum leg-to-leg or leg-to-ground voltage should not exceed 260 volts, or 504 volts for high-voltage machines with the Internal High Voltage Option.

[1] The current requirements shown in the table reflect the circuit breaker size internal to the machine. This breaker has an extremely slow trip time. It may be necessary to size the external service breaker up by 20-25%, as indicated by “power supply”, for proper operation.

[2] The high-voltage requirements shown reflect the Internal 400V configuration which is standard on European machines. Domestic and all other users must use the External 480V option.

Air Requirements

The CNC Lathe requires a minimum of 100 PSI at 4 scfm at the input to the pressure regulator on the back of the machine. This should be supplied by at least a two horsepower compressor, with a minimum 20-gallon tank, that turns on when the pressure drops to 100 PSI.

Machine Type	Main Air Regulator	Input Airline Hose Size
GT / SL / TL-Series	85 psi	3/8" I.D.

The recommended method of attaching the air hose is to the barb fitting at the back of the machine with a hose clamp. If a quick coupler is desired, use at least a 3/8".

NOTE: Excessive oil and water in the air supply will cause the machine to malfunction. The air filter/regulator has an automatic bowl dump that should be empty before starting the machine. This must be checked for proper operation monthly. Also, excessive contaminants in the air line may clog the dump valve and cause oil and/or water to pass into the machine.

NOTE: The nipple between the air filter/regulator and the Bijur oil lubricator (See illustration in "Air Connection" section) reservoir tank below the control box on the back of the machine is for the optional rotary table. DO NOT use this as a connection for an auxiliary air line. Auxiliary connections should be made on the left side of the air filter/regulator.

TOOLS REQUIRED

Precision bubble level (0.0005 inch per 10")
1 1/8" hex wrench or ratchet
1 1/2" wrench
Test indicator (0.0005)
3/4" wrench
Claw hammer

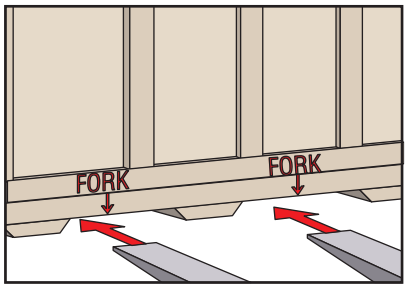
A forklift capable of lifting more than 9,000 pounds (14,000 pounds for the SL-30, 23,000 pounds for SL-40), with forks at least 5' long by 6" wide (6' by 6" wide for SL-30 and 8' by 8" wide for SL-40, SL-40L).

MATERIALS REQUIRED

Wire and air hose or piping as specified in the Service Requirements section
A small amount of grease
Way lube for the lubricator (Vactra #2)

Warning!

THE LATHE CRATE CAN ONLY BE MOVED WITH A FORKLIFT.



CAUTION! The fork positions are marked on the crate. (Also, note that there are three skids at each side of the pallet. The heavy part of the machine [the back] is positioned over the two skids that are closest together.) If the fork positions are ignored, there is a good chance that the retaining bolts will be sheared off by the forks and also that the machine will tip over when it is picked up.

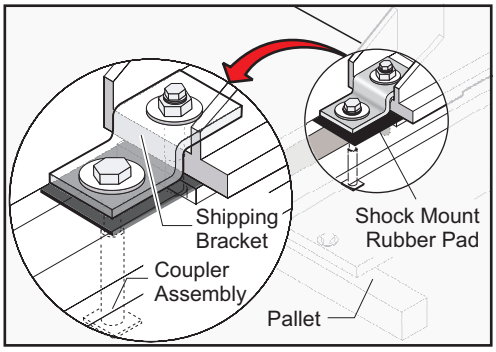
Unpacking the Lathe

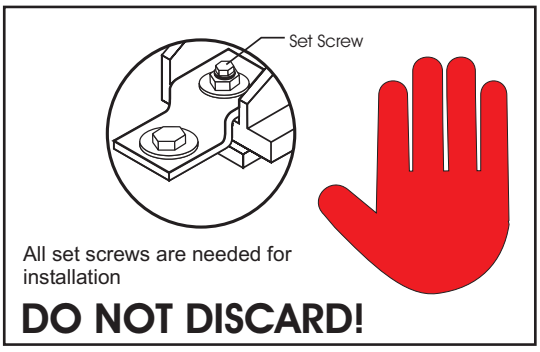
Uncrating

1. Remove the cover.

CAUTION! Do not put undue pressure on the top of the machine as you remove the cover.

2. Remove the coolant tank. Remove the cleats that held them in place.





3. Remove the ¾" bolts holding the base to the pallet and the plastic thread protecting sleeve from the base.

4. Remove the nuts, on the leveling screws, holding the shipping bracket to the base casting. Remove the shipping brackets.

5. Lift the machine off the pallet.

Leveling the Lathe

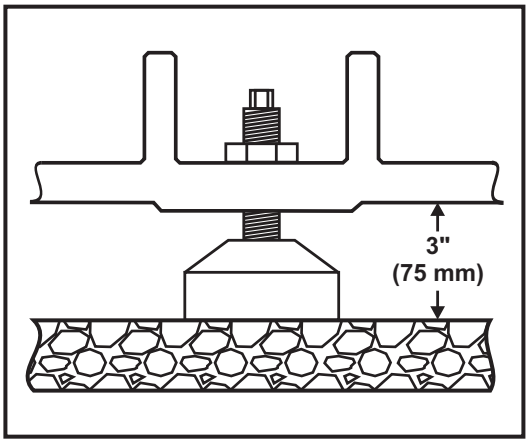
Setting in Place

CAUTION! Do not lift the machine any farther than necessary off the floor when moving it, and move as slowly and cautiously as possible. Dropping the machine, even from a height of a few inches, can cause injury, result in expensive repairs, and void the warranty.

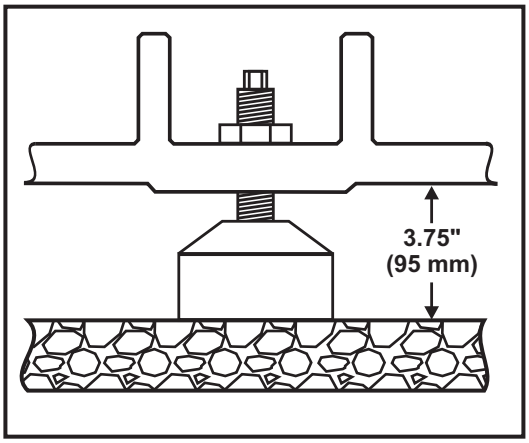
1. Unbolt clamp plates. Lift the machine until the bolts clear the pallet.

2. Thread leveling screws through casting until thread is approximately 3/8" above the top of the casting. If a screw is excessively hard to turn, remove it, dress the threads in the hole with a 1-14 tap, and inspect the screw. If the screw has dings, dress the threads with a 60° V file. Install the lock nuts on the leveling screws, but do not tighten. SL-20 machines require the lock nuts to be installed under the leveling foot.

3. Move the machine to where it will be located. Take leveling pads out of the tote kit, grease the dimple in each pad, and locate them under the leveling screws at the four corners. Lower the machine.



Floor to Base Gap (14-2462)

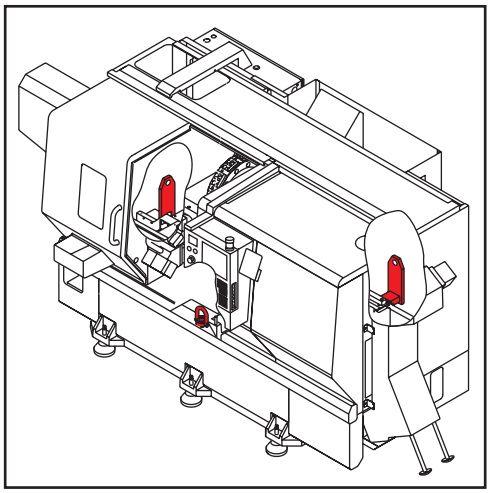


Floor to Base Gap (14-2010)

4. Remove all banding and packing material around the control panel, monitor and doors.

5. Remove foot switches from inside machine and attach cable to socket located at left end of front support beam, with cable facing downward.

6. Remove the lifting brackets if equipped. Replace the plugs (Haas part number 59-0487) in the casting. Sealant must be used on the plugs to prevent oil and coolant from entering the base casting.



DS / ST Series Leveling

General steps of leveling:

- Remove rear covers.
- Level in Z-Axis direction.
- Level in X-Axis direction.
- Remove twist in casting.

Tools Required:
Leveling Tool - T-2119A
Machinist's level (.0001")
3/4" wrench

Leveling the Lathe

The lathe should be in place, on the leveling pads and power should be applied to the machine.

1. The only screws that should be in contact with the pads are the four corners. The two middle screws should be backed away from the leveling pads.

2. Jog the tool turret to the middle of travel in both X and Z-axis.

3. At the rear of the machine, remove the top rear cover to expose the Z-axis linear guides (See figure 1).

Figure 1

Level the lathe in the Z-axis:

4. Place a machinist's level on the back right Z-axis linear guide (See figure 2).

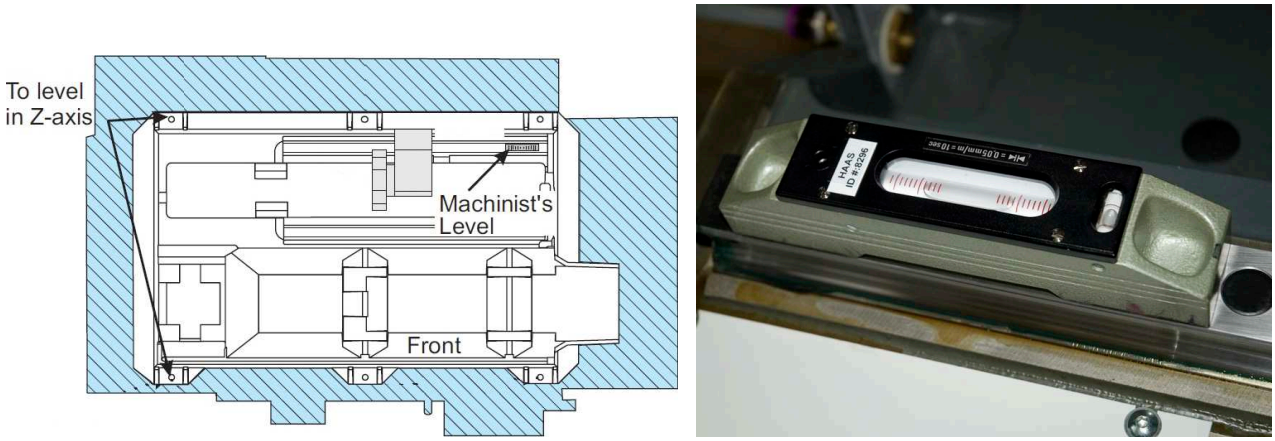


Figure 2

5. Level the lathe in the Z-axis, by adjusting the two left leveling screws (the front and back leveling screws closest to the spindle). Machine level is within +/- 0.0005".

Level the lathe in X-axis:

6. Use the leveling tool (T-2119A), or a ground block across the rear Z-axis linear guide and place the machinist's level on it. The level is now parallel to the X-axis.(See figure 3).

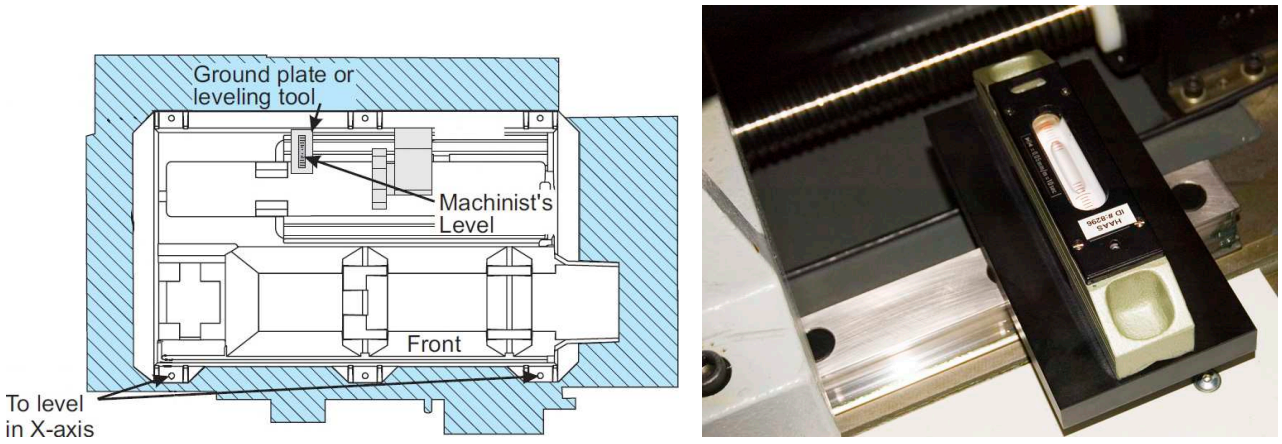


Figure 3

7. Level the lathe in the X-axis, using only the two front leveling screws. Machine level is within +/- 0.0005”.

8. Jog the turret to home in the Z-axis only.

Remove twist:

Note: If available, a magnetic base on the face of the turret could be used to support the level. This would save doing steps 9-13.

9. Change parameter 43 bit 18 from 1 to 0.

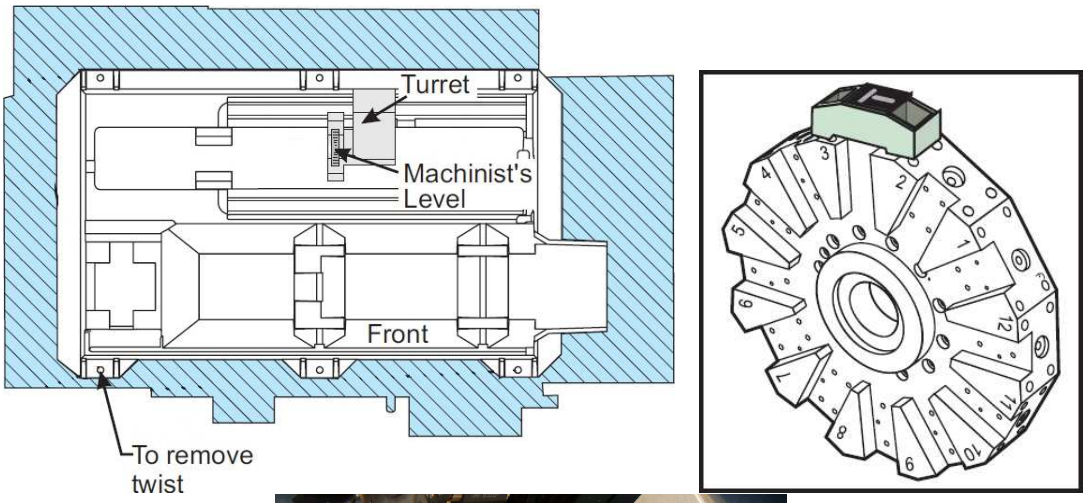
10. Go to MDI and enter <M> <4> <3> and press <CYCLE START>.

11. Press <HAND JOG>, then <A>, then <HAND JOG> to jog the turret. Note: use a speed other that "0.1", the turret will rotate too fast at 0.1.

12. Once the top surface of the turret is level by eye, Change speed to <0.0001>.

13. Place the machinist’s level on the top of the turret as shown and slowly rotate. Allow time for the bubble to settle.

For dual spindle lathes, use a magnetic base to place a second level on the secondary spindle head (see the following photo). Tap the base into place to read twist on the level.



Secondary Spindle Level Mounting

Figure 4

14. Handle jog the Z-axis from home to max travel.

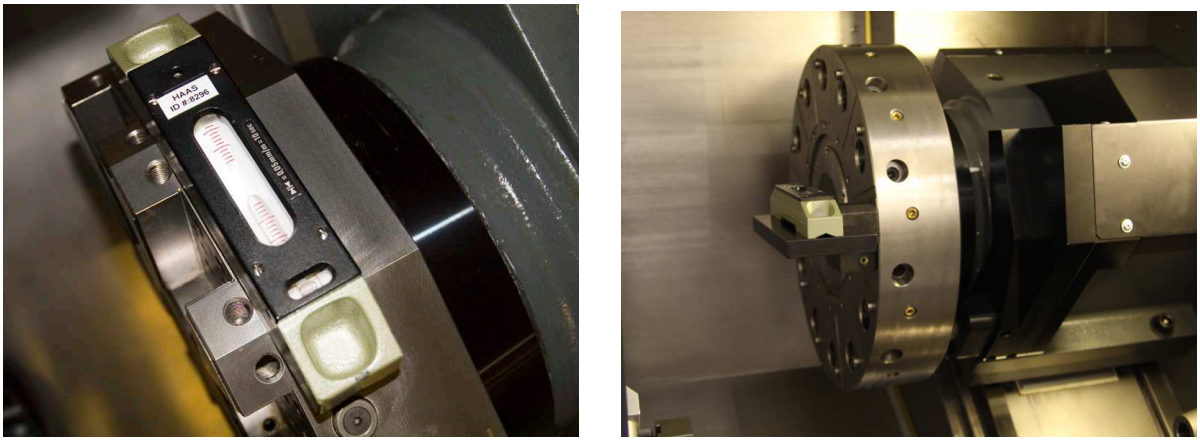


Figure 5

Bolt-on Turret *VDI Turret*

15. Use the front leveling screws to remove any twist. Adjust until it is within +/- 0.0005” over its full Z-axis travel range.

Dual Spindle Lathes: Repeat steps 14 and 15 using the secondary spindle axis (B) to check for twist and correct as needed.

16. Lower the middle two leveling screws (front and back of machine) and torque to 10 ft lb. (See figure 6)

Figure 6

17. Recheck for twist, if necessary loosen the front middle leveling screw to remove any twist. Adjust until it is within +/- 0.0005” over its full Z-axis travel range (and B-axis range for dual spindle lathes).

18. Tighten the jam nuts.

19. Verify that the machine remains level.

Reset machine:

20. Remove the machinist’s level from the turret.

21. Press <HAND JOG>, then <A>, then <HAND JOG> to jog the turret. Note: use a speed other that "0.1", the turret will rotate too fast at 0.1.

22. Jog the turret to pocket 1 clamping position, use the coolant nozzle as a guide.

23. Go to MDI and enter <M> <4> <4> and press <CYCLE START>.

24. Change parameter 43 bit 18 from 0 to 1.

25. Home the turret by pressing <ZERO RET>, <A>, <SINGL>.

26. Replace the rear cover.

SL-Series Leveling

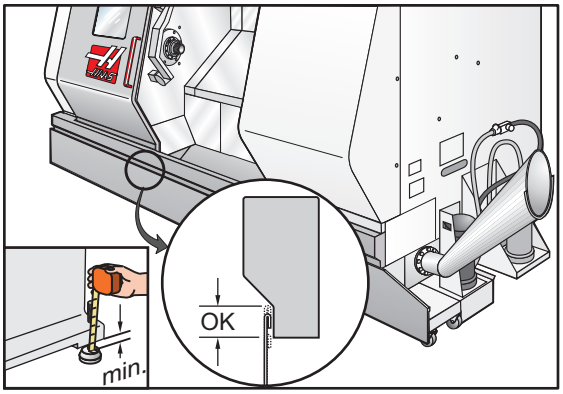
Leveling the machine is required to provide proper coolant and lubrication drainage and to ensure equal loading on all four of the casting feet for consistent cutting performance. Please read through entire sequence before starting.

1. Position the turret close to the chuck (shipping position). Remove right-end rear panel to access the Z-axis linear guide rails.

2. Place a machinist's level across linear guides to level front-to-back. Place level along linear guides to level machine left-to-right.**Take care to avoid damage to linear guide rails.**

3. Level machine by rotating leveling screws. Adjust adjacent screws alternately to maintain proper loading.

4. Adjust machine height (see figure). Verify that each leveling screw requires approximately the same torque to turn. This will ensure proper loading. Tighten lock nuts.

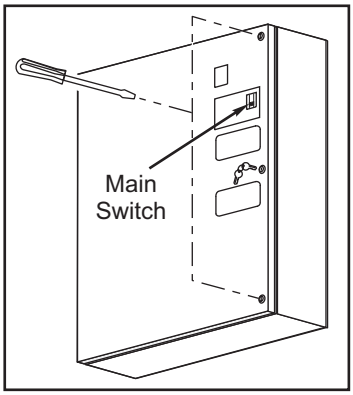


Initial Setup

WARNING!

At this point, there should be NO electrical connection to the machine. The electrical panel should be closed and secured.

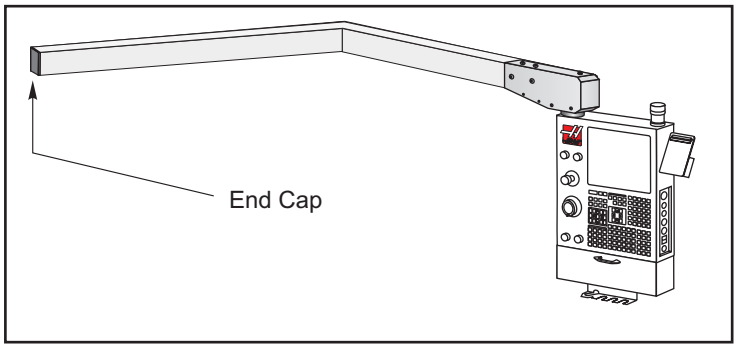
Set the main switch at the upper right of the electrical panel on the back of the machine to OFF. Using a screwdriver to unlock the two latches on the panel door, unlock the cabinet with the key, and open the door.



Take sufficient time to check all the components and connectors associated with the circuit boards. With the power off, push on them gently to make sure that they are seated in their sockets. Look for any cables that have become disconnected, look for any signs of damage and loose parts in the bottom of the panel box. If there are any signs that the machine was mishandled, be extremely careful in powering up the machine (be ready to shut it off IMMEDIATELY). Or if there are obvious problems, call the factory BEFORE proceeding.

Support Arm End Cap

The tote kit Supplied will include one support arm end cap with an O-ring. The end cap is placed on the machine end of the controller support arm.



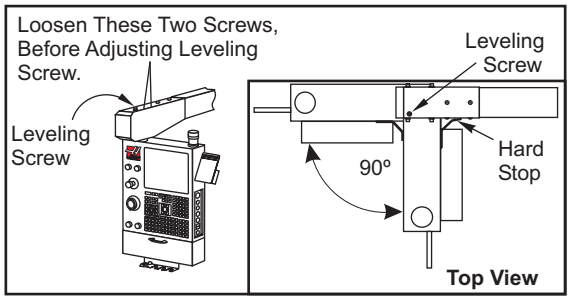
Thin Pendant

The thin pendant assembly is shipped in place on the front of the lathe, covered with corrugated cardboard padding. When unpacking, remove the cardboard and shipping bolt (accessed through the glove box).

Pendant Leveling

The pendant leveling feature allows the adjustment of the pendant angle.

1. Rotate the pendant to the position in the following figure for proper leveling. Loosen the two (2) screws on the end cap.Use a wrench on the leveling screw to change the pendant angle.



2. Tighten the two (2) screws on the end cap once the pendant is level.

3. Rotate the pendant 90° forward and check the level again. Repeat the procedure if necessary.

Air Connection

CAUTION! Working with air service required for the lathe can be hazardous. Be sure that pressure has been removed from the air line before you connect it to the machine, disconnect it from the machine, or service parts of the air system.

1. With the pressure off in the air line, connect the air supply to the hose barb next to the air filter/ regulator. If the fitting supplied is not compatible, replace it.

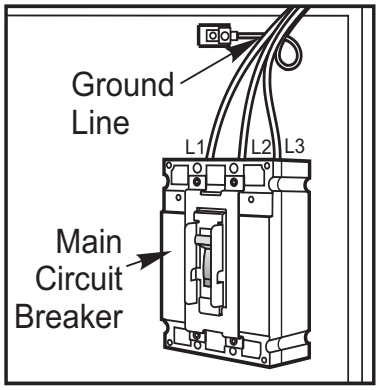
2. Start the compressor, set it between 100 and 150 PSI. Set the regulator on the machine to 85 to 90 PSI.

CAUTION! Working with electrical services required for the lathe can be extremely hazardous. The electrical power must be off and steps taken to ensure it is not turned on while working. In most cases this means turning off a circuit breaker in a panel, then locking the panel door. However, if this is not the case or are not sure how to do this, check with appropriate personnel or otherwise obtain the necessary help before contining.

NOTE: The machine must have air pressure at the air gauge, or a "Low Air Pressure" alarm will be present on power up.

WARNING!

The electrical panel should be closed and secured at all times except during installation and service. At those times, only qualified electricians should have access to the panel. When the main circuit breaker is on, there is high voltage throughout the electrical panel (including the circuit boards and logic circuits) and some components operate at high temperatures. Therefore, extreme caution is required.



1. Hook up the three power lines to the terminals on top of the main circuit breaker at upper right of electrical panel. Connect the separate ground line to the ground bus to the left of the terminals.

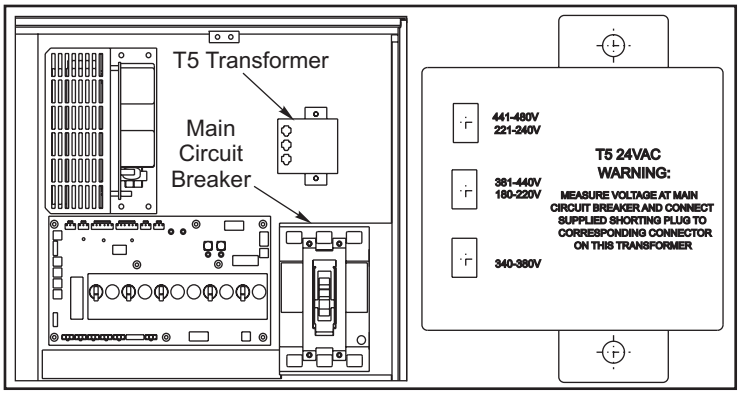
NOTE: Make sure that the service wires actually go into the terminal-block clamps. (It is easy to miss the clamp and tighten the screw. A poor connection will cause the machine to run intermittently or have other problems, such as servo overloads.) To check, simply pull on the wires after the screws are tightened.

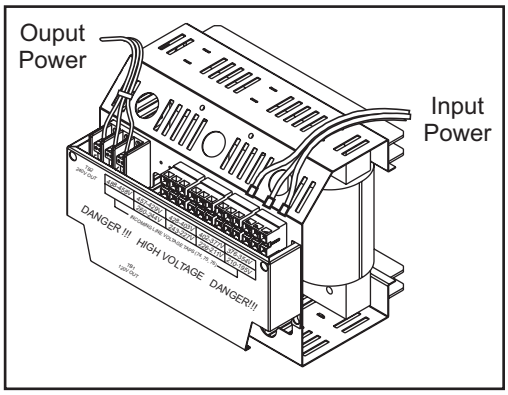
2. After the line voltage is connected to the machine, make sure that main circuit breaker (at top-right of rear cabinet) is OFF. Turn ON the power at the source. Using a digital voltmeter and appropriate safety procedures, measure the voltage between all three pair phases at the main circuit breaker and write down the readings. The voltage must be between 195 and 260 volts (360 and 480 volts for high voltage option).

NOTE: Wide voltage fluctuations are common in many industrial areas; minimum and maximum voltage supplied to a machine while it is in operation must be known. U.S. National Electrical Code specifies that machines should operate with a variation of +5% to -5% around an average supply voltage. If problems with line voltage occur, or low line voltage is suspected, an external transformer may be used. If you suspect voltage problems, voltage should be checked every hour or two during a typical day to be sure it does not fluctuate more than +5% or -5% from an average.

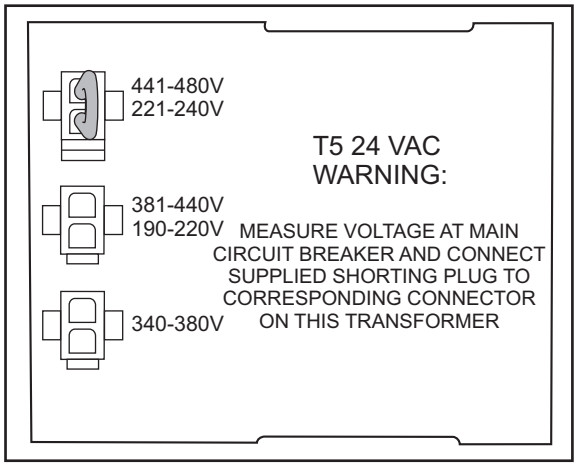
CAUTION! Make sure the main circuit breaker is set to OFF and power is off at your supply panel BEFORE you change the transformer connections. Make sure that all three black wires are moved to the correct terminal block and that they are tight.

3. Check the connections on the transformer at the bottom-right corner of the rear cabinet. The three black wires labeled 74, 75, and 76 must be moved to the terminal block triple which corresponds to the average voltage measured in step 2 above. There are four positions for the input power for the 260 volt transformer and five positions for the 480 volt transformer. The labels showing the input voltage range for each terminal position is shown in the following illustration:

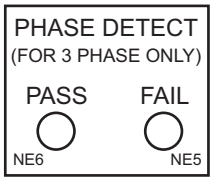




4. Transformer T5 supplies 24VAC used to power the main contactor. The transformer has two input connectors located about two inches from the transformer, which allow it to be connected to either 240V or 200V. Users that have 220V-240V RMS input power should use the connector labeled 240V, while users with 190-220V input power should use the connector labeled 200V. Failure to use the correct input connector will result in either overheating of the main contactor or failure to reliably engage the main contactor.



5. Set the main circuit breaker to ON. Check for evidence of problems, such as the smell of overheating components or smoke. If such problems are indicated, immediately set the main circuit breaker to OFF and call the factory.



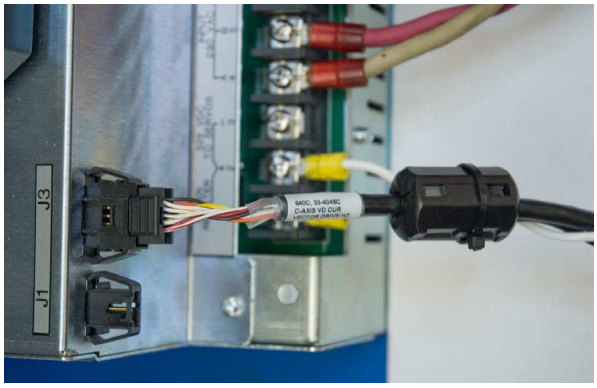
Warning!

High Pressure Coolant (HPC) pump is three phase and must be phased correctly. Improper phasing will damage the HPC pump and void the warranty. Refer to the HPC start up section, if equipped.

6. After the power is on, measure the voltage across the bottom terminals on the main circuit breaker. It should be the same as the measurements where the input power connects to the main breaker. If there are any problems, check the wiring.

7. Apply power to the control by pressing the Power-On switch on the front panel. Check the high voltage buss on the Vector Drive (pin 2 with respect to pin 3 on the terminal bus at the bottom of the drive). It must be between 310 and 360 volts. If the voltage is outside these limits, turn off the power and recheck steps 2 and 3. If the voltage is still outside these limits, call the factory. Next, check the DC voltage displayed in the second page of the Diagnostic data on the display. It is labeled DC BUS. Verify that the displayed voltage matches the voltage measured at pins 2 and 3 of the Vector Drive +/- 7 VDC.

If the displayed voltage exceeds the measured voltage by 12 volts or more, install a ferrite EMI filter (65-1452) to the current command cable near its connection to the vector drive. Secure with a cable tie (See photo). Recheck voltage.



8. Electrical power must be phased properly to avoid damage to your equipment. The Power Supply Assembly PC board incorporates a "Phase Detect" circuit with neon indicators. When the orange neon is lit (NE5), the phasing is incorrect. If the green neon is lit (NE6), the phasing is correct. If both neon indicators are lit, you have a loose wire; check the connections. Adjust phasing by swapping L1 and L2 of the incoming power lines at the main circuit breaker.

WARNING!

ALL POWER MUST BE TURNED OFF AT THE SOURCE PRIOR TO ADJUSTING PHASING.

9. Turn off the power and set the main circuit breaker to OFF. Close the door, lock the latches, and turn the power back on.

10. Remove the key from the control cabinet and give it to the shop manager.

Installation Procedure for External 480V Transformer

Introduction

The external transformer adds to overall machine reliability and performance, however it does require extra wiring and a place to locate it. The external transformer provides electrostatically shielded isolation. This type of transformer acts to isolate all common mode line transients and improve EMI conducted emissions.

The external transformer has a 45 KVA rating. It is a 480V 60Hz only transformer.

Installation

The transformer should be located as close to the machine as possible. The input and output wiring of the transformer should conform to the local electrical codes and should be performed by a licensed electrician. The following is for guidance only, and should not be construed to alter the requirements of local regulations.

The input wire should not be smaller than the 6AWG for the 45KVA transformer. Cable runs longer than 100” will require at least one size larger wire. The output wire size should be 4 AWG.

The transformer is 480V to 240V isolation transformers with delta wound primary and secondary windings. The primary windings offer 7 tap positions, 2 above and 4 below the nominal input voltage of 480V.

The primary side should be wired as follows:

Input Voltage Range	Tap
493-510	1 (504)
481-492	2 (492)
469-480	3 (480)
457-468	4 (468)
445-456	5 (456)
433-444	6 (444)
420-432	7 (432)

This should produce a voltage on the secondary side of 234-243 V RMS L-L. Verify this and readjust the taps as required. At the machine, connect the cables at the input of the internal 230V transformer to the 227-243V taps. Apply power to the machine and verify that the DC voltage between pins 2 and 3 of the Vector Drive (2nd and 3rd pins from the left) is 329-345VDC. If not, return to the 480V isolation transformer and readjust the taps as required. Do not use the taps on the internal 230V transformer to adjust the voltage.

50Hz Installations

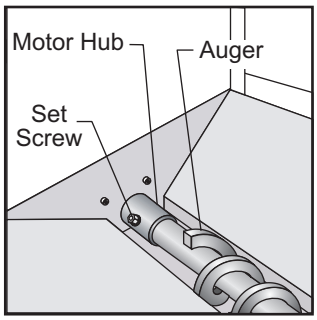
The external transformers are 60Hz rated, and cannot be used at 50Hz without derating the input voltage. For these applications, the internal 230V transformer should be tapped on the lowest setting (195-210V RMS). The external transformer should be tapped according to the following table. If these tap settings do not produce a DC bus voltage between pins 2 and 3 on the Vector Drive between 320 and 345VDC, readjust the taps on the external transformer as required. Do not move the taps on the internal transformer from the lowest position.

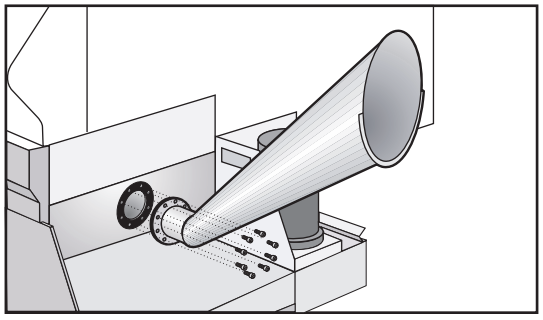
Input Voltage Range	Tap
423-440	1 (504)
412-422	2 (492)
401-411	3 (480)
391-400	4 (468)
381-390	5 (456)
371-380	6 (444)
355-370	7 (432)

Optional Chip Auger installation

1. Unpack the auger and discharge tube.

2. Slide the auger into the discharge tube opening and then slip opposite end onto motor hub. Fasten to motor hub with the 5/16-18 x 2½” bolt.



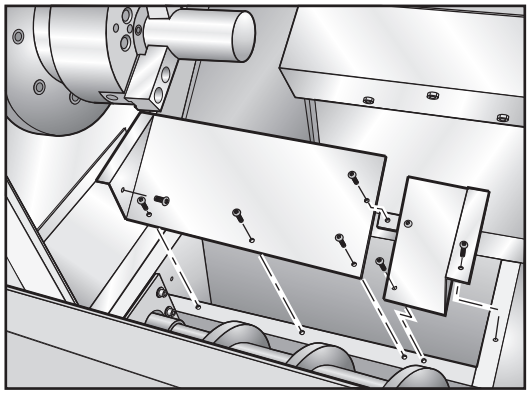


3. Install gasket and slide the discharge tube into the opening. Attach the discharge tube with bolts and locking washers and tighten uniformly.

4. After machine start-up, check the operation of the auger to ensure the direction of rotation will move the chips toward the discharge tube. If the auger is turning so that the chips are not being moved toward the discharge tube, change PARAM 209 bit 12 from 1 to 0 or 0 to 1 to establish a new forward direction.

SL-10 Chip Auger Discharge Tube Installation

1. Remove the screws that secure the inner front and rear wings. Remove the inner front and rear wings. Slide the chip auger assembly towards the rear of the machine.



2. Unpack the discharge tube. Install gasket and slide the discharge tube into the opening. Attach the discharge tube with bolts and locking washers and tighten uniformly.

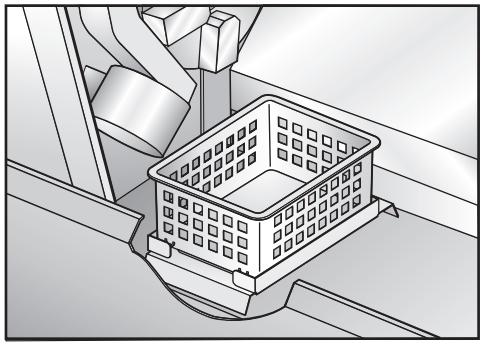
3. Slide the chip auger assembly back into its original location. Reinstall the inner front and rear wings using the BHCS removed in step 1.

4. After machine start-up, check the operation of the auger to ensure the direction of rotation will move the chips toward the discharge tube. If the auger is turning so that the chips are not being moved toward the discharge tube, change PARAM 209 bit 12 from 1 to 0 or 0 to 1 to establish a new forward direction.

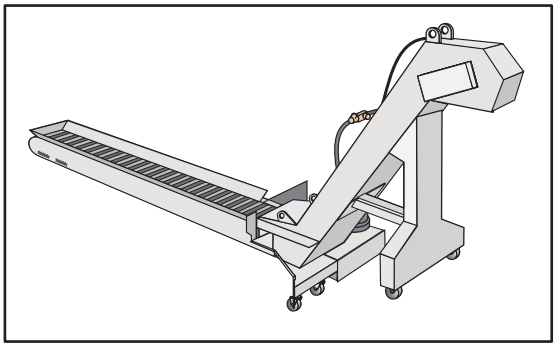
SL-10 Parts Basket

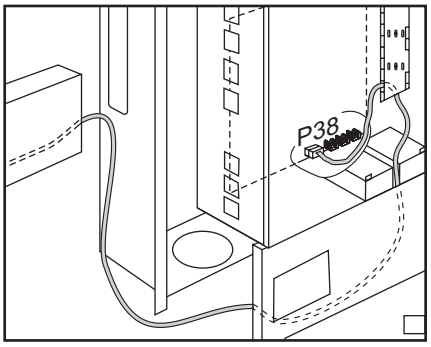
Installation

Place the parts basket tray over the chip auger trough. Set the parts basket on the parts catcher tray. Position the basket underneath the chuck.



Optional Chip Conveyor





1. Unpack the chip conveyor and locate the conveyor discharge cover. Remove the side and nose wings from the conveyor pickup area.

2. Attach a lift to the hoist loops, raise the conveyor and reorient the caster wheels in the operating position.

3. Slide conveyor into opening on the right side of the machine until the incline start point is near the machine enclosure. Adjust caster wheels to support the conveyor 1/8” to1/4” above the lip of the enclosure pan.

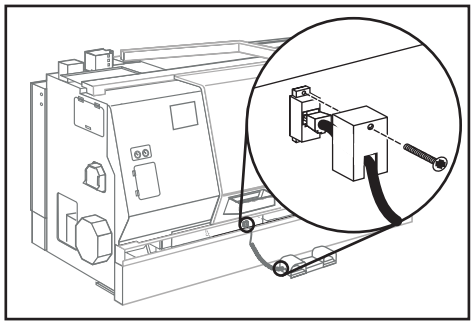
4. Install the side and nose wings, and discharge cover.

5. Route the chip cable through the hole in the bottom of the control cabinet. Thread it in and back out of the central cable trough. Plug the connector to the I/O Board at input P38 and close the cabinet door.

NOTE: On a machine with a safety circuit, the chip conveyor will only run with the door closed regardless of the Conveyor Door Override bit.

Foot Switch Installation

To connect the foot switch assembly, remove the retaining cover, plug in the foot switch, then replace the cover.



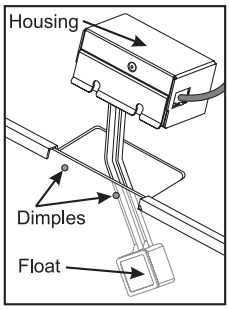
NOTE: A replacement foot switch cable (RJ12 6P6C Straight Wiring Coil Cord) is packed in the lathe’s control cabinet.

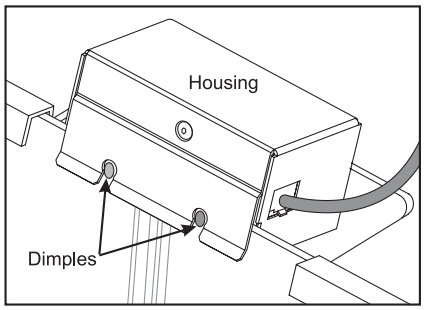
Coolant System

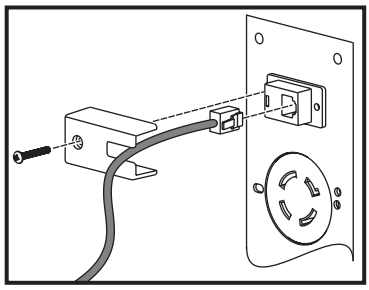
Coolant Tank

1. Position the coolant tank at the front of the machine. Connect the coolant pump and the auger cables to the connectors located on the control cabinet

2. The Coolant Level Float Assembly is shipped in a separate box. It consists of a housing, float and cable. Install the Coolant Level Float Assembly by lowering the float through the tank lid. Line up the slots in the housing with the dimples on the side of the tank and press down so the float assembly clips onto the tank.







3. Insert a plastic push wire mount into the hole in the tank lid, then route the cable towards the right side of the lathe. Use the plastic push wire-mounts as needed to ensure the cable does not get damaged. Tie wrap the coolant float cable to other cables, when available, when routing from the coolant tank.

4. Connect the cable to the Coolant Level Gauge receptacle on the right side panel. Remove the cover from the RJ-12 style connector, plug in the coolant level sensor cable, and replace the cover.

5. Select the Current Commands screen on the operator's pendant and move the float up and down to ensure that the display reflects a corresponding change in the coolant level.

6. Attach the coolant hose to the pump fitting located at the base of the coolant pump.

7. Slide the coolant tank into place beneath the machine. Insure the cables and hoses are not damaged as the coolant tank is pushed in.

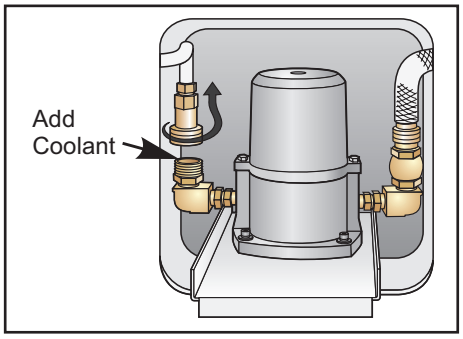
8. Fill the tank with the approximately 35 gallons of coolant (50 gallons for SL-30, 75 gallons for the SL-40). Fill with water based coolant only.*

***Mineral cutting oils will damage rubber based components throughout the machine and void the warranty.**

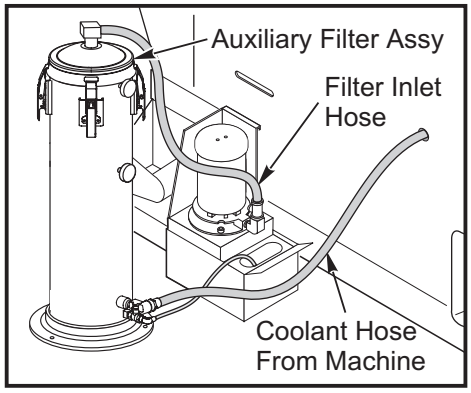
SL-10 Coolant Pump

Priming the Coolant Pump

After machine installation, or extended periods of non-use, add coolant to inlet side of the pump until full.



Auxiliary Filter for Standard Coolant Systems



1. Place the Auxiliary Filter system next to the coolant tank of the machine. Connect the output of the Standard Coolant pump to the input of the Auxiliary Filter. Connect the Auxiliary Filter output hose to the coolant hose of the machine.

2. The Auxiliary Filter tank must be filled with coolant before use. To fill the Auxiliary Filter tank from the Standard Coolant tank, turn on the Standard Coolant Pump. Open the ball valve, located on the top of the Auxiliary Filter tank. Wait for coolant to appear in the drain-back hose. Close the ball valve; the Auxiliary Filter tank is full.

Optional High Pressure Coolant System

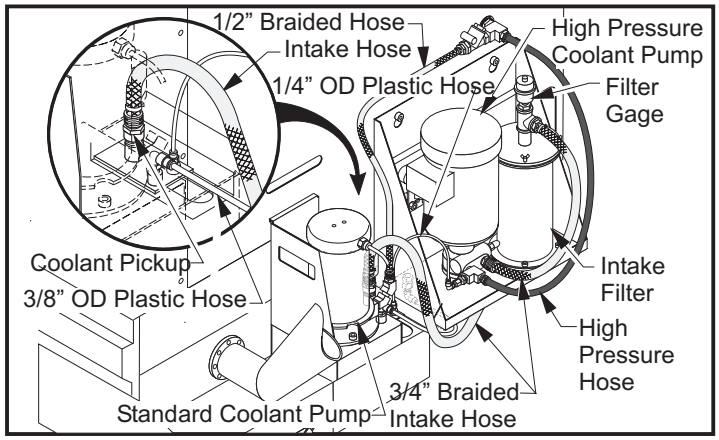
Installation

1. Connect the intake filter hose to the coolant pickup connection next to the coolant pump on the coolant tank.

2. Route the 1/4" OD plastic hose attached to the high pressure coolant pump down into the coolant tank. Insert it in to the 1/4" OD connector next to the coolant pickup. Route the 3/8" OD plastic hose from the bottom of the HPC unit to the 3/8" OD push-in elbow next to the coolant pump.

3. Attach the 1/2" braided hose to the standard coolant pump. Prime the high pressure coolant system.

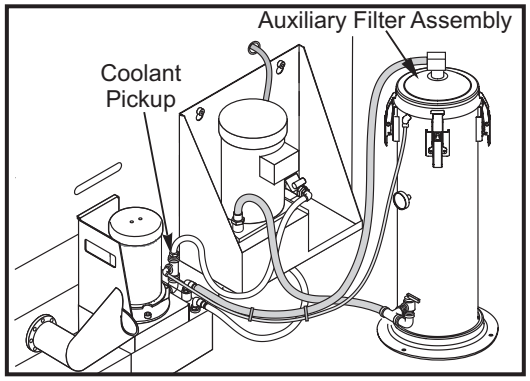
4. Run the standard coolant pump and check all connections for leaks.



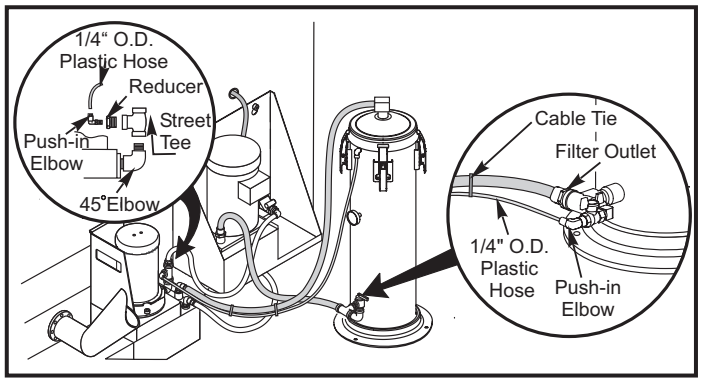
Installed High Pressure Coolant System

Optional Auxiliary Filter for High Pressure Coolant

Installation



Standard Filtration Setup



Auxiliary Filter Priming System

1. Attach the hose from the top of the auxiliary filter to the hose connector on the coolant pickup.

2. Disassemble the fittings on the primary coolant pump. Reassemble with two (2) 1/2” 45° fittings, a male to male 1/2” fitting, a cross fitting, and a 1/2” hose fitting on the other end of it. On one of the two remaining sides of the cross fitting, install a 1/2” to 1/4” reducer and a 1/4” push-in elbow. On the other side, install a 1/2” plug. (See Auxiliary Filter Priming System figure.) Note that the illustration shows the cross fitting rotated 90° ccw for clarity. The 1/4” push-in elbow should face the Auxiliary Filter.

3. Insert 1/4" OD plastic hose into the push-in elbow on the pump. Route the hose along the intake filter hose and around the intake line of the auxiliary filter. Trim the plastic hose to length and insert it into the push-in elbow at the top of the filter. Secure the plastic hose to the inlet hose with the supplied cable ties.

4. Attach the hose from the bottom of the auxiliary filter to the inlet of the high pressure pump.

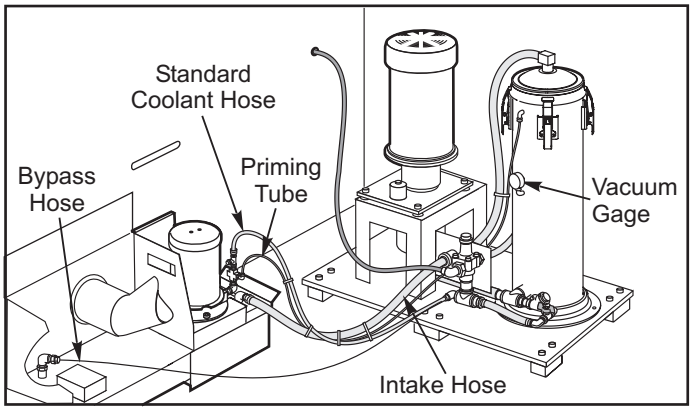
5. Check that the filter lid is securely closed.

6. Run the primary coolant system for ten minutes to prime the auxiliary filter before using the high pressure system.

NOTE: The intake filter on high pressure coolant is not used when the auxiliary filter is installed.

1000 Psi High Pressure Coolant Installation

Place the 1000psi HPC assembly next to the standard coolant pump.



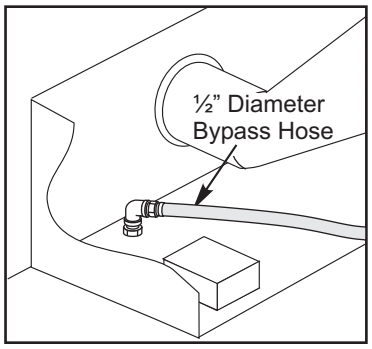
1. Connect the power cable for the pump assembly to an external source in order to power the motor. Note that the CNC control does not provide power to the pump motor. Customer supplied external power must be supplied at the time of installation. Power required is 208-230 volt 3-phase 50/60Hz, protected by a 20-amp circuit breaker. The pump assembly is pre-wired with a NEMA L15-20 plug.

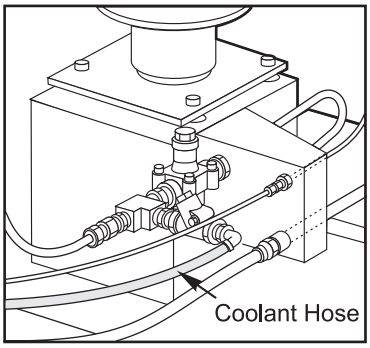
The pump assembly can also use an **alternate power source**, these are: 240-230V 50/60HZ @ 20A or 480V 50/60HZ @ 10A

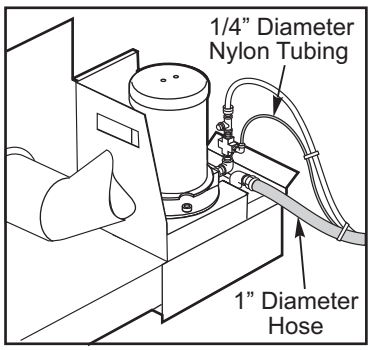
To power the pump assembly from an alternate source, first replace the plug at the end of the cable with an appropriate plug for the voltage being used. Then, rewire the pump motor according to the directions on the side of the motor.

2. Connect the 1" diameter intake hose from the HPC pump to the cover plate assembly on the coolant pump mount. Connect the 1/2" diameter bypass hose from the pressure regulator to the coolant tank.

3. Insert the 1/4" diameter nylon tubing from the HPC pump to the connector on the standard coolant pump.







Initial Start-Up

Ensure that a correct style tool is in place; a tool and tooling block with coolant passages.
Before using the 1000psi system the auxiliary filter must be primed. Run the standard coolant pump for 5 minutes, this will fill the auxiliary tank, through the priming hose.

To reduce wear and prolong the life of the auxiliary filter, the 1/4" nylon hose is connected between the standard coolant pump and the auxiliary filter which will maintain the coolant level in the filter tank.

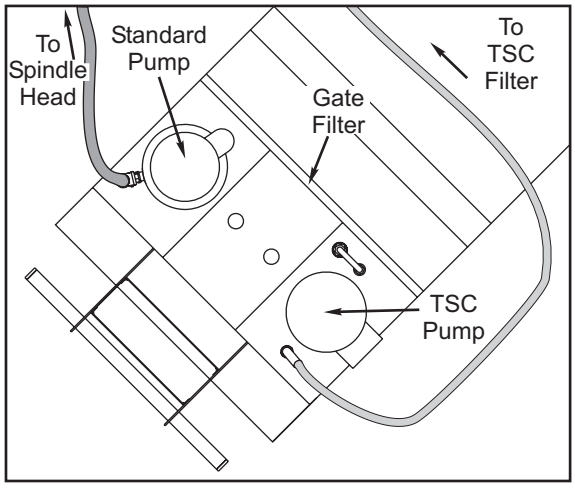
Pressure Regulator Adjustment

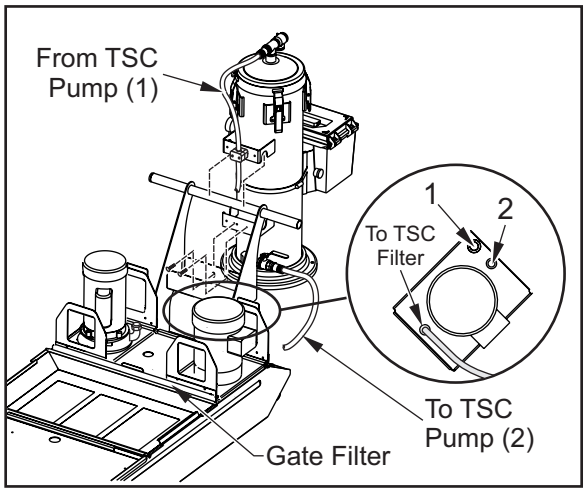
The pressure regulator has been set at 1000psi and tested at the factory. No further adjustment is required. However, to change the pressure, loosen the regulator jam nut. Turn the adjusting bolt clockwise to increase the pressure or counter clockwise to decrease the pressure. (Note, the system does not need to be on to change pressure) Tighten the regulator nut once the pressure has been set.

Optional Auxiliary Filter for HPC System

Installation

1. Hang the auxiliary filter assembly from the coolant tank handle and secure it with two 1/4-20 screws as shown.





Standard Filtration Setup

2. Connect the hose attached to the spindle head to the hose connection on the Standard Coolant Pump.

3. Separate the hoses coming from the Auxiliary Filter. They have been connected together for shipping.

4. Attach the Auxiliary Filter male connector (top hose) to female connector on the HPC Coolant Pump Assembly (Items labeled “1” in the previous illustration).

5. Attach the Auxiliary Filter female connector (bottom hose) to the short hose with the male connector on the HPC Coolant Pump Assembly (Items labeled “2” in the previous illustration).

6. Connect the plastic tubing (shipped tied to the Auxiliary Filter) from the small elbow fitting on the top of the Auxiliary Filter to the small elbow fitting on the Standard Coolant Pump hose connector.

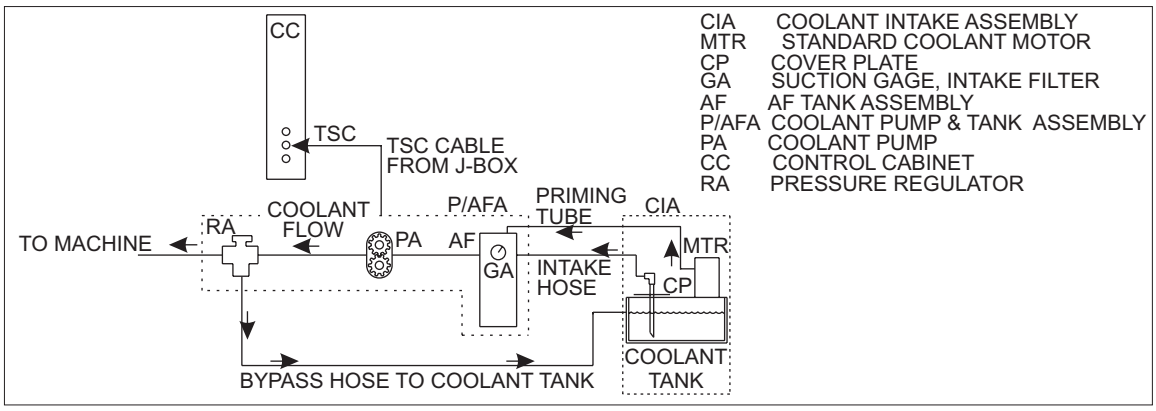
7. Connect the hose attached to the HPC Coolant Pump Assembly to the HPC Filter Assembly.

8. Make sure the filter lid is securely closed.

9. Run the primary coolant system for ten minutes to prime the bag filter housing before using the HPC system.

1000 PSI High-Pressure Coolant Installation

Place the 1000psi HPC assembly next to the coolant tank behind the machine with the hose connections facing the back of the machine. Use the following coolant schematic as an aid for hose routing.



1. Connect the power cable for the pump assembly to an external source in order to power the motor. Note that the CNC control does not provide power to the pump motor. Customer supplied external power must be supplied at the time of installation. The power required is 208-230 volt 3-phase 50/60Hz, and have a 20-amp circuit breaker. The pump assembly is pre-wired with a NEMA L15-20 plug.

The pump assembly can also use an alternate power source, these are:
240-230V 50/60HZ @ 20A or 480V 50/60HZ @ 10A

To power the pump assembly from an alternate source, first replace the plug at the end of the cable with an appropriate plug for the voltage being used. Then, rewire the pump motor according to the directions on the side of the motor.

2. Plug the HPC cable from HPC junction box (J-box) to the HPC amphenol port on the side of the control cabinet.

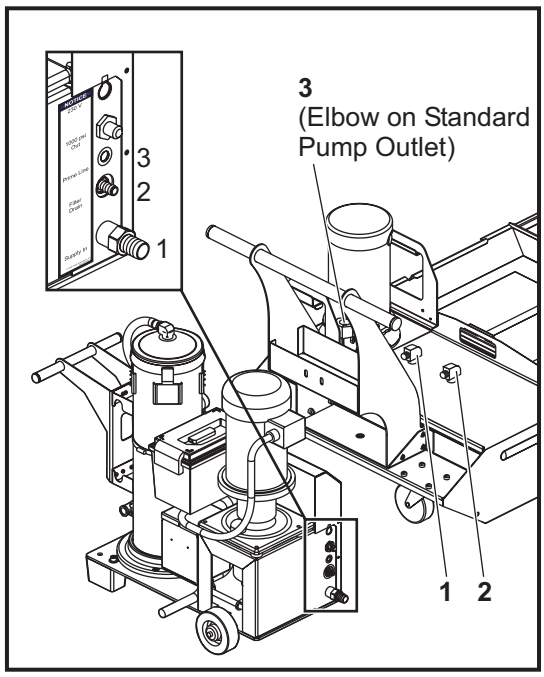
3. Connect the hose attached to the coolant connection on the spindle head to the hose connection on the Standard Coolant Pump.

4. Connect the hose attached to the HPC input on the machine's head to the connector labeled "1000 psi Out" on the HPC1000 connector panel (located on the side opposite the handle).

5. Attach the supply hose from the coolant tank lid to the connector labeled "Supply In" on the HPC1000 connector panel (items labeled "1" in the following illustration).

6. Connect the filter drain line from the coolant tank lid to the connector labeled "Filter Drain" on the HPC1000 connector panel (items labeled "2" in the following illustration).

7. Connect the plastic tubing (ships tied to the Auxiliary Filter) from the connector labeled "Prime Line" on the HPC1000 connector panel to the small elbow fitting on the Standard Coolant Pump hose connector (items labeled "3" in the following illustration).



TSC1000 / HPC1000 Setup

Initial Start-Up

Before using the 1000psi system the auxiliary filter must be primed. There are two ways to do this. The first is to run the standard coolant pump for 5 minutes. This will fill the auxiliary tank, through the priming hose.

The second method is to attach the wash down hose to the standard coolant pump. Turn on the standard coolant system (press “MDI”, then “Coolant”). It may be necessary to turn the valve(s) on the standard coolant pump to divert coolant to the hose. Open the auxiliary filter tank cover and use the wash down hose to fill the auxiliary filter with coolant. Replace the auxiliary tank cover and tighten securely.

NOTE: To ensure the HPC pump does not lose its priming, a 1/4” nylon hose is connected between the standard coolant pump and the auxiliary filter to maintain the coolant level in the filter tank.Pressure Regulator Adjustment

Machine Power On

WARNING!

DO NOT press POWER UP/RESTART on the control panel while the shipping bracket is in place.

With the main switch on the electrical panel set to ON, press and release POWER ON at the upper left of the control panel. After a few seconds, the display will appear on the screen.

Hydraulic Unit Phasing

The machine must be phased properly. Improper phasing will cause damage to the hydraulic unit and void the warranty.

1. Press and release the RESET button twice (or until all alarms are cancelled) to turn the axis motors on. (The message “ALARM” appears at the lower right of the screen if one or more alarms are in effect.)

NOTE: The hydraulic pump runs whenever the axis motors are energized.

2. Check the pump pressure gauge on the hydraulic unit. The hydraulic pump is located on the left side of the lathe. If the pressure reads zero, immediately power off the machine.

CAUTION! If the hydraulic pump is allowed to run for more than 30 seconds in this condition, serious damage will occur.

When pressure reads zero, it means the machine is not properly phased, and the pump is rotating backward. If the pressure gauge shows a proper pressure, the phasing is correct, and no further action is required.

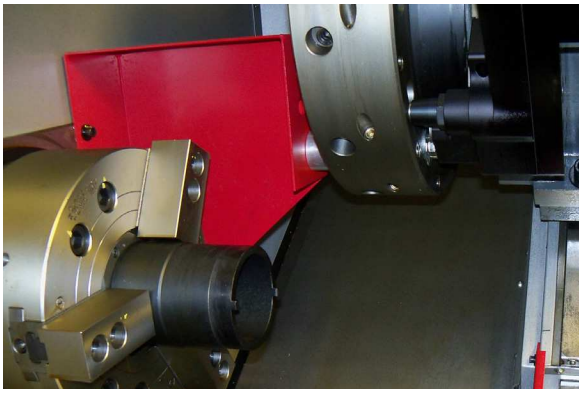
3. To properly phase the machine:
   - Make sure there is no power at the input side (top) of the main circuit breaker.
     MEASURE THE VOLTAGE!
   - Exchange any two wires at the input side (top) of the main circuit breaker
   - Close the control box.
   - Return to Step 1 and retest for proper phasing.

Removing Shipping and Lifting Brackets

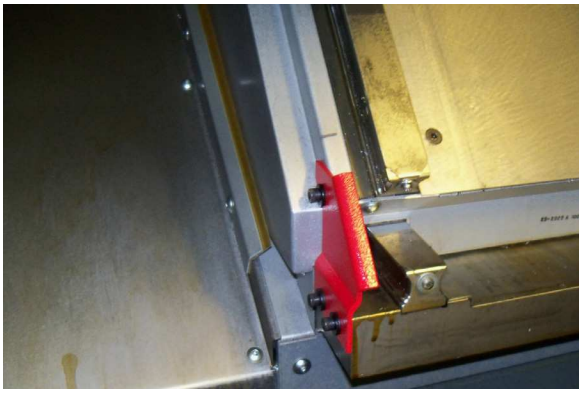
All brackets (shipping and lifting) must be removed before operating the machine. Use the following instructions and photographs to located each bracket and remove.

The order of removal is:

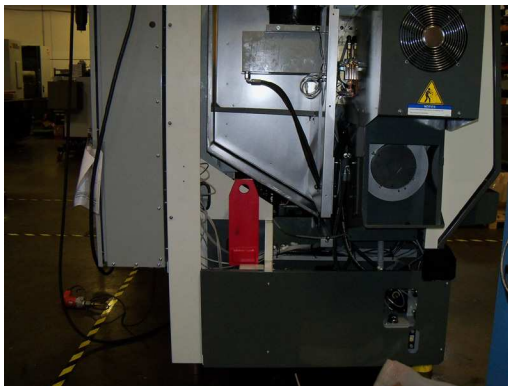
1. Remove rear lifting bracket and spindle shipping bracket.



2. Remove the Y-Axis shipping bracket (Y-axis lathes only).



3. Power up the machine and home Z-Axis only.
4. Remove left end lift bracket and front lifting shackle.



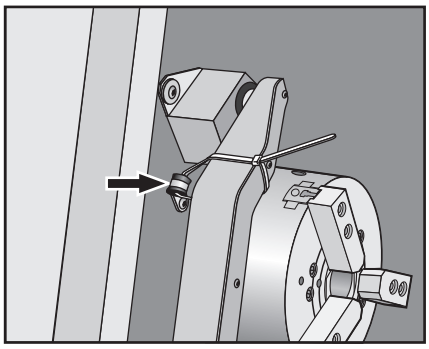
5. Press the Reset button twice, or until there are no alarms. The message “Alarm” appears at the lower right of the screen if the machine has an alarm.

NOTE: If any alarms are present and cannot be cleared with the Reset button, press the ALARM/MESGS for more information on the alarms. If you are unable to clear the alarms, write down the alarm numbers and call the factory.

6. Close the door and press and release the Zero Return button followed by the Auto All Axes button.

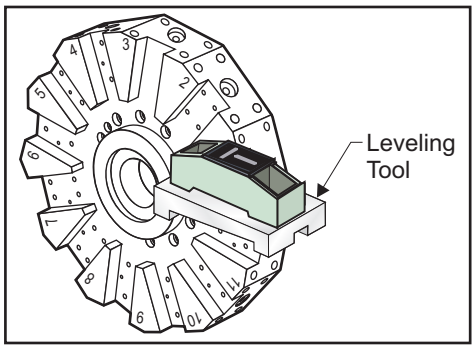
Optional Tool Probe

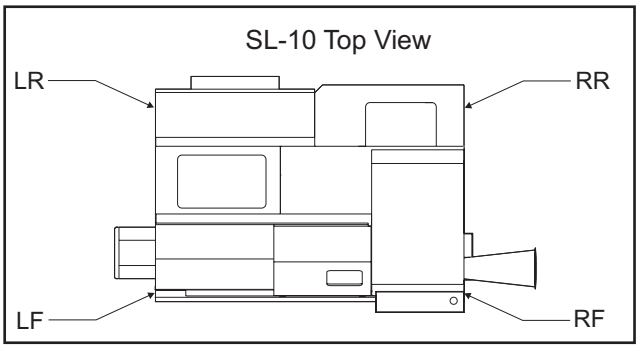
The Tool Probe is secured in place for shipping with a cable tie. Before operating the turning center, cut the cable tie. Remove screw holding cable clamp in place, remove cable clamp and re-install the screw.



SL-10 Leveling

1. Remove all weight from the right-front (RF) leveling screw. Place a machinist’s level on the leveling tool as shown. If the lathe has a VDI turret, install a VDI tool holder and clamp the leveling tool in the tool holder. Then place a machinist’s level on the leveling tool. Use the remaining 3 leveling screws to put the machine base within the measuring range of the level.





Leveling Screw Terms and Locations

2. Jog the Z-axis back and forth and adjust the pressure on the RF screw to remove roll from the Z-axis. Maximum acceptable roll deviation is 0.0005”/10 throughout the entire Z-axis travel.

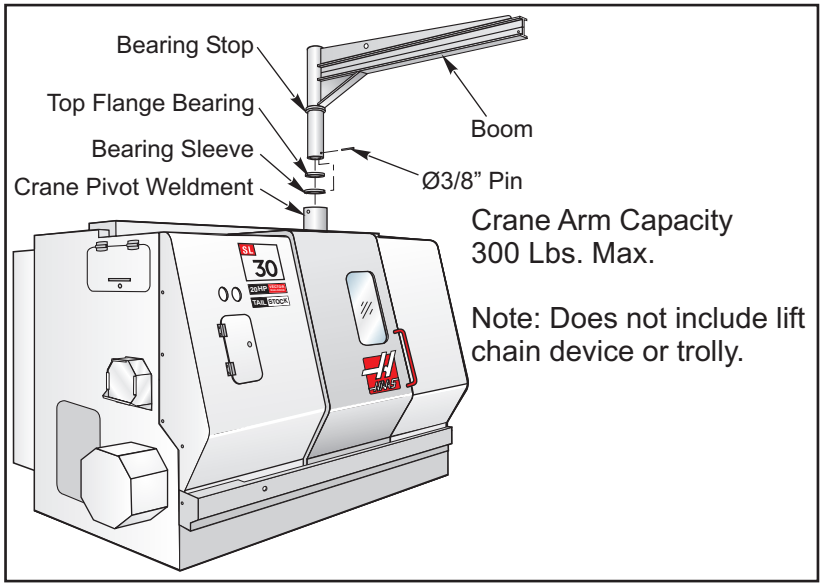
Crane Arm Installation Instructions for SL-30 and SL-40

1. Remove crane arm from the shipping base.

2. Slide the Top Flange Bearing onto the shaft of the boom with the flange facing the bearing stop. Slide the Lower Bearing onto the shaft and fasten in place with the Ø.38” pin.

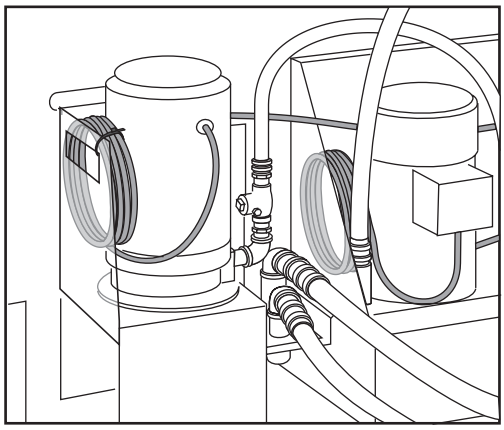
3. Lift crane arm into position over crane pivot weldment. There is a hole in the boom especially for lifting.

4. Lower the crane arm into place inside the crane pivot weldment.



Cable Handling/Storage

Complete the machine installation by looping and storing the extra lengths of electrical cables. Use the following techniques when dealing with excessive cable length.



- Loop cables individually, being careful to not force the cable into too sharp a bend and tie-wrap the loop. The cable bend radius should not be less than 4 times the diameter of the cable.
- Place the loop in the cable out of sight, hidden by the machine sheet metal, if possible.
- Do NOT allow the cables to rest on the floor.
- Do NOT coil a cable around another piece of machinery (such as a pump motor).

1102 Hass Chucker Lathe

Haas Automation, Inc.

Chucker Lathe

Operator's Manual Supplement
96-0226
Revision B
November 2017
English
Original Instructions

Haas Automation Inc.
2800 Sturgis Road
Oxnard, CA 93030-8933
U.S.A. | HaasCNC.com

This product uses Java Technology from Oracle Corporation and we request that you acknowledge that Oracle owns the Java Trademark and all Java related Trademarks and agree to comply with the trademark guidelines at www.oracle.com/us/legal/third-party-trademarks/index.html.

Any further distribution of the Java programs (beyond this appliance/machine) is subject to a legally binding End User License Agreement with Oracle. Any use of the commercial features for production purposes requires a separate license from Oracle.

LIMITED WARRANTY CERTIFICATE

Haas Automation, Inc.

Covering Haas Automation, Inc. CNC Equipment

Effective September 1, 2010

Haas Automation Inc. (“Haas” or “Manufacturer”) provides a limited warranty on all new mills, turning centers, and rotary machines (collectively, “CNC Machines”) and their components (except those listed below under Limits and Exclusions of Warranty) (“Components”) that are manufactured by Haas and sold by Haas or its authorized distributors as set forth in this Certificate. The warranty set forth in this Certificate is a limited warranty, it is the only warranty by Manufacturer, and is subject to the terms and conditions of this Certificate.

Limited Warranty Coverage

Each CNC Machine and its Components (collectively, “Haas Products”) are warranted by Manufacturer against defects in material and workmanship. This warranty is provided only to an end-user of the CNC Machine (a “Customer”). The period of this limited warranty is one (1) year. The warranty period commences on the date the CNC Machine is installed at the Customer’s facility. Customer may purchase an extension of the warranty period from an authorized Haas distributor (a “Warranty Extension”), any time during the first year of ownership.

Repair or Replacement Only

Manufacturer’s sole liability, and Customer’s exclusive remedy under this warranty, with respect to any and all Haas products, shall be limited to repairing or replacing, at the discretion of the Manufacturer, the defective Haas product.

Disclaimer of Warranty

This warranty is Manufacturer’s sole and exclusive warranty, and is in lieu of all other warranties of whatever kind or nature, express or implied, written or oral, including, but not limited to, any implied warranty of merchantability, implied warranty of fitness for a particular purpose, or other warranty of quality or performance or noninfringement. All such other warranties of whatever kind are hereby disclaimed by Manufacturer and waived by Customer.

Limits and Exclusions of Warranty

Components subject to wear during normal use and over time, including, but not limited to, paint, window finish and condition, light bulbs, seals, wipers, gaskets, chip removal system (e.g., augers, chip chutes), belts, filters, door rollers, tool changer fingers, etc., are excluded from this warranty. Manufacturer's specified maintenance procedures must be adhered to and recorded in order to maintain this warranty. This warranty is void if Manufacturer determines that (i) any Haas Product was subjected to mishandling, misuse, abuse, neglect, accident, improper installation, improper maintenance, improper storage, or improper operation or application, including the use of improper coolants or other fluids, (ii) any Haas Product was improperly repaired or serviced by Customer, an unauthorized service technician, or other unauthorized person, (iii) Customer or any person makes or attempts to make any modification to any Haas Product without the prior written authorization of Manufacturer, and/or (iv) any Haas Product was used for any non-commercial use (such as personal or household use). This warranty does not cover damage or defect due to an external influence or matters beyond the reasonable control of Manufacturer, including, but not limited to, theft, vandalism, fire, weather condition (such as rain, flood, wind, lightning, or earthquake), or acts of war or terrorism.

Without limiting the generality of any of the exclusions or limitations described in this Certificate, this warranty does not include any warranty that any Haas Product will meet any person's production specifications or other requirements, or that operation of any Haas Product will be uninterrupted or error-free. Manufacturer assumes no responsibility with respect to the use of any Haas Product by any person, and Manufacturer shall not incur any liability to any person for any failure in design, production, operation, performance, or otherwise of any Haas Product, other than repair or replacement of same as set forth in the warranty above.

Limitation of Liability and Damages

Manufacturer will not be liable to Customer or any other person for any compensatory, incidental, consequential, punitive, special, or other damage or claim, whether in an action in contract, tort, or other legal or equitable theory, arising out of or related to any Haas product, other products or services provided by Manufacturer or an authorized distributor, service technician, or other authorized representative of Manufacturer (collectively, "authorized representative"), or the failure of parts or products made by using any Haas Product, even if Manufacturer or any authorized representative has been advised of the possibility of such damages, which damage or claim includes, but is not limited to, loss of profits, lost data, lost products, loss of revenue, loss of use, cost of down time, business good will, any damage to equipment, premises, or other property of any person, and any damage that may be caused by a malfunction of any Haas product. All such damages and claims are disclaimed by Manufacturer and waived by Customer. Manufacturer's sole liability, and Customer's exclusive remedy, for damages and claims for any cause whatsoever shall be limited to repair or replacement, at the discretion of Manufacturer, of the defective Haas Product as provided in this warranty.

Customer has accepted the limitations and restrictions set forth in this Certificate, including, but not limited to, the restriction on its right to recover damages, as part of its bargain with Manufacturer or its Authorized Representative. Customer realizes and acknowledges that the price of the Haas Products would be higher if Manufacturer were required to be responsible for damages and claims beyond the scope of this warranty.

Entire Agreement

This Certificate supersedes any and all other agreements, promises, representations, or warranties, either oral or in writing, between the parties or by Manufacturer with respect to subject matter of this Certificate, and contains all of the covenants and agreements between the parties or by Manufacturer with respect to such subject matter. Manufacturer hereby expressly rejects any other agreements, promises, representations, or warranties, either oral or in writing, that are in addition to or inconsistent with any term or condition of this Certificate. No term or condition set forth in this Certificate may be modified or amended, unless by a written agreement signed by both Manufacturer and Customer. Notwithstanding the foregoing, Manufacturer will honor a Warranty Extension only to the extent that it extends the applicable warranty period.

Transferability

This warranty is transferable from the original Customer to another party if the CNC Machine is sold via private sale before the end of the warranty period, provided that written notice thereof is provided to Manufacturer and this warranty is not void at the time of transfer. The transferee of this warranty will be subject to all terms and conditions of this Certificate.

Miscellaneous

This warranty shall be governed by the laws of the State of California without application of rules on conflicts of laws. Any and all disputes arising from this warranty shall be resolved in a court of competent jurisdiction located in Ventura County, Los Angeles County, or Orange County, California. Any term or provision of this Certificate that is invalid or unenforceable in any situation in any jurisdiction shall not affect the validity or enforceability of the remaining terms and provisions hereof, or the validity or enforceability of the offending term or provision in any other situation or in any other jurisdiction.

Customer Feedback

If you have concerns or questions regarding this Operator's Manual, please contact us on our website, www.HaasCNC.com. Use the "Contact Haas" link and send your comments to the Customer Advocate.

You can find an electronic copy of this manual and other useful information on our website in the "Resource Center". Join Haas owners online and be a part of the greater CNC community at these sites:


diy.haascnc.com
The Haas Resource Center: DIY Documentation and Procedures


haasparts.com
Your Source for Genuine Haas Parts


www.facebook.com/HaasAutomationInc
Haas Automation on Facebook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Follow us on Twitter


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Haas Automation on LinkedIn

www.youtube.com/user/haasautomation
Product videos and information


www.flickr.com/photos/haasautomation
Product photos and information

Customer Satisfaction Policy

Dear Haas Customer,

Your complete satisfaction and goodwill are of the utmost importance to both Haas Automation, Inc. and the Haas distributor (HFO) where you purchased your equipment. Normally, your HFO will rapidly resolve any concerns you have about your sales transaction or the operation of your equipment.

However, if your concerns are not resolved to your complete satisfaction, and you have discussed your concerns with a member of the HFO's management, the General Manager, or the HFO's owner directly, please do the following:

Contact Haas Automation's Customer Service Advocate at 805-988-6980. So that we may resolve your concerns as quickly as possible, please have the following information available when you call:

- Your company name, address, and phone number
- The machine model and serial number
- The HFO name, and the name of your latest contact at the HFO
- The nature of your concern

If you wish to write Haas Automation, please use this address:

Haas Automation, Inc. U.S.A.
2800 Sturgis Road
Oxnard CA 93030
Att: Customer Satisfaction Manager
email: customerservice@HaasCNC.com

Once you contact the Haas Automation Customer Service Center, we will make every effort to work directly with you and your HFO to quickly resolve your concerns. At Haas Automation, we know that a good Customer-Distributor-Manufacturer relationship will help ensure continued success for all concerned.

International:

Haas Automation, Europe
Mercuriusstraat 28, B-1930
Zaventem, Belgium
email: customerservice@HaasCNC.com

Haas Automation, Asia
No. 96 Yi Wei Road 67,
Waigaoqiao FTZ
Shanghai 200131 P.R.C.
email: customerservice@HaasCNC.com

Declaration of Conformity

Product: CNC Lathes (Turning Centers)*

*Including all options factory- or field-installed by a certified Haas Factory Outlet (HFO)

Manufactured By: Haas Automation, Inc.

2800 Sturgis Road, Oxnard CA 93030

805-278-1800

We declare, in sole responsibility, that the above-listed products, to which this declaration refers, comply with the regulations as outlined in the CE directive for Machining Centers:

- Machinery Directive 2006 / 42 / EC
- Electromagnetic Compatibility Directive 2014 / 30 / EU
- Low Voltage Directive 2014 / 35 / EU
- Additional Standards:
  - EN 60204-1:2006 / A1:2009
  - EN 614-1:2006+A1:2009
  - EN 894-1:1997+A1:2008
  - CEN 13849-1:2015

RoHS: COMPLIANT by Exemption per producer documentation. Exempt by:

a) Large scale stationary industrial tool
b) Monitoring and control systems
c) Lead as an alloying element in steel, aluminum, and copper

Person authorized to compile technical file:

Jens Thing

Address:

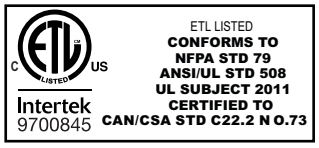
Haas Automation Europe
Mercuriusstraat 28
B-1930 Zaventem
Belgium

USA: Haas Automation certifies this machine to be in compliance with the OSHA and ANSI design and manufacturing standards listed below. Operation of this machine will be compliant with the below-listed standards only as long as the owner and operator continue to follow the operation, maintenance, and training requirements of these standards.

- *OSHA 1910.212 - General Requirements for All Machines*
- *ANSI B11.5-1984 (R1994) Lathes*
- *ANSI B11.19-2003 Performance Criteria for Safeguarding*
- *ANSI B11.22-2002 Safety Requirements for Turning Centers and Automatic Numerically Controlled Turning Machines*
- *ANSI B11.TR3-2000 Risk Assessment and Risk Reduction - A Guideline to Estimate, Evaluate, and Reduce Risks Associated with Machine Tools*

CANADA: As the original equipment manufacturer, we declare that the listed products comply with regulations as outlined in the Pre-Start Health and Safety Reviews Section 7 of Regulation 851 of the Occupational Health and Safety Act Regulations for Industrial Establishments for machine guarding provisions and standards.

Further, this document satisfies the notice-in-writing provision for exemption from Pre-Start inspection for the listed machinery as outlined in the Ontario Health and Safety Guidelines, PSR Guidelines dated April 2001. The PSR Guidelines allow that notice in writing from the original equipment manufacturer declaring conformity to applicable standards is acceptable for the exemption from Pre-Start Health and Safety Review.



All Haas CNC machine tools carry the ETL Listed mark, certifying that they conform to the NFPA 79 Electrical Standard for Industrial Machinery and the Canadian equivalent, CAN/CSA C22.2 No. 73. The ETL Listed and cETL Listed marks are awarded to products that have successfully undergone testing by Intertek Testing Services (ITS), an alternative to Underwriters' Laboratories.

Haas Automation has been assessed for conformance with the provisions set forth by ISO 9001:2008. Scope of Registration: Design and Manufacture of CNC Machines Tools and Accessories, Sheet Metal Fabrication. The conditions for maintaining this certificate of registration are set forth in ISA's Registration Policies 5.1. This registration is granted subject to the organization maintaining compliance to the noted stardard. The validity of this certificate is dependent upon ongoing surveillance audits.

Original Instructions

How to Use This Manual

To get the maximum benefit of your new Haas machine, read this manual thoroughly and refer to it often. The content of this manual is also available on your machine control under the HELP function.

IMPORTANT: Before you operate the machine, read and understand the Operator's Manual Safety chapter.

Declaration of Warnings

Throughout this manual, important statements are set off from the main text with an icon and an associated signal word: "Danger," "Warning," "Caution," or "Note." The icon and signal word indicate the severity of the condition or situation. Be sure to read these statements and take special care to follow the instructions.

Description	Example
Danger means that there is a condition or situation that **will cause death or severe injury** if you do not follow the instructions given.	 ***DANGER:*** *No step. Risk of electrocution, bodily injury, or machine damage. Do not climb or stand on this area.*
Warning means that there is a condition or situation that **will cause moderate injury** if you do not follow the instructions given.	 ***WARNING:*** *Never put your hands between the tool changer and the spindle head.*
Caution means that **minor injury or machine damage could occur** if you do not follow the instructions given. You may also have to start a procedure over if you do not follow the instructions in a caution statement.	 ***CAUTION:*** *Power down the machine before you do maintenance tasks.*
Note means that the text gives **additional information, clarification, or helpful hints.**	 ***NOTE:*** *Follow these guidelines if the machine is equipped with the optional extended Z-clearance table.*

Text Conventions Used in this Manual

Description	Text Example
Code Block text gives program examples.	`G00 G90 G54 X0. Y0.;`
A **Control Button Reference** gives the name of a control key or button that you are to press.	Press **[CYCLE START]**.
A **File Path** describes a sequence of file system directories.	*Service* > *Documents and Software* >...
A **Mode Reference** describes a machine mode.	MDI
A **Screen Element** describes an object on the machine's display that you interact with.	Select the **SYSTEM** tab.
System Output describes text that the machine control displays in response to your actions.	`PROGRAM END`
User Input describes text that you should enter into the machine control.	`G04 P1.;`
Variable n indicates a range of non-negative integers from 0 to 9.	`Dnn` represents `D00` through `D99`.

Contents

Chapter 1: Safety

1.1 General Safety Notes

CAUTION: *Only authorized and trained personnel may operate this equipment. You must always act in accordance with the Operator's manual, safety decals, safety procedures, and instructions for safe machine operation. Untrained personnel present a hazard to themselves and the machine.*

IMPORTANT: *Do not operate this machine until you have read all warnings, cautions, and instructions.*

CAUTION: *The sample programs in this manual have been tested for accuracy, but they are for illustrative purposes only. The programs do not define tools, offsets, or materials. They do not describe workholding or other fixturing. If you choose to run a sample program on your machine, do so in Graphics mode. Always follow safe machining practices when you run an unfamiliar program.*

All CNC machines contain hazards from rotating work, loosely clamped parts, belts and pulleys, high voltage electricity, noise, and compressed air. You must always follow basic safety precautions to reduce the risk of personal injury and mechanical damage.

The work area must be adequately illuminated to allow clear view and safe operation of the machine. This includes the operator work area and all areas of the machine that might be accessed during maintenance or cleaning. Adequate illumination is the responsibility of the user.

Cutting tools, workholding, workpiece and coolant are beyond the scope and control of Haas Automation, Inc. Each of these potential hazards associated with it (sharp edges, heavy lifting considerations, chemical composition, etc) and it is the responsibility of the user to take appropriate action (PPE, training, etc).

Cleaning of the machine is required during normal use and prior to maintenance or repair. Optional equipment is available to aid cleaning such as washdown hoses, chip conveyors and chip augers. Safe use of this equipment requires training and might require appropriate PPE and is the responsibility of the user.

This operator’s manual is intended as a reference guide and is not to be the sole source of training. Complete operator training is available from the authorized Haas distributor.

1.1.1 Summary of Types of Operation for Haas Automation Machine Tools

Haas CNC Lathes are intended for cutting and shaping of metals and other hard materials. They are general purpose in nature and a list of all of those materials and types of cutting would never be complete. Almost all cutting and shaping is performed by a rotating part clamped in a chuck. The tools are held on a turret. Some cutting operations require liquid coolant. That coolant is also an option depending on the type of cutting.

Operations of Haas Lathes are separated into three areas. They are: Operations, Maintenance, and Service. Operations and Maintenance are intended to be performed by a trained and qualified machine operator. This Operator's Manual contains some of the information necessary to operate the machine. All other machine operations are to be considered Service. Service is only to be performed by specially trained service personnel.

Operation of this machine consists of the following:

1. Machine Setup
    - Machine setup is done to initially set up the tools, offsets, and fixtures required to perform a repetitive function that later is called machine operation. Some machine setup functions can be done with the door open but are limited to “hold to run”.
2. Machine operating in Automatic Mode
    - Automatic operation is initiated with Cycle-Start and can only be done with the doors closed.
3. Operator loading and unloading of materials (parts)
    - Parts loading and unloading is what precedes and follows an automatic operation. This must be done with the doors open and all machine automatic motion is stopped when the door is open.
4. Operator loading and unloading of cutting tools
    - Tool loading and unloading is done less often than setup. It is often required when a tool has become worn and must be replaced.

Maintenance only consists of the following:

1. Adding and maintaining condition of coolant
    - Adding coolant and maintaining coolant concentration is required at regular intervals. This is a normal operator function and is either done from a safe location outside of the work enclosure or with the doors open and the machine stopped.
2. Adding lubricants

- Adding lubricants for spindle and axes is required at regular intervals. These are often months or years in length. This is a normal operator function and is always done from a safe location outside of the work enclosure.

3. Cleaning chips out of the machine

   - Cleaning out of chips is required at intervals dictated by the type of machining performed. This is a normal operator function. It is performed with the doors open and all of the machine operation is stopped.

Service only consists of the following:

1. Repairing of a machine that is not operating correctly

   - Any machine that is not operating correctly requires service by factory trained personnel. This is never an operator function. It is not considered maintenance. Installation and service instructions are provided separately from the Operator's Manual.

2. Machine moving, unpacking, and installation

   - Haas machines are shipped to a user's location almost ready to operate. They still require a trained service person to complete the installation. Installation and service instructions are provided separately from the Operator's Manual.

3. Machine packing

   - Machine packing for shipment requires the same packing material supplied by Haas in the original shipment. Packing requires a trained service person to complete the installation. Shipping instructions are provided separately from the Operator's Manual.

4. Decommission, dismantle and disposal

   - Machine is not expected to be disassembled for shipment; it can be moved in its entirety in the same manner in which it was installed. Machine can be returned to the manufacturer's distributor for disposal; manufacturer accepts any/all components for recycling per Directive 2002/96/EC.

5. End-of-life disposal

   - End-of-life disposal must conform to the laws and regulations in the region the machine is located. This is a jointly the responsibility of the owner and seller of the machine. The risk analysis does not address this phase.

1.1.2 Read Before Operating

DANGER: *Do not enter the machining area any time the machine is in motion, or at any time that machine motion is possible. Severe injury or death may result. Motion is possible when the power is on and the machine is not in* **[EMERGENCY STOP]**.

Basic safety:

- This machine can cause severe bodily injury.
- This machine is automatically controlled and may start at any time.
- Consult your local safety codes and regulations before you operate the machine. Contact your dealer if you have questions about safety issues.
- It is the machine owner's responsibility to make sure that everyone who is involved in installing and operating the machine is fully acquainted with the operation and safety instructions provided with the machine, BEFORE they work with the machine. The ultimate responsibility for safety rests with the machine owner and the individuals who work with the machine.
- Use appropriate eye and ear protection when you operate the machine.
- Use appropriate gloves to remove processed material and to clean the machine.
- Replace windows immediately if they are damaged or severely scratched.

Electrical safety:

- The electrical power must meet the required specifications. Attempting to run the machine from any other source can cause severe damage and will void the warranty.
- The electrical panel should be closed and the key and latches on the control cabinet should be secured at all times, except during installation and service. At those times, only qualified electricians should have access to the panel. When the main circuit breaker is on, there is high voltage throughout the electrical panel (including the circuit boards and logic circuits) and some components operate at high temperatures; therefore, extreme caution is required. Once the machine is installed, the control cabinet must be locked, with the key available only to qualified service personnel.
- Do not reset a circuit breaker until the reason for the fault is investigated and understood. Only Haas-trained service personnel should troubleshoot and repair Haas equipment.
- Do not press **[POWER UP]** on the control pendant before the machine is fully installed.

Operation Safety:

- Do not operate the machine unless the doors are closed and the door interlocks are functioning correctly.

- Check for damaged parts and tools before you operate the machine. Any part or tool that is damaged should be properly repaired or replaced by authorized personnel. Do not operate the machine if any component does not appear to be functioning correctly.
- When a program runs, the tool turret can move rapidly at any time.
- Improperly clamped parts machined at high speeds/feeds may be ejected and puncture the enclosure. It is not safe to machine oversized or marginally clamped parts.

Release of person trapped in the machine:

- No person should every be located inside the machine during operation
- In the unlikely event a person is trapped inside the machine the emergency stop button should be immediately depressed and the person removed

Recover from a jam or blockage:

- Of the chip conveyor - Follow the cleaning instructions on the Haas Resource Center (diy.haascnc.com). If necessary, close the doors and reverse the conveyor so the jammed part or material is accessible, and remove. Use lifting equipment or get assistance for lifting heavy and awkward parts.
- Of a tool and material/part - Close the doors, press **[RESET]** to clear and displayed alarms. Jog the axis so the tool and material are clear.
- If the alarms do not reset or you are unable to clear a blockage, contact your Haas Factory Outlet (HFO) for assistance.

Follow these guidelines when you work with the machine:

- Normal operation - Keep the door closed and guards in place (for non-enclosed machines) while the machine operates.
- Part loading and unloading – An operator opens the door, completes the task, closes the door, and then presses **[CYCLE START]** (starting automatic motion).
- Machining job set-up – When set-up is complete, turn the set-up key to lock out set-mode and remove the key.
- Maintenance / Machine Cleaner– Press **[EMERGENCY STOP]** or **[POWER OFF]** on the machine before you enter the enclosure.
- Tool loading or unloading – A machinist enters the machining area to load or unload tools. Exit the area completely before automatic movement is commanded (for example, **[NEXT TOOL]**, **[TURRET FWD]**, **[TURRET REV]**).

Chuck safety:

DANGER: *Improperly clamped parts or oversized parts may be ejected with deadly force.*

- Do not exceed the chuck's rated speed. Higher speeds reduce chuck clamping force.

- Unsupported barstock must not extend outside the drawtube.
- Grease the chuck weekly. Follow the chuck manufacturer's instructions for regular service.
- Chuck jaws must not protrude beyond the diameter of the chuck.
- Do not machine parts larger than the chuck.
- Follow all of the chuck manufacturer's warnings regarding the chuck and workholding procedures.
- Hydraulic pressure must be set correctly to securely hold the work piece without distortion.
- Improperly clamped parts at high velocity may puncture the safety door. You must reduce the spindle speed to protect the operator when performing dangerous operations (e.g. turning oversized or marginally clamped parts).

Periodic maintenance of machine safety features:

- Inspect door interlock mechanism for proper fit and function.
- Inspect safety windows and enclosure for damage or leaks.
- Verify all enclosure panels are in place.

Door Safety Interlock maintenance:

- Inspect the door interlock, verify the door interlock key is not bent, misaligned, and that all fasteners are installed.
- Inspect the door interlock itself for any signs of obstruction or misalignment.
- Immediately replace an components of the Door Safety Interlock system that do not meet this criteria.

Door Safety Interlock testing:

- With the machine in run mode, close the machine door, run the spindle at 100 RPM, pull the door and verify the door does not open.

Machine Enclosure and Safety Glass maintenance and testing:

Routine Maintenance:

- Visually inspect the enclosure and safety glass for any signs of distortion, breakage or other damage.
- Replace the Lexan windows after 7 years or if they are damaged or severely scratched.
- Keep all safety glass and machine windows clean to allow proper viewing of the machine during operations.
- A daily visual inspection of the machine enclosure to verify all panels are in place should be performed.

Testing of machine enclosure:

- No testing of the machine enclosure is necessary.

1.1.3 Machine Environmental Limits

This table list the environmental limits for safe operation:

T1.1: Environmental Limits (Indoor Use Only)

	Minimum	Maximum
Operating Temperature	41 °F (5.0 °C)	122 °F (50.0 °C)
Storage Temperature	-4 °F (-20.0 °C)	158 °F (70.0 °C)
Ambient Humidity	20% relative, non-condensing	90% relative, non-condensing
Altitude	Sea Level	6,000 ft. (1,829 m)

CAUTION: *Do not operate the machine in explosive atmospheres (explosive vapors and/ or particulate matter).*

1.1.4 Machine Noise Limits

CAUTION: *Take precautions to prevent hearing damage from machine/machining noise. Wear ear protection, change your application (tooling, spindle speed, axis speed, fixturing, programmed path) to reduce noise, or restrict access to machine area during cutting.*

Typical noise levels at the operator's position during normal operation are as follows:

- **A-Weighted** sound pressure level measurements will be 69.4dB or lower.
- **C-Weighted** instantaneous sound pressure levels will be 78.0dB or lower.
- **LwA** (sound power level A-weighted) will be 75.0dB or lower.

NOTE: *Actual noise levels while cutting material are greatly affected by the user's choice of material, cutting tools, speeds and feeds, workholding and other factors. These factors are application specific and are controlled by the user, not Haas Automation Inc.*

1.2 Unattended Operation

Fully enclosed Haas CNC machines are designed to operate unattended; however, your machining process may not be safe to operate unmonitored.

As it is the shop owner's responsibility to set up the machine safely and use best practice machining techniques, it is also the owner's responsibility to manage the progress of these methods. You must monitor your machining process to prevent damage, injury, or loss of life if a hazardous condition occurs.

For example, if there is the risk of fire due to the material machined, then you must install an appropriate fire suppression system to reduce the risk of harm to personnel, equipment, and the building. Contact a specialist to install monitoring tools before machines are allowed to run unattended.

It is especially important to select monitoring equipment that can immediately detect a problem and perform an appropriate action without human intervention.

1.3 Setup Mode

All Haas CNC machines are equipped with locks on the operator doors and a key switch on the side of the control pendant to lock and unlock setup mode. Generally, setup mode status (locked or unlocked) affects how the machine operates when the doors are opened.

Setup mode should be locked out (the keyswitch in the vertical, locked position) at most times. In locked mode, the enclosure doors are locked closed during CNC program execution, spindle rotation or axis movement. The doors automatically unlock when the machine is not in cycle. Many machine functions are unavailable with the door open.

When unlocked, setup mode allows a skilled machinist more access to the machine to set up jobs. In this mode, machine behavior is dependent on whether the doors are opened or closed. Opening the doors when the machine is in cycle stops motion and reduces spindle speed. The machine allows several functions in setup mode with the doors opened, usually at reduced speed. The following charts summarize the modes and allowed functions.

Machines with software version 100.17.000.1016 or higher have Parameter 2083, Setup Mode Safety Type, that affects the machine's Setup mode. When Parameter 2083 is set to **`Normal`**, the machine Setup and Run modes behave as outlined in the table that follows. When Parameter 2083 is set to **`Strict`**, both the Setup and Run modes adhere to the Run mode behaviors. Contact your local Haas Factory Outlet to set Parameter 2083 to your desired setting on your machine.

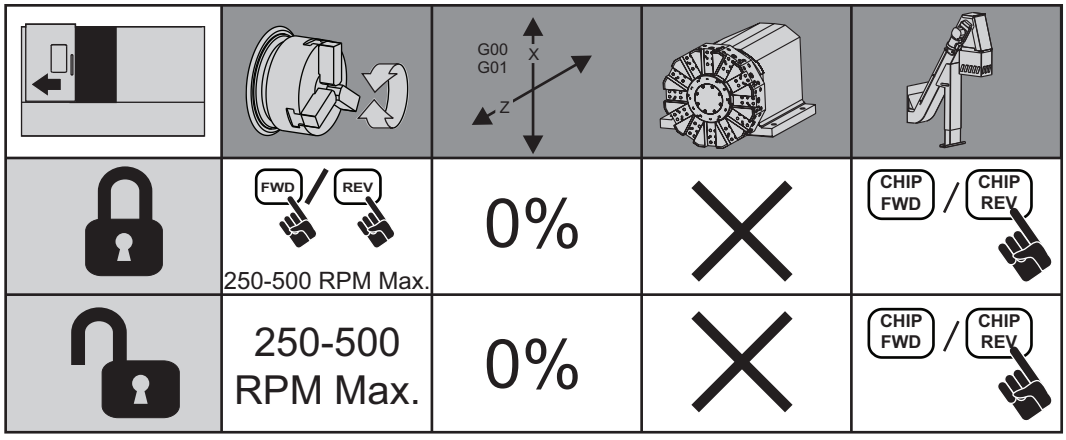
DANGER: *Do not attempt to override safety features. Doing so makes the machine unsafe and voids the warranty.*

1.3.1 Machine Behavior with the Door Open

For safety, machine operations stop when the door is open and the setup keyswitch is locked. The unlocked position allows limited machine functions with the door open.

T1.2: Setup / Run Mode Limited Overrides with the Machine Doors Open

Machine Function	Keyswitch Locked	Keyswitch Unlocked
Maximum Rapid	Not allowed.	Not allowed.
Cycle Start	Not allowed. No machine motion or program execution.	Not allowed. No machine motion or program execution.
Spindle **[FWD]** / **[REV]**	Allowed, but you must press and hold **[FWD]** or **[REV]**. Maximum 250-500 RPM, depending on the lathe model.	Allowed, but maximum 250-500 RPM, depending on the lathe model.
Tool Change	Not allowed.	Not allowed.
Next Tool	Not allowed.	Not allowed.
Opening door while a program is running	Not allowed. The door is locked.	Allowed, but axis motion stops and the spindle slows to a maximum of 250-500 RPM.
Conveyor motion	Allowed, but you must press and hold **[CHIP REV]** to run in reverse.	Allowed, but you must press and hold **[CHIP REV]** to run in reverse.



1.3.2 Robot Cells

A machine in a robot cell is allowed to run a program while the door is open, regardless of the position of the Run-Setup key. While the door is open, the spindle speed is limited to the lower of the factory RPM limit or Setting 292, Door Open Spindle Speed Limit. If the door is opened while the spindle RPM is above the limit, the spindle will decelerate to the limit RPM. Closing the door removes the limit and the programmed RPM is restored.

This open-door condition is allowed only while a robot communicates with the CNC machine. Typically, an interface between the robot and the CNC machine addresses the safety of both machines.

Robot cell setup is beyond the scope of this manual. Work with a robot-cell integrator and your HFO to correctly set up a safe robot cell.

1.4 Modifications to the Machine

Haas Automation, Inc. is not responsible for damage caused by modifications you make to your Haas machine(s) with parts or kits not manufactured or sold by Haas Automation, Inc. The use of such parts or kits may void your warranty.

Some parts or kits manufactured or sold by Haas Automation, Inc. are considered user-installable. If you choose to install these parts or kits yourself, be sure to completely read the accompanying installation instructions. Make sure you understand the procedure, and how to do it safely, before you begin. If you have any doubts about your ability to complete the procedure, contact your Haas Factory Outlet (HFO) for assistance.

1.5 Improper Coolants

Coolant is an important part of many machining operations. When it is correctly used and maintained, coolant can improve part finish, lengthen tool life, and protect machine components from rust and other damage. Improper coolants, however, can cause significant damage to your machine.

Such damage can void your warranty, but it can also introduce hazardous conditions to your shop. For example, coolant leaks through damaged seals could create a slipping hazard.

Improper coolant use includes, but is not limited to, these points:

- Do not use plain water. This causes machine components to rust.
- Do not use flammable coolants.
- Do not use straight or “neat” mineral-oil products. These products cause damage to rubber seals and tubing throughout the machine. If you use a minimum-quantity lubrication system for near-dry machining, use only the recommended oils.

Machine coolant must be water-soluble, synthetic oil-based or synthetic-based coolant or lubricant.

NOTE: *Be sure to maintain your coolant mixture to keep the coolant concentrate at acceptable levels. Improperly maintained coolant mixtures can allow machine components to rust. Rust damage is not covered by your warranty.*

Ask your HFO or your coolant dealer if you have questions about the specific coolant that you plan to use. The Haas Resource Center website has videos and other general information about coolant use and maintenance. You can also scan the code below with your mobile device to directly access this information.

1.6 Safety Decals

The Haas factory puts decals on your machine to quickly communicate possible hazards. If decals become damaged or worn, or if you need additional decals to emphasize a particular safety point, contact your Haas Factory Outlet (HFO).

NOTE: *Never alter or remove any safety decal or symbol.*

Be sure to familiarize yourself with the symbols on the safety decals. The symbols are designed to quickly tell you the type of information they give:

- Yellow Triangle - Describes a hazard.
- Red Circle with Slash-Through - Describes a prohibited action.
- Green Circle - Describes a recommended action.
- Black Circle - Gives information about machine or accessory operation.

F1.1: Example Safety Decal Symbols: [1] Hazard Description, [2] Prohibited Action, [3] Recommended Action.

1.6.1 Decal Symbols Reference

This section gives explanations and clarifications for the safety symbols you will see on your machine.

T1.3: Hazard Symbols – Yellow Triangles

Symbol	Description
	Moving parts can entangle, trap, crush, and cut. Keep all parts of your body away from machine parts when they move, or whenever motion is possible. Motion is possible when the power is on and the machine is not in **[EMERGENCY STOP]**. Secure loose clothing, hair, etc. Remember that automatically controlled devices can start at any time.
	Do not extend unsupported bar stock out the rear of the drawtube. Unsupported bar can bend and “whip”. A whipping bar can cause severe injury or death.
	The Regen is used by the spindle drive to dissipate excess power and will get hot. Always use care around the Regen.

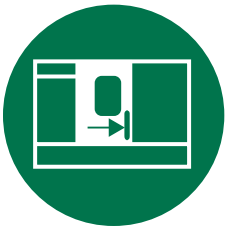
Symbol	Description
	There are high voltage components on the machine that can cause electrical shock. Always use care around high voltage components.
	Always securely clamp workpieces in the chuck or collet. Properly fasten chuck jaws.
	Secure loose clothing, hair, jewelry, etc. Do not wear gloves around rotating machine components. You can be pulled into the machine, resulting in severe injury or death. Automatic motion is possible when the power is on and the machine is not in **[EMERGENCY STOP]**.

T1.4: Prohibited Action Symbols – Red Circles with Slash-Through

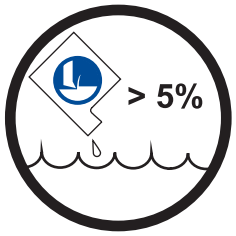
Symbol	Description
	Do not enter the machine enclosure when the machine is capable of automatic motion. When you must enter the enclosure to complete tasks, press **[EMERGENCY STOP]** or power off the machine. Put a safety tag on the control pendant to alert other people that you are inside the machine, and that they must not turn on or operate the machine.
	Do not machine ceramics.

Symbol	Description
	Do not use chuck jaw extensions. Do not extend chuck jaws beyond the chuck face.
	Keep your hands and body away from the area between the tailstock and workholding when automatic motion is possible.
	Do not use pure water as coolant. This will cause machine components to rust. Always use a rust-inhibitive coolant concentrate with water.

T1.5: Recommended Action Symbols – Green Circles

Symbol	Description
	Keep the machine doors closed.
	Always wear safety glasses or goggles when you are near a machine. Airborne debris can cause eye damage. Always wear hearing protection when you are near a machine. Machine noise can exceed 70 dBA.
	Read and understand the operator's manual and other instructions included with your machine.
	Grease and maintain the chuck regularly. Follow the manufacturer's instructions.

T1.6: Informational Symbols – Black Circles

Symbol	Description
	Maintain the recommended coolant concentration. A “lean” coolant mixture (less concentrated than recommended) may not effectively prevent machine components from rusting. A “rich” coolant mixture (more concentrated than recommended) wastes coolant concentrate without further benefit over the recommended concentration.

1.6.2 Other Safety Information

You may find other decals on your machine, depending on the model and options installed. Be sure to read and understand these decals. These are examples of other safety decals in English. You can contact your Haas Factory Outlet (HFO) to get these decals in other languages.

1.7 More Information Online

For updated and supplemental information, including tips, tricks, maintenance procedures, and more, go to DIY.HaasCNC.com.

You can also scan this code with your mobile device to directly access the “Best Practices” page on the Resource Center, which includes information about safety.

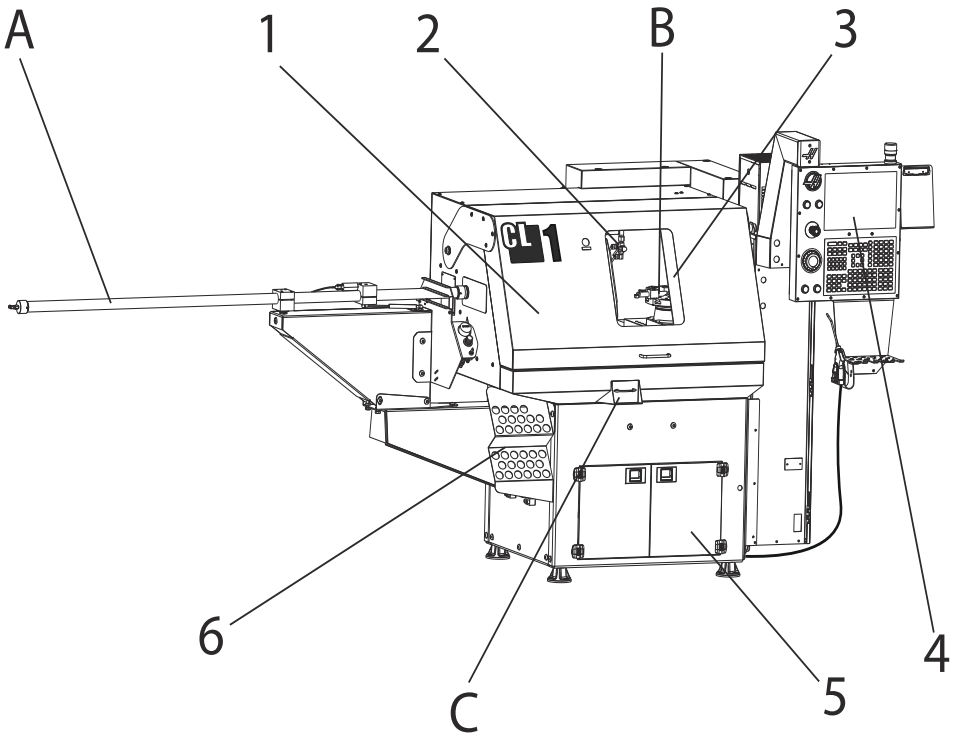
Chapter 2: Introduction

2.1 Chucker Lathe Features

The following figures show some of the standard and optional features of your Haas lathe.

NOTE: *These figures are representative only; your machine's appearance may vary depending on the model and installed options.*

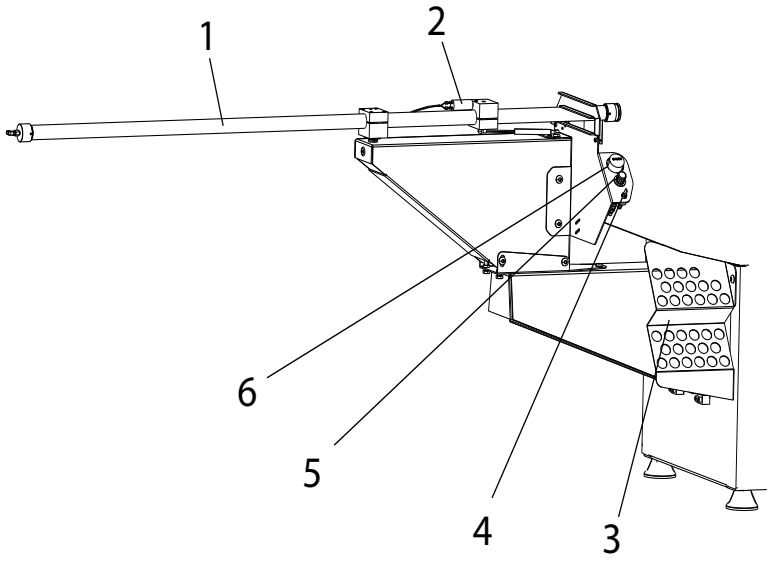
F2.1: Chucker Lathe Features (CL-1 shown front view)



1. Operator Door
2. Coolant Nozzles
3. Auto Door (optional) / Manual Door (std)
4. Control Pendent
5. Coolant Tank/Pump (optional)
6. Collet Holder

A. Bar Pusher (optional)
B. ATT8 Tool Changer
C. Parts Catcher (optional)

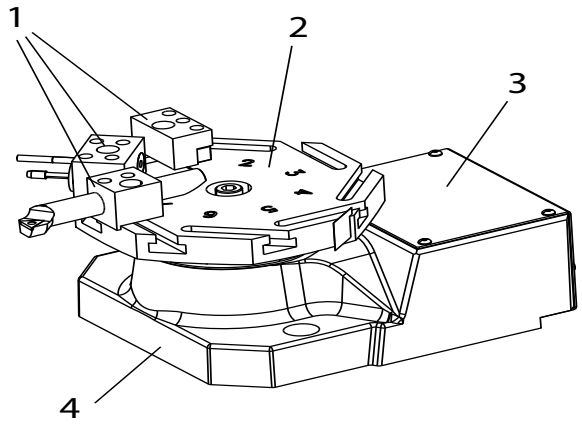
F2.2: Detail A - Bar Pusher



1. Bar Pusher Tube
2. End of Bar Pressure Switch
3. Collet Holder
4. Manual Feed Switch
5. Regulator
6. Air Pressure Gauge

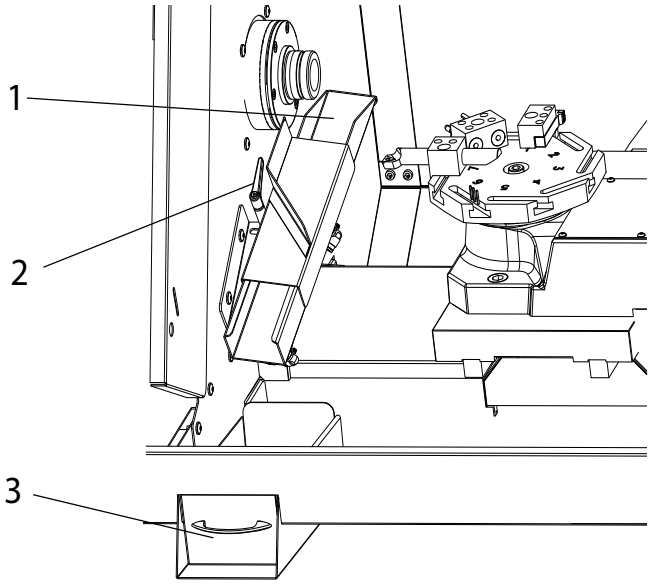
F2.3: Detail B - ATT8 Tool Changer

1. Tool Holders
2. 8 Station Turret
3. Turret Motor Cover
4. ATT8 Mounting Base



F2.4: Detail C - Parts Catcher

1. Part Chute
2. Side-to-Side Adjustment Handle
3. Parts Tray



Chapter 3: Operation

3.1 Introduction

You will find the majority of the information on how to operate your Chucker Lathe in the Lathe Operator's Manual. Operational differences are described in the following sections:

- Machine Power-On
- ATT8 Turret Operation
- Bar Pusher Operation
- Parts Catcher Operation

3.2 Moving the Chucker Lathe

Warning

The Chucker Lathe has a high center of gravity. Move the machine slowly and carefully to prevent it from falling over.

1. You will need a pallet jack that has at least 1500 lb capacity and forks that will fit in the space between the Chucker Lathe's leveling pads (22.5", 571 mm).

2. Lift the Chucker Lathe from the control cabinet side. Carefully move the Chucker Lathe to its operating location, then lower it onto the leveling pads.

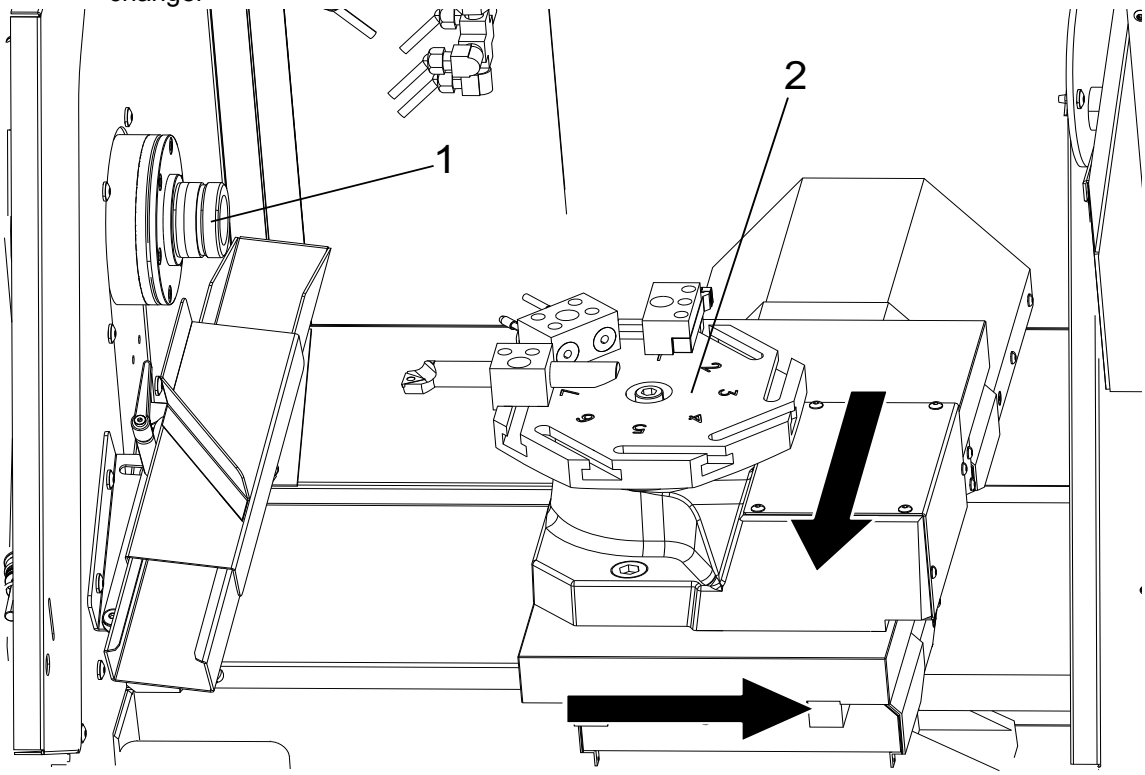
3. Make sure there is equal tension on each leveling screws.

3.3 Machine Power-On

Follow this procedure to turn on a Chucker Lathe for the first time.

Before you do this procedure, make sure that possible crash areas, such as the spindle, and tool changer are clear and that all shipping brackets have been removed.

F3.1: Power-Up X/Z Axis Home Movement and Possible Crash Areas: [1] spindle, [2] tool changer



1. Press and hold **[POWER ON]** until you see the Haas logo on the screen.

   After a self-test and boot sequence, the display shows the startup screen. The startup screen gives basic instructions to start the machine. Press **[CANCEL]** to dismiss the screen. You can also press **[F1]** to disable it.

2. Turn **[EMERGENCY STOP]** clockwise to reset it.

3. Press **[RESET]** to clear the startup alarms. If you cannot clear an alarm, the machine may need service. Contact your Haas Factory Outlet (HFO) for assistance.

4. Close the doors.

WARNING: *Before you do the next step, remember that automatic motion begins immediately when you press* **[POWER UP/RESTART]**. *Make sure the motion path is clear. Stay away from the spindle, tool changer.*

5. Press **[POWER UP/RESTART]**.

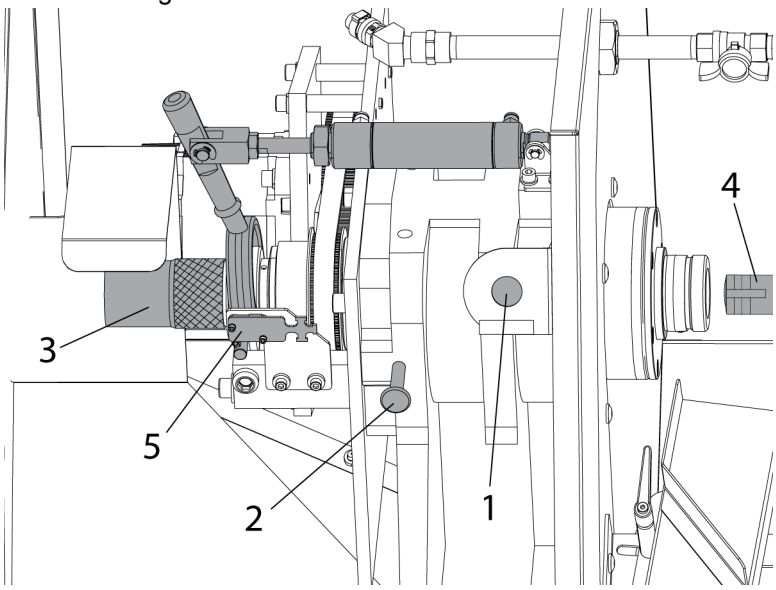
The axes move slowly until the machine finds the home switch for each axis. This establishes the machine home position.

The control is now in **OPERATION:MEM** mode.

3.4 Workholding

Installing a Collet

NOTE: The numbers in brackets in the following set of instructions refer to the numbered parts listed in the following illustration.



1. Open the large operator door.

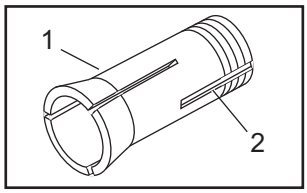
2. Press the CHUCK button [1] to unclamp the collet. The message “UNCLAMPED” appears on the control screen.

3. Push on the spindle lock pin [2] and turn the spindle by hand until the pin engages and the spindle can not turn.

4. Turn the knurled knob [3] at the end of the drawbar assembly clockwise until you can insert the collet [4] into the spindle nose. The spindle contains a collet anti-rotation pin to align the collet for installation. Turn the collet in the spindle head until you feel the anti-rotation pin engage with the pin slot on the collet.

NOTE: Make sure the collet is correctly aligned with the anti-rotation pin. An incorrectly aligned collet can damage the spindle and the collet.

F3.2: Collet Anti-rotation Pin: [1] Collet, [2] Collet anti-rotation pin slot.



5. Turn the knurled knob clockwise to draw the collet into the spindle. You will feel the draw bar tighten on the collet threads.

Inserting a Workpiece

1. Put a part into the open collet.

2. Turn the knurled knob clockwise until the part is tight in the collet, then loosen the knob about one half-turn.

3. Press the CHUCK button. Make sure that the part is clamped in the collet.

WARNING!

If the part is in place, but the collet and the part are not tight, do not operate the spindle.

4. Next, find the correct clamping force for your stock:

a. Press the CHUCK button to unclamp the collet ('UNCLAMPED' will be displayed on the screen).

b. Turn the knurled knob slightly; clockwise to tighten, counterclockwise to loosen.

c. Press the CHUCK button to clamp the collet.

The part is properly clamped when the draw bar arm hesitates during clamping, then continues to the end of the piston stroke. The mechanism makes a distinct sound when it clamps.

WARNING!

If the arm does not go to full stroke, the collet has not properly clamped the part. The machine will not start the spindle until the micro switch [5] is tripped when the collet is clamped.

WARNING!

If the arm does not hesitate while the part is clamped, the part will not be clamped tightly and it may spin when the tool makes contact. The part may also come out, causing damage or injury.

5. Do a couple of test clamps to make sure the collet is set at the correct tension.

NOTE: A standard 5C collet has a maximum adjustment range of only around 0.010". Part diameter variation or bar stock variations may therefore cause improper clamping. Good machining practices include regular inspection of bar stock diameter and/or adjustment of the collet.

6. Make sure to disengage the spindle lock pin before you try to operate the spindle.

Removing a Collet

1. Open the large operator door and press the CHUCK button to unclamp the collet.

2. Push on the pin and turn the spindle by hand until the pin engages and the spindle can not turn.

3. Turn the knurled knob counterclockwise to begin loosening the collet. If there is bar stock in the collet, remove it from the collet as soon as it is loose enough.

5. Keep turning the knurled knob until the collet is loose, then remove the collet from the spindle.

Collet Use Tips

Some collets hold certain materials better than others, so make sure to choose the proper collet for the application (i.e., serrated vs. smooth).

Standard collets pull back while they clamp material. If the part outer diameter (OD) varies, pullback (Z-distance) will vary.

Because of their design, dead length (exact length) collets position parts more consistently.

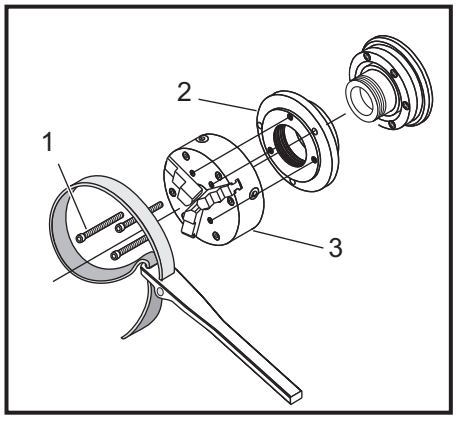
NOTE: Do not try to adjust the length of the draw bar arm air cylinder. Contact Haas Service for adjustment. If roller bearings spin while the spindle turns, contact Haas Service.

Installing a Chuck

1. Engage the spindle lock pin while you do this procedure.

2. Attach the chuck to its back plate with the Socket Head Cap Screws (SHCS) supplied in the kit. Torque the SHCS to 25 ft-lbs.

F3.3: Installing a Chuck: [1] Socket-head cap screw (SCHS), [2] Face plate, [3] Chuck.



3. Gently turn the assembly onto the spindle nose until it seats against the spindle shoulder. Tighten the chuck with a strap wrench to approximately 70 ft-lbs.

Chuck Alignment

Follow this procedure to eliminate runout in the chuck.

1. Place a precision test bar in the chuck.

2. Set a dial indicator against the test bar and rotate the chuck.

3. Use the chuck adjustment screws to align the chuck until the dial indicator reads zero

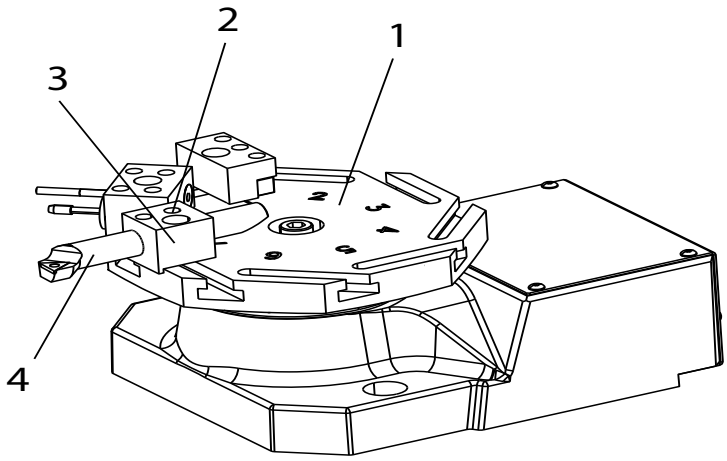
Chuck Removal

1. Engage the spindle lock pin.

2. Use a strap wrench to unscrew the chuck. To avoid damaging the chuck, do not pry against the chuck jaws.

3.5 ATT8 Turret Operation

F3.4: ATT8 Turret Detail: [1] Turret, [2] tool-retention screws, [3] tool holder, [4] tool,



NOTE: *The ATT8 has a 1/2 inch turning tool height from the top of the turret.*

To set up the ATT8 turret:

1. Loosen the tool-retention screws [2]. Put the tool [4] into the tool holder [3] and tighten the tool-retention screws [2].

CAUTION: *If you use the air gun to remove chips and coolant from the turret, do not blow air into the ring cover at the base of the turret. Compressed air can force chips and coolant into the mechanism. This damages the unit.*

3.5.1 ATT8 Operational Test

Use this program to test the tool changer:

1. Enter the following code:

```
%
T1 ;
T2 ;
T3 ;
T4 ;
T5 ;
T6 ;
T7 ;
T8 ;
T7 ;
T6 ;
T5 ;
T4 ;
T3 ;
T2 ;
M99 ;
;
;
;
%
```

NOTE: *Use T-address codes to operate the tool changer. For example, `T303` rotates the tool changer to the number 3 tool position, and uses offset 3. Add the T-address code to the program like the other lines of code. Refer to the Lathe Operator's manual for more information on the T-codes and tool offsets.*

2. Press **[CYCLE START]**.

3.5.2 ATT8 Tool Change Recovery

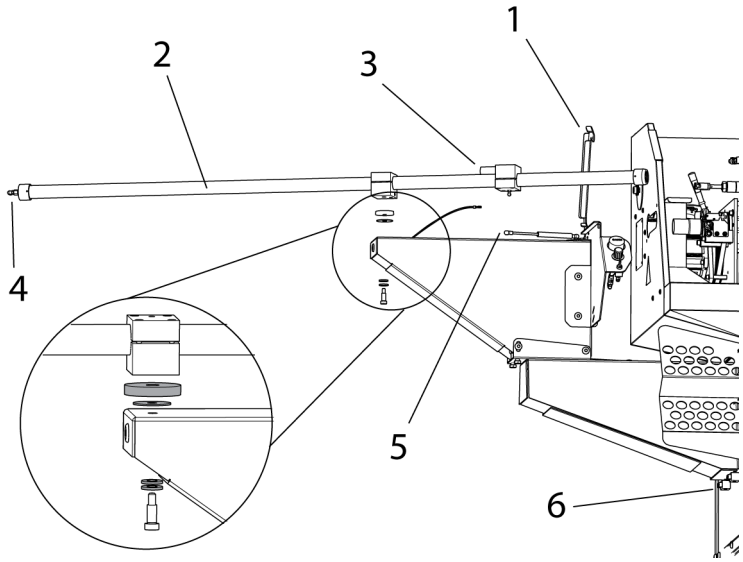
To recover the tool changer from an incomplete tool change:

1. Press **[MDI DNC]**.

CAUTION: *The tool changer moves rapidly when you push* **[TURRET FWD]** *or* **[TURRET REV]**. *To prevent injury, give the turret sufficient clearance.*

2. Press **[TURRET FWD]** or **[TURRET REV]**.

3.6 Bar Pusher Installation

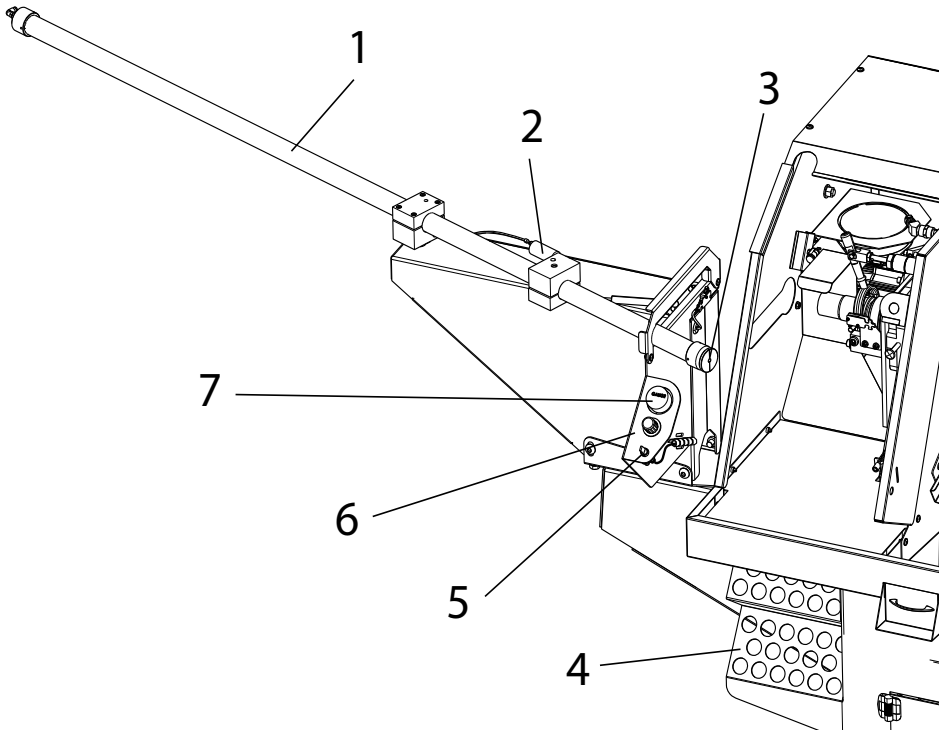


To install the bar pusher:

1. Open the bar retainer [1] on the pusher mount.
2. Place the bar pusher tube [2] on the mount and install the hardware as illustrated.
3. Connect the wire to the EOB pressure switch [3]. Connect the 1/4” air hose to the end of the pusher tube [4].
4. Connect the strut [5] to the pusher tube.
5. Rotate the pusher tube [2] into the Run position and secure the bar retainer [1].

3.6.1 Bar Pusher Setup

F3.5: Bar Pusher Detail: [1] bar pusher tube, [2] end of bar (EOB) pressure switch, [3] support collar, [4] collet holder, [5] manual feed switch, [6] regulator, [7] air pressure gauge



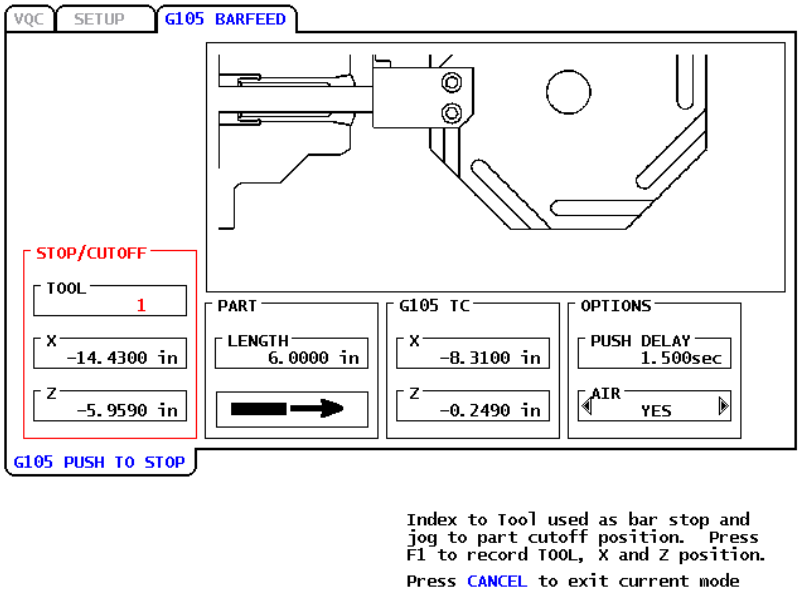
NOTE: *The bar pusher can only be used with a collet. Do not use a chuck with the pusher option.*

To set up the bar pusher:

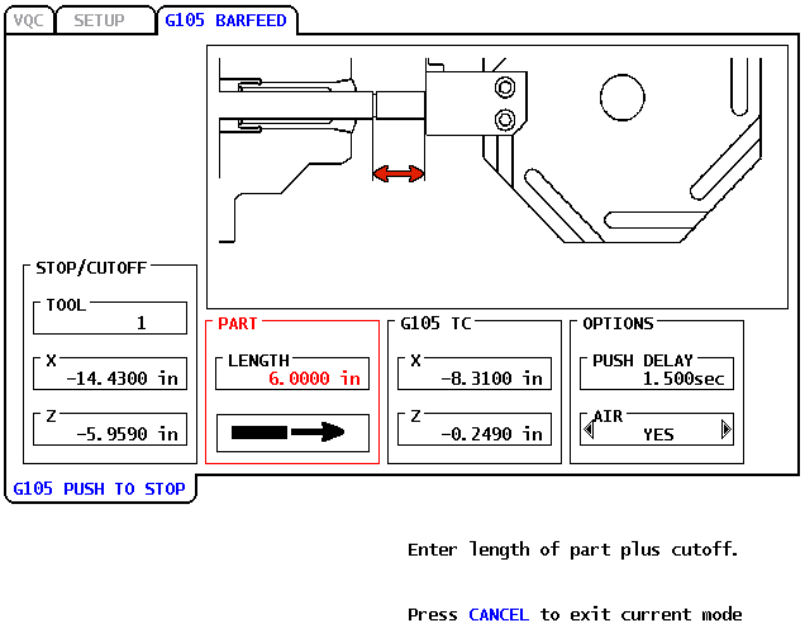
1. Open the operator door and rotate the pusher tube [1] to the load position.
2. Insert one piece of bar stock into the pusher tube [1] and install a two piece support collar [3] in the end of the pusher tube. The bar stock should have a slight chamfer on both ends to prevent binding and inconsistent push lengths.
3. Manually feed the bar using the manual feed switch [5]. Adjust the pusher air regulator [6] until the bar pushes out smoothly. Larger bar stock will require more air pressure. Stop feeding the bar when adjusted and push it back into the pusher tube.
4. Rotate the bar pusher tube [1] back to the run position. Manually feed the bar stock into the collet to the position where it will be cut off. Press the clamp button and check that the collet is adjusted correctly to properly clamp on the stock.

5. Select a tool with a flat edge that you want to use for the bar pusher stop. Handle jog the tool until the X and Z are even with the cutoff position.

6. Navigate to the PUSH TO STOP screen in the BARFEED page in IPS. Press **[F1]** to load the tool number, offset, and X and Z absolute position. Or the information can be entered manually by selecting each box using the cursor arrows, typing the appropriate values and press **[ENTER]**.

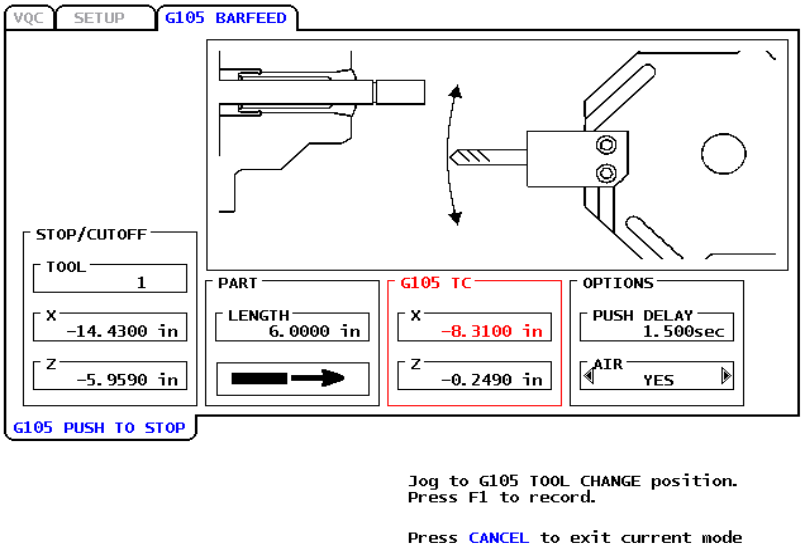


7. Enter the part length, plus the cutoff distance. Press the down arrow, the control will



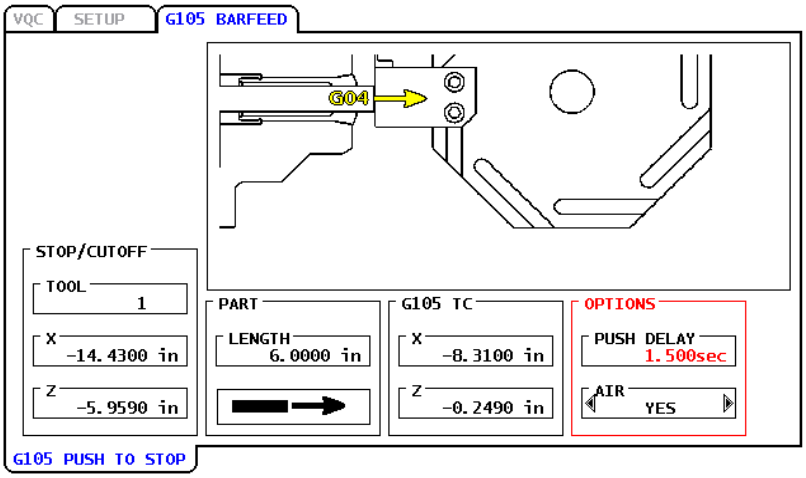
prompt you to close the door and press **[CYCLE START]**to push the bar to the part plus cutoff distance. The collet will open and the stock will feed. The Z axis will move into position and the collet will clamp.

8. Jog the turret to a safe tool change position and press F1. The machine will move to



this location to change tools.

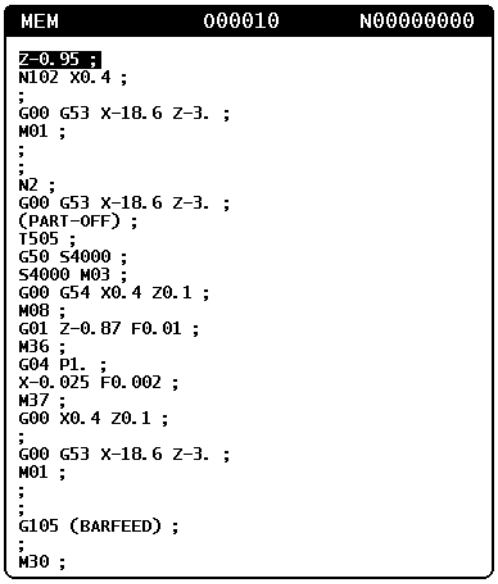
9. Enter the time in seconds for the air push delay. Arrow right or left to select YES or



NO for Air Help on while running (normally set to YES). This feature, when enabled, will keep constant air pressure to the pusher to support the part. Smaller diameter material should use the Air Help to prevent bar whip while running.

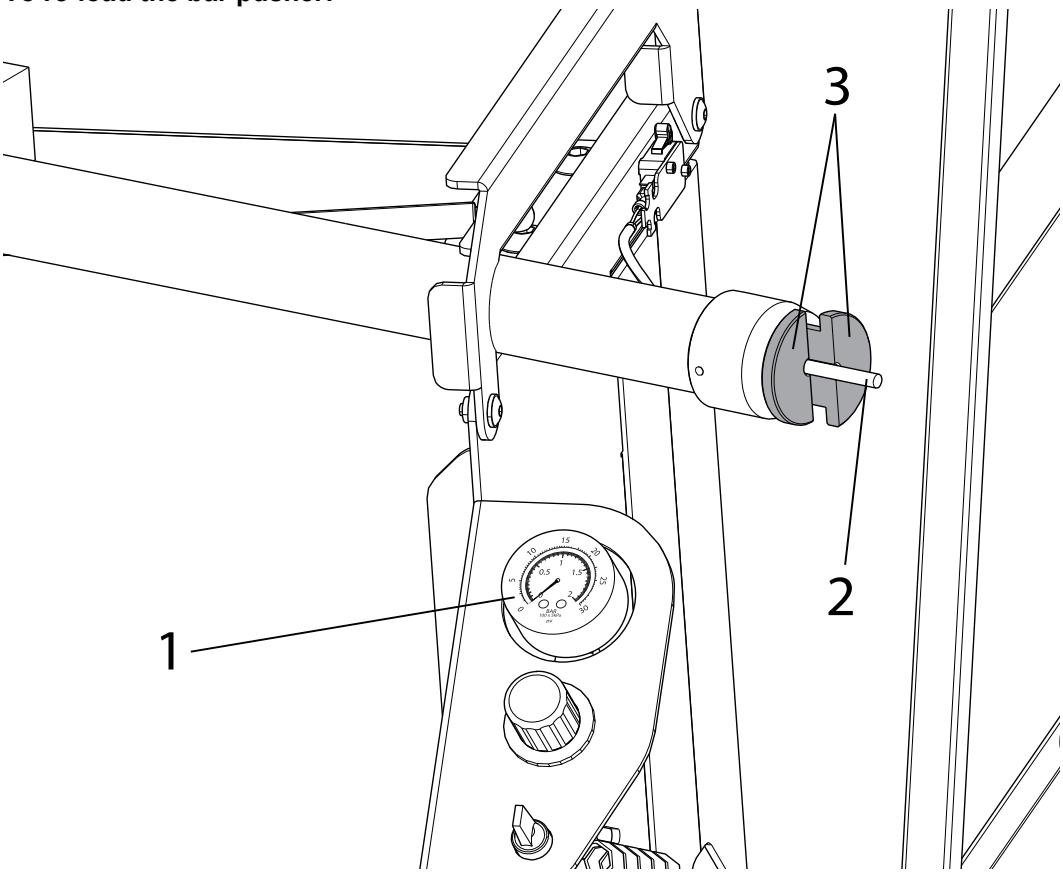
3.6.2 Bar Pusher Operation

To operate the bar pusher:



1. After the bar pusher has been set up, the push is activated by a **G105** command in a program. Above is an example of a bar push after a part cutoff at then end of a program.
2. At the end of the pusher stroke the piston will push out the collars and activate the EOB pressure switch.

To re-load the bar pusher:



1. Check the bar pusher air pressure gauge [1], it should read 0 PSI/BAR. If not press **[RESET]** on the control.
2. With the operator door open, rotate the bar pusher tube to the load position.
3. Push one piece of bar stock [2] into the pusher tube. Install a support collar[3] around the stock in the end of the tube.
4. Rotate the bar pusher tube back into the run position. Activate the manual feed switch to feed the bar through the collet to the cutoff position. Clamp the collet. Press **[CYCLE START]** to continue running.

3.6.3 Bar Pusher Variables

These variables allows you to change the function of the control. When a program reads a system variable, it can modify its behavior based on the value in the variable.

`#13100` = Part Push Length - A positive number changes the length the bar is pushed from the stop position.

`#13115` = Turret Position of the Stop - This is the tool number for stop.

#13116 = X-axis Stop Position - The machine position with no work coordinate position applied.

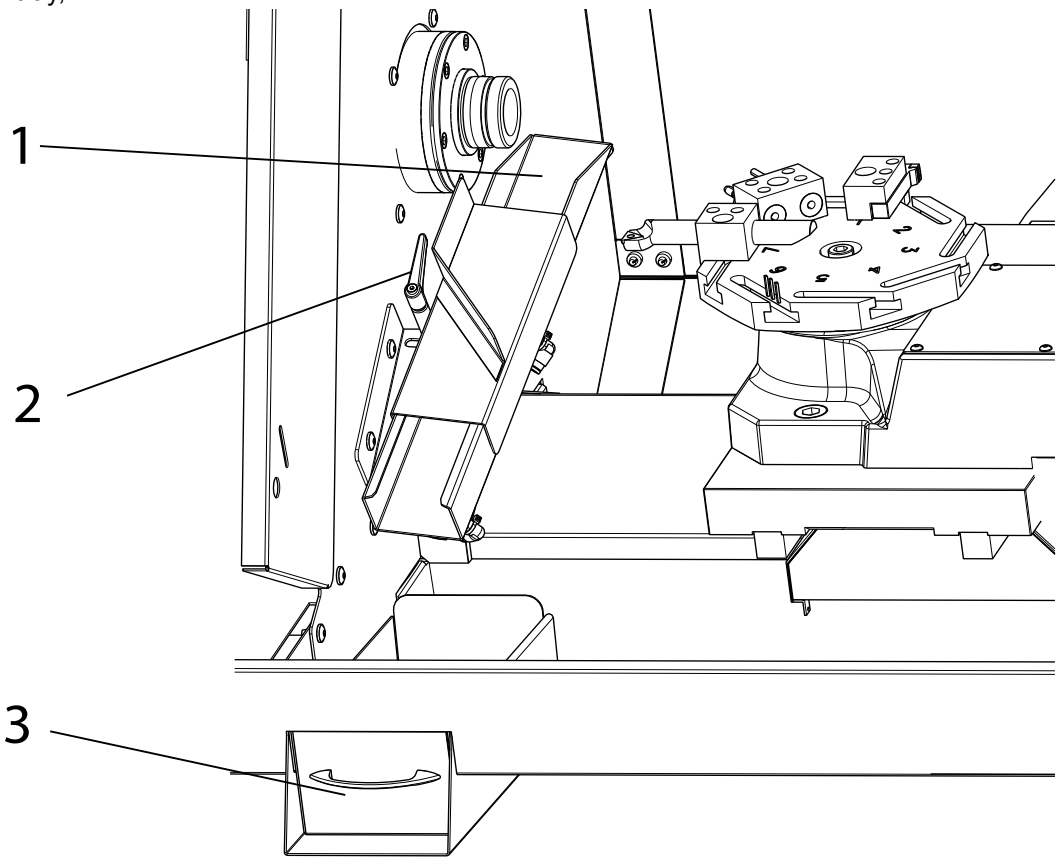
#13117 = Z-axis Stop Position - The machine position with no work coordinate position applied.

#13118 = X-axis Tool Change Position - The machine position with now work coordinate position applied.

#13119 = Z-axis Tool Change Position - The machine position with now work coordinate position applied.

3.7 Chucker Lathe Parts Catcher Setup

F3.6: Chucker Lathe Parts Catcher: [1] part chute, [2] side-to-side adjustment clamp [3] parts tray,



To setup the parts catcher:

1. Extend the stock out of the collet to the length of the finished part. Clamp the collet.
2. Command an **M36** to extend the part chute [1]. Loosen the adjustment clamp [2] and position the part chute as needed to catch the stock.
3. Press **[RESET]** to retract the parts chute.

3.7.1 Chucker Lathe Parts Catcher Operation

To operate the parts catcher:

1. The parts catcher is activated with an **M36** and is deactivated with an **M37**.
2. With the parts catcher setup, use an **M36** while the part is being cut off. This is an example program using the parts catcher during a part off.

```
ACTIVE PROGRAM - 000213

;
;
G00 G53 X-18.6 Z-3. ;
M01 ;
;
;
N2 ;
G00 G53 X-18.6 Z-3. ;
(PAART OFF) ;
T505 ;
G50 S4000 ;
S4000 M03 ;
G00 G54 X0.4 Z0.1 ;
M08 ;
G01 Z-0.87 F0.01 ;
M36 (PART CATCHER ON) ;
G04 P1. ;
X-0.025 F0.002 ;
M37 (PART CATCHER OFF) ;
G00 X0.4 Z0.1 ;
;
G00 G53 X-18.6 Z-3. ;
M01 ;
;
;
G105 (BARPUSH) ;
;
M30 ;
```

3. The cutoff parts will fall into the part tray. Pull out the tray and empty the parts as needed.

Chapter 4: Maintenance

4.1 Introduction

Regular maintenance is important to make sure that your machine has a long and productive life with minimal downtime. The most common maintenance tasks are simple and you can do them yourself. You can also ask your HFO about their comprehensive preventive maintenance program for complex maintenance tasks.

4.2 CL Lubrication

The linear guides and ball screws are automatically lubricated. The Chucker Lathe uses the Haas Liquid Grease system. Refill the liquid grease canister as needed.

Manually lubricate the bar pusher piston bi-monthly. Use the manual feed switch to push the piston out of the pusher tube. Wipe off the piston with a clean cloth. Apply a thick layer of grease (SHC460 or Mobil 1 Synthetic grease) to the piston and insert it into the pusher tube.

Lubricate the collet and spindle contact points with a light coat of molybdenum grease (Haas p/n 99-0007 or Mobil p/n CM-P) once a month. Make sure collets are in good condition and free from burrs. Following this procedure will extend the life of the spindle/collet, and help prevent sticking.

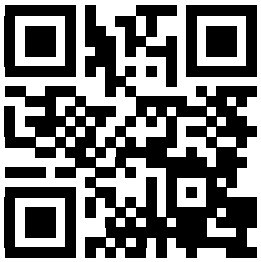
The current maintenance schedule and recommended type of lubricant is found in the Haas Resource Center on the Haas website. diy.haascnc.com

4.3 Troubleshooting

Symptom	Possible Cause	Corrective Action
Part push-back	Drawbar adjusted too loose	Re-adjust drawbar clamp position.
	Low air pressure will reduce the available clamp force.	Correct low pressure condition. Pressure should be above 80 psi. 100 psi is recommended.
	Excessive thrust loads	Utilizing a collet stop will prevent push-back. The collet stop is not an option when using the bar pusher. Do not exceed 3,000 RPM.
	The collet is not correct for the material.	Verify the collet is properly sized for the bar stock per the manufacturers recommendations. Use serrated collets when needed.
Bar pusher vibration	Excessive spindle speed.	Reduce spindle speed to 3,000 RPM or less. Larger bar stock is more susceptible to vibrations at speed.
	Bar stock chamfer not centered.	Center chamfer both ends of the bar stock.
	Bar pusher support collars are worn.	Replace worn out support collars.
	G105 bar pusher air option is off when it should be on.	Maintain air pressure with G105 Option Air "Yes" on the setup page.
	Bar pusher air pressure too high or too low.	Adjust Bar pusher air pressure to meet bar stock size. Larger bars 15-20 psi, smaller bars 10-15 psi.
Collet sticking and/or insufficient clamping pressure.	Excessive spindle/collet friction	Lubricate spindle and collet interface with a Molybdenum disulfide grease.
Chips clogging coolant nozzles.	The coolant level is low.	Remove chips from nozzle and adjacent plumbing and always maintain a coolant lever in the tank above 2". Coolant levels lower than 2" will allow chips to enter the pump.
Chips not flowing into the chip bin.	Build-up of stringy chips.	Review tooling and feedrates to eliminate stringy chips.

4.4 More Information Online

For updated and supplemental information, including tips, tricks, maintenance procedures, and more, visit the Haas Resource Center at diy.HaasCNC.com. You can also scan the code below with your mobile device to go directly to the Resource Center:

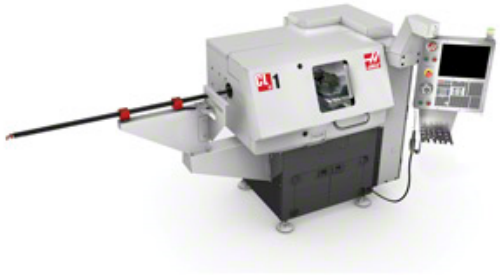


Index

1102 Hass Chucker Lathe

Haas Automation, Inc.

CL-1 Pre-Installation Guide



- Pre-Installation Checklist -
- Introduction -
- Placement and Preparation -
- Shipping Dimensions -
- Electrical Specification -
- Air / Coolant -

Pre-Installation Information - CL-1

Pre-Installation Checklist

Specification	Task	Completed?
Foundation	The foundation meets the specifications.	☐
Anchor (Optional)	You have the anchors	☐
	The cores are drilled.	☐
	The anchors are installed.	☐
Machine / Optional Components Location	You downloaded the Machine Layout Document.	☐
	The machine location is prepared.	☐
	The building entrance is large enough for the machine.	☐
	You have the equipment to lift or move the machine.	☐
Electrical	The input voltage supply is correct.	☐
	The correct wire size is installed.	☐
	The correct supply circuit-breaker is installed.	☐
Compressed Air	The air pressure supply and pressure are correct.	☐
	The power output of the compressor is correct.	☐
	The compressor duty rating and capacity are correct.	☐
Coolant	The coolant type is correct.	☐
	The coolant concentration is correct.	☐

Introduction

Your machine installation is easier and faster if the installation site is correctly prepared. Gather this information:

- Make sure that your floor is correct for the machine. Refer to the "Placement and Preparation" in this document for more information.
  - If you must pour a new foundation, make sure that you have sufficient time for the concrete to reach 28-day strength.
- Clear the installation location. Make a clear path to bring the machine to the location.
- Make sure that you have the correct electrical wiring and air conduit to the machine location.
- Schedule the installation date and time. Tell your HFO so that they can send a technician.
- If you have questions about this procedure, contact your HFO for more information.

Placement and Preparation

☑ Foundation

You must put your machine on a solid and stable concrete foundation. The standard 6" (150 mm) concrete floor in industrial buildings is usually sufficient. Refer to these specifications:

- The concrete must be poured directly on the grade.
- The concrete must be 3,500 psi (240 bar) at 28-day strength.
- The concrete aggregate must be 1" (25 mm) mix.
- The steel reinforcement must be 40 ksi (2700 bar) tensile strength.
- The excavation must be cut near flat ground. Remove any loose material in the excavation. This prevents settling.
- Follow all local building codes and regulations.
- Continuous slab

☑ Anchoring (Optional)

Anchoring is not necessary for correct performance.

Machine anchor kits are available from your HFO. These kits do not meet building, seismic, or stationary equipment installation specifications. Contact a specialist if you need to meet these specifications.

- Go to *diy.haascnc.com* for the anchoring instructions and anchor footprint. Select the machine model to find this information.

Machine Placement

You can use a forklift, roller dolly, or an overhead crane to move your machine. Be sure to use a lifting device with sufficient capacity.

Refer to this list when you plan your machine placement:

- Put the machine onto a continuous concrete slab.
- The leveling feet of the machine must be at least 12" (300 mm) from the edge of the concrete slab.
- Isolate the machine from vibration from other machines or other sources.
- Do not put the machine on inappropriate surfaces. This includes asphalt, brick, wood or dirt.
- If you plan to put the machine on a floor other than the ground level, consult with a structural expert.

You must have access to the control cabinet for safety and regular operations. Make sure you have a space of 3' (1 m) between the control cabinet and any structures.

Your HFO service technician completes the final leveling procedure.

Optional Component Location

Make sure the machine location has sufficient space for optional components, such as:

- Chip Conveyor - You must have space to remove and install the conveyor for maintenance.
- Haas Bar Feeder - You must have space on the spindle side of the machine.
- External Transformers.

Shipping Information - CL-1

Shipping Dimensions, Weight, and Crating Information

Domestic/Export Pallet

Export Crate

Domestic Pallet L x W x H
79 x 58 x 86 in 201 x 148 x 218 cm
Export Pallet L x W x H
79 x 58 x 86 in 201 x 148 x 218 cm
Weight
2,100 lb 955 kg

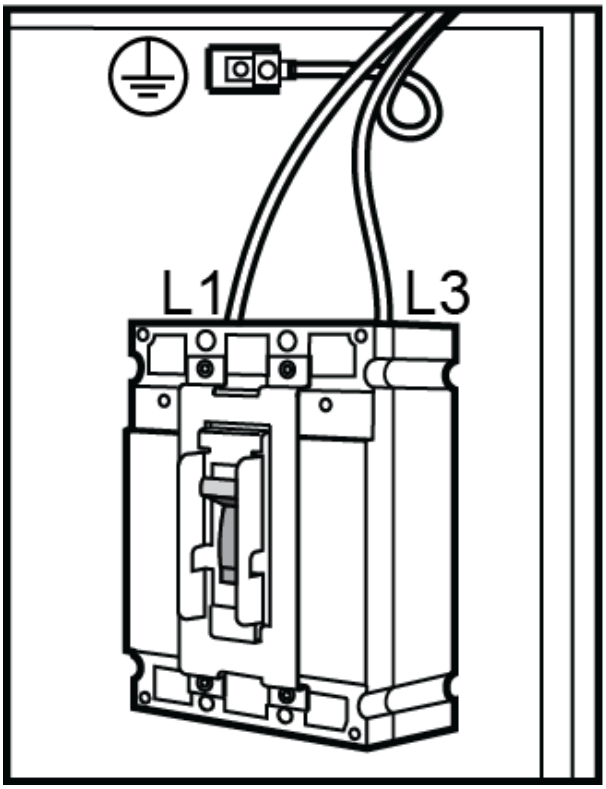
Domestic Pallet L x W x H **with w/ Barfeeder Option**
102 x 58 x 86 in 260 x 148 x 218 cm
Export Pallet L x W x H **with w/ Barfeeder Option**
102 x 58 x 86 in 260 x 148 x 218 cm
Weight **with w/ Barfeeder Option**
2,300 lb 955 kg

This document provides machine weight and shipping dimensions. The weight listed for a machine may vary as much as +/- 5% due to option selection, casting variations, and even the moisture content of the wooden crates surrounding the machine.

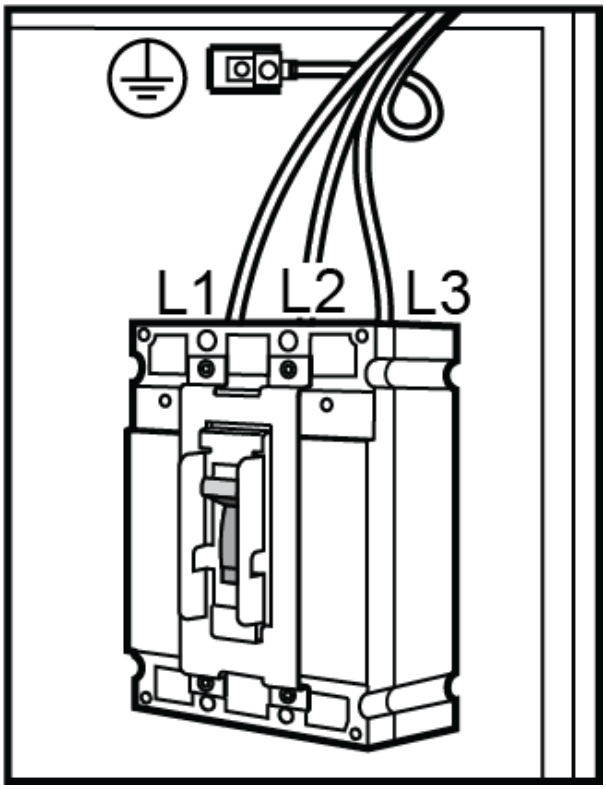
Electrical Specifications - CL-1

MACHINE	SPINDLE DRIVE	PEAK (HP/KW)	CONT (HP/KW)	INPUT AC VOLTAGE	FULL LOAD AMPS
CL-1	Belt	5.0 / 3.7	1.75/1.3	220 (1 Phase)	16
CL-1	Belt	5.0 / 3.7	1.75/1.3	220 (3 Phase)	12

1Φ



3Φ



Electrical Requirements for Haas Machines

General

- The electrical power must meet the applicable safety codes and ordinances.
- An authorized electrician must make the connection from the main breaker to the machine.
- Refer to the Machine Layout Drawing for the location of the machine's electrical input.

Ground

- The ground wire is required for operator safety and correct operation.
- A separate ground wire must be connected to the chassis of the machine. The wire must be of the same conductor size as the input power. The wire must have a minimum cross sectional area of 10mm²(AWG #7).
- The ground wire must be supplied from the main building ground.
- Do not use a conduit as a ground wire.
- Do not use a cold-water pipe or ground rod to supply the machine ground buss

Three Phase Power

- Many machines use three-phase power. This can be Wye or Delta type.
- You must ground the power source. One leg or center leg for Delta. Neutral for Wye.
- All phases must be balanced. Voltages must stay constant within +/- 10%.

Single Phase Power

- Some machines let you use single-phase power. Refer to the "Electrical Specifications" table above.
- The supplied power must be 208-240 V AC and stay constant within +/- 10%.

Wire Size

- ⚠ The wire size requirements depend on your wire lengths. Refer to your local electrical codes.

Service Breaker

- Make sure the circuit breaker that connects to the machine meets with the Haas Specification. Refer to the "Full Load Amps" column in the "Electrical Specification" table above.
- Use the next larger-size industrial-grade breaker that meets your local codes and regulations.

Phase Converters

- Do not use a phase converter unless it is necessary.
- Phase converters can cause the machine to operate at less than full power.

480 V Power

- Haas machines are designed to operate on 230 VAC power. An optional internal high-voltage transformer (380 - 480 VAC) is available for all models, except the CL-1 and CM-1.
- **Note:** This optional high-voltage internal transformer is not field installable; it must be ordered with the machine.

Air/Coolant Requirements - CL-1

Air Pressure

Your machine must have a clean, dry air supply at a minimum pressure and volume to operate correctly. Refer to the table below.

- For the location of the air inlet, refer to the Machine Layout Drawing located at http://haascnc.com.

Note: If you make auxiliary air connections, they must be on the input (unregulated) side of the air filter/regulator or air shutoff valve.

- Supply compressed air with a minimum 2 hp (1.5 kW) compressor with a minimum of 20-gallon (75 L) tank, made for continuous duty.
- Your compressor must have 2 hp (1.5 kW) for each machine (e.g., an installation of 5 machines requires a 10 hp (7.5 kW) compressor).

MACHINE SERIES	MINIMUM REQUIREMENTS	INLINE AIR LINE	COUPLER	MINIMUM AIR PRESSURE *
CL-1	1 scfm (28 L/min)	3/8"	3/8"	40 psi (2.8) bar

* If incoming air pressure is higher than 120 psi (8.2 bar), you need to supply an air-pressure regulator.

Coolant

Caution: Do not use straight or "neat" mineral oil products as coolant. These products cause damage to the tubing and seals on the machine. If you use a minimum-quantity lubrication system, use only the recommended oils.

Note: Be sure to maintain your coolant mixture to keep the coolant concentrate at acceptable levels. Improperly maintained coolant mixtures can allow machine components to rust. Rust damage is not covered by your warranty.

- Go to our Machine Tool Coolant resource on diy.haascnc.com. The Machine Tool Coolant Video Series gives you complete information about coolant maintenance.
- The machine coolant must be one of these types:
  - soluble oil coolant
  - semi-synthetic coolant
  - synthetic coolant

Techno Inc. In Business Since 1986
CNC Router Systems

LC SERIES BASIC SETUP INSTRUCTIONS

***IMPORTANT!* READ THIS SETUP THOROUGHLY BEFORE RUNNING THE MACHINE. HAVE A LICENSED ELECTRICIAN PERFORM ALL ELECTRICAL CONNECTIONS BASED ON YOUR LOCAL CODES.**

This document provides information on how-to setup the LC Series CNC Routers. More detailed documentation is on the Techno CD-ROM. All manuals should be read and understood for proper operation of the machine. These setup instructions contain additional reference documentation keep all information together.

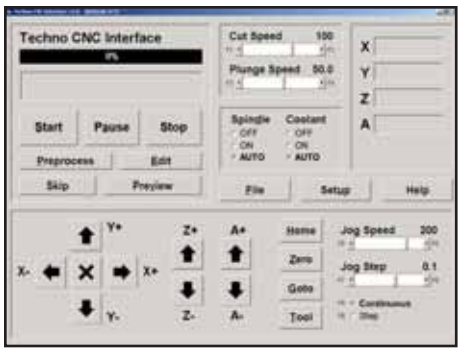
LC SERIES SETUP INSTRUCTIONS

APPENDICES

i. Minimum System Requirements

- PC with 800Mhz Pentium 3 Processor, 2 GB Memory, 256 Ram, CD-ROM
- Windows 98, ME, 2000, XP or Vista*
- Two Available PCI Slots

*If Vista PC Operating System of choice, Techno Technical Support will provide required instructions to accommodate software compatibility.



LC SERIES BASIC SETUP INSTRUCTIONS

I. UNPACKING AND MACHINE IDENTIFICATIONS

All Techno machines are shipped assembled and secured to a wooden pallet. If your machine was shipped disassembled in any way please refer to the Reassembly Instructions provided with your machine.

STEP 1: Unpack all items that shipped with your machine. Check the items against the packing slip to be sure nothing was left out. Notify Techno immediately if you are missing any pieces of your shipment.

Please note the four forklift tubes on the front and rear of the machine. Also note the four removable forklift guides (not on all models) on the underside of the machine. The forklift tubes and guides will provide the most stability when lifting the machine and will not damage the frame.

STEP 2: Forklift your machine up from the floor, remove the wooden pallet. Locate your machines four leveling feet.

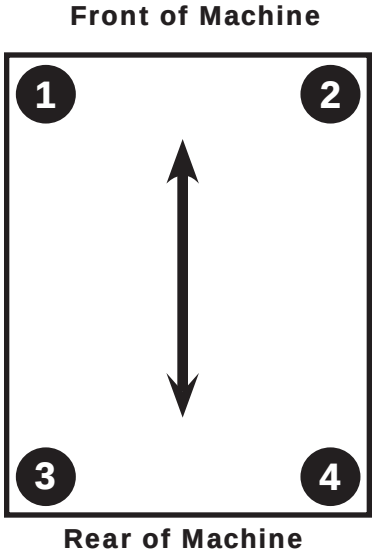
STEP 3: Carefully screw the four leveling feet into the bottom of each machine leg. Using a level beam, Techno recommends that you level the machine in the following fashion (refer to DIAGRAM 1 for a visual):

- Begin leveling the machine width wise, start at the front left leg and level it with the front right leg. Repeat to the rear legs lengthwise, start with the front left leg and proceed to the rear left leg. Then level width wise from the left front leg to the right front leg.
- Repeat on the right and rear sides of the machine until the machine is level.

STEP 4: Remove all four forklift guides (not on all models) from the underside of the machine. They are held onto the frame by three screws each. Your machine will not operate if these remain on the frame.

STEP 5: Power up your computer (if your ordered a Techno computer) and perform the manufacturer's basic user setup.

DIAGRAM 1: *Top View of Machine*



PICTURE 1: *One of Four Forklift Guides*

PICTURE 2: *Four Leveling Feet*

II. INSTALLING SERVO PCI INTERFACE CARD

Refer to computer manufacturer's manual for the accessibility and location of the PCI Slots. Install the PCI Interface Card before the software.

WARNING: Ground yourself during installation.

STEP 1: Turn off and unplug power to your computer. Remove the computers side cover and locate a vacant PCI slot.

STEP 2: Remove the vacant PCI slot's cover plate, and the PCI Interface Card from its protective anti-static packaging.

The PCI Interface Card connectors mate with the PC Motherboard in only one way.

STEP 3: Gently but firmly insert the PCI Interface Card into the vacant PCI slot. Secure with screw (if applicable), and close the computers side cover.

STEP 4: Attach the SCSII Cable connector to the newly installed PCI Interface Card.

PICTURE 3: *PCI Interface Card & SCSII Cable*

III. WIRING THE AC SPINDLE MOTOR INVERTER

The following instructions pertain to those machines equipped with an AC Spindle. This is NOT used with Porter Cable or other 120VAC Spindles. It is strongly recommended that all 220 and 440 VAC connections be connected through a power disconnect switch for use with either CNC Spindle and/or vacuum pump setups. This switch is required for safety and to meet National Electrical Codes.

Before powering up your machine you will need to have a LICENSED ELECTRICIAN properly connect the wiring from your machine to the AC Spindle Motor Inverter. Please note that your AC Spindle Motor Inverter may look slightly different from the one pictured in this setup. Size will vary according to the Horsepower of your spindle, however all instructions are the same. Review the manufacturer's inverter manual before proceeding.

PICTURE 4: *Power Disconnect Switch*

WARNING: ALL WIRING AND ELECTRICAL SETUP MUST BE COMPLETED BY A LICENSED ELECTRICIAN. FAILURE TO DO SO MAY CAUSE DAMAGE TO YOUR MACHINE.

STEP 1: Open the front cover by loosening the cover screw. Remove the cover plate and set screws aside.

STEP 2: Connect the inverter power wires to the appropriate terminals within the Inverter Box.

Review the manufacturer's inverter manual for more details on single and three phase wiring.

STEP 3: Replace the metal cover plate and lock the front cover screw. Connect all power to your machine and proceed with the software installation.

Be sure to connect power to your machine, your spindle, and your PC.

Continued on the next page...

PICTURE 5: *AC Spindle Motor Inverter*

PICTURE 6: *3-Phase Inverter Wiring*

IV. INSTALLING THE TECHNO CNC INTERFACE

When you reconnect power, turn your computer on and when Windows starts up it will detect "new hardware."

STEP 1: Follow the Window's prompts. When asked to "search" for a suitable driver, insert the Techno CD.

STEP 2: When asked for "optional search locations" choose your computer's CD drive.

STEP 3: Click on **Setup Techno CNC Interface.**

KEEP THE TECHNO CD IN A SAFE PLACE, IT CONTAINS ADDITIONAL DOCUMENTATION (PDF FILES).

SCREEN CAPTURE 1: *Installation Screen*

V. SCALE FACTOR INTERFACE SETUP

STEP 1: Start the Techno CNC Interface.

STEP 2: From the Main Menu click on the Setup Button, then Systems.

The Setup>System screen will appear.

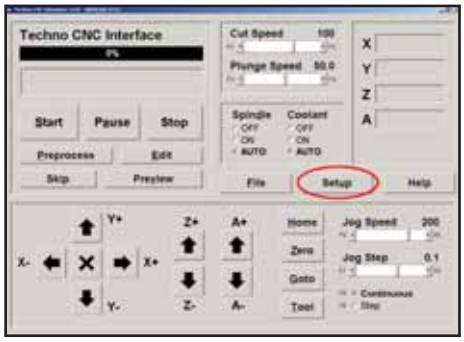
STEP 3: Input the numbers printed on the Scale Factor Sticker located on the front leg of the machine.

See the circled section in SCREEN CAPTURE 3. Make sure to type the numbers exactly how they appear on the sticker including any negative values. (I.e. -20320)

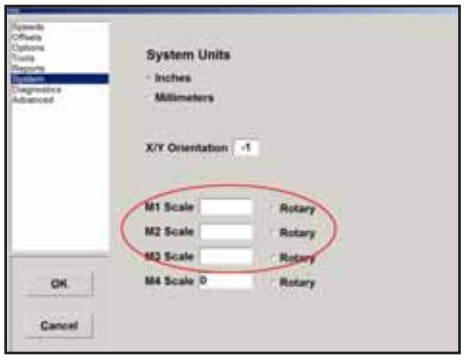
STEP 4: Click the OK Button in the Setup>System screen to save the changes made. Return to the Techno Interface Main Menu.

If the values are not written on the front leg of your TECHNO CNC ROUTER then the interface default values should apply.

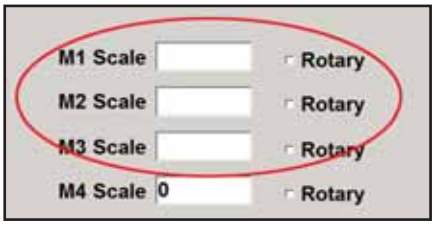
SCREEN CAPTURE 2: *Main Menu*



SCREEN CAPTURE 3: *Systems Menu*



SCREEN CAPTURE 4: *Scale Factor Settings*



VI. TOUCHPAD INTERFACE SETTINGS

The following setup will require you to load an actual cutting tool into the spindle and touch it to the touchpad. See Appendix A-Proper Colleting Guidelines for instructions on how to load a tool properly.

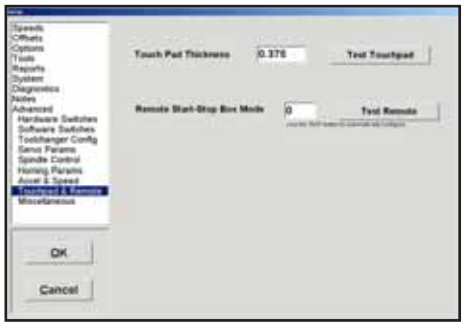
The settings for the Touchpad need to be tested and/or configured in the Techno CNC Interface prior to using the machine.

STEP 1: From the main menu click *Setup>Advanced>Touchpad & Remote*, click the Test Touchpad Button. The message "Pick up the touchpad and touch it to the tip of the tool in the spindle..." should then appear. Follow the on screen prompts.

If the "test passed" screen appears, click "ok", the test has indicated that the Touchpad is functioning properly. Exit the setup menu and return to the main menu.

If the test failed (nothing happened), you need to click where indicated "click here". The "test cancelled" screen should appear, click "ok." Repeat the touchpad test again. If it fails once more, turn off power, check all connections and call Technical Support for further assistance.

SCREEN CAPTURE 5: *Touchpad & Remote*



PICTURE 7: *Touchpad to Tip of Tool in Spindle*

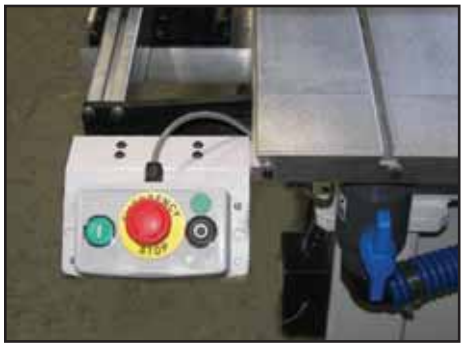
VII. E-STOP START/STOP BOX INTERFACE SETTINGS

The green button is the START button, hit this button to resume the machine program after having hit the black PAUSE button. The PAUSE button temporarily stops the machine. ***PUSH THE EMERGENCY STOP (E-STOP) BUTTON WHENEVER YOU NEED TO STOP THE MACHINE IMMEDIATELY.*** To reset the Start/Stop Box E-stop, twist the E-Stop button clockwise. The machine will not work if the E-Stop is still pushed in.

The settings for the E-Stop Start/Stop Box need to be entered and/or configured in the Techno CNC Interface prior to using the machine.

STEP 1: From the Main Menu, go to *Setup>Advanced>Touchpad & Remote.* Click on the Test Remote Button. Follow the on screen prompts.

PICTURE 8: *Mounted Start/Stop Box*

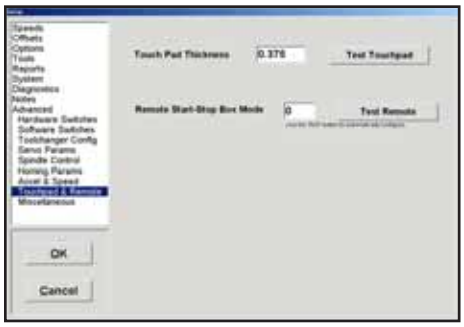


STEP 2: Press the Start button on your remote E-Stop Start/Stop Box when prompted. Press the Pause button on your remote Start Stop Box when prompted.

If the test passes, you should get the message: "Remote test passed."

If the test fails, repeat. If test fails again, turn power off, check all connections and call Techno Tech Support for further assistance.

SCREEN CAPTURE 5: *Touchpad & Remote*



VIII. USING THE VACUUM TABLE SETUP

The following setup will be the same for all Pumps and Blowers. It is strongly recommended that all 220 and 440 VAC connections be connected through a power disconnect switch for use with either CNC spindle and/or vacuum pump setups. This switch is required for safety and to meet National Electrical Codes.

WARNING: A LICENSED ELECTRICIAN MUST PERFORM THE FOLLOWING INSTALLATION! REFER TO THE MANUFACTURERS DOCUMENTATION PROVIDED WITH THE PUMP/BLOWER BEFORE PROCEEDING WITH THIS SETUP. FAILURE TO DO SO CAN RESULT IN DAMAGE TO THE PUMP/BLOWER.

PICTURE 9: *Power Disconnect Switch*

SETTING UP THE VACUUM PUMP/BLOWER

Shipped with your Pump/Blower will be a closed Motor Starter Box. Although the Vacuum Pump/ Blower Motor has been wired and tested in the factory prior to shipping, a licensed electrician will have to connect wires to the inside of the Motor Starter Box.

PICTURE 10: *3-Phase Wired Pump*

3-Phase Pump Wiring

STEP 1: Disconnect ALL power sources. Unscrew the Motor Starter Box Cover and remove.

STEP 2: Remove the appropriate knockout hole from the outside of the Motor Starter Box according to where you desire the cables to enter the box.

STEP 3: Insert the AC Power (220 or 440VAC) cable through the knockout hole and connect it to L1, L2, and L3 as specified in the manufacturer's manual.

STEP 4: Replace the Motor Starter Box cover and continue with the setup.

Single-Phase Pump Wiring

STEP 1: Disconnect ALL power sources. Unscrew the Motor Inverter Box Cover and remove.

STEP 2: Remove the appropriate knockout hole from the outside of the Motor Inverter Box according to where you desire the cables to enter the box.

STEP 3: Insert the AC Power (220 or 440VAC) cable through the knockout hole and connect it to R/L1, S/L2, and T/L3 as specified in the manufacturer's manual.

STEP 4: Replace the Motor Inverter Box cover and continue with the setup.

STEP 5: Connect the Pump/Blower power. Check the rotation of the pump.

WARNING: THE DIRECTION OF ROTATION IS CRITICAL IF THE ROTATION (ARROW ON CASING OF PUMP/BLOWER) IS INCORRECT, SWITCH 2 PHASES. IF YOU RUN THE PUMP CONTINUOUSLY IN THE WRONG DIRECTION THE VANES WILL BE DAMAGED!

STEP 6: Connect the machine end of the vacuum signal connector, behind the front control panel of the Servo Controller Box to the motor starter's mating connector.

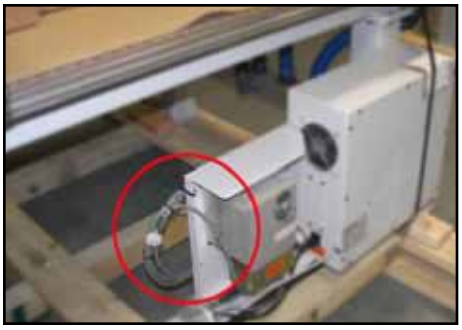
Continued on the next page...

PICTURE 11: *3-Phase Motor Starter Box*

PICTURE 12: *Single-Phase Wired Pump*

PICTURE 13: *Single-Phase Motor Invertor Box*

PICTURE 14: *Machine Signal Connector*



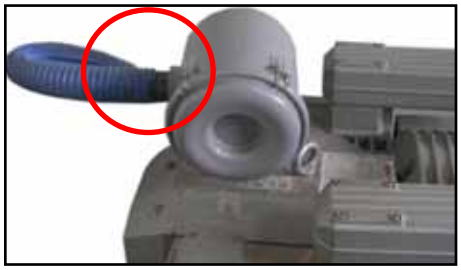
STEP 7: Next connect one end of the Vacuum Hose to the manifold fitting and snake the hose out through the bottom of the machine.

STEP 8: Connect the other end of the vacuum hose to the Vacuum Pump/Blower filter. Engage power and test run the Pump/Blower.

KEEP VACUUM PUMPS RUNNING, ROUTINELY GREASE THE PUMPS ONCE A YEAR.

PICTURE 15: *Manifold-Vacuum Hose Conn.*

PICTURE 16: *Filter-Vacuum Hose Conn.*



USING THE VACUUM HOLD-DOWN

The Techno Vacuum Table is very effective in "holding down" parts to be routed. For this method to work well, simple procedures need to be followed.

STEP 1: Define the area where your work piece will be positioned on the vacuum table.

STEP 2: Using the red rubber plugs, fill-in ALL the vacuum grid holed outside your defined work area, leaving the holes inside that area untouched.

STEP 3: Using the black foam rubber gasketing, section (wall-off) your work area from the rest of the table. This will create an area of concentrated vacuum, which will generate the greatest amount of vacuum "hold-down".

Continued on the next page...

PICTURE 17: *Rubber Plug in Vac Table*

PICTURE 18: *Foam Gasketing in Vac Table*

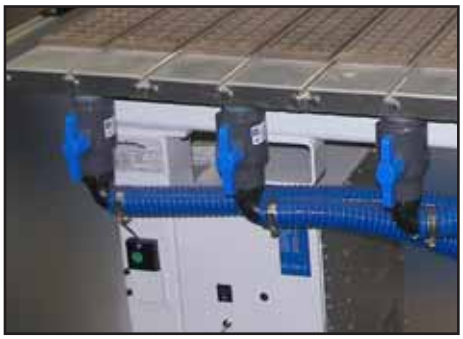
Holes and channels outside your work area but not activated by the vacuum valve do not need to be plugged. DO NOT STRETCH the gasket material while inserting it into the gasket slots. This will produce tears in the gasket material causing leaks leading to the loss of vacuum and secure pieces that fly off the table surface. When joining two separate pieces of gasket material, make sure to push them together so the two pieces form a tight seal.

STEP 4: Turn ON (valve vertical) the valves that pertain to your work area and turn OFF (valve horizontal) the ones outside of that area. This concentrates all the vacuum "hold-down" capacity to your defined work area. Each valve controls two rows of vacuum table extrusions.

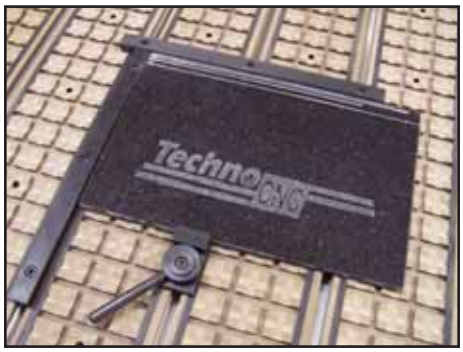
Use Techno's line of fixturing accessories (cam clamps, clamp bars, toggle clamps, t-nuts and more) to secure odd-shaped items.

WARNING: Proper care should be taken to make sure that objects held down with the vacuum table are secure. There is a danger that objects can become loose and could be thrown by the action of the cutting tool. Proper safety precautions against flying debris must be taken. Safety glasses must be worn at all times of operation.

PICTURE 19: *Vacuum Table Control Valves*



PICTURE 20: *Vacuum Table Fixturing*



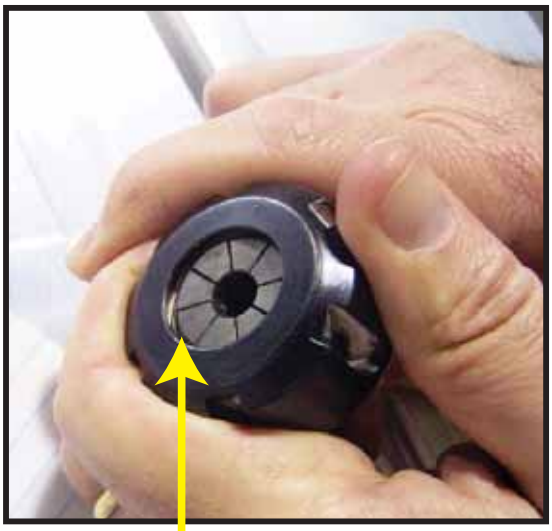
"DON'T LET THIS HAPPEN TO YOUR MACHINE!"

PREVENT FIRE HAZARDS by using the proper feeds, speeds, and tooling while operating your Techno machine. For example, setting feeds and speeds too low and/or using dull tool bits creates friction at the material. The friction generates heat which can result in a fire that can be drawn through the vacuum table without you knowing it. Be very careful when cutting composite material, especially wood composites like MDF and Particleboard.

APPENDIX A - COLLETING GUIDELINES

COLLETING GUIDELINES

WRONG!



This picture shows an improper assembly. Notice the gap and angle of the collet in relation to the nut. The collet is not flush to the end of the collet nut. Correct this assembly before using.

RIGHT!

The picture above is how your collet nut assembly should look: the end of the collet is flush with the bottom surface of the collet nut. You will hear and feel a “SNAP” as the collet properly goes into the collet nut. Once it is assembled, then “SCREW” the nut onto the threaded spindle end.

DO NOT PUSH THE COLLET INTO THE SPINDLE AT ANY TIME!

Only the proper assembly should be screwed onto the spindle.

FOR TOOLCHANGE AND FIXED COLLET SPINDLES:

ONLY USE TOOLHOLDERS, COLLET NUTS AND TOOLS THAT ARE BALANCED TO MEET OR EXCEED THE MAX RATED SPEED OF THE SPINDLE.

THE SPINDLE WILL BE DAMAGED IF UNBALANCED EQUIPMENT IS USED! ALL AUTOMATIC TOOL CHANGE SPINDLES REQUIRE FILTERED *DRY* AIR. THIS MIGHT REQUIRE THE ADDITION OF A WATER REMOVAL SYSTEM TO YOUR AIR COMPRESSOR. SUPPLYING WATER SATURATED AIR TO THE ATC SPINDLE WILL RESULT IN DAMAGE THAT IS NOT COVERED BY THE WARRANTY.

APPENDIX B - LUBRICATION SPECS.
LUBRICATION SPECS. FOR LC / LCP / LCX SERIES MACHINES

Y-Axis (Long Axis) – THK Products

Grease: Lithium-based grease (JIS NO. 2) or Urea-based Grease (JIS No. 2), such as AFB Grease (THK), Alvania Grease No. 2 (Shell), Daphne Eponex Grease No. 2 (Idemitsu Kosan) or equivalent.

Oil: Sliding surface oil or turbine oil (ISOVG32-68), such as Super Multi 32 to 68 (Idemitsu Kosan), Vactra No. 2S (Mobile), DT Oil (Mobile), Tonner Oil (Showa Shell or equivalent.

TABLE 1 - THK

	BALLSCREW	RAIL	CARRIAGE
GREASE	√	√	√
OIL	√	√	
Note: On some items you can use either the grease or oil.			

X and Z-Axes – ISEL Products

Grease: Alvania-1, -2, -3 (Shell) for light, med. and heavy-duty apps, respectively.

Oil: Renolin CLP 100 (Part No. 299020).

TABLE 2 - ISEL

	BALLSCREW	RAIL	CARRIAGE
GREASE	√		√
OIL		√	√
Note: On some items you can use either the grease or oil.			

APPENDIX B - LUBRICATION SPECS cont.

LC/LCP/LCX SERIES LUBRICATION MAINTENANCE

For regular work loads, machine maintenance is required at least once a month. The machine should also be lubricated once it is received.

WARNING: Before inserting any object into the machine, press the E-Stop Button. DO NOT use WD-40 or silicon spray on the machine, it may damage the drive components.

Use the Grease and Oil Recommendations listed on the previous page, paying close attentions to what grease and/or oil must be used. It is different for the three axes.

LONG AXIS (Y) - THK BALL SCREW

1. Clean the ball screw with a dry rag removing old grease and debris that may have collected.

2. Apply grease (See Table 1) on the ball screw and run the machine back and forth several times to spread the grease out. By applying the grease and running the axis back and forth, small particles that may have collected in the ball nut may be flushed out. Repeat Steps 1 and 2 again. **(PICTURE 1)**

THK CARRIAGES AND RAILS:

THK specifications indicate a small amount of grease needs to be applied to the rails after 4 months of use. PICTURE X indicated the location of a grease fitting. There are 4 bearing carriages total, 2 on each side. **(PICTURE 2)**

GANTRY (X AND Z AXES) - BALL SCREWS AND RAILS

1. Remove black end caps at the top and bottom of Z-axis and both ends of (X-axis) Gantry, there are 4 spots per axis. See alternate lubrication instructions (1B, 2B) for nylon wipes below. **(PICTURE 3)**

2. Jog the axis to end of travel or until lube point is visible. Using the a grease gun, insert a small amount of grease (see TABLE 2). This lube point greases both the bearing and ball screw simultaneously. Run the machine back and forth 1/2 dozen times. **(PICTURE 3A)**

If you can not reach the lube points then you can apply grease and oil (see TABLE 2) through the nylon wipes.

1B. Apply oil to an acid brush. Spread apart the rubber guards and brush oil onto the rails. When applying oil to the rail behind the ball screw, it may be necessary to bend the acid brush to reach the rails. **(PICTURE 4)**

2B. Apply grease to a second acid brush or your finger and apply grease to the ball screw.

PICTURE 1: *Ball Screw Grease Fitting*

PICTURE 2: *THK Rails & Carriage Grease Fittings*

PICTURE 3: *Gantry Grease Fittings*

PICTURE 3A: *Z-Axis Grease Fittings*

PICTURE 4: *Rail Behind Ball Screw Fitting*

APPENDIX C - ADDITIONAL RESOURCES

CUSTOMER SUPPORT WEBSITE

http://support.technocnc.com/

Visit this site for software updates and the Tech-Support Wizard.
This Wizard is password protected for our customers.

Username: technocnc **Password:** multiaxis

MACHINE SERIAL NUMBERS

There are two machine serial number labels on your machine. The larger label is located on your control box and contains the Serial Number with Machine Voltage Information. The second smaller label contains the machine serial number identical to the larger label and is located on the front base of the machine under the table top extrusion. Examples of both are pictured to the right. Record the serial number and have readily available when contacting Techno.

TO REORDER VACUUM SUPPLIES:
Call Techno Today at: 516-328-3970

ITEM	PART NUMBER
Rubber Plugs	H91X30-PL006-001
Foam Rubber Gasketing	HX4892-W0002

TO ORDER CNC TOOLING ROUTER BITS:
Ray Jakas, Tooling Sales Manager
516-328-3970 ext. 163
tooling@technocnc.com · www.technocnc.com/tooling/

1103 Techno Router

Techno LC Tabletop Series CNC Routers

Overview | Features | Accessories

The LC Series Tabletop CNC Router

Techno offers two models of the LC Tabletop Series CNC Router. Both models come standard with ball screws on all three axes, and closed-loop servo controls. The use of such superior components, results in superior machine performance and longevity. The LC Tabletop Series CNC Router is an excellent choice for small to midsized shops and will meet all demanding applications at a very low price. This CNC Router series is an excellent entry-level router which allows the user to start with the basics and build on it as the business grows. The LC Tabletop Series CNC Router can be ordered with or without a heavy-duty aluminum extrusion stand, and can be equipped with many of the options and accessories as a full size machine.

Get A Quote

Application Assist.

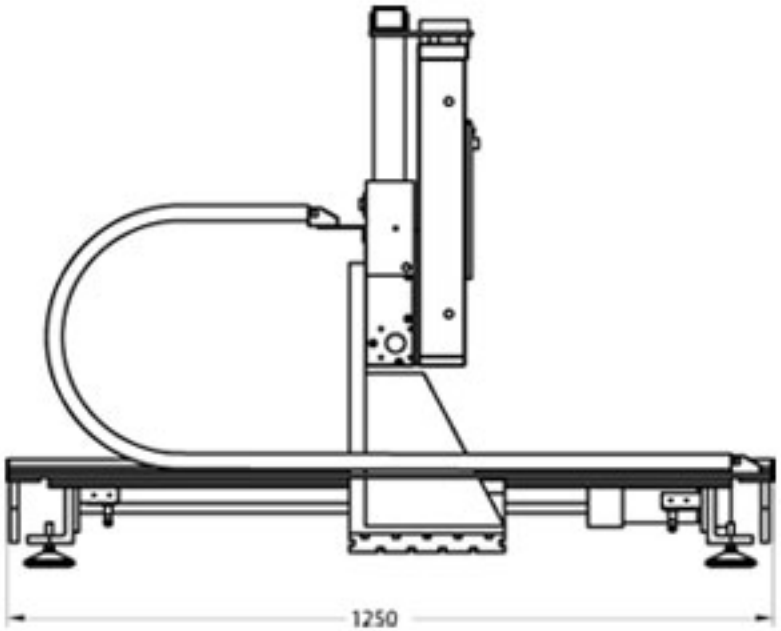
- Additional Views of CNC Router
- Applications for CNC Routers and Routable Materials
- Detailed Construction Features of CNC Router
- LC Series Router Foot Print
- View CNC Router Interface

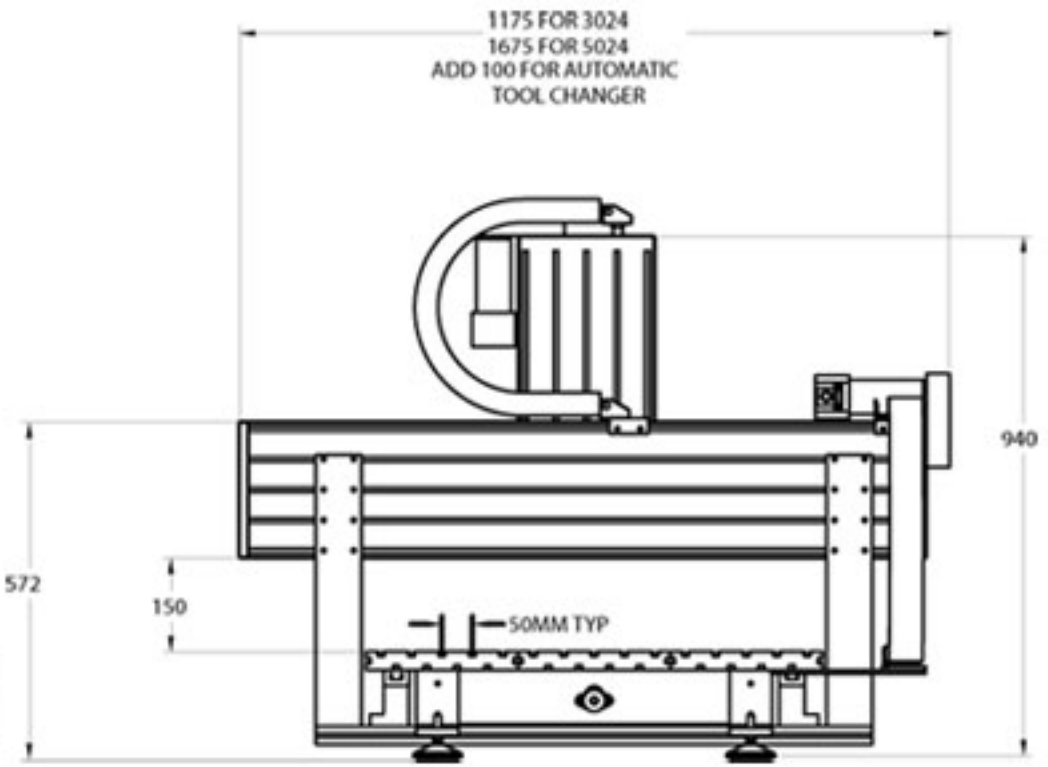
- Large Format LC CNC Routers
- Patriot CNC Router

Machine Model	Process Area X x Y	Floor Print W x L x H	Repeat	Resolution	Maximum Speed in. / min.	Bridge Clearance	Z Travel	Weight lbs.
3024	30 x 24	47 x 49 x 37	. 001"	.0002"	250	5-7/8"	8.9"	338
5024	50 x 24	67 x 49 x 37						362

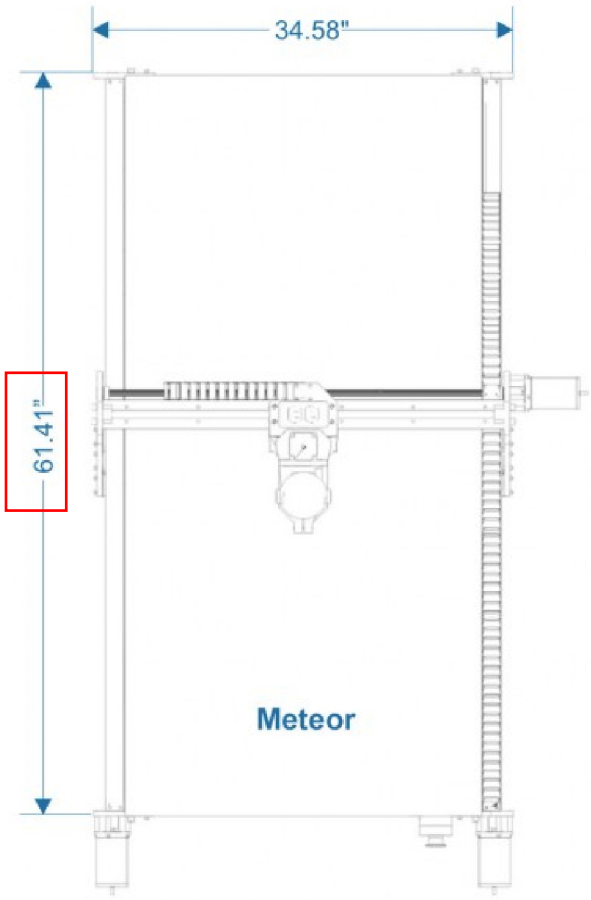
Click the appropriate blue Machine Model number to add the model to your quote request form. **Dimensions are in Inch.**

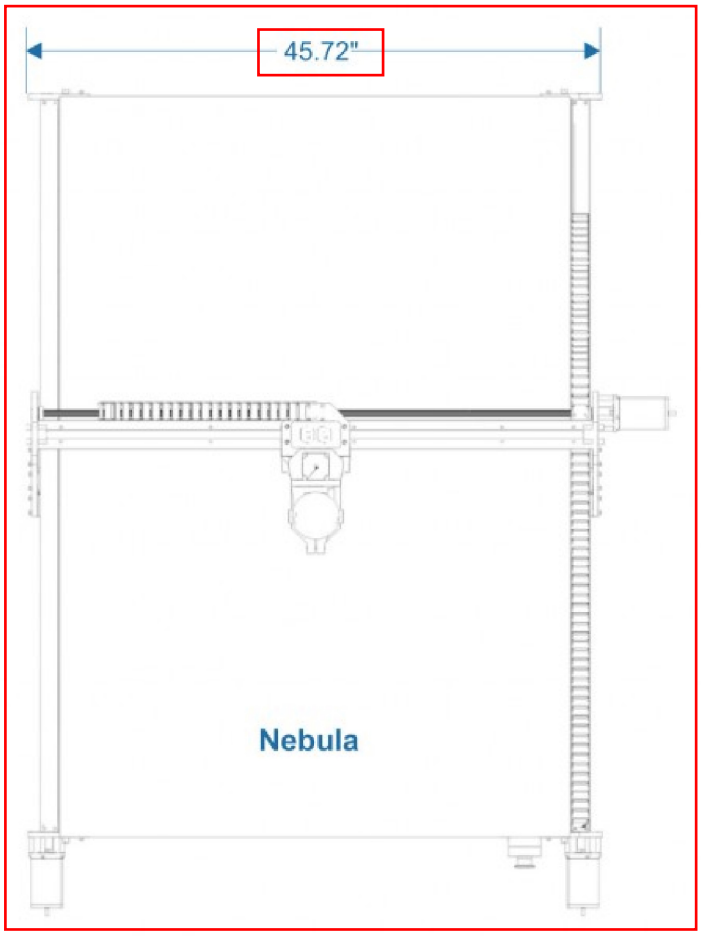
1103 Techno Router

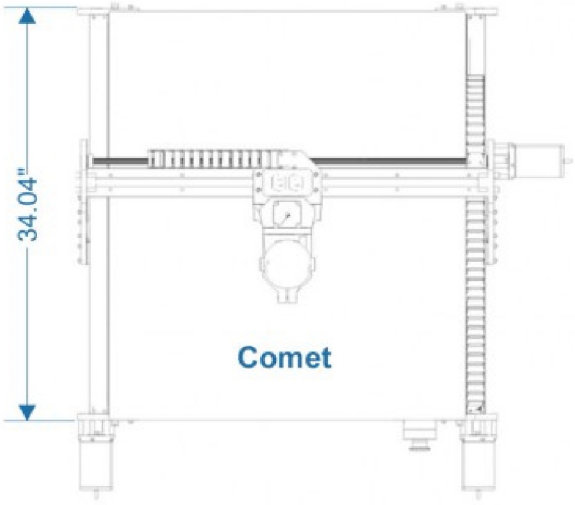


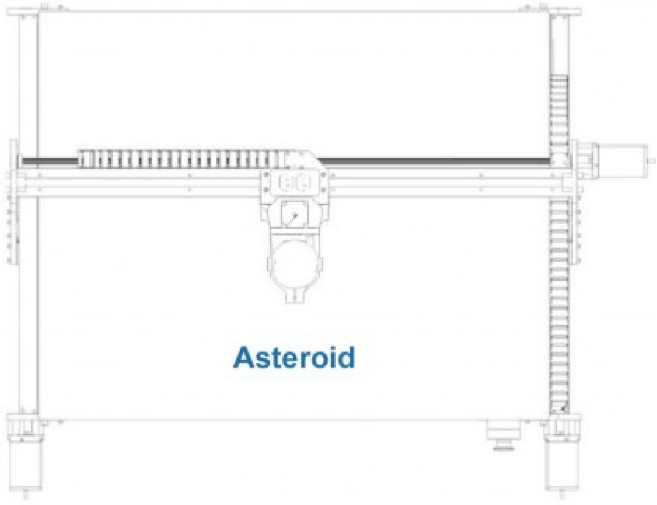


1104 Probotix Router









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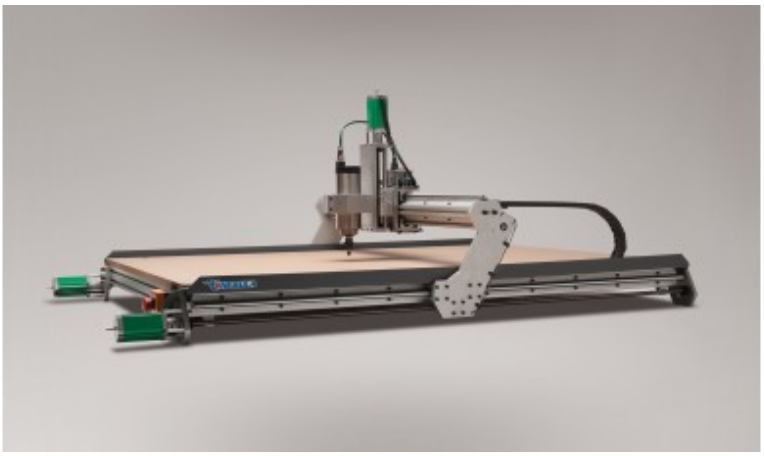
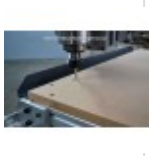










- Description
- Specification
- Shipping
- Videos

The Galaxy Series machines must ship by freight carrier. The default shipping option is FOB Origin ($0) and the buyer is responsible for arranging pick-up with a freight courier. The freight is one palletized crate class 92.5 from 61615 USA - see the grid below for weights and dimensions. If you are in the continental USA, Mexico, or Canada we can offer a custom rate quote for freight shipping to your door. Email support@probotix.com with your shipping address, product, and if delivery address is residential and we will send you a quote. To have custom freight added to your shopping cart before checkout, call us at 309.691.2643 between 8 and 5 Central Monday - Friday.

	Work Envelope	Total Machine Weight	Weight of Spoil Board	Crate Dimensions	Shipping Weight
Comet	25 x 25	105	19	48 x 48 x 30	350
Asteroid	37 x 25	125	26	48 x 60 x 30	400
Meteor	25 x 50	139	34	48 x 72 x 30	450
Nebula	37 x 50	158	48	60 x 72 x 30	500

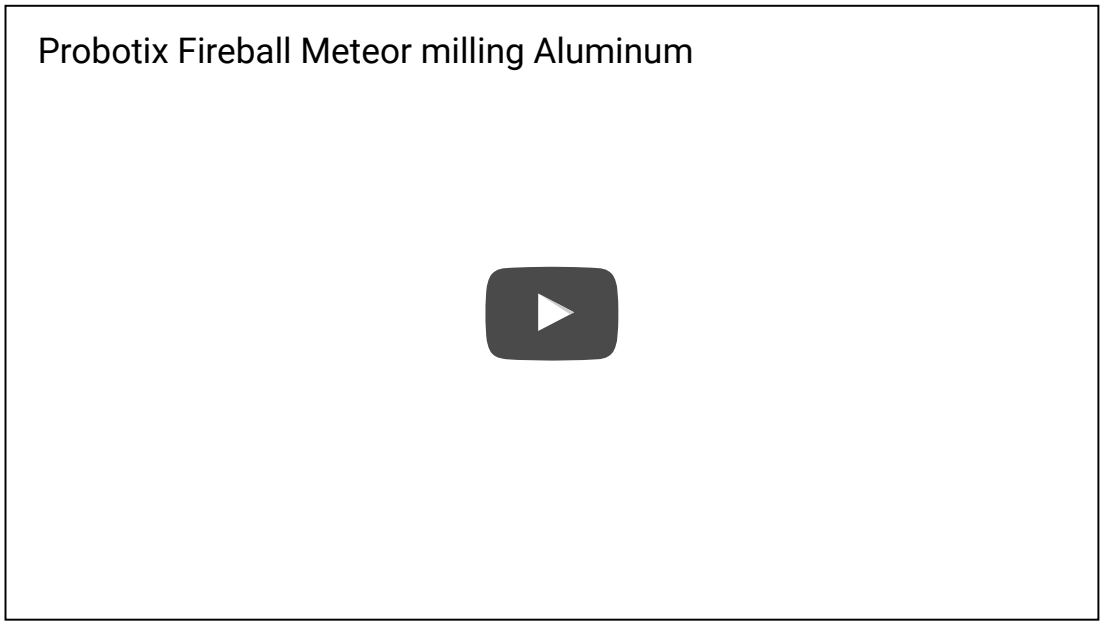
* Weights in pounds, Dimensions in Inches

PROBOTIX - An Introduction to LinuxCNC

from **PROBOTIX**

30:47

Introduction to LinuxCNC from PROBOTIX on Vimeo.



NEBULA CNC ROUTER

With a whopping 37" x 50" work envelope, the Nebula is our biggest machine yet! raises the bar on the tabletop CNC routers. This is a high performance, general purpose machine tool positioner, suitable for many uses such as guitar building, clock making, plaques, signs, RC aircraft parts and more!

This machine comes fully assembled and is shipped in a crate handled by a freight carrier. With pre-installed home/limit switches, spindle control relay, cable chain, and carriage mounted spindle power jack, no other machine on the market comes close to being this complete, and ready-to-run.

This machine is supported by the FireBall CNC Yahoo Group. Feel free to drop in there to learn more or to ask any questions before buying.

Design Features:

37” x 50” x 5” Machine Travel

Large enough to make guitar bodies, our #1 most requested feature. This machine is at the very edge of what you can do with an ACME screw mounted in this way, where it will not whip at high speeds. By using this mounting method and not using ballscrews nor rack-n-pinion, we are able to produce this machine with ZERO lathe work.

The machine was designed such that every part of it could be manufactured in-house within the work envelope of our milling machines. By having zero lathe work and in-house milling, we don't have to deal with the outsourcing to expensive machine shops.

Fully Supported Linear Rails

Less flex. Supported round rails offer the same benefit as the hiwin type of rails, at a fraction of the cost.

Precision ACME Leadscrews

More affordable than ballscrews, yet capable of precise positioning and rapid travels.

Anti-backlash Nuts On All Axis

Zero backlash. Delrin anti-backlash nuts apply pressure to both sides of the screw face eliminating backlash. The anti-backlash nuts by design will wear out, but are user replaceable.

200 Inches Per Minute Rapids

Less time flying through the air to get from one entry point to the next. Any faster than this and you'd have to set the acceleration so low that it'd never reach that speed anyhow due to the mass of the gantry and carriage.

Solid Aluminum Construction

More rigidity. Very minimal tool deflection.

Open Frame/Tandem Motor Design

The tandem motor setup, coupled with some LinuxCNC sorcery makes squaring the machine a breeze. The independent but simultaneous left and right homing sequence will re-square itself every time the machine is homed. Tandem motors also prevent racking, which can be a problem when the tool is operating at the edges of the work envelope. Removing the leadscrew from the center of the table eliminates work piece height limitations.

T-Slot Extrusion Construction

The open frame design allows for taller work pieces and many fixturing options. The spoil board can be mounted above or below the frame. Also, the spoil board could be completely removed, and the user can fabricate any sort of mounting system, rotary table, etc. The use of T-Slot on the frame makes fabricating your custom fixtures and mounting them a breeze.

Pre-installed Limit/Home Switches

Because of the tandem motor setup, homing switches are essential, and thus are factory installed. No other machine in this class comes with pre-installed homing/limit switches.

Cable Chain Cable Management

Clean and professional IGUS cable chains guide and protect the wiring. Another exclusive feature that you will not find on any other machine on the market.

Fully Assembled & Wired

Even includes frame mounted emergency stop switch. Nope - the other guys don't have this either.

Five-driver Stepper Motor Driver Kit

This machine was designed around our MondoStep Stepper Motor Driver kit with 420ozin Motors and 40V power supply. No other motor driver kit will run this machine as it was intended. The motor/driver kit comes as ready-

to-run, with enclosure, fan, connectors, and all. All you have to do is connect the motor and switch jacks, attach it to the PC, and power it on.

Included PC w/ LinuxCNC Control Software

Because of the tandem motor setup and the custom configuration necessary for LinuxCNC to coordinate the homing sequence, we feel it is best for us to include a pre-configured PC. Also, it needs to be a modern PC to spit out the step pulses fast enough to achieve our high speeds.

Relay Controlled Spindle

Relay spindle control is standard on this machine. There is a 110V power jack mounted to the carriage. This allows us to run the spindle power through the cable chain. The user can easily change out spindles as needed, and will not have to cut off the plug on the power cord - which would void the warranty on your spindle.

Choice of Trim Router Mounts

The bolt pattern is the same as the V90, and any of our spindle mounts will work on this machine. An array of this bolt pattern on the z-axis face allows you to mount the spindle in several positions relative to the z-axis travel. This will help with different tool length requirements, and fixturing offsets.

Work Envelope	
X Travel	37+ Inches
Y Travel	50+ Inches
Z Travel	5+ Inches
Performance	
Maximum Speed	200 Inches Per Minute (per axis), 330 Inches Per Minute (combined)
Resolution	0.00125 Inches
Mechanical	
Drive Mechanism	1/2" 5-Start ACME Screws w/ Anti-backlash Nuts
Linear Rails	16mm Fully Supported Rails on X & Y Axis, 16mm Open Rail on Z Axis
Machine Frame	3060M Aluminum T-slot Extrusion
Electrical	
Control System	Unity CNC Controller (5x 4.2Amp Bi-polar Drivers), LinuxCNC Control PC
Power Requirements	10A@110VAC for Control System, 20A@220VAC for optional VFD Spindle

NEBULA CNC ROUTER

- Brand: Galaxy Series
- Product Code: GS-NEBULA
- Availability: In Stock

- **$4,699.00**

Available Options

* Spindle/Router Mount Dewalt DWP-611
* Z Touch-off Puck --- Please Select ---
* ATLaS Automatic Tool Length Sensor --- Please Select ---
* 8pc Starter Carbide 1/4" Shank Tool Bit Set --- Please Select ---
* 4th Axis Rotary --- Please Select ---
* Spindle --- Please Select ---
* CAM Software --- Please Select ---
* Dust Collection --- Please Select ---
* Threaded Inserts and Table Grid --- Please Select ---
* Dovetail/Joinery Fixture --- Please Select ---
* Aluminum Stand --- Please Select ---
* Keyboard/Mouse/Monitor Arm --- Please Select ---

Qty 1

Add to Cart

Tags: nebula, cnc, router, routers

UNIVERSAL LASER SYSTEMS

1105 Laser

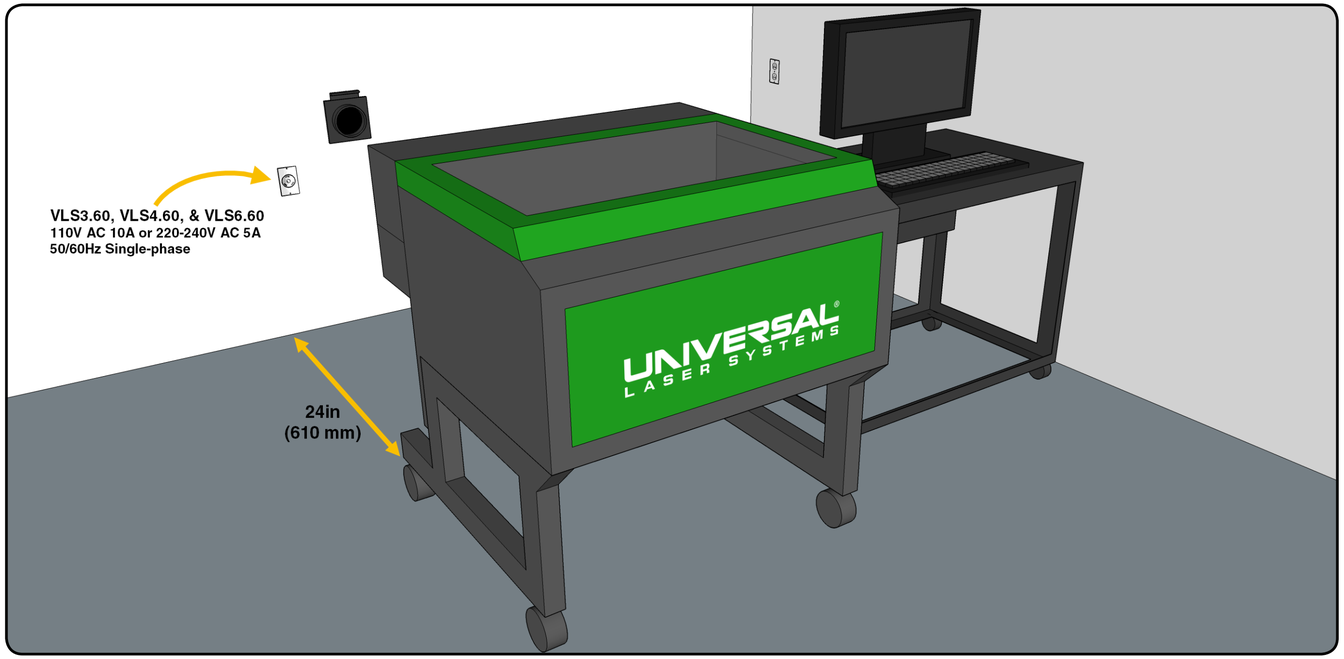
VLS6.60 Laser Solution - Site Preparation

1) Location & Environmental Requirements

The VLS6.60 needs to be placed in a well-ventilated office like environment or light-duty manufacturing facility with noncondensing humidity between the temperatures of 50° F (10° C) to 95° F (35° C). An optimal temperature range of 73° F (22° C) to 77° F (25° C) is recommended for peak performance.

The VLS6.60 laser solution requires sufficient space for ventilation beyond its foot print of (W x H x D) 44 x 39 x 37.5 inches (1118 x 991 x 953 mm). When designing the space, an additional 24 inches (610 mm) behind the laser solution needs to be considered.

Requirements met? Yes ☐ No ☐



2) Power Requirements

The VLS6.60 laser solution requires a power outlet rated at 110V AC 10A, or 220-240V AC 5A, 50/60Hz Single-phase on its own circuit. This circuit also needs to be grounded (earthed) and stable (surge and spike protected). Supplementary 110V or 220V AC power outlets are recommended to provide power for a computer and any remaining devices/accessories.

Requirements met? Yes ☐ No ☐

3) Exhaust Requirements

To ensure proper removal of debris from the laser solution, an exhaust blower or air filtration system is required. The exhaust system must be capable of moving 500 CFM (cubic feet per minute) of air at 6 inches of static pressure (850 m^3/hr at 1.5 kPa) utilizing the two 4 inch (101.6 mm) ports on the rear of the laser solution. When selecting an exhaust system it is imperative that you consider the length of hose needed to connect the laser solution to the exhaust system as pressure is lost over long distances.

Requirements met? Yes ☐ No ☐

4) Receiving & Relocation

The VLS6.60 will arrive in a crate with the dimensions of 51 x 42 x 59 inches (1296 x 1067 x 1499 mm) and a weight of over 500 lbs. (226 kg). Please note below if you have a receiving dock or if a lift gate will be required on the delivery truck.

☐ Have Receiving Dock
☐ Lift Gate Required

Requirements met? Yes ☐ No ☐

5) Computer Requirements

- Dedicated Windows 7 or higher PC (32- and 64-bit)
- 2.0 GHz processor (minimum)
- 1 GB of RAM (minimum)
- 40 GB hard drive (minimum)
- Monitor
- Mouse and keyboard (unless using a Touchscreen)
- Available USB 2.0 hi-speed or USB 3.0 compliant port only
- Internet connection and email address (optional)

Requirements met? Yes ☐ No ☐

Signatures

Please review, sign, save, and send this form to support@ulsinc.com to initiate the scheduling of a technician to install the laser solution. For domestic, United States only, installations please allow for a two week lead time at minimum and for international installations please allow for a three week lead time at minimum from the date ULS receives this form. By signing below you indicate that your facilities meet the requirements for the laser solution to the best of your knowledge.

Customer: _____ Date: _____

1105 Laser

UNIVERSAL® LASER SYSTEMS

VLS Platform Series

Flexibility for Growing Businesses

The VLS3.60, VLS4.60 and VLS6.60 freestanding laser platforms offer increased maximum laser power levels and larger working areas than the desktop models. In addition, VLS freestanding laser platforms are equipped with Universal Laser Systems' patented Rapid Reconfiguration™ technology, so laser sources can be installed, removed and exchanged in seconds without the use of tools. The increased workspace, power and flexibility of the VLS freestanding laser platforms make them a good choice for a growing business.

Choice of five colors

Laser Technology Benefits

- **Software Controlled** - Any Windows®-based software with a print function can be used with the laser system.
- **Multi-Material** - Process an endless number of materials.
- **Multi-Process** - Cut, engrave, mark and produce photo images in one step.
- **Non-Contact** - Modify material without applying any physical force.
- **On-Demand** - Produce everything you need in real time, without waiting for hard-tooling.

Uniquely Universal Features

- **Laser Sources**
  Our patented, metal core, air-cooled, free-space slab, CO_2 lasers produce excellent beam quality with even power distribution, good near-field and far-field characteristics and long life. Dual lasers dramatically increase speed, edge quality and power.

- **Rapid Reconfiguration™**
  Unique to ULS, Rapid Reconfiguration allows our modular platforms to be field-reconfigured with a variety of laser sources, optics & accessories, in seconds and without tools. Easily exchange laser wattage to change peak power and increase speed and throughput.

- **Universal Control Panel (UCP)**
  Our exclusive integrated materials database in the UCP print driver automatically determines the optimum processing settings for your target material. Just select the material type, enter the material thickness and press "start."

- **High Power Density Focusing Optics™**
  High Power Density Focusing Optics (HPDFO™) allow the laser beam to be focused to a much smaller spot, making it possible to engrave smaller text and produce sharper images at tighter tolerances.

- **1-Touch Laser Photo™**
  1-Touch Laser Photo is our popular software package that makes it quick and easy to reproduce stunning photographic images on nearly any material.

System Specifications

	VLS3.60	VLS4.60	VLS6.60
Work Surface Area (W x H)	24 x 12 in (610 x 305 mm)	24 x 18 in (610 x 457 mm)	32 x 18 in (813 x 457 mm)
Maximum Part Size[1] (W x H x D)	29 x 17 x 9 in (737 x 432 x 229 mm)	29 x 23 x 9 in (737 x 584 x 229 mm)	37 x 23 x 9 in (940 x 584 x 229 mm)
Dimensions (W x H x D)	36 x 38 x 30 in (914 x 965 x 762 mm)	36 x 39 x 36 in (914 x 991 x 914 mm)	44 x 39 x 36 in (1118 x 991 x 914 mm)
Rotary Capacity	Max. Diameter 8 in (203 mm).		
Motorized Z-Axis Lifting Capacity	40 lbs (18 kg)		
Available Focus Lenses	2.0 / HPDFO™		
Laser Platform Interface Panel	Five-button keypad		
Computer Requirements	Requires dedicated PC with Windows® 7/8/10 32/64 bit and one available USB port (2.0 or higher).		
Cabinet Style[2]	Free-standing		
Laser Options	10, 25, 30, 40, 50, 60 watts		
Approximate Weight	235 lbs (107 kg)	270 lbs (122 kg)	325 lbs (147 kg)
Power Requirements	110V/10A; 220V-240V/5A		
Exhaust Connection	One 4 in (102 mm) port 250 CFM @ 6 in static pressure (425 m^3/hr at 1.5 kPa).		Two 4 in (102 mm) ports 500 CFM @ 6 in static pressure (850 m^3/hr at 1.5 kPa).

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UNIVERSAL® LASER SYSTEMS

Learn more at **ulsinc.com**

CDRH Class 1 safety enclosure for CO_2 laser[2]. Class 2 for red laser pointer.

[1] *Maximum part size defined as used with 2.0 lens.*

[2] *CDRH Class 1 laser safety enclosure provides for safe operation without the need for an interlocked room or protective eyewear.*

ULS laser systems are protected under one or more of U.S. Patents: 5,661,746; 5,754,575; 5,867,517; 5,881,087; 5,894,493; 5,901,167; 5,982,803; 6,181,719; 6,313,433; 6,342,687; 6,423,925; 6,424,670; 6,983,001; 7,060,934; 7,415,051; 7,469,000; 7,715,454; 7,723,638; 7,947,919; 8,101,883; 8,294,062; 8,599,898; 8,603,217; 8,101,883; 8,294,062; 8,599,898; 8,603,217; 9,155,988; 9,263,844; 9,263,845; 9,281,649; 9,346,122; 9,354,630; D517,474. Other U.S. and international patents pending. Made in the U.S.A.

The VLS Desktop system has been awarded U.S. Design Patent No. D517,474 for the unique design of its external cabinet, which also functions as a Class 1 laser safety enclosure.

MC013-0715 REV2017.03

OMAX Corporation

1106 Omax Maxiem Waterjet

ADVANCED ABRASIVE WATERJET SYSTEMS

0707

MAXIEM 0707 JetMachining Center

The next generation MAXIEM® 0707 JetMachining® Center sets a new standard for abrasive waterjet machining. Faster, smoother, and more precise, the MAXIEM 0707 is ideal for a wide range of modern machining needs. The exclusive advanced Intelli-*TRAX*® digital linear encoder provides one-micron resolution instant feedback to the motor control system so the machine knows precisely where the cutting head is at all times. The mobile control station with widescreen display provides flexibility in controller positioning. Optional accessories such as the Rapid Water Level Control for submerged cutting and Collision Sensing Terrain Follower for machining irregular surfaces expand your JetMachining capabilities and dramatically improve production.

FEATURES & BENEFITS

- Fast cutting speeds and high precision that is backed by our exclusive Intelli-MAX® Software with real world cutting data
- Programmable Motorized Z-Axis with a precision OMAX MAXJET®5i Nozzle boosts productivity and process efficiency
- Drive system protected against water, dirt, and grit
- Powerful all-in-one controller computer with large 23" screen
- Highly efficient, industry-proven direct drive pumps available up to 40 hp with operating efficiencies up to 85%
- Free Intelli-VISOR® SE System Monitoring simplifies routine maintenance planning to minimize downtime
- Optional Rapid Water Level Control for quiet submerged cutting
- Optional Bulk Abrasive Feed Assembly transports garnet from the assembly's large hopper into the Zero Downtime Hopper located at the Programmable Motorized Z-Axis
- Optional Variable Speed Solids Removal System (VS-SRS) designed for industrial use increases uptime through automated solids removal
- Factory tested as a complete system before shipping
- Machines a wide range of materials and thicknesses, from metals and composites to glass and plastics
- Designed and manufactured at the OMAX factory in Kent, Washington, USA
- Does not create heat-affected zones or mechanical stresses
- No tool changes & minimal fixturing dramatically reduce setup
- Convenient controller storage drawers keep essential tools and spares close by to maintain machine uptime
- Uses substantially less cooling water than inefficient hydraulic intensifier pumps
- Small, efficient footprint for minimal floor space utilization
- Lowest electrical consumption compared to other pump technology
- Leaves behind a satin-smooth edge, reducing secondary operations
- No noxious fumes, liquid or oils used in, or caused by, the machining process
- Environmentally "green" system uses only natural garnet abrasive and water in the cutting process

MAXIEM® BUILT BY OMAX

MADE IN THE USA

0707

MACHINE DIMENSIONS

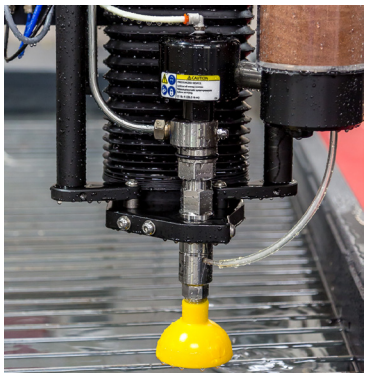
Footprint (without controller)	6'7" x 8'3" (2,007 mm x 2,515 mm)
Weight (tank empty)	2,400 lb (1,089 kg)
Height (with whip plumbing)	9'0" (2,743 mm)
Operating Weight (with water in tank)	5,100 lb (2,313 kg)

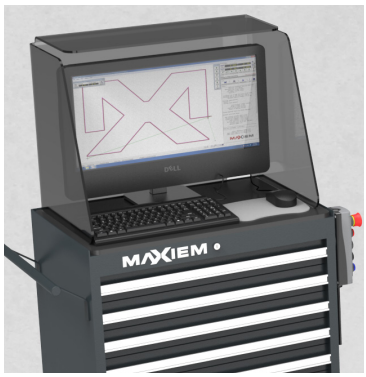
WORK ENVELOPE

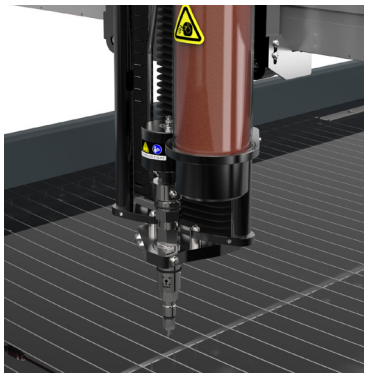
X-Y Cutting Travel*	2'7" x 2'6" (787 mm x 762 mm)
Z-Axis Travel*	12" (305 mm)
Table Size*	4'8" x 3'1" (1,435 mm x 953 mm)

DRIVE DESCRIPTION

- Brushless servo motors
- Stainless steel hardened precision ground shaft ways
- Real-time closed loop feedback with digital drives
- Bridge-style Y-Axis
- Intelli-*TRAX* drive technology with precision linear encoders
- Precision Programmable Motorized Z-Axis







STANDARD MODEL SPECIFICATIONS

Material Support Slats	34 4" x 14Ga Galvanized Steel (102 mm x 2 mm)
Maximum Supported Material Load	300 lbs/sq ft (1,465 kg/sq meter)
Electrical Requirements	3-Phase, 380-480 VAC ±10%, 50-60 Hz
Speed	500 in/min (12,700 mm/min)
Linear Positional Accuracy*	±0.003" (±0.076 mm)
Repeatability*	±0.001" (±0.025 mm)

OPTIONAL ACCESSORIES

- Rapid Water Level Control for submerged cutting
- Intelli-VISOR EX Monitoring Expansion Package
- OMAX Mini MAXJET 5i Nozzle
- 7/15 Mini MAXJET5 Nozzle
- Bulk Abrasive Delivery Assembly
- Collision Sensing Terrain Follower
- Material Holding Kit
- Waterjet Brick Kit
- High Pressure Universal Swivel Plumbing
- Bridge-mounted Pause Button and USB Port
- Air and Water Conditioning Kit
- Additional Seats of Intelli-MAX Software Suite
- Variable Speed Solids Removal System (VS-SRS)
- Water-only MAXJET 5 Nozzle
- Laser Feature Finder
- Z-Axis Pneumatic Drill
- Manual Tilt Z-Axis
- Splash Shield Kit
- Water Resistant Keyboard & Mouse
- Access Control Circuit Interface for safety interlocks
- Catcher Tank Armor Plating
- Extended Slat Package
- Laminar Filter

*Optional accessories may reduce cutting travel. Photos may show optional accessories. For a complete list of accessories, contact an OMAX sales representative. Accuracy specifications are at 72° F (22° C) Pumps are built to meet UL and CE specifications. Contact OMAX for detailed utility requirements.

ABOUT OMAX

OMAX is the global total solutions provider in advanced abrasive waterjet systems. Our intuitive Intelli-MAX Software Suite simplifies programming and reduces setup times, increasing your productivity. OMAX engineers continue to innovate technology for abrasive waterjet machining, from proven 4th generation pump designs to cutting edge drive systems with micron-level accuracy. With the largest abrasive waterjet support network in the world, OMAX continues to shape the future of waterjets.

To see how a MAXIEM JetMachining Center can save you time and money, call or visit our website and request a free part analysis today.

ABRASIVE WATERJET *vs.* OTHER METHODS

WWW.OMAX.COM/COMPARE

CE

WWW.OMAX.COM

Made in the USA

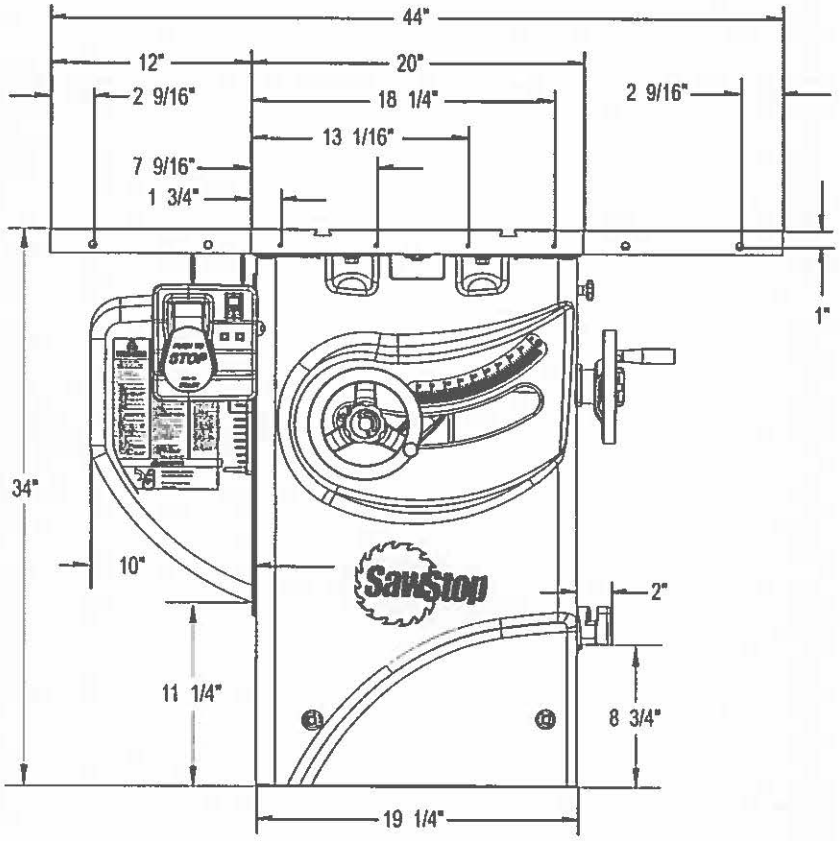
OMAX CORPORATION
21409 72nd Avenue South
Kent, WA 98032
TEL 1-253-872-2300 / 1-800-838-0343
FAX 1-253-872-6190

1107 Table Saw

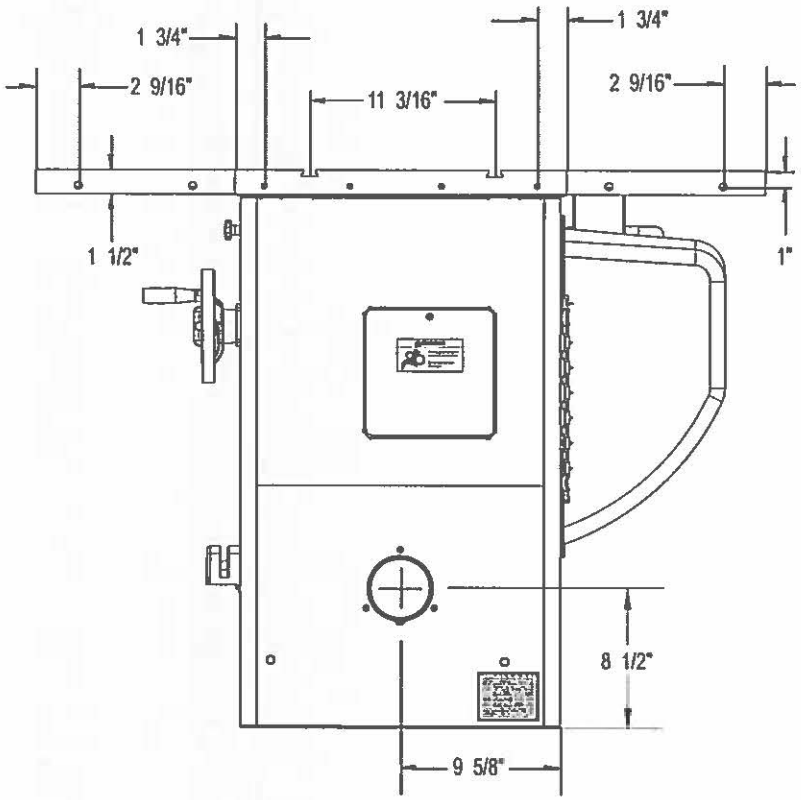
Professional Cabinet Saw Specifications

Overall saw dimensions:	44" w x 29¾" d x 34" h (table saw only) 69⅛" w x 33" d x 34" h (w/ T-Glide Fence System & 36" rails) 85¼" w x 33" d x 34" h (w/ T-Glide Fence System & 52" rails)
Cabinet footprint:	19⅜" w x 19⅜" d
Cast iron table:	20" w x 27" d, 44" w x 27" d (w/ extension wings)
Extension wing:	12" w x 27" d
Extension table (optional):	23¾" w x 27" d (36" rails), 40⅛" w x 27" d (52" rails)
Weights (approx.):	335 lb (table saw with extension wings only) 426 lb (w/ T-Glide Professional Series II Fence System, 36" rails & table) 449 lb (w/ T-Glide Professional Series II Fence System, 52" rails & table) 35 lb (cast iron extension wing)
Shipping weight (approx.):	390 lb (boxed table saw)
Blade:	40-tooth, professional grade, ⅝" arbor
Blade diameter:	10"
Blade tilt:	Left
Blade kerf:	0.118" (3 mm)
Blade plate thickness:	0.078" (2 mm)
Max. depth of cut, blade at 0°:	3⅛"
Max. depth of cut, blade at 45°:	2¼"
Max. rip, right of blade:	36" (w/ optional 36" rails) 52" (w/ optional 52" rails)
Max. rip, left of blade:	12" (w/ T-Glide Professional Series II Fence System)
Dado diameter:	8" (requires a separate brake cartridge and table insert)
Dado max. width:	13/16"
Arbor diameter at blade:	⅝"
Main bearing size:	62 mm OD x 30 mm ID
Second bearing size:	52 mm OD x 25 mm ID
Table in front of blade (max. elevation):	10¼"
Table behind blade (max. elevation):	7½"
Arbor runout:	0.001" maximum allowable runout
Table flatness measured diagonally:	0.010" maximum gap
Blade alignment with miter slot:	0.010" maximum displacement
Deviation of miter gauge indexing stops from actual angle:	±0.25°
Alignment between spreader and blade:	0.010" maximum difference
Miter slots:	T-shaped, ¾" at top, 1" at bottom, ⅜" deep
Cabinet dust collection port diameter:	4"
Blade guard dust collection port inner diameter:	1.25"
Blade guard dust collection port outer diameter:	1.5"
Riving knife / spreader thickness:	0.090" (2.3 mm)
Blade guard:	polycarbonate, extends only 1 3/16" to right of blade
Standard Insert:	zero-clearance, phenolic core, melamine surfaces
Belts:	2 V-ribbed belts — arbor belt is static dissipative
Handwheels:	7" diameter, cast iron chrome plated
Overall table and extension wing flatness:	0.025" Maximum gap
Motor options:	3hp for Model PCS31230

Professional Cabinet Saw Dimensions

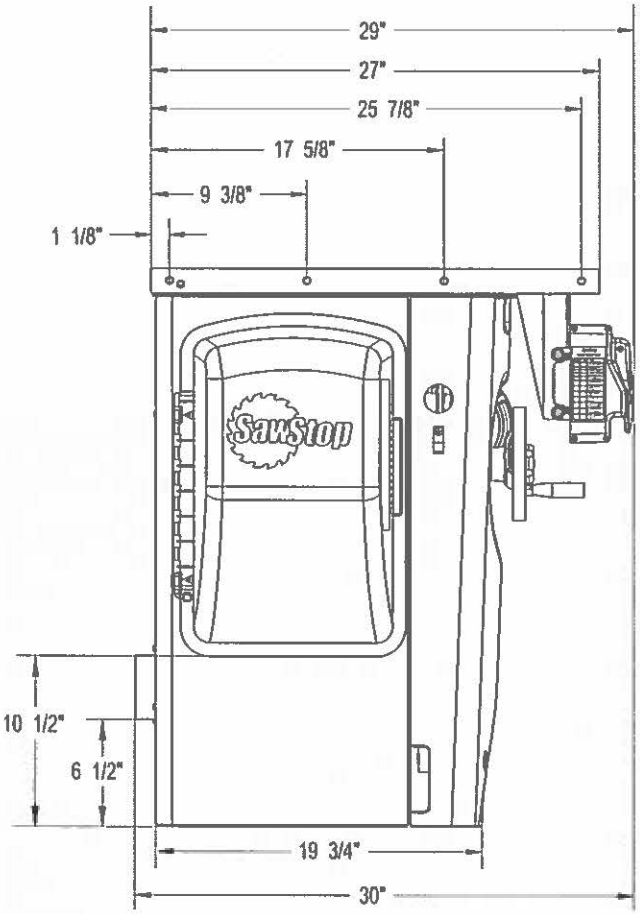


Front View

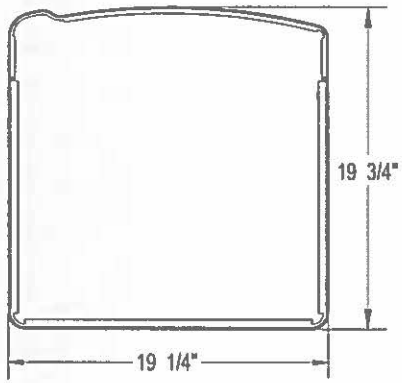


Rear View

Professional Cabinet Saw Dimensions

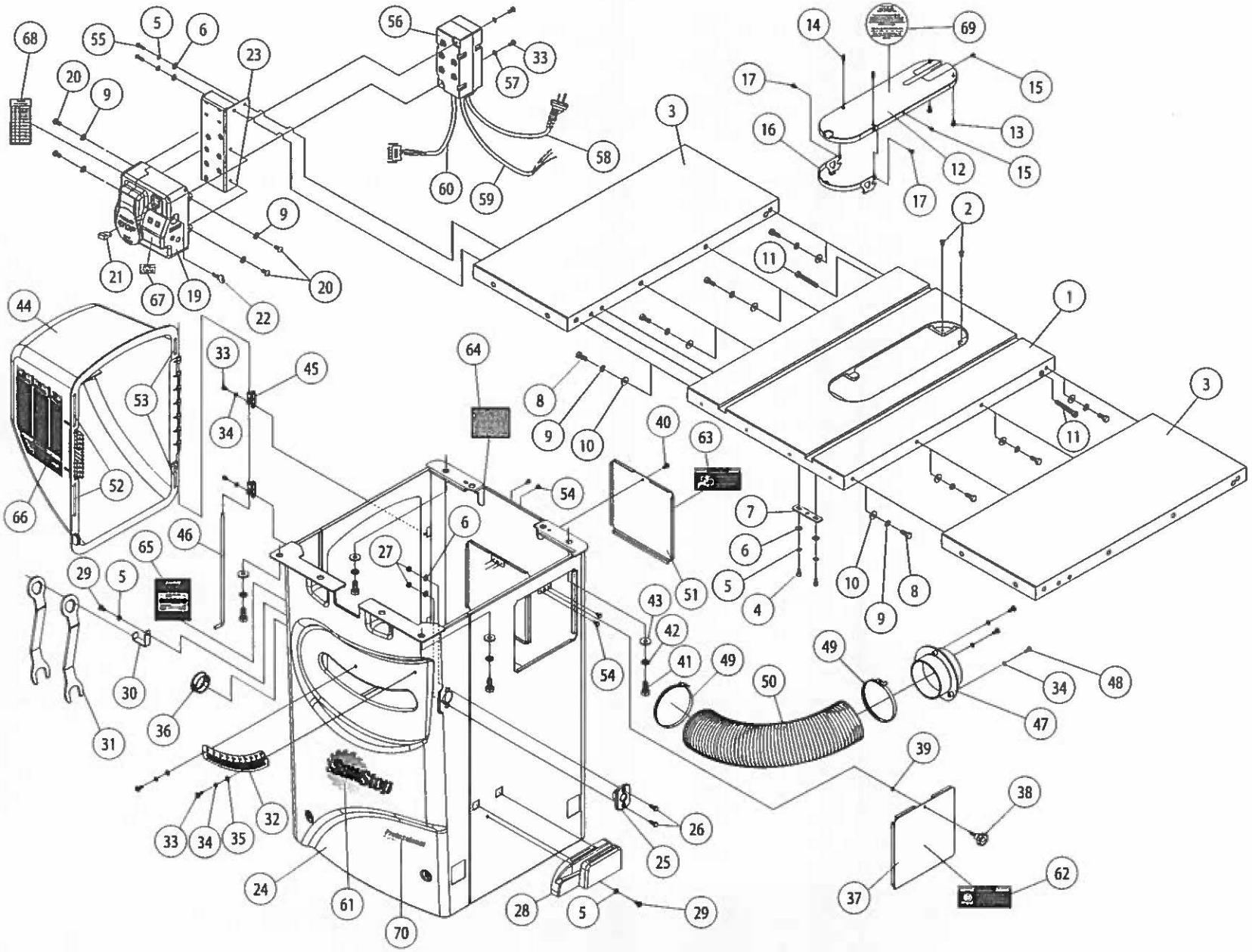


Left Side View



Footprint

Cabinet and Table Exploded View



Cabinet and Table Parts List

No.	Description	Part No.	Qty.
1	Table	PCS-001	1
2	Rear Lock Down Screw for Insert	PCS-002	2
3	Cast Iron Extension Wing	PCS-003	2
4	M6x1.0x12 Socket Cap Screw	PCS-004	2
5	M6 Lock Washer	PCS-005	6
6	M6x15x1.5 Washer	PCS-006	6
7	Table Alignment Bracket	PCS-007	1
8	M8x1.25x20 Hex Head Bolt	PCS-008	8
9	M8 Lock Washer	PCS-009	12
10	M8x20x2 Washer	PCS-010	8
11	M6x1.0x50 Socket Cap Screw	PCS-244	2
12	Standard Insert Assembly (includes items 13-18)	TSI-SLD	1
13	Rear Leveling Screw	PCS-013	2
14	M6x1.0x14 Set Screw	PCS-014	2
15	M6x1.0x8 Set Screw	PCS-015	2
16	Table Insert Lock-Down Lever	PCS-253	1
17	M4x0.7x10 Flat Head Phillips Screw	PCS-017	2
19	Switch Box Assembly (includes items 21-22, 67-68)	PCS-019	1
20	M8x1.25x12 Button Head Socket Screw	PCS-020	4
21	Switch Box Lock Out Key	PCS-021	1
22	Bypass Key	PCS-022	1
23	Switch Box Mounting Bracket	PCS-023	1
24	Cabinet	PCS-024	1
25	Tilt Shaft Mounting Bracket	PCS-025	1
26	M6x1.0x15 Hex Head Bolt	PCS-026	2
27	M6x1.0 Hex Nut	PCS-027	2
28	Accessory Tool Holder	PCS-028	1
29	M6x1.0x12 Button Head Socket Screw	PCS-029	2
30	Blade Wrench Holder	PCS-030	1
31	Blade Wrench	PCS-031	2
32	Tilt Angle Scale	PCS-032	1
33	M5x0.8x8 Button Head Phillips Screw	PCS-033	6
34	M5 Lock Washer	PCS-034	7
35	M5x10x1 Washer	PCS-035	2
36	Switch Box Cable Grommet	PCS-036	1
37	Side Cabinet Access Door	PCS-037	1
38	Cabinet Access Door Lock Knob	PCS-038	1
39	M6 Lock Knob Retaining Washer	PCS-039	1
40	M6x1.0x10 Button Head Socket Screw	PCS-040	1
41	M10x1.5x25 Hex Head Bolt	PCS-041	4

Cabinet and Table Parts List

No.	Description	Part No.	Qty.
42	M10 Lock Washer	PCS-042	4
43	M10x25x3 Washer	PCS-043	4
44	Motor Cover	PCS-044	1
45	Motor Cover Mounting Bracket	PCS-045	2
46	Motor Cover Rod	PCS-046	1
47	Dust Collection Port	PCS-047	1
48	M5x3x15 Button Head Phillips Screw	PCS-048	3
49	Hose Clamp	PCS-049	2
50	Dust Collection Hose	PCS-050	1
51	Rear Cabinet Access Door	PCS-051	1
52	Motor Cover Foam Large	PCS-052	2
53	Motor Cover Foam Small	PCS-053	2
54	Access Door Rubber Pad	PCS-054	4
55	M6x1.0x20 Button Head Socket Screw	PCS-055	2
56	230V Contactor Box (PCS31230)	PCS-056	1
57	M5 External Tooth Lock Washer	PCS-058	2
58	Main Power Cable (PCS31230)	PCS-059	1
59	Motor Cable Assembly	PCS-060	1
60	Motor Control Cable Assembly	PCS-061	1
61	SawStop Label	PCS-062	1
62	Blade Retraction Warning Label	PCS-063	1
63	Gear Warning Label	PCS-064	1
64	Patent Label	PCS-065	1
65	Specification Label (PCS31230)	PCS-066	1
66	Main Warning Label	PCS-068	1
67	Main Power Label	PCS-069	1
68	System Status Label	PCS-070	1
69	Table Insert Warning Label	PCS-071	1
70	Professional 3HP Model Label	PCS-260	1

1108 Laser Fume Extractor

THE WORLD LEADER IN
FUME EXTRACTION TECHNOLOGY

www.bofa.co.uk/laser-fume-extraction.asp

LASER Fume Extraction Solutions

AD 1000 iQ

Advantage

High performance **laser fume extraction** system for applications in laser **marking, coding and engraving**.

BOFA's AD 1000 iQ high end laser extraction system combines extremely large filter capacity with high airflow and pressure rates, making it the ideal choice for heavy duty applications that generate large amounts of particulate and gaseous organic compounds.

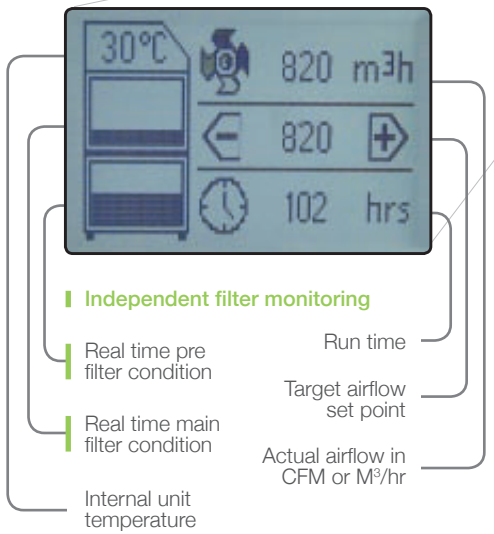
Performance is enhanced with the inclusion of several features including BOFA's patented DeepPleat DUO pre filter and the acclaimed iQ Operating System. These take performance and safety parameters to a new level and ensures that maintenance, downtime and ownership costs are kept to a minimum.

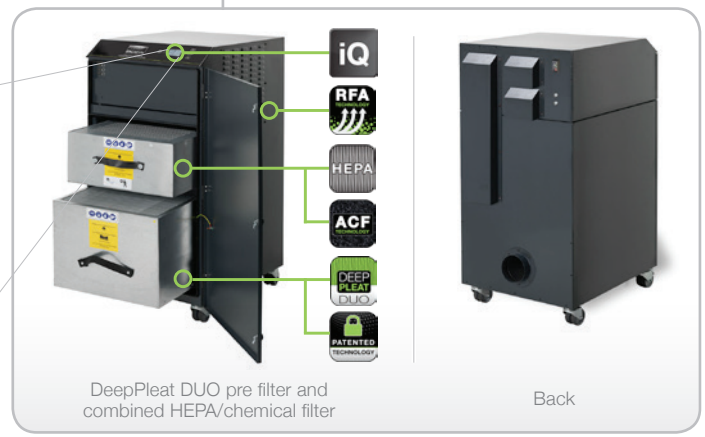
STANDARD FEATURES:

- iQ Operating System
- High airflow and pressure rates
- Reverse Flow Air filter technology
- DeepPleat DUO pre filter
- Automatic flow control system
- Real time airflow reading
- High contrast display
- 'Run safe' operation
- Remote diagnostics via USB
- Independent filter condition monitoring, display and warnings
- Combined HEPA/Gas filter incorporating ACF technology
- Filters with long life and low replacement cost

OPTIONAL FEATURES:

- VOC gas sensor (Volatile Organic Compound)
- Remote stop / start interface
- Filter change / System fail signal
- Interfacing with host laser
- On-board compressor
- Larger silencing inlet/out boxes
- Optional filter medias





DeepPleat DUO pre filter and combined HEPA/chemical filter

Back

Take a look at the iQ animation, which explains exactly why the patented BOFA iQ Operating System provides unrivalled control and data management for your fume extraction unit.

Patented Technology - Patent No: GB2 499 812

bofa.co.uk/iqOperationSystem.asp

UNITS - PART NUMBERS

Model	Voltage	Part No.	24V Stop / Start	Filter change / System failure signal	VOC Monitoring	On-board Compressor
AD 1000 iQ Stainless Steel	230V	L0772	A2001	A2002	A2003	A2007
	115V	L0771				
AD 1000 iQ Powder Coated	230V	L0762				
	115V	L0761				

OPTION

Larger exhaust silencing boxes
A1060094

REPLACEMENT FILTERS - PART NUMBERS

Model	DeepPleat DUO Pre Filter	Combined HEPA/Gas Filter
AD 1000 iQ	A1030222	A1030297

TECHNICAL DATA

	EU	US
Dimensions (HxWxD)	1197 x 600 x 790mm	47.1 x 23.6 x 31.1"
Cabinet Construction	Brushed stainless steel / Powder coated mild steel	
Airflow / Pressure	850m³/hr / 100mbar	500cfm / 100mbar
Electrical Data	230v 1ph 50/60Hz Full load current: 12.8 amps / 2.2kw	115v 60/50Hz Full load current: 19.5 amps / 2.2kw
Noise Level	< 63dBA (at typical operating speed)	
	< 58dBA - with rear silencing boxes fitted (at typical operating speed)	
Weight	140kgs	309lbs
Approvals	CE	

DEEPPLEAT DUO PRE FILTER SPECIFICATIONS

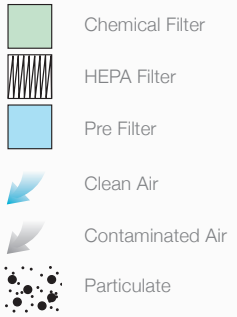
Surface Media Area	30m² approx
Filter Media	Glass Fibre
Filter Media Construction	Maxi Pleat Construction with Webbing Spacers
Filter Housing	Zintec mild steel
Filter Efficiency	F8 (95% @ 0.9 microns)

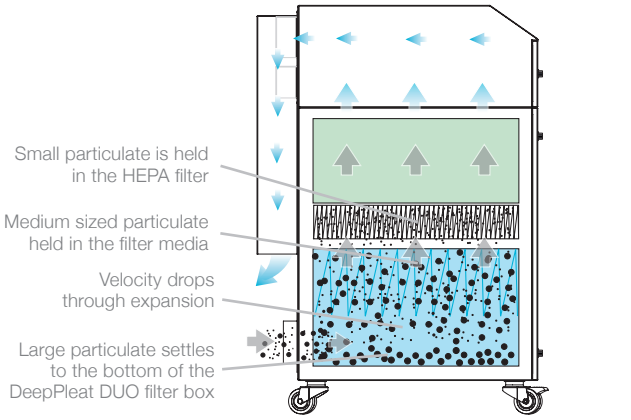
COMBINED HEPA/GAS FILTER SPECIFICATIONS

Surface Media Area	7.5m² approx
HEPA Filter Media	Glass Fibre
HEPA Media Construction	Maxi Pleat Construction with Webbing Spacers
Filter Housing	Zintec Mild Steel
Treated Activated Carbon	34kgs
Filter Efficiency	99.997% @ 0.3 microns

Other hose kits and filters are available. All of the above units are fitted with our standard filter combinations. For specific applications please call us for details. Replacement filters should always be ordered using the part number on the filters inside your extractor to ensure the correct filter is ordered. Datasheet correct at time of print.

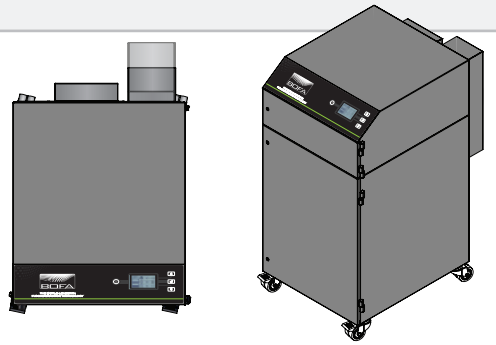
AIRFLOW THROUGH FILTERS

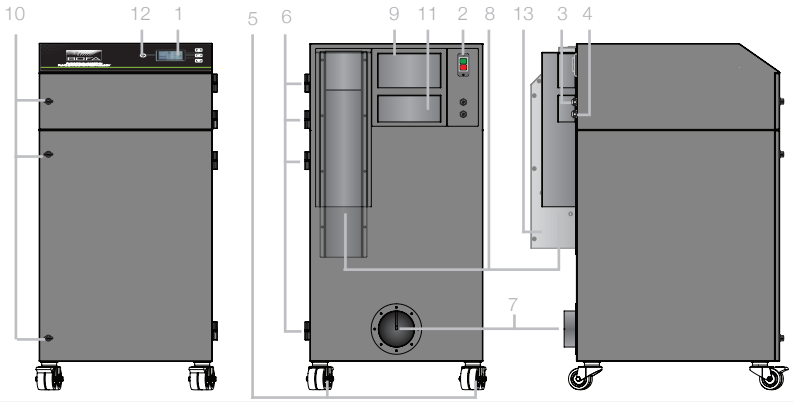




TECHNICAL SPECIFICATION

1 iQ Display
2 On / Off Switch
3 Power Cable
4 Signal / Interface Cable
5 Castors
6 Door Hinge
7 Hose Inlet Connection - 125mm
8 Exhaust Outlet
9 Motor Cooling Inlet
10 Door Latch
11 Motor Cooling Outlet
12 Standby Button
13 Larger Exhaust/Inlet Silencing Box





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British Quality

1111 Storage Rack

FLEXTEC MULTI-PROCESS WELDERS

FLEXTEC 350X, 500, 500P, 650X

FLEXTEC FAMILY OVERVIEW

Machine	Input (V)	Output (A) 100%	Output (A) 60%	SMAW	GTAW	GMAW	Pulse	FCAW-G	FCAW-S	SAW	Gouging carbon diameter in. (mm)
Flextec 350X Construction	380-575 3 Phase	300	350	•	•	•		•	•		1/4 (6.4)
Flextec 350X Standard	380-575 3 Phase	300	350	•	•	•		•	•		1/4 (6.4)
Flextec 500	380-575 3 Phase	450	500	•	•	•		•	•		3/8 (9.6)
Flextec 500P	380-575 3 Phase	450	500	•	•	•	•	•	•		3/8 (9.6)
Flextec 650X	380-575 3 Phase	650	750	•	•	•		•	•	•	1/2 (12.7)

Simple

- Streamlined operator panel minimizes setup time

Reliable

- Built on industry-proven design elements
- Engineered for outdoor use and harsh environments (IP23 rated)

Flexible

- Compatible with portable feeders and bench or boom feeders of all types.
- Choice of models to fit any application and budget

Processes »
Stick, DC TIG, MIG, Flux-Cored, Arc Gouging

Applications »
Fabrication, Production, Education, Shipbuilding, Construction

Output »

Input »

Product Number »
Flextec 350X:
- K4271-1 350X Construction Model
- K4272-1 350X Standard Model

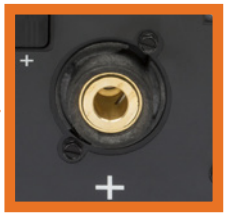
Flextec 500:
- K4091-1 Base Model

Flextec 500P:
- K4092-1 Base Model

Flextec 650X:
- K3425-1 Base Model

FLEXIBILITY

Flextec Power sources support multiple weld processes: MIG, TIG, Stick, Gouging, FCAW, SAW
Flextec can be used with nearly all Lincoln Electric wire feeders. Due to available feeder communication connections.



CrossLinc®
(Lincoln Electric LN-25X model)
CrossLinc Technology communicates through a standard weld cable to enable voltage or current control at the arc without a control cable.

5-pin Control Cable Connection
(Lincoln Electric Power Feed® models)
5-pin high-speed digital communication enables advanced process capability and additional operator controls. Allows compatibility with future wire feeder models.

14-pin
(Lincoln Electric LF, LN and Flex Feed® models)
14-pin analog communication enables compatibility with most existing Lincoln wire feeders.

Across-the-arc Connection
(Lincoln Electric LN-25 PRO / Activ8® models)
Across-the-arc feeders connect to the power source using the weld cables. This basic configuration does not use a control cable or CrossLinc Technology, so voltage control is only accessed at the welding power source.

FLEXTEC/WIRE FEEDER SYSTEM FEATURES BY CONNECTION TYPE

● Standard ● Specific Models Only

Feeder Connection Type	Features						
	WFS Control	Voltage Control	Memories	Limits/ Lockouts	Advanced U/I Controls [1]	Synergic Modes[2]	Pulsing Capability
5-pin Digital (ArcLink)	●	●	●	●	●	●	●
14-pin Analog	●	●	●	●	●		
CrossLinc	●	●					
Across-the-arc	●						

(1) Advanced controls include pre-flow, post-flow, run-in, starting parameters. crater fill, burn back, spot timer and electronic trigger lock.
(2) Synergic Modes enable easy setup with one-knob output control for the system.

AVAILABLE CONNECTION TYPES BY MACHINE AND FEEDER MODEL

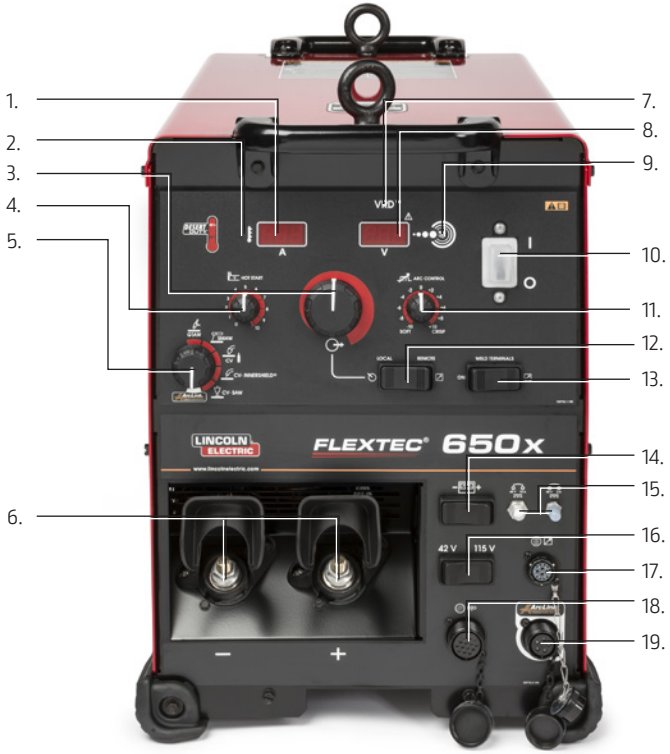
Model	Feeder Connection Type			
	Voltage Sensing/Across-the-arc	14-pin Analog	5-pin Digital	CrossLinc
MACHINES				
Flextec 350X Construction	●			●
Flextec 350X Standard	●	●	●	●
Flextec 500	●	●	●	
Flextec 500P	●	●	●	
Flextec 650X	●	●	●	●
WIRE FEEDERS				
LN-25X	●			●
Activ8®, LN-25, LN-25 PRO, LN-25 Pipe	●			
LN-25 Pro Dual	●	●		
LF-72 and LF-74		●		
Flex Feed 74HT		●		
Flex Feed 84		●		
Power Feed Family			●	
MAXsa® 10[5], 19 (Flextec 650X only)			●	
LT-7 (Flextec 650X only)		●		

(5) MAXsa 10 K2814-4 or newer.

Select machine and feeder that have the same connection type

FLEXTEC 500/500P
Controls »

1. Amperage Display Meter
2. Thermal LED
3. Output Control Dial
4. Hot Start Control Dial
5. Weld Process Selector Switch
6. Local/Remote Selector Toggle Switch
7. Circuit Breaker Reset Button for the 5-pin Wire Feeder Connector
8. **5-pin ArcLink Wire Feeder Connector**
9. Positive and Negative 1/2 in. (12.7 mm) Welding Output Studs
10. VRD (Voltage Reduction Device) Indicator Lights
11. Voltage Display Meter
12. Power Switch
13. Arc Force Control Dial
14. Weld Terminals On/Remote Selector Switch
15. Circuit Breaker Reset Button for the 14-pin Wire Feeder Connector
16. Remote Output Control (12-pin Universal Connector)
17. **14-pin Wire Feeder Connector**
18. Wire Feeder Voltmeter Polarity Selection Switch



FLEXTEC 650X
Controls »

1. Amperage Display Meter
2. Thermal LED
3. Output Control Dial
4. Hot Start Control Dial
5. Weld Process Selector Switch
6. Positive and Negative Welding Output Studs
7. VRD (Voltage Reduction Device) Indicator Light
8. Voltage Display Meter
9. **CrossLinc Indicator Light**
10. Power Switch
11. Arc Force Control Dial
12. Local/Remote Selector Toggle Switch
13. Weld Terminals On/Remote Selector Switch
14. Wire Feeder Voltmeter Polarity Selection Switch
15. Circuit Breaker Reset Buttons for 42V feeders and ArcLink peripherals
16. 42V or 115V Wire Feeder Selector Switch
17. **Remote Output Control 12-pin Universal Connector**
18. 14-pin Wire Feeder Connector
19. **5-pin ArcLink Connector**

SPECIFICATIONS

MACHINES	Product Number	Input Power	Rated Output Current/Voltage/ Duty Cycle	Input Current @ Rated Output	Output Range	H x W x D in (mm)	Net Weight lb (kg)
FLEXTEC 350X Construction (Tweco®)	K4271-1	380/460/575/3/50/60	350A/34V/60% 300A/32V/100%	26/23/18	5-425A Max OCV 80V DC	17 x 13 x 23 (477 x 356 x 673)	77 (35)
FLEXTEC 350X Construction (Dinse®)	K3441-1						
FLEXTEC 350X Standard (Tweco)	K4272-1						82 (37)
FLEXTEC 350X Standard (Dinse)	K3442-1						
FLEXTEC 500	K4091-1	380/460/575/3/50/60	500A/40V/60% 450A/38V/100%	39/31/31 33/27/27	5-500A	18.8 x 14 x 26.5 (477 x 356 x 673)	120 (54)
FLEXTEC 500P	K4092-1	380/460/575/3/50/60	500A/40V/60% 450A/38V/100%	39/31/31 33/27/27	5-500A	18.8 x 14 x 26.5 (477 x 356 x 673)	120 (54)
FLEXTEC 650X	K3425-1	380/460/575/3/50/60	750A/44V/60% 650A/44V/100%	61/50/40 57/47/38	10-815A	21.8 x 16.1 x 29.3 (554 x 409 x 584)	165 (75)

Rack systems in several configurations are available for the Flextec 350X, 500 and 650X models.
More details are available in Bulletin E5.92

Flextec Racks

K3402-1, Flextec® 350X Construction 4-Pack Rack

K3403-1, Flextec® 350X Standard 4-Pack Rack

(Expandable to 8-Pack rack with K3410-1, Flextec® 350X 4-Pack to 8-Pack Rack Conversion Kit

K4098-1, Flextec 500 4-Pack Rack

K3510-1, Flextec 650X 4-Pack Rack

K4099-1, Flextec 500 6-Pack Rack

PACKAGES – WHAT'S INCLUDED

Description	Product Number	FLEXTEC 350X PACKAGES LN-25X One-Pak K4278-1	LF-72 Heavy Duty One-Pak K3438-1	Flex Feed 84 Heavy Duty One-Pak K3439-1
Flextec 350X Construction Model	K4271-1	•		
Flextec 350X Standard Model	K4272-1		•	•
Input power cord 8.5 ft (2.6 m)	–	•	•	•
LN-25X	K4267-1	•		
LF-72 Bench Model, Heavy Duty Wire Reel Stand	K2327-7		•	
Flex Feed 84 Single Bench Model, Heavy Duty Wire Reel Stand	K5000-2			•
2 Roll Drive and Wire Guide Kit 0.045 (1.1 mm) Cored	KP1697-045C	•		
4 Roll Drive and Wire Guide Kit 0.040-0.045 (1.0-1.1 mm) Solid Wire	KP1505-045S			•
2 Roll Drive and Wire Guide Combination Kit 0.035-0.045 (0.9-1.1 mm) Solid Wire	KP1696-1		•	
Magnum® PRO Curve™ 300 Gun and Cable Ready-Pak - 15 ft (4.5 m)	K2951-2-10-45	•	•	•
Tweco Connector Cable Package – includes 10 ft (3 m) work cable with clamp and 10 ft (3 m) electrode cable	K1803-2		•	•
Harris® Flowmeter Regulator and Hose	3100211		•	•

Description	Product Number	FLEXTEC 500 PACKAGES Flex Feed 74HT Ready-Pak K4093-1	LF-72 Heavy Duty Ready-Pak K4094-1	LF-74 Heavy Duty Ready-Pak K4095-1	LF-72 Standard Duty One-Pak K4096-1	Flex Feed 84 Heavy Duty One-Pak K3440-1
Flextec 500 Model	K4091-1	•	•	•	•	•
Flex Feed 74HT, High Torque for larger wire diameters	K3883-13	•				
LF-72 Bench Model, Heavy Duty Wire Reel Stand	K2327-7		•			
LF-72 Bench Model, Standard Duty Wire Reel Stand	K2327-5				•	
LF-74 Bench Model, Heavy Duty Wire Reel Stand	K2426-5			•		
Flex Feed 84 Single Bench Model, Heavy Duty Wire Reel Stand	K5000-2					•
3/0 Welding Cable (10 ft lug to lug)	K1842-10	•	•	•	•	•
Work Lead Package – 15 ft (4.5 m) cable with GC500 ground clamp	K2149-1	•	•	•	•	•
Harris Flowmeter Regulator and Hose	3100211	•	•	•	•	•
Inverter and Wire Feeder Cart	K3059-4	•	•	•		
4 Roll Drive and Wire Guide Kit 0.040-0.045 (1.0-1.1 mm) Solid Wire	KP1505-045S					•
2 Roll Drive and Wire Guide Combination Kit 0.035-0.045 (0.9-1.1 mm) Solid Wire	KP1696-1		•		•	
4 Roll Drive and Wire Guide Combination Kit 0.035-0.045 (0.9-1.1 mm) Solid Wire	N/A			•		
Inverter Cart Mounting Bracket Kit – Secures feeder to K3059-4/-5 inverter cart. Compatible with FlexFeed and Power Feed wire feeders.	K4068-1	•				
Flextec 500 / 500P Locking Foot Kit – secures Flextec 500/500P to the Inverter Cart, rack and accessories	K3056-2	•	•	•		
Magnum PRO Curve™ 400 Gun and Cable Ready-Pak - 15 ft (4.5 m) See Bulletin E12.05	K2952-2-10-45	•	•	•		•

PACKAGES – WHAT'S INCLUDED

Description	Product Number	FLEXTEC 500P PACKAGES Power Feed 84 Heavy Duty Ready-Pak K4097-1	 Flextec 500P w/ CE Filter Kit One-Pak K4091-3
Flextec 500P Model	K4092-1	•	•
Power Feed 84, Heavy Duty Wire Reel Stand, U/I, USB	K3328-13	•	
3/0 Welding Cable (10 ft lug to lug)	K1842-10	•	
Work Lead Package (15ft) includes GC500 ground clamp	K2149-1	•	
Harris Flowmeter Regulator and Hose	3100211	•	
Inverter and Wire Feeder Cart	K3059-4	•	
Inverter Cart Mounting Bracket Kit – Secures wire feeder to K3059-4/-5 inverter cart. Compatible with Flex Feed and Power Feed wire feeders.	K4068-1	•	
Flextec 500 / 500P Locking Foot Kit – Secures Flextec 500/500P to the Inverter Cart, rack and accessories	K3056-2	•	
Magnum PRO Curve 400 Gun and Cable Ready-Pak - 15 ft (4.5 m). See Bulletin E12.05	K2952-2-10-45	•	
Flextec 500 CE Filter Kit	K3129-2		•

Description	Product Number	FLEXTEC 650X PACKAGES LF-72 Heavy Duty Ready-Pak K3511-1	 LF-74 Heavy Duty Ready-Pak K3512-1	 LF-74 Heavy Duty One-Pak K3513-1	 Flex Feed 84 Heavy Duty One-Pak K3514-1	 CE Filter One-Pak K3515-1
Flextec 650X Model	K3425-1	•	•	•	•	•
LF-72 Bench Model, Heavy Duty Wire Reel Stand (Includes 0.035/0.045 in. (0.9/1.2 mm)reversible drive rolls)	K2327-7	•				
LF-74 Bench Model, Heavy Duty Wire Reel Stand (Includes 0.035/0.045 in. (0.9/1.2 mm)reversible drive rolls)	K2426-5		•	•		
Flex Feed 84 Single Bench Model, Heavy Duty Wire Reel Stand	K5000-2				•	
3/0 Welding Cable (10 ft lug to lug)	K1842-10	•	•	•	•	
4/0 Work Lead Package (15ft) includes GC500 ground clamp	K2149-1	•	•	•	•	
Harris Flowmeter Regulator and Hose	3100211	•	•	•	•	
Inverter and Wire Feeder Cart	K3059-4	•	•			
4 Roll Drive and Wire Guide Kit 1/16 in. (1.6 mm) Cored	KP1505-1/16C		•	•	•	
2 Roll Drive and Guide tube Kit 0.045 in. (1.2 mm) Solid Wire	KP1696-045S	•				
2 Roll Drive and Wire Guide Combination Kit 0.035-0.045 (0.9-1.1 mm) Solid Wire	KP1696-1	•				
4 Roll Drive and Wire Guide Combination Kit 0.035-0.045 (0.9-1.1 mm) Solid Wire	N/A		•	•		
Magnum PRO Curve 400 Gun and Cable Ready-Pak - 15 ft (4.5 m). See Bulletin E12.05	K2952-2-10-45	•				
Magnum PRO Curve 400 Gun and Cable 15 ft (4.5 m)	K2952-2		•	•	•	
Gun Connector Kit	K466-10		•	•	•	
Liner 0.052-1/16 in. (1.3-1.6 mm) dia. 15 ft (4.6 m) length	KP44-116-15		•	•	•	
Flextec 650X CE Filter	K3129-1					•

ACCESSORIES

• Compatible	Product Number	350X Standard Model K4272-1	350X Construction Model K4271-1	500 Base Model K4091-1	500P Base Model K4092-1	650X Base Model K3425-1
GENERAL						
CrossLinc Remote – Adjust voltage or current at the arc. For CrossLinc-equipped welders. See publication MC16-137	K4345-1	•	•			•
Multi-Process Switch – Easily change welding process and polarity without changing cables at the machine	K3091-1	•	•	•	•	•
12-pin to 6-pin Adapter – Allows 6-pin remote controls (K870, K963-3, K857, K4217-1) to be used with 12-pin Universal Connection	K2909-1	•	•	•	•	•
Wireless Foot Pedal with 6-pin Amphenol® – Permits remote adjustment of output[1]	K4217-1	•	•	•	•	•
Remote Output Control with 12-pin Universal Connector (25 feet) – Permits remote adjustment of output	K857-2	•	•	•	•	•
Remote Output Control with 6-pin Amphenol Connector (100 feet) – Permits remote adjustment of output[1]	K857-1	•	•	•	•	•
Foot Amptrol with 12-pin Amphenol connector (25 ft) – Remote current control for TIG welding	K870-2	•	•	•	•	
Hand Amptrol Rotary Track Style, 12-pin Amphenol (25 ft) – Remote current control for TIG welding[1]	K963-4	•	•	•	•	•
Flextec 350X CE Filter Kit (380-575 Vac)	K4420-1	•	•			
Flextec 500/500P CE Filter Kit (380-575 Vac)	K3129-2			•	•	
Flextec 650X CE Filter Kit (380-575 Vac)	K3129-1					•
3/0 Welding Cable – Lug to Lug, 3/0, 600A, 60% duty cycle, 10 ft.	K1842-10			•	•	•
4/0 Work Lead Package – Lug to Lug, 4/0 cable with GC500 work clamp. 15 ft. (4.6 m) length	K2149-1			•	•	•
Harris® Model 355 Flowmeter Regulator and Hose – Includes 10 ft. (3.0 m) hose	3100211	•	•	•	•	•
Single Cylinder Inverter and Wire Feeder Cart – Requires K4068-1 mounting bracket for LF, Flex Feed and Power Feed Feeders. Requires locking foot kit for Flextecs	K3059-4	•	•	•	•	•
Dual Cylinder Inverter and Wire Feeder Cart – Requires K4068-1 mounting bracket for LF, Flex Feed and Power Feed Feeders. Requires locking foot kit for Flextecs	K3059-5	•	•	•	•	•
Inverter Cart Mounting Bracket Kit – Use for mounting Flex Feed or Power Feed (to the K3059-4 inverter cart)	K4068-1	•	•	•	•	•
Flextec 350 Locking Foot Kit – Allows the Flextec to lock to the inverter cart, Multi-Process Switch, Cool-Arc® 55 water cooler	K4424-1	•	•			
Flextec 500 / 500P Locking Foot Kit – Allows the Flextec to lock to the inverter cart, Multi-Process Switch, Cool-Arc 55 water cooler	K3056-2			•	•	
GFCI Kit – UL-approved 120V ground fault circuit interrupter replaces existing non-GFCI receptacle	K3157-1					•

[1] Requires the K2909-1 12-pin to 6-pin adapter if used with Flextec® 350X, 500, 500P.

ACCESSORIES • Compatible	Product Number	350X Standard Model K4272-1	350X Construction Model K4271-1	500 Base Model K4091-1	500P Base Model K4092-1	650X Base Model K3425-1
GENERAL						
LC-40 – Tweco-Style Plug (male, 1/0 Thru 2/0) 1/0 - 2/0 (50-70 mm^2)	K3416-70	•	•			
LC-40 – Tweco-Style Receptacle (female, 1/0 Thru 2/0) 1/0-2/0 (50-70 mm^2)	K3417-70	•	•			
LC-40HD – Tweco-Style Plug (male, 3/0 Thru 4/0) 2/0-4/0 (70-70-95 mm^2)	K3416-90	•	•			
LC-40HD –Tweco-Style Receptacle (female, 3/0 Thru 4/0) 2/0-4/0 (70-70-95 mm^2)	K3417-90	•	•			
Miller® Rack Adapter Kit – Allows Flextec 350X machines to be mounted in standard Miller Electric inverter racks. Requires the K4424-1 Flextec 350X Locking Foot Kit for each welder	K4421-1	•	•			
WIRE FEEDERS & GUNS						
LN-25X – Includes CrossLinc communication technology	K4267-1	•	•			•
LN-25 PRO Dual Power – Includes 14 pin connection	K2614-6	•	•	•	•	•
Flex Feed 74 HT – Four drive-roll, high-torque, industrial semiautomatic wire feeder for general/structural fabrication	K3883-13	•		•	•	•
Flex Feed 84 Single Bench – four drive roll feeder with heavy duty wire reel stand for general/structural fabrication	K5000-2	•		•	•	•
Flex Feed 84 Dual Bench – four drive roll feeder with heavy duty wire reel stand and contactor for general/structural fabrication	K5002-2	•		•	•	•
LF-72 Bench Model, Standard Duty Wire Reel Stand – Two drive roll feeder designed for MIG and cored wire welding in job shop and manufacturing environments	K2327-5	•		•	•	•
LF-72 Bench Model, Heavy Duty Wire Reel Stand – Two drive roll feeder designed for MIG and cored wire welding in job shop and manufacturing environments	K2327-7	•		•	•	•
LF-74 Bench Model, Heavy Duty Wire Reel Stand – Four drive roll feeder designed for MIG and cored wire welding in job shop and manufacturing environments	K2426-5	•		•	•	•
Power Feed 84, Heavy Duty Wire Reel Stand, U/I, USB – Four drive roll, digital ArcLink semiautomatic industrial wire feeder built on a modular platform to be used in a variety of applications	K3328-13	•		•	•	•
Magnum PRO Curve 300 Gun and Cable Ready-Pak - 15 ft (4.5 m) – For MIG or flux-cored welding. Includes Tweco-style back-end connector kit, liner, diffuser, nozzle, contact tip fully assembled	K2951-2-10-45	•	•			
Magnum PRO Curve 400 Gun and Cable Ready-Pak - 15 ft (4.5 m) – For MIG or flux-cored welding. Includes Tweco-style back-end connector kit, liner, diffuser, nozzle, contact tip fully assembled	K2952-2-10-45			•	•	•
Magnum PRO Guns and Accessories – See publication E12.05	–	•	•	•	•	•

* For additional feeders see www.lincoln/semi-autowirefeeder

The Lincoln Electric Company
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www.lincolnelectric.com

Publication E5.97 | 07/17

1111 Storage Rack

Multi-Operator Welders VIEW ALL

FLEXTEC® 500 6-PACK RACK

K4099-1

Top Features
Streamlined operator panel minimizes setup time
Components designed to run cool for long life in high temperature environments
IP-23 rated for use in harsh environments
Compatible with a variety of wire feeder types–analog, digital, and across-the-arc feeders
Premium multi-process arc characteristics for wire, stick and DC TIG processes

Input Power
380/460/575/3/50/60

Processes
Stick, MIG, Flux-Cored, DC TIG, Arc Gouging

Output CC CV DC

Input 50/60 Hz 3 PHASE

MSRP: $31,484.32

WHERE TO BUY

EQUIPMENT DETAILS

Features and Benefits
Documents
Specifications
What's Included
More Information
Accessories

INPUT POWER	380/460/575/3/50/60
RATED OUTPUT	500A/40V/60% 450A/38V/100%
INPUT CURRENT	138/100/81A
OUTPUT RANGE	5-500A
DIMENSIONS (H X W X D)	70.25 in x 49.5 in x 33 in (1784 mm x 1257 mm x 838 mm)
NET WEIGHT	1100.00 (498.96 kg)

Related Products

Caster Kit

Four caster kit compatible with all Lincoln inverter racks. Allows for easier mobility in the shop

MSRP: $395.45

WHERE TO BUY

Related Accessories

Tweco® Style Plug (male, 1/0 Thru 2/0)

Tweco Style Plug (male, 1/0 Thru 2/0)

MSRP: $35.99

WHERE TO BUY

Tweco® Style Receptacle (female, 1/0 Thru 2/0)

Tweco Style Receptacle (female, 1/0 Thru 2/0)

MSRP: $35.99

WHERE TO BUY

1111 Storage Rack

Compact, Rugged and Complete

Inverter Racks

K3402-1 Flextec 350X Construction 4-Pack Rack (Expandable to 8-Pack rack with K3410-1 Flextec 350X 4-Pack to 8-Pack Rack Conversion Kit) Shown with optional casters

KEY FEATURES

Lincoln Electric's rack systems are ideal for grouping several inverter power sources in a portable industrial-grade package for construction and other environments.

Processes »

Invertec® V275-S: Stick, TIG, Gouging

Invertec® V350-PRO: Stick, TIG, MIG, Flux-Cored, Gouging

Flextec® 350X, 500 and 650X: Stick, TIG, MIG,Flux-Cored, Gouging

Output »

CC [1] CC CV DC

Input »

3 PHASE 50/60 Hz

Product Number »

See Back

[1] Invertec® V275-S only

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LINCOLN ELECTRIC

FEATURES

- **One easy connection**
  Allows power sources to be connected with one primary power drop
- **The power sources are factory installed in the rack and wired to the main power distribution panel**
- **Entire system meets National** Electrical Code (NEC). – Compare the best in class rated output and wide amperage range
- **Individual fuses** – Provide overcurrent protection for each power source
- **Two overhead lifting eyes, fork lift slots[1], and heavy duty optional casters – Provide ease of portability**
- **Optional Caster Kit** – Available for Inverter Racks. Order K2665-1
- **Accommodates standard length machine input cables** –
  Ensures the power sources can be placed in any position on the rack
- **Common disconnect** – Units have a 200 amp, 600 volt, 3 phase disconnect switch (V350 Pro and V275-S units only)
- **Units are IP23 or IP23S Rated** –
  Depending on model
- **Fold Down fuse panel** – Makes it more convenient to access wiring and change fuses (Flextec models only)
- **Square tube frame construction** – Supports more weight and stands up to rugged job site use

(1) Fork access configuration varies by rack model

RACKS

Flextec 350X Racks

K3402-1, Flextec® 350X Construction 4-Pack Rack

K3403-1, Flextec® 350X Standard 4-Pack Rack

(Expandable to 8-Pack rack with K3410-1, Flextec® 350X 4-Pack to 8-Pack Rack Conversion Kit

Flextec Racks

K4098-1, Flextec 500 4-Pack Rack

K3510-1, Flextec 650X 4-Pack Rack

K4277-1, Flextec 350X Construction 6-Pack Rack

K4281-1, Flextec 350X Standard 6-Pack Rack

K4099-1, Flextec 500 6-Pack Rack

Invertec Racks

K2666-1, Invertec® V275-S 4-Pack Rack

K2667-1, Invertec V350-PRO 4-Pack Rack

K2667-2, Invertec V350-PRO 6-Pack Rack

K2666-2, Invertec V275-S 8-Pack Rack

RECOMMENDED ACCESSORIES

GENERAL OPTIONS

Flextec 350X Empty 4-Pack Rack
Complete rack assembly without welders.
Order K3400-1

Flextec 350X 4-Pack to 8-Pack Rack Conversion Kit
Expand the 4-pack (K3400-1) rack with or without welders to an 8-pack rack.
Order K3410-1

Flextec 350X Locking Foot Kit
Required when adding Flextec 350X welders to an empty rack.
Order K4424-1

Rack Caster Kit
Add heavy duty casters to any rack.
Order K2665-1

Tweco®-style Plug
(male, 1/0 Thru 2/0)
Order K3416-70

Tweco-Style Receptacle
(female, 1/0 Thru 2/0)
Order K3417-70

Tweco-Style Plug
(male, 3/0 Thru 4/0)
Order K3416-90

Tweco-Style Receptacle
(female, 3/0 Thru 4/0)
Order K3417-90

PRODUCT SPECIFICATIONS

Product Name	Output connection	Product Number	Rack Input Power[1]	Rated Output Current / Voltage / Duty Cycle[2]	Rack Input Current @ Rated Output	Output Range	H x W x D in. (mm)	Net Weight lbs.(kg)
4-Pack Rack Flextec 350X Standard Model (Compact)	Tweco	K3403-1	380/460/575/3/50/60	350A/34V/60% 300A/32V/100%	74/68/68 (4-Pack) 125/113/113 (8-Pack)	5-425A	59.72 x 37.25 x 32.88 (1516 x 946 x 835)	620 (281)
6-Pack Rack Flextec 350X Standard Model	Tweco	K4281-1			100/90/90		71.22 x 48 x 35.5 (1809 x 1219 x 902)	650 (294)
4-Pack Rack Flextec 350X Construction Model (Compact)	Tweco	K3402-1			74/68/68 (4-Pack) 125/113/113 (8-Pack)		59.72 x 37.5 x 32.88 (1516 x 952 x 835)	620 (281)
6-Pack Rack Flextec 350X Construction Model	Tweco	K4277-1			74/68/68		71.22 x 48 x 35.5 (1809 x 1219 x 902)	675 (306)
4-Pack Rack Flextec 500	Lug	K4098-1		500A/40V/60% 450A/38V/100%	103/75/61A	5-500 A	71.22 x 36 x 35.5 (1809 x 914 x 902)	800 (363)
6-Pack Rack Flextec 500	Lug	K4099-1		500A/40V/60% 450A/38V/100%	138/100/81A		71.22 x 48 x 35.5 (1809 x 1219 x 902)	1100 (498)
4-Pack Rack Flextec 650X	Lug	K3510-1	380/460/575/3/50/60	650A/44V/100% 750A/44V/60%	202/167/103A	10-815 Amps	71.22 x 36 x 35.5 (1809 x 914 x 902)	960 (435)
4-Pack Rack V275-S	Tweco	K2666-1	208/230/460/575/3/60	275A/31V/35%	96/89/46/39A	5-275 Amps	55.69 x 38.5 x 33.5 (1414 x 978 x 851)	483 (219)
			220/380/400/415/440/3/50	250A/30V/35%	89/53/53/50/46A			
8-Pack Rack V275-S	Tweco	K2666-2	208/230/460/575/3/60	275A/31V/35%	161/149/77/65A		55.69 x 58.5 x 33.5 (1414 x 1486 x 851)	986 (447)
			220/380/400/415/440/3/50	250A/30V/35%	149/89/89/83/77A			
4-Pack Rack V350-PRO	Tweco	K2667-1	208/230/380- 415/460/575/3/50/60	350A/34V/60%	138/128/78/67/57A	5-425 Amps	55.69 x 44.5 x 33.5 (1414 x 1130 x 851)	796 (361)
6-Pack Rack V350-PRO	Tweco	K2667-2			185/171/104/90/76A		55.69 x 58.5 x 33.5 (1414 x 1486 x 851)	1,039 (471)

(1) *Fused for 380/460/575/3/50/60 VAC operation. For 230 or 208 VAC operation, primary fuses must be changed.*
(2) *Based on a 10 minute period. Output is for each individual machine.*

For best welding results with Lincoln Electric equipment, always use Lincoln Electric consumables.
Visit www.lincolnelectric.com for more details.

The Lincoln Electric Company
22801 St. Clair Avenue · Cleveland, OH · 44117-1199 · U.S.A.
www.lincolnelectric.com

1112 ProtoMax Waterjet

ProtoMAX
BUILT BY OMAX

MACHINE DIMENSIONS

Footprint	41.5" x 39.5" (1,054 mm x 1,004 mm)
Weight (tank empty)	550 lb (250 kg)
Height (Lid Closed)	56.5" (1,435 mm)
Height (Lid Open)	73.0" (1,854 mm)
Operating Weight (with water in tank)	750 lb (340 kg)

STANDARD MODEL SPECIFICATIONS

Maximum Supported Material Load	50 lbs/sq ft (244 kg/sq m)
Electrical Requirements	230-240 VAC, single phase, 30A, 50/60 Hz
Speed	100 in/min (2,540 mm/min)
Linear Positional Accuracy	±0.005" (±0.127 mm)
Repeatability	±0.003" (±0.076 mm)

WORK ENVELOPE

X-Y Cutting Travel[1]	12.0" x 12.0" (304 mm x 304 mm)
Z-Axis Travel[1]	1.0" (25 mm)
Table Size	14.5" x 15.25" (368 mm x 393 mm)

PUMP DESCRIPTION

Pump Horsepower	5 HP (3.7 kW)
Output Pressure	30,000 psi (2,068 bar)
Orifice and Flow Rate[2]	0.008" / 0.25 gpm (0.2 mm / 0.95 lpm)

ABOUT OMAX

OMAX is the global total solutions provider in advanced abrasive waterjet systems. Our intuitive Intelli-MAX Software Suite simplifies programming and reduces setup times, increasing your productivity. OMAX engineers continue to innovate technology for abrasive waterjet machining, from proven 4th generation pump designs to cutting edge drive systems with micron-level accuracy. With the largest abrasive waterjet support network in the world, OMAX continues to shape the future of waterjets.

To see how ProtoMAX can work in your existing shop or school, call or visit our website today.

OMAX

PROTOMAX PRICING OPTIONS

Please use the included pricing as a quote or for budgeting purposes.[5]

GET STARTED: STANDARD SYSTEM

The **STANDARD SYSTEM** includes the ProtoMAX abrasive waterjet system, complete with the table, pump, laptop with pre-installed software, and everything needed to start abrasive waterjet cutting after initial installation.

DESCRIPTION	QUANTITY	PRICE
ProtoMAX Abrasive Waterjet Cutting Table	1	Included
ProtoMAX 30,000 psi 5 HP Direct Drive Pump	1	Included
Nozzle Assembly (nozzle body, mixing tube, last-chance filter, and jewel orifice)	1	Included
Laptop with Intelli-MAX Proto Software Pre-Installed	1	Included
Unlimited Seats of Software	1	Included
Free Software Upgrades For Life	1	Included
ProtoMAX Garnet Abrasive (55lb bucket)	1	Included
One-Year Warranty	1	Included
Shipping to Continental US (Hawaii & Alaska additional)	1	Included
	TOTAL[3]	**$19,950**[5]

ADD CONSUMABLES & ACCESSORIES: UPGRADE PACKAGE

The **UPGRADE PACKAGE** starts with the Standard System and adds additional consumables, such as spare mixing tubes, extra jewel orifices, and filters. This package features a powered Drain Water Filter Tank[4] that helps filter the excess garnet and other debris from the tank water. Also included is the Water Spray Kit, which helps keep the cutting area interior clean and is handy for cleaning freshly cut parts.

DESCRIPTION	QUANTITY	PRICE
STANDARD SYSTEM	1	Included
System Spare Parts Kit (tank slats, mixing tubes, nozzle filters, and jewel orifices)	1	Included
Drain Water Filter Tank (DWFT)[4]	1	Included
Water Spray Kit (spray nozzle and hose)	1	Included
	TOTAL[3]	**$21,450**[5]

STOCK UP ON GARNET: POWER USER PACKAGE

Become a **POWER USER** by having extra garnet at a bundled price to your Standard System with Upgrade Package to keep you cutting for hours on end.

DESCRIPTION	QUANTITY	PRICE
STANDARD SYSTEM	1	Included
UPGRADE PACKAGE	1	Included
ProtoMAX Garnet Abrasive (55lb bucket)	6 @ $67.50 ea.	Included
	TOTAL[3]	**$21,855**[5]

[1] [illegible]
[2] [illegible]
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[5] [illegible]

WWW.PROTOMAX.COM
[illegible]
OMAX CORPORATION
TEL

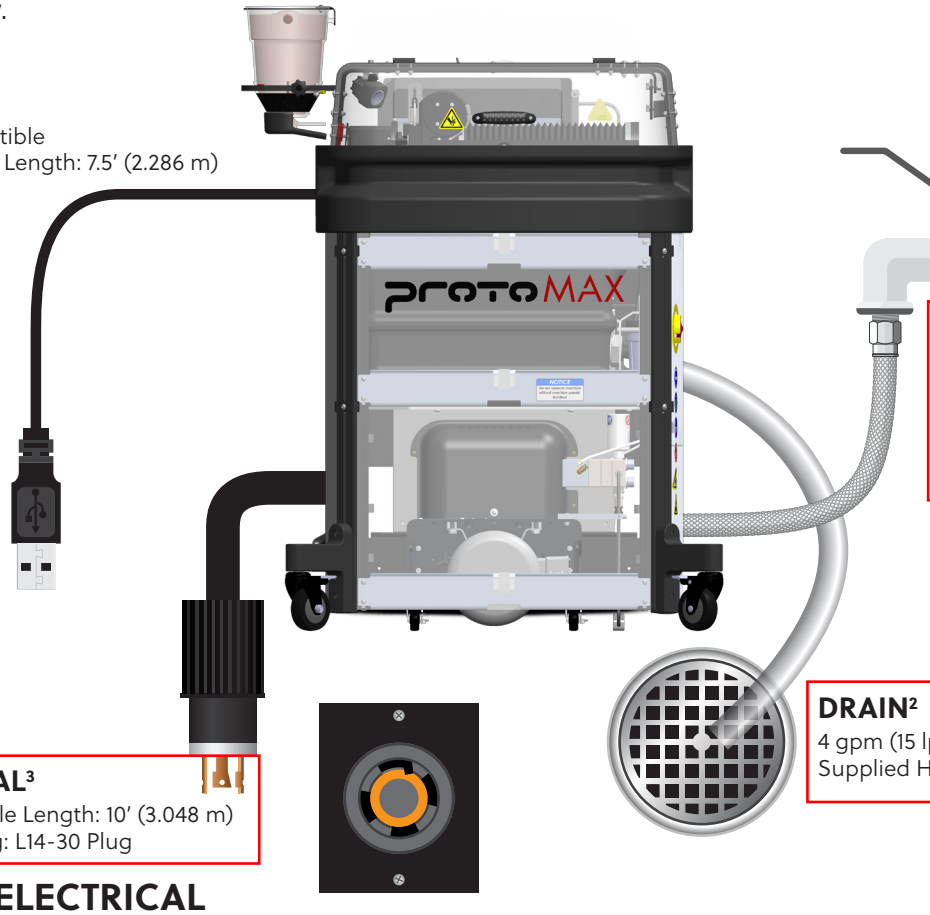
1112 ProtoMax Waterjet

Utilities Requirements

System Requirements

ENVIRONMENT & LOCATION

The ProtoMAX is intended for indoor use, and must be placed on a level hard, void-free, solid, non-porous, flame-resistant surface. A concrete floor is recommended. For operator, maintenance, and utility access, a pathway width of 24" (0.610 m) minimum is recommended around all sides of the ProtoMAX. The ideal operating environment should have an ambient temperature between 50° and 90° F (10-32° C) with 95% or less humidity.



WATER & ELECTRICAL

1. The ProtoMAX requires clean water and contains a filter located near the inlet water connection. Additional water filtering may be required to prevent premature clogging of these filters if the incoming water is especially dirty. For ProtoMAX water quality recommendations, visit the ProtoMAX FAQs at protomax.com.

2. Although drain flow is minimal when waterjet cutting, it is recommended that the drain flow capacity be 4 gpm (15 lpm). This allows the user to regulate the water height in the catcher tank and also empty it without any restrictions. This also easily allows the use of the optional Drain Water Filter Tank.

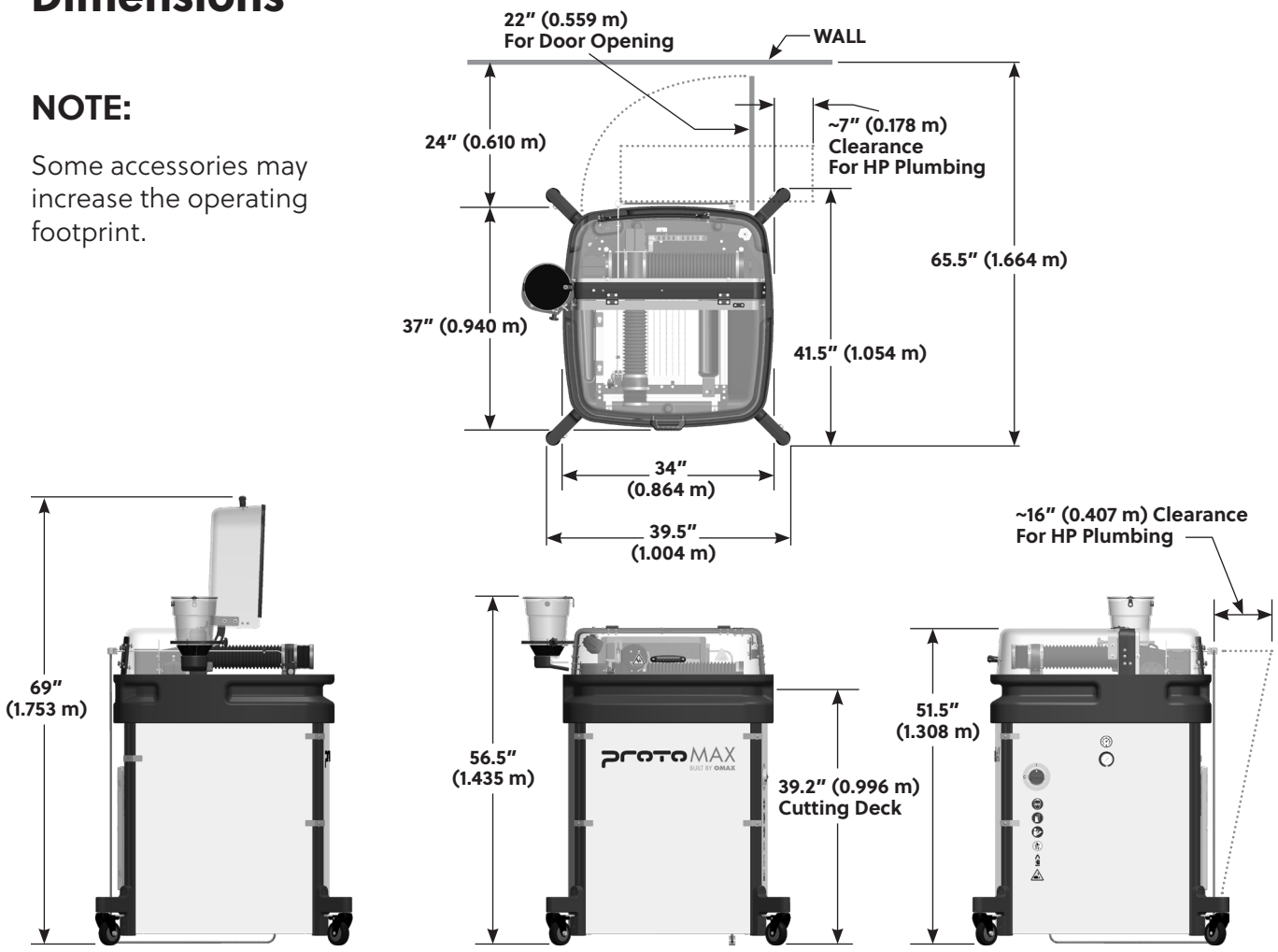
3. The ProtoMAX input voltage requirement is 230-240 VAC, single phase, 50/60 Hz, 22.3-20.5 FLA, Short Circuit Current Rating (SCCR) 5 kA. In the United States, Canada, & Mexico, a dedicated 30A supply with an L14-30 receptacle properly installed and grounded by a qualified electrician or service personnel in accordance with national, state, and local codes is required. For countries other than United States, Canada and Mexico, OMAX does not supply a suitably rated industrial grade plug. A suitably rated plug and receptacle in accordance to standards IEC 60309-1 and IEC60309-2 may fulfill this requirement. You must plug the cord into a matching outlet that is properly installed and grounded in accordance with all local codes and ordinances. The ProtoMAX computer requires connection to a separate 100-240 VAC, 50/60Hz power source receptacle.

Utilities Requirements

Features & Dimensions

NOTE:

Some accessories may increase the operating footprint.



UNPACKING & LIFT REQUIREMENTS

The ProtoMAX is shipped on a 49" x 47" (1.245 x 1.194 m) square pallet in a 62" (1.575 m) tall crate on a liftgate truck. The total palletized weight is approximately 750 lbs (341 kg) and consists of the table (~330 lbs; 150 kg), pump (~200 lbs; 91 kg), accessories, a 55 lb (25 kg) bucket of garnet, and packing. It is recommended that you have a pallet floor jack at minimum to maneuver the container near its final location to simplify unpacking and installation. The table and pump are on casters to aid in moving those assemblies into location. It is recommended to use at least two people to offload the contents from the pallet.

OMAX CORPORATION
21409 72nd Avenue South
Kent, WA 98032
TEL 1-818-647-1994

Air Compressor (OFCI) in Custodian Room G106

Ingersoll Rand

Reciprocating Single- and Two-stage Air Compressors
2-25 hp

Innovation

Reliability

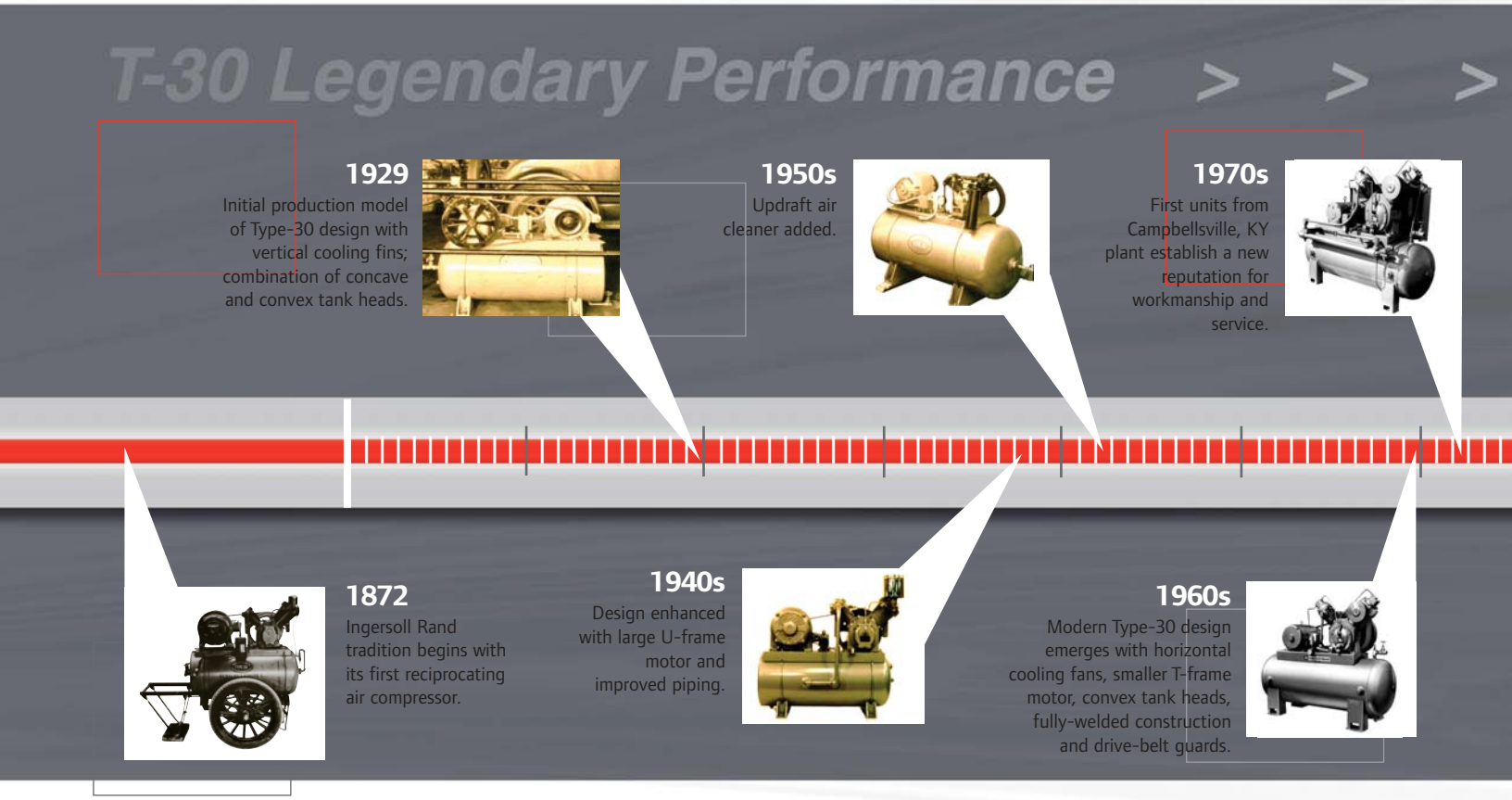
Efficiency

Ingersoll Rand
Industrial Technologies

Legendary Performance

For more than a century, Ingersoll Rand has inspired progress by driving innovation through revolutionary technology and talented people.

It's a legacy of creating new standards for how the world gets work done. We're the technology leader in compressed air not only because we develop best-in-class products, but also because we stand behind our customers in all aspects of what we do. No matter what your product, process or location, Ingersoll Rand has the expertise, the technology and the unmatched service to meet your needs.



Providing Customer-driven Compressor Solutions

When you've been delivering reliable reciprocating compressor results for more than 100 years, it's natural that your corporate culture supports a strong tradition of evolutionary enhancements. Every new generation of employees builds on the experience and insights of their mentors. Today's legendary Ingersoll Rand air compressors started with an original rock-solid design and have steadily improved with added control and performance upgrades over the years.

They are world-renowned for their impressive legacy of long-life performance, ease of service and evolutionary design enhancements.

Efficient. Reliable. Built to last.

Ingersoll Rand has sold millions of reciprocating compressors worldwide.

1980s
First blue-colored units feature new enhancements.

1990s
Fully packaged units with E-series starters and CSA package certification are introduced.

2000
Premier Series packaging adds dual controls, deluxe starter, and liquid-filled pressure gauge.

2002
Compact single-stage compressors introduced.

2003
Pressure-lubricated model with industrial-grade two-stage air cleaner added.

2006
Fully packaged model with aftercooler, automatic tank drain, and low-oil-level shutdown is top choice for round-the-clock applications.

Efficiency, Reliability, Built to Last

Ingersoll Rand

Time-tested design and enhancements establish Ingersoll Rand single- and two-stage reciprocating compressors as the benchmark for:

Efficiency and Reliability

With a proven design and stellar track record, the Ingersoll Rand reciprocating compressor family has earned worldwide recognition for reliable, trustworthy performance that saves money and enhances business success through:

- Lower life-cycle costs
- An ability to thrive in punishing applications
- Optimum solutions for greater efficiency
- Configurations that meet varying needs

Built to Last

Due to the laws of physics, there are certain aspects of reciprocating compressor design, construction and performance that have never changed – like cast-iron durability, copper-finned cooling coils, reliable lubrication and easy maintenance. That's where Ingersoll Rand design and operating experience really pays off in terms of long-term productivity and return on investment. Ask any one of the millions of active Ingersoll Rand reciprocating compressor users around the world.

Serviceability

Ingersoll Rand designed the reciprocating compressors to last a lifetime – thanks to quick, easy maintenance with renewable components. Easy access to the pump components allows for quick routine maintenance and replacement of parts like the stainless steel valve, individually cast cylinders, piston rings and gaskets, and the 15,000-hour bearings. This key serviceability aspect extends the life of the compressor and lets you amortize your initial capital cost over a much longer equipment life span for a superior payback on your investment.

Innovation

For more than 100 years, Ingersoll Rand has maintained the delicate balance between known performance and new developments by keeping the best features and upgrading others as new technology becomes available. The result is higher efficiency for today's energy-conscious world and enhanced value for the extended life of your investment.

Customer-driven Solutions

Another residual benefit of compressor longevity is our cumulative experience with how different users prefer, need and operate their compressors. Years of experience in the reciprocating compressor business and servicing a variety of users have taught us what is most important to compressor users. And that means more choices for you to satisfy your specific needs.

Your choices range from the size of the units and the sophistication of the features to popular packaged solutions. There are even gas-powered packages perfect for field service, fleet maintenance, remote pneumatic applications or emergency back-up needs.

The Ideal Design for Applications Where Air is Taken for Granted

Ingersoll Rand single- and two-stage reciprocating air compressors are an ideal choice for applications that demand a reliable air supply for everyday use, but where running an air compressor ranks a distant second to running your business.

- **Automotive Shops**
- **Light Manufacturing**
- **Construction**
- **Commercial Applications**
- **Fabrication**
- **Pneumatic Equipment**
- **Processing Lines**

It's All About Choices

Better choices lead to better solutions for saving money and improving overall return on investment in your unique application.

That's why Ingersoll Rand single- and two-stage reciprocating compressors offer you more choices of compressor sizes and compressor features to suit your needs. If you define unsurpassed performance by maximum operating pressure, increased air flow and extended duty cycles, count on an Ingersoll Rand reciprocating air compressor to deliver it reliably.

Take advantage of Ingersoll Rand expertise, product selection, service and system solutions to help you identify the optimum compressor size, performance features and package options for your applications. And learn how you can strengthen your business through:

- Lower operating costs
- Increased productivity
- Improved quality
- A better working environment

Two-stage Electric-powered Air Compressors			
Feature	**Value Package (5, 7.5, 10 & 15hp)**	**Value Plus Package (10 & 15hp)**	**Premium Package (5, 7.5, 10, 15 & 20hp)**
100% Cast Iron Pump	✔	✔	✔
ASME Coded Receiver Tank	✔	✔	✔
NEMA 1 & ODP Motor	✔	✔	✔
Magnetic Motor Starter	✔ (Except 2340 packages with single-phase voltage)	✔	✔ (Except 2340 packages with single-phase voltage)
Automatic Start/Stop Control with Pressure Switch	✔	✔	✔ (5 & 7.5hp only)
Oil Sight Glass	✔ (10 & 15hp only)	✔	
Manual Drain	✔		
Electric Drain		✔	✔
Air-Cooled Aftercooler		✔	✔
Low Oil Level Switch			✔
Dual Control with Centrifugal Unloader			✔ (10 & 15hp only)

Value Package (5, 7.5, 10 & 15hp) An economical choice in a dependable compressed air source, the Value Package offers the perfect solution for commercial, automotive and light industrial applications with intermittent load demands.

Value Plus Package (10 & 15hp) For applications that demand a heavier-duty cycle. Step up to this enhanced version of our base package. It is ideal for light industry applications. The Value Plus Package comes factory-fitted with options shown above for unmatched reliability in most diversified applications.

Premium Package (5, 7.5, 10, 15 & 20hp) For applications that are the most demanding or require greater control over compressed air supply. Step up to our top-of-the-line Premium Package. These air compressors come standard with factory-fitted options shown above for unmatched reliability in 100% continuous-duty applications.

Single-stage Air Compressor

Configured in space-saving stationary and portable models, these durable compressors are a favorite with DIY homeowners and in the construction industry.

Key features include:

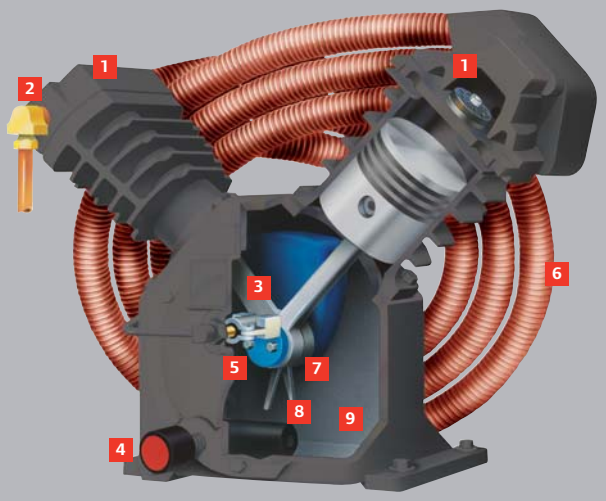
- Industry-leading 5,000-8,000 hour design life
- Industrial-quality cast iron construction
- Reliable high-speed valve design
- Fully-balanced crankshaft that reduces vibration
- 135 psi max. discharge pressure
- Honda engine-driven wheel barrow compressor

Two-stage Gas-powered Air Compressors

Ingersoll Rand's two-stage gasoline engine driven air compressors are designed to provide compressed air where electric power is not readily available. They're used in fleet and field service applications, remote pneumatic applications and emergency production lines.

- Available with easy-starting Honda, or Kohler engines
- Fuel-efficient idle control
- Advanced safety features including low oil level shutdown for gas engines

Why Ingersoll Rand Pumps Are Better... Excellence in Design!



1. **Two-stage Design:** Delivers pressures up to 175 psig
2. **Radial Fins for Maximum Cooling:** Even 360° cooling of barrel cylinders eliminates hot spots
3. **One-piece Connecting Rod:** Fewer wearing parts
4. **Low Oil Level Switch:** Provides constant protection
5. **Centrifugal Unloader:** Ensures loadless starts, for maximum starter protection
6. **Integral Fan Blade/Finned Copper Intercooler:** Runs cooler, even in the most demanding conditions
7. **Overhung Crankshaft:** Precision balanced to run smoothly and quietly; simplifies maintenance and wear-sleeve replacement
8. **Splash Lubrication:** Simple and reliable.
9. **100% Cast Iron:** Designed for a lifetime

Selection Guide
for Electric-drive Stationary Air Compressors

1. Select Your Compressor

Stationary Compressors	
Applications	**Recommended Package**
Intermittent Duty	Two-stage Value
Medium Duty	Two-stage Value Plus
100% Continuous Duty	Two-stage Premium
DIY	Single-stage

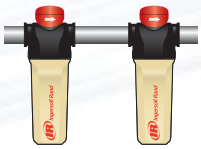
Portable Compressors	
Applications	**Recommended Package**
Remote/Fleet/ Field Service	Two-stage Gas-driven
DIY/Construction	Single-stage

2. Choose Your Air Quality

Ingersoll Rand compressed air treatment equipment is used to remove contaminants present in a compressed air system.

Shop Quality Air

General system protection removes bulk liquid and solid contaminates:

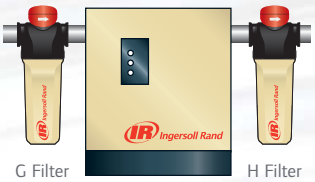


G Filter H Filter

- Light manufacturing
- Light auto service shop
- Pneumatic tools
- Dry cleaning

Dry, Clean Air

Complete system protection removes liquid and solid contaminates:



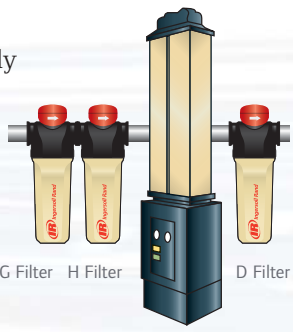
G Filter H Filter

Refrigerated Dryer

- Medium-to-heavy manufacturing
- Large auto service shop
- Auto body shop
- Printing
- Laundry
- Instrumentation

Critical Quality Air

Applications that require virtually no water vapor or contaminates:

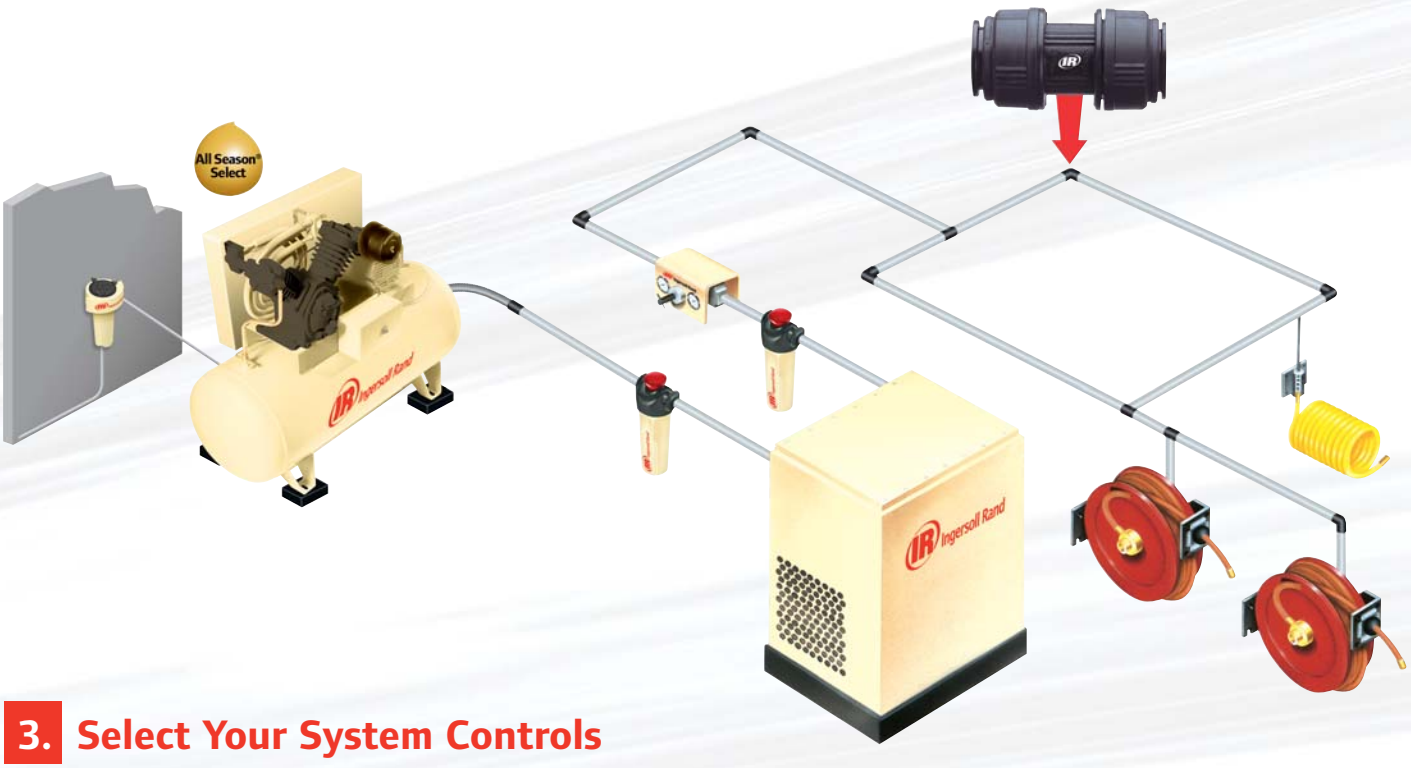


G Filter H Filter D Filter

Desiccant Dryer

- Advanced pneumatics and instrumentation
- Spray application booths
- Piping exposed to freezing temperatures

G - General Purpose H - High Efficiency D - Dust Protection



3. Select Your System Controls and Accessories

Ingersoll Rand accessories are available for all power sources.

IntelliFlow Pneumatic Flow Controller

- Energy savings
- Control pressure ± 1 psig (.07 bar g)
- Single point control system
- Reduce leak losses
- Increase system productivity
- Protect all downstream equipment

EZ-line SimplAir Compressed Air Piping

- High-quality anodized aluminum pipe
- Non-corrosive piping
- Reduced pressure loss
- Higher flow rates than other piping
- Easy and fast installation

EDV Electronic Drain Valve

- Automatically removes moisture from tanks, compressors, filters, drip legs

Filters, Regulators and Lubricators (FRLs)

FRLs provide point-of-use air conditioning to enhance tool longevity and process quality. Filters remove rust, scale and condensation that increase wear on tools regulators and provide constant pressure with varying upstream pressure. Lubricators provide lubricating oil to tools, cylinders, valves and other equipment.

Oil Water Separators

- Removes oil from drain condensate
- Allows for clean water discharge

Global Reach, Local Touch

No matter what the industry or location, Ingersoll Rand is committed to serving you 24 hours a day, seven days a week. Our worldwide network of distributors, engineers and certified, factory-trained technicians, are a phone call away — ready to support you with innovative and cost-effective service solutions that will keep you running at peak performance.

Start-up Kits

Ingersoll Rand offers All Season Select® start-up kits to provide improved protection. Each kit contains all the parts needed to correctly start up and maintain your compressor for the first year. The start-up kits provide everything you need for 2,000 hours of service between changes under normal operating conditions, along with the added protection of a two-year extended warranty.

All start-up kits include:

- All Season Select® lubricant, our synthetic, all-temperature blend designed to increase efficiency, reduce wear and prevent carbon build-up
- Replacement air filter elements

Specifications

Two-stage Electric-powered – Value Package

Model	hp	Tank Size/ Configuration	Stationary or Portable	Capacity (cfm) @ 175 psig	Max Pressure (psig)	Dimensions (L x W x H in)	Net Weight (lbs)	Tank Outlet (in)	Startup Kit
2340L5-V	5.0	60-Gal. Vertical	S	14.0	175	48 x 40 x 76	435	0.50	32305880
2340N5-V	5.0	80-Gal. Vertical	S	14.0	175	48 x 40 x 76	505	0.50	32305880
2475N5-V	5.0	80-Gal. Vertical	S	16.8	175	48 x 40 x 76	505	0.75	32305880
2475N7.5-V	7.5	80-Gal. Vertical	S	24.0	175	48 x 40 x 76	611	0.75	32305880
2545E10-V	10.0	120-Gal. Horizontal	S	35.0	175	83 x 36 x 65	920	0.75	32305898
2545K10-V	10.0	120-Gal. Vertical	S	35.0	175	51 x 46 x 83	1,104	1.00	32305898
7100E15-V	15.0	120-Gal. Horizontal	S	50.0	175	83 x 36 x 65	1,239	0.75	32305898

Available voltages: 230/1/60 (5-7.5 hp only), 200/3/60, 230/3/60, 460/3/60 and 575/3/60 voltages
Packages include magnetic starter (except 2340 models with single-phase voltage), manual drain, automatic start/stop control with pressure switch

Two-stage Electric-powered – Value Plus Package

Model	hp	Tank Size/ Configuration	Stationary or Portable	Capacity (cfm) @ 175 psig	Max Pressure (psig)	Dimensions (L x W x H in)	Net Weight (lbs)	Tank Outlet (in)	Startup Kit
2545E10-VP	10.0	120-Gal. Horizontal	S	35.0	175	83 x 36 x 65	1,104	0.75	32305898
2545K10-VP	10.0	120-Gal. Vertical	S	35.0	175	51 x 46 x 83	1,104	1.00	32305898
7100E15-VP	15.0	120-Gal. Horizontal	S	50.0	175	83 x 36 x 65	1,297	0.75	32305898

Available voltages: 200/3/60, 230/3/60, 460/3/60 and 575/3/60 voltages
Packages include magnetic starter, electric drain, Automatic start/stop control with pressure switch, air-cooled aftercooler

Two-stage Electric-powered – Premium Package

Model	hp	Tank Size/ Configuration	Stationary or Portable	Capacity (cfm) @ 175 psig	Max Pressure (psig)	Dimensions (L x W x H in)	Net Weight (lbs)	Tank Outlet (in)	Startup Kit
2475N5-P	5.0	80-Gal. Vertical	S	16.8	175	48 x 40 x 76	597	0.75	32305880
2475N7.5-P	7.5	80-Gal. Vertical	S	24.0	175	48 x 40 x 76	611	0.75	32305880
2545E10-P	10.0	120-Gal. Horizontal	S	35.0	175	83 x 36 x 65	1,104	0.75	32305898
2545K10-P	10.0	120-Gal. Vertical	S	35.0	175	51 x 46 x 83	1,104	1.00	32305898
7100E15-P	15.0	120-Gal. Horizontal	S	50.0	175	83 x 36 x 65	1,297	0.75	32305898

Available voltages: 230/1/60 (5-7.5 hp only), 200/3/60, 230/3/60, 460/3/60 and 575/3/60 voltages
Packages include magnetic starter, electric drain, automatic start/stop control with pressure switch (5 hp & 7.5hp), dual control with centrifugal unloader (10hp & 15hp), air-cooled aftercooler, low oil level switch

Single-stage Electric-powered

Model	hp	Tank Size/ Configuration	Stationary or Portable	Capacity (cfm) @ 90 psig	Max Pressure (psig)	Dimensions (L x W x H in)	Net Weight (lbs)	Tank Outlet (in)	Startup Kit
P1IU-A9	2.0	4-Gal. Twin	P	4.30	135	19 x 19 x 19	77	0.25	–
P1.5IU-A9	2.0	20-Gal. Vertical	P	5.20	135	22 x 23 x 43	200	0.25	–
SS3J2-WB	2.0	8-Gal. Twin	P	5.70	135	43 x 18 x 25	175	0.25	97338099
SS3J3-WB	3.0	8-Gal. Twin	P	11.3	135	43 x 18 x 25	175	0.25	97338099
SS3L3	3.0	60-Gal. Vertical	S	11.3	135	20 x 23 x 66	300	0.50	97338099
SS5L5	5.0	60-Gal. Vertical	S	18.1	135	20 x 30 x 71	310	0.50	20100251

Available voltages: 120/1/60 (P1IU-A9), 115/1/60 (P1.5IU-A9), and 230/1/60 (SS3, SS5) voltages

Two-stage Gas-powered

Model	hp	Engine	Tank Size/ Configuration	Stationary or Portable	Capacity (cfm) @ 175 psig	Max Pressure (psig)	Dimensions (L x W x H in)	Net Weight (lbs)	Tank Outlet (in)	Startup Kit
2475F13GH	13	Honda	30-Gal. Horizontal	P	25.0	175	51 x 33 x 44	469	0.50	32312936
2475X13GH	13	Honda	Baseplate Mounted	P	25.0	175	33 x 36 x 36	440	0.50	32312936
2475F12.5G	13	Kohler	30-Gal. Horizontal	P	24.0	175	51 x 33 x 44	469	0.50	32305872
2475X12.5G	13	Kohler	Baseplate Mounted	P	24.0	175	33 x 36 x 36	440	0.50	32305872

Single-stage Gas-powered

Model	hp	Engine	Tank Size/ Configuration	Stationary or Portable	Capacity (cfm) @ 90 psig	Max Pressure (psig)	Dimensions (L x W x H in)	Net Weight (lbs)	Tank Outlet (in)	Startup Kit
SS3J5.5GH-WB	5.5	Honda	8-Gal. Twin	P	11.8	135	43 x 18 x 26	175	0.25	97339501

Air Compressor (OFCI) in Custodian Room G106

2475N7.5-P Two Stage Cast Iron Air Compressor

an artwork by Ingersoll Rand

Part Number:
2475N7.5-P

Price: $2,682.00

Choose Options

Kits
None

Voltage
230/1/60

Quantity
1 Add to Cart

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Same Day Shipping
On most orders placed by 3pm EST when choosing UPS shipping options
text

Description | Availability | Shipping Info

Ingersoll-Rand's Type-30 air compressors provide unsurpassed performance in the most demanding applications. Recognized industry leaders for quality, power and reliability, Ingersoll Rand air compressors have been trusted for over 75 years and are the world's best-selling reciprocating compressor. Each premium unit includes a two-stage, 100% cast iron pump, ODP electric motor, mounted and wired magnetic motor starter, automatic start & stop control with a NEMA 1 pressure switch, and an ASME coded air receiver tank.

- Electric driven 2-stage model
- 80 gallon vertical tank
- Designed to run at high volumes and high pressure, without interruption
- Solid, 100% cast iron construction and components

- Unsurpassed quality and reliability - millions in use!

Technical Details

- 7.5 horsepower
- 24 ACFM @ 175 PSIG
- Receiver: 80 vertical
- Weight: 500 pounds
- Dimensions: 38L x 26W x 70H

- Air Compressors > Two Stage > 5 - 7.5 Horsepower
- Air Compressors > Two Stage

sales@ingersollrandcompressedair.com

BID FORM AND PROPOSAL

Sacramento City Unified School District ("District" or "Owner")

From: _____
(Proper Name of Bidder)

ACKNOWLEDGEMENT OF GENERAL CONDITIONS

The General Conditions and definitions therein are accessible on the SCUSD website at www.scusd.edu/construction-projects and are an integral part of the Contract Documents. The Contractor shall not disclaim knowledge of the meaning and effect of any term or provision of these General Conditions, and Supplemental Conditions, if any, and agrees to strictly abide by their meaning and intent. In the event the Contractor fails to initial this acknowledgement, the District shall have the right to reject the Bid.

CONTRACTOR'S INITIALS: _____

The undersigned declares that the Contract Documents including, without limitation, the Notice to Bidders and the Instructions to Bidders have been read and agrees and proposes to furnish all necessary labor, materials, tools, transportation, services and equipment to perform and furnish all work in accordance with the terms and conditions of the Contract Documents, including, without limitation, the Drawings and Specifications of Bid No. 0557-429

PROJECT: SCHOOL OF ENGINEERING & SCIENCE CTEIG NEW BUILDING

and will accept in full payment for that Work the following total lump sum amount, all taxes included. **The basis of determining the lowest responsible, responsive bidder will be based upon the stated value of the TOTAL BID.**

A. _____ ***BASE BID***	Dollars	$ _____
B. _____ ***10% OWNER'S CONTINGENCY***	Dollars	$ _____
C. FIFTY THOUSAND ***ALLOWANCE FOR EARTHWORK/UTILITIES***	Dollars	$ 50,000.00
D. _____ ***TOTAL BID***	Dollars	$ _____

5. **Alternate #1**

_____ Dollars $ _____

Deductive

Revised scope of work for concrete paving, subgrade preparation, fencing and vegetative swale on the east side of the new classroom building as shown on the Architectural, Civil & Landscape Drawings.

Alternate #2

_____ Dollars $ _____

Additive

Install new pullboxes in the existing play field, and install underground power and data conduits between the existing Box C-1 & P-1 to the new pullboxes. See Addendum 1 for more information.

Descriptions of alternates are primarily scope definitions and do not necessarily detail the full range of materials and processes needed to complete the construction.

6. **BID SUBMISSION**

Bids may be submitted electronically on E-Builder^{tm} or delivered to the District.

7. **ALLOWANCE**

The above allowance shall only be allocated for items relating to the Work. Contractor shall not bill for or be due any portion of this allowance unless the District has identified specific work, Contractor has submitted a price for that work or the District has proposed a price for that work, the District has accepted the cost for that work, and the District has prepared a change order incorporating that work. Contractor hereby authorizes the District to execute a unilateral deductive change order at or near the end of the Project for all or any portion of the allowance not allocated.

8. **REVIEW OF WORK IN CONTRACT DOCUMENTS**

The undersigned has reviewed the Work outlined in the Contract Documents and fully understands the scope of Work required in this Proposal, understands the construction and project management function(s) is described in the Contract Documents, and that each Bidder who is awarded a contract shall be in fact a prime contractor, not a subcontractor, to the District, and agrees that its Proposal, if accepted by the District, will be the basis for the Bidder to enter into a contract with the District in accordance with the intent of the Contract Documents.

9. **DISCREPANCIES AND OMISSIONS**

The undersigned has notified the District in writing of any discrepancies or omissions or of any doubt, questions, or ambiguities about the meaning of any of the Contract Documents, and has contacted the Architect before bid date to verify the issuance of any clarifying Addenda.

10. **WORK COMMENCEMENT AND COMPLETION**

The undersigned agrees to commence work under this Contract on the date established in the Contract Documents and to complete all work within the time specified in the Contract Documents.

11. LIQUIDATED DAMAGES

The liquidated damages clause of the General Conditions and Agreement is hereby acknowledged.

12. DISTRICT BID RIGHTS

It is understood that the District reserves the right to reject this bid and that the bid shall remain open to acceptance and is irrevocable for a period of ninety (90) days.

13. DOCUMENTS TO BE ATTACHED

The following documents are attached hereto and hereby attests that all required provisions of said forms will be strictly adhered to:

- Bid Bond on the District's form or other security.
- Designated Subcontractors List.
- All other forms listed in the instructions to bidders

14. ACCEPTANCE OF ADDENDA

Acceptance of the following addenda is hereby acknowledged:

No. _____, Dated _____	No. _____, Dated _____
No. _____, Dated _____	No. _____, Dated _____

15. REQUIRED LICENSE

Bidder acknowledges that the license required for performance of the Work is a **B – General Building** license.

16. LABOR HARMONY

The undersigned hereby certifies that Bidder is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the Work.

17. BIDDER COMPETENTCY

The Bidder represents that it is competent, knowledgeable, and has special skills with respect to the nature, extent, and inherent conditions of the Work to be performed. Bidder further acknowledges that there are certain peculiar and inherent conditions existent in the construction of the Work that may create, during the Work, unusual or peculiar unsafe conditions hazardous to persons and property.

18. BIDDER RISKS

Bidder expressly acknowledges that it is aware of such peculiar risks and that it has the skill and experience to foresee and to adopt protective measures to adequately and safely perform the Work with respect to such hazards.

19. **FALSE CLAIMS**

Bidder expressly acknowledges that it is aware that if a false claim is knowingly submitted (as the terms "claim" and "knowingly" are defined in the California False Claims Act, Cal. Gov. Code, §12650 et seq.), the District will be entitled to civil remedies set forth in the California False Claim Act. It may also be considered fraud and the Contractor may be subject to criminal prosecution.

20. **BIDDER CERTIFICATION**

The undersigned Bidder certifies that it is, at the time of bidding, and shall be throughout the period of the contract, licensed by the State of California to do the type of work required under the terms of the Contract Documents and registered as a public works contractor with the Department of Industrial Relations. Bidder further certifies that it is regularly engaged in the general class and type of work called for in the Contract Documents.

Furthermore, Bidder hereby certifies to the District that all representations, certifications, and statements made by Bidder, as set forth in this bid form, are true and correct and are made under penalty of perjury.

Dated this _____ day of _____ 20 ____

Name of Bidder _____

Type of Organization _____

Signed by _____

Title of Signer _____

Address of Bidder _____

Taxpayer's Identification No. of Bidder _____

Telephone Number _____

Fax Number _____

E-mail _____ Web page _____

Contractor's License No(s): No.: _____ Class: _____ Expiration Date: _____

No.: _____ Class:_____ Expiration Date: _____

No.: _____ Class:_____ Expiration Date: _____

Public Works Contractor Registration No.: _____

If Bidder is a corporation, affix corporate seal.

Name of Corporation: _____

President: _____

Secretary: _____

Treasurer: _____

Manager: _____

END OF DOCUMENT

DOCUMENT 00 73 13

SPECIAL CONDITIONS

1. Mitigation Measures

2. Modernization projects

3. General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities.

DOCUMENT 00 73 13

SPECIAL CONDITIONS

1. MITIGATION MEASURES

Contractor shall comply with all applicable mitigation measures, if any, adopted by any public agency with respect to this Project pursuant to the California Environmental Quality Act. (Public Resources Code section 21000 et seq.)

2. MODERNIZATION PROJECTS

A. **Access**. Access to the school buildings and entry to buildings, classrooms, restrooms, mechanical rooms, electrical rooms, or other rooms, for construction purposes, must be coordinated with District and onsite District personnel before Work is to start. Unless agreed to otherwise in writing, only a school custodian will be allowed to unlock and lock doors in existing building(s). The custodian will be available only while school is in session. If a custodian is required to arrive before 7:00 a.m. or leave after 3:30 p.m. to accommodate Contractor's Work, the overtime wages for the custodian will be paid by the Contractor, unless at the discretion of the District, other arrangements are made in advance.

B. **Master Key.** Upon request, the District may, at is own discretion, provide a master key to the school site for the convenience of the Contractor. The Contractor agrees to pay all expenses to re-key the entire school site and all other affected District buildings if the master key is lost or stolen or if any unauthorized party obtains a copy of the key or access to the school.

C. **Maintaining Services.** The Contractor is advised that Work is to be performed in spaces regularly scheduled for instruction. Interruption and/or periods of shutdown of public access, electrical service, water service, lighting, or other utilities shall be only as arranged in advance with the District. Contractor shall provide temporary services to all facilities interrupted by Contractor's Work.

D. **Maintaining Utilities**. The Contractor shall maintain in operation during duration of Contract, drainage lines, storm drains, sewers, water, gas, electrical, steam, and other utility service lines within working area.

E. **Confidentiality**. Contractor shall maintain the confidentiality of all information, documents, programs, procedures and all other items that Contractor encounters while performing the Work. This requirement shall be ongoing and shall survive the expiration or termination of this Contract and specifically includes, without limitation, all student, parent, and employee disciplinary information and health information.

F. **Work During Instructional Time**. By submitting its bid, Contractor affirms that Work may be performed during ongoing instruction in existing facilities. If so, Contractor agrees to cooperate to the best of its ability to minimize any disruption to the school up to, and including, rescheduling specific work activities, at no additional cost to District.

G. No Work During Student Testing. Contractor shall, at no additional cost to the District and at the District's request, coordinate its Work to not disturb District

students including, without limitation, not performing any Work when students at the Site are taking State-required tests. **6. GENERAL PERMIT FOR STORM WATER DISCHARGES ASSOCIATED WITH**

3. CONSTRUCTION AND LAND DISTURBANCE ACTIVITIES

Contractor acknowledges that all California school districts are obligated to develop and implement the following requirements for the discharge of storm water to surface waters from its construction and land disturbance activities (storm water requirements), without limitation:

A. Municipal Separate Storm Sewer System (MS4) is a system of conveyances used to collect and/or convey storm water, including, without limitation, catch basins, curbs, gutters, ditches, man-made channels, and storm drains.

B. Storm Water Pollution Prevention Plan (SWPPP) contains specific best management practices (BMPs) and establishes numeric effluent limitations at:

1. Sites where the District engages in maintenance (e.g., fueling, cleaning, repairing) for transportation activities.

2. Construction sites where one (1) or more acres of soil will be disturbed, or the project is part of a larger common plan of development that disturbs more than one (1) acre of soil.

3. Contractor shall comply with any District storm water requirements that are approved by the District and applicable to the Project, at no additional cost to the District.

4. At no additional cost to the District, Contractor shall provide a Qualified Storm Water Practitioner who shall be onsite and implement and monitor any and all SWPPP requirements applicable to the Project, including but not limited to:

a. At least forty-eight (48) hours prior to a forecasted rain event, implementing the Rain Event Action Plan (REAP) for any rain event requiring implementation of the REAP, including any erosion and sediment control measures needed to protect all exposed portions of the site; and

b. Monitoring any Numeric Action Levels (NALs), if applicable.

END OF DOCUMENT

SECTION 07 46 20

FIBER CEMENT SOFFIT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fiber cement soffit panels.

B. Related trim, flashings, accessories, and fastenings.

1.2 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry

1.3 REFERENCES

A. ASTM D3359 - Standard Test Method for Measuring Adhesion by Tape Test, Tool and Tape.

B. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Verification Samples: For each finish product specified, two samples, minimum size 4 by 6 inches (100 by 150 mm), representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Minimum of 2 years experience with installation of similar products.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store siding on edge or lay flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

A. Product Warranty: Limited, non-pro-rated product warranty.

1. HardieSoffit HZ10 panels for 30 years.

B. Finish Warranty: Limited product warranty against manufacturing finish defects for a period of 15 years from the date of purchase.

C. Workmanship Warranty: Application limited warranty for 2 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: James Hardie Building Products, Inc., which is located at: 26300 La Alameda Suite 400 ; Mission Viejo, CA 92691; Tel: 866-274-3464; www.jameshardiecommercial.com

B. Substitutions: Under provisions of Section 01 25 13.

2.2 SIDING

A. Soffit Panels: HardieSoffit HZ10 soffit panel, factory sealed on 5 sides as manufactured by James Hardie Building Products, Inc.
1. Type: Smooth vented, provides 5 square inches (32.3 sq.cm) of net free ventilation per linear foot, 24 inches (610 mm) by 8 feet (2438 mm).

2.3 FINISHES

A. Factory Primer: Provide factory applied universal primer.
1. Primer: Factory primed by James Hardie.
2. Paint: Refer to Section 09 90 00.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If framing preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Nominal 2 inch by 4 inch (51 m by 102 mm) wood framing selected for minimal shrinkage and complying with local building codes, including the use of water-resistive barriers or vapor barriers where required. Minimum 1-1/2 inches (38 mm) face and straight, true, of uniform dimensions and properly aligned.
1. Install water-resistive barriers and claddings to dry surfaces.
2. Repair any punctures or tears in the water-resistive barrier prior to the installation of the siding.
3. Protect siding from other trades.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Install a water-resistive barrier is required in accordance with local building code requirements.

D. The water-resistive barrier must be appropriately installed with penetration and junction flashing in accordance with local building code requirements.

3.3 INSTALLATION

A. Install materials in strict accordance with manufacturer's installation instructions.

B. Place fasteners no closer than 3/8 inch (9.5 mm) from panel edges and 2 inches (51 mm) from panel corners.

3.4 FINISHING

A. Finish factory primed siding with a minimum of one coat of high quality 100 percent acrylic or latex or oil based exterior grade paint within 180 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 09 90 00

PAINTING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Products and application.

C. Surface finish schedule.

1.2 REFERENCES

A. ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.

B. SSPC - The Society for Protective Coatings.

1.3 SYSTEM DESCRIPTION

A. Preparation of all surfaces to receive final finish.

B. Painting and finishing work of this section using coating systems of materials including primers, sealers, fillers, and other applied materials whether used as prime, intermediate, or finish coats.

C. Surface preparation, priming, and finish coats specified in this Section are in addition to shop-priming and surface treatment specified under other Sections.

D. Painting and finishing all exterior and interior surfaces of materials including structural, mechanical, and electrical work on site, in building spaces, and above or on the roof.

E. Paint exposed surfaces except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces.

1.4 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this Section.

1.5 QUALITY ASSURANCE

A. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with five years experience.

B. Applicator: Company specializing in commercial painting and finishing with five years documented experience.

C. Coats: The number of coats specified is the minimum number acceptable. If full coverage is not obtained with the specified number of coats, apply such additional coats as are necessary to produce the required finish.

D. Employ coats and undercoats for all types of finishes in strict accordance with the recommendations of the paint manufacturer.

E. Provide primers and undercoat paint produced by the same manufacturer as the finish coat.

F. The minimum dry film thickness of each coat of paint shall comply with the manufacturer's recommendations for each type of paint used.

1.6 REGULATORY REQUIREMENTS

A. Comply with applicable codes and regulations of governmental agencies having jurisdiction including those having jurisdiction over airborne emissions and industrial waste disposal. Where those requirements conflict with this specification, comply with the more stringent provisions.

B. Comply with the current applicable regulations of the California Air Resources Board (CARB) and the Environmental Protection Agency (EPA).

C. In the South Coast Air Quality Management District (SCAQMD), where lower VOC contents are specified for a number of categories, certain products maybe covered under the manufacturer's SCAQMD - approved Averaging Program. As a result, certain products may be fully compliant with SCAQMD Rule 1113, despite having VOC contents higher than specified limits.

1.7 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00.

B. Provide manufacturer's technical information and instructions for application of each material proposed for use by catalog number.

C. List each material by catalog number and cross-reference specific coating with specified finish system.

D. Provide manufacturer's certificate that products proposed meet or exceed specified materials.

E. Submit samples under provisions of Section 01 33 00.

F. Submit two samples 8-1/2 x 11 inch in size of each paint color and texture applied to cardboard. Resubmit samples until acceptable color, sheen and texture is obtained.

G. On same species and quality of wood to be installed, submit two 4 x 8 inch samples showing system to be used.

1.8 FIELD SAMPLES

A. Provide field samples under provisions of Section 01 33 00.

B. On wall surfaces and other exterior and interior components, duplicate specified finishes on at least 100 sq.ft. of surface area.

C. Provide full-coat finishes until required coverage, sheen, color and texture are obtained.

D. Simulate finished lighting conditions for review of field samples.

E. After finishes are accepted, the accepted surface may remain as part of the work and will be used to evaluate subsequent coating systems applications of a similar nature.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site and store and protect under provisions of Section 01 61 00.

B. Deliver products to site in sealed and labeled containers; inspect to verify acceptance.

C. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing. Paint containers not displaying product identification will not be acceptable.

D. Store paint materials at minimum ambient temperature of 50 degrees F and a maximum of 90 degrees F, in well ventilated area, unless required otherwise by manufacturer's instructions.

E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Provide continuous ventilation and heating facilities to maintain interior surface and ambient temperatures above 50 degrees F with a maximum humidity level of 50 percent for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is above 50 percent, unless required otherwise by manufacturer's instructions.

C. Minimum Application Temperatures for Latex Paints: 50 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

D. Minimum Application Temperature for Varnish and Urethane Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 foot candles measured mid-height at substrate surface.

1.11 EXTRA MATERIAL

A. Provide a five gallon unopened container of each color and surface texture to Owner.

B. Label each container with color, texture, and room locations in addition to the manufacturer's label.

2. PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - PAINT

A. Unless specifically identified otherwise, product designations included in this section are those of the Dunn-Edwards Corporation, www.dunnedwards.com and shall serve as the basis of design standard for kind, quality, performance and function.

B. Subject to full compliance with specified requirements, other manufacturers offering equivalent products are:

1. Benjamin Moore Paints, www.benjaminmoore.com.

C. Substitutions: Under provisions of Section 01 25 13.

2.2 MATERIALS

A. Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.

B. Good flow and brushing properties; capable of drying or curing free of streaks or sags.

C. “Deep Tone” colors to be composed of 100 percent acrylic pigments with a colored base.

D. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

E. Chemical Components of Interior Paints and Coatings: Shall not exceed the limitations of Green Seal’s Standard GS-11 for VOC content and the following restrictions:

1. Flat Paints and Coatings: VOC content of not more than 50 g/L.

2. Non-Flat Paints and Coatings: VOC content of not more than 50 g/L.

3. Anticorrosive Coatings: VOC content of not more than 100 g/L.

4. Varnishes and Sanding Sealers: VOC content of not more than 275 g/L.

5. Stains: VOC content of not more than 250 g/L.

6. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).

7. Restricted Components: Paints and coatings shall not contain any of the following:

   (a) Acrolein.

   (b) Acrylonitrile.

   (c) Antimony.

   (d) Benzene.

   (e) Butyl benzyl phthalate.

   (f) Cadmium.

   (g) Di (2-ethylhexyl) phthalate.

   (h) Di-n-butyl phthalate.

   (i) Di-n-octyl phthalate.

   (j) 1,2-dichlorobenzene.

   (k) Diethyl phthalate.

   (l) Dimethyl phthalate.

   (m) Ethylbenzene.

   (n) Ethylene Glycol.

   (o) Formaldehyde.

   (p) Hexavalent chromium.

   (q) Isophorone.

   (r) Lead.

   (s) Mercury.

   (t) Methyl ethyl ketone.

   (u) Methyl isobutyl ketone.

   (v) Methylene chloride.

   (w) Naphthalene.

   (x) Toluene (methylbenzene).

   (y) 1,1,1-trichloroethane.

   (z) Vinyl chloride.

2.3 FINISHES

A. Refer to schedule at end of Section for surface finish schedule.

3. PART 3 EXECUTION

3.1 INSPECTION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1.	Plaster and Gypsum Wallboard	:	12 percent.
2.	Masonry, Concrete, and Concrete Unit Masonry	:	12 percent.
3.	Interior Located Wood	:	15 percent.
4.	Exterior Located Wood	:	15 percent.

D. Beginning of installation means acceptance of existing surfaces.

3.2 SURFACE PREPARATION - GENERAL

A. Remove electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces or finishing.

B. Remove all finish hardware from doors and frames prior to preparing surfaces or finishing.

C. Correct minor defects and clean surfaces which affect work of this Section.

D. Shellac and seal marks which may bleed through surface finishes.

E. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Aluminum Surfaces: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.

G. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

H. Concrete Floors: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

I. Gypsum Board: Repair all voids, nicks, cracks and dents with patching materials and finish flush with adjacent surface. Latex fill minor defects. Spot prime defects after repair.

J. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Pretreat with phosphoric acid etch or vinyl wash. Apply coat of etching primer the same day as pretreatment is applied.

K. Concrete and Unit Masonry: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

L. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

M. Uncoated Steel and Iron: Remove grease, scale, dirt, and rust. Where heavy coatings of scale are evident, remove by wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint after repairs.

N. Shop Primed Steel: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime paint steel surfaces.

O. Interior Wood: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.

P. Exterior Wood: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior caulking compound after prime coat has been applied.

Q. Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.

R. Wood Doors: Seal top and bottom edges with 2 coats of spar varnish sealer.

3.3 PROTECTION OF ADJACENT WORK

A. Protect elements surrounding the work of this Section from damage or disfiguration.

B. Repair damage to other surfaces caused by work of this Section.

C. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.

D. Remove empty paint containers from site.

3.4 WORK NOT TO BE PAINTED

A. Painting is not required on surfaces in concealed and inaccessible areas such as furred spaces, foundation spaces, utility tunnels, pipe spaces and duct shafts.

B. Do not paint metal surfaces such as stainless steel, chromium plate, brass, bronze, and similar finished metal surfaces.

C. Do not paint anodized aluminum or other surfaces which are specified to be factory pre-finished.

D. Do not paint sandblasted or architecturally finished concrete surfaces.

E. Do not paint over Underwriters Laboratories, Factory Mutual or other code-required labels or identifications.

3.5 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Do not apply finishes to surfaces that are not dry.

C. Apply prime coat to surfaces which are to be painted or finished.

D. Apply each coat to uniform finish.

E. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

F. Sand lightly between coats to achieve required finish.

G. Allow applied coat to dry before next coat is applied.

H. The number of coats specified is the minimum that shall be applied. Apply additional coats when undercoats, stains or other conditions show through final paint coat, until paint film is of uniform finish, color and appearance.

I. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

J. Prime back surfaces of interior and exterior woodwork with primer paint.

K. Prime back surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.

L. Paint mill finished door seals to match door or frame.

M. Paint primed steel glazing stops in doors to match door or frame.

N. Cloudiness, spotting, lap marks, brush marks, runs, sags, spikes and other surface imperfections will not be acceptable.

O. Where spray application is used, apply each coat of the required thickness. Do not double back to build up film thickness of two coats in one pass.

P. Where roller application is used, roll and redistribute paint to an even and fine texture. Leave no evidence of roller laps, irregularity of texture, skid marks, or other surface imperfections.

3.6 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Paint shop primed equipment. Do not paint shop prefinished items.

B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

C. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are prefinished.

D. Replace identification markings on mechanical or electrical equipment when painted accidentally.

E. Paint interior surfaces of air ducts, and connector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to limit of sight line. Paint dampers exposed behind louvers, grilles, and connector and baseboard cabinets to match face panels.

F. Paint exposed conduit and electrical equipment occurring in finished areas.

G. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

H. Color code equipment, piping, conduit, and exposed ductwork in accordance with requirements indicated. Color band and identify with flow arrows, names, and numbering.

I. Replace electrical plates, hardware, light fixture trim, and fittings removed prior to finishing.

J. Paint grilles, registers, and diffusers which do not match color of adjacent surface.

K. Paint all mechanical and electrical equipment, vents, fans, and the like occurring on roof.

L. Do not paint moving parts of operating units; mechanical or electrical parts such as valve operators; linkages; sensing devices; and motor shafts.

M. Do not paint over labels or equipment identification markings.

N. Do not paint mechanical room specialties such as compressors, boilers, pumps, control panels, etc.

O. Do not paint switch plates, light fixtures, and fixture lenses.

3.7 CLEANING

A. As Work proceeds, promptly remove paint where spilled, splashed, or spattered.

B. During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.

C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

3.8 PROTECTION OF COMPLETED WORK

A. Protect finished installation under provisions of Section 01 61 00.

B. Erect barriers and post warning signs. Maintain in place until coatings are fully dry.

C. Confirm that no dust generating activities will occur following application of coatings.

3.9 PATCHING

A. After completion of painting in any one room or area, repair surfaces damaged by other trades.

B. Touch-up or re-finish as required to produce intended appearance.

3.10 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 45 29.

B. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary.

C. The Owner will engage the services of an independent testing agency to sample paint material being used.

D. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.

E. The testing agency will perform appropriate quantitive materials analysis and other characteristic testing of materials as required by the Owner.

F. If test results show materials being used and their installation do not comply with specified requirements or manufacturer's recommendations, the Contractor may be directed to stop painting, remove noncomplying paint, pay for testing and repaint surfaces to acceptable condition.

3.11 COLOR SCHEDULE

A. Paint and finish colors shall be selected by the Architect from manufacturer's entire range of standard and custom color selections and special colors selected to match or compliment the colors of other materials, equipment, or components which comprise the work.

B. Access doors, registers, exposed piping, electrical conduit and mechanical/electrical panels: Generally the same color as adjacent walls.

C. Exterior and interior steel doors, frames and trim: Generally a contrasting color to adjacent walls.

D. Doors generally are all the same color, but of a contrasting color from frame and trim.

E. Exterior and interior steel fabrications: Generally a contrasting color to adjacent walls.

F. Exposed interior mechanical/ductwork: Generally a contrasting color to adjacent walls or ceiling.

G. Ceilings are generally to be painted a different color than walls.

H. Three different color schemes for painting of walls.

I. Approximately 20 percent of overall painting work will be required to be "Deep Tone" colors. This work will require one additional coat of paint beyond that as specified.

3.12 SCHEDULE - EXTERIOR SURFACES

A. Wood-Painted (Flat Acrylic)

1st coat:	ESZPROO EZ Prime Premium
2nd coat:	EVSH10 Evershield
3rd coat:	EVSH10 Evershield

B. Wood Painted (Eggshell Acrylic)

1st coat:	EZPROO EZ Prime Premium
2nd coat:	EVSH30 Evershield
3rd coat:	EVSH30 Evershield

C. Wood - Painted (Semi-Gloss Acrylic)

1st coat:	EZPROO EZ Prime Premium
2nd coat:	SSHL50 Spartashield
3rd coat:	SSHL50 Spartashield

D. Wood - Painted (Gloss Acrylic)

1st coat:	EZPROO EZ Prime Premium
2nd coat:	SSHL60 Spartashield
3rd coat:	SSHL60 Spartashield

E. Wood - Semi-Transparent

1st coat:	WPT3 "OKON Weatherpro"

F. Concrete (Flat Acrylic)

1st coat:	ESPROO Eff-Stop Premium
2nd coat:	EVSH10 Evershield
3rd coat:	EVSH10 Evershield

G. Concrete (Eggshell Acrylic)

1st coat:	ESPROO Eff-Stop Premium
2nd coat:	EVSH30 Evershield
3rd coat:	EVSH30 Evershield

H. Steel-Primed or Unprimed (Flat Acrylic)

1st coat:	BRPR00 Bloc-Rust Premium
2nd coat:	EVSH10 Evershield
3rd coat:	EVSH10 Evershield

I. Steel - Primed or Unprimed (Eggshell Urethane Alkyd Enamel)

1st coat:	BRPR00 Bloc-Rust Premium
2nd coat:	ASHL30 Aristoshield
3rd coat:	ASHL30 Aristoshield

J. Steel - Primed or Unprimed (Semi-Gloss Urethane Alkyd Enamel)

1st coat:	BRPR00 Bloc-Rust Premium
2nd coat:	ASHL50 Aristoshield
3rd coat:	ASHL50 Aristoshield

K. Steel - Primed or Unprimed (Gloss Urethane Alkyd Enamel)

1st coat:	BRPR00 Bloc-Rust Premium
2nd coat:	ASHL70 Aristoshield
3rd coat:	ASHL70 Aristoshield

L. Steel - Galvanized and Aluminum (Flat Acrylic)

1st coat:	Pre Treat - Supreme Chemical Metal Clean and Etch SCME-01
2nd coat:	Ultrashield Galvanized Metal Primer
3rd coat:	EVSH10 Evershield
4th coat:	EVSH10 Evershield

M. Steel - Galvanized and Aluminum (Eggshell Urethane Alkyd Enamel)

1st coat:	Supreme Chemical Metal Clean and Etch SCME-01
2nd coat:	Ultrashield Galvanized Metal Primer
3rd coat:	ASHL30 Aristoshield
4th coat:	ASHL30 Aristoshield

N. Steel - Galvanized and Aluminum (Semi-Gloss Urethane Alkyd Enamel)

1st coat:	Supreme Chemical Metal Clean and Etch SCME-01
2nd coat:	Ultrashield Galvanized Metal Primer
3rd coat:	ASHL50 Aristoshield
4th coat:	ASHL50 Aristoshield

O. Steel - Galvanized and Aluminum (Gloss Urethane Alkyd Enamel)

1st coat:	Supreme Chemical Metal Clean and Etch SCME-01
2nd coat:	Ultrashield Galvanized Metal Primer
3rd coat:	ASHL70 Aristoshield
4th coat:	ASHL70 Aristoshield

P. Cementitious Siding/Soffit:

1st coat:	Kelly-Moore KM 295 KelBond Universal Primer
2nd coat:	Kelly-Moore KM 1200 Color Shield Exterior 100% Acrylic Flat
3rd coat:	Kelly-Moore KM 1200 Color Shield Exterior 100% Acrylic Flat

3.13 SCHEDULE - INTERIOR SURFACES

A. Wood - Painted (Eggshell, Acrylic)

1st coat:	UGPROO Ultra-Grip Premium
2nd coat:	SPMA30 Suprema
3rd coat:	SPMA30 Suprema

B. Wood - Painted (Semi-Gloss Acrylic)

1st coat:	UGPROO Ultra-Grip Premium
2nd coat:	SPMA50 Suprema
3rd coat:	SPMA50 Suprema

C. Wood-Painted (Gloss Acrylic)

1st coat:	UGPROO Ultra-Grip Premium
2nd coat:	SSHL60 Spartashield
3rd coat:	SSHL60 Spartashield

D. Glue-Laminated Wood and Wood Timber Members (Satin-Flat Polyurethane)

1st coat:	V109 Stainseal - Minwax Stain
2nd coat:	Cabot W.B. Polyurethane CAB 8082-1
3rd coat:	Cabot W.B. Polyurethane CAB 8082-1
4th coat:	Cabot W.B. Polyurethane CAB 8082-1

E. Wood - Transparent (Stain - Semi-Gloss Polyurethane)

1st coat:	V109 Stainseal - Minwax Stain
Filler coat (Open grain wood only):	Valspar Wood Filler VSP 0109
2nd coat:	Cabot W.B. Polyurethane CAB 8087-1
3rd coat:	Cabot W.B. Polyurethane CAB 8087-1
4th coat:	Cabot W.B. Polyurethane CAB 8087-1

F. Wood-Transparent (Stain-Semi-Gloss Lacquer)

1st coat:	Valspar Stainseal V-QYB and V-QYR
2nd coat:	Contractors Edge CE-275PROSS
3rd coat:	Contractors Edge CE-275PRO60
4th coat:	Contractors Edge CE-275PRO60

G. Steel - Primed or Unprimed (Flat Acrylic)

1st coat:	BRPR00 Bloc-Rust Premium
2nd coat:	SPMA10 Suprema
3rd coat:	SPMA10 Suprema

H. Steel - Primed or Unprimed (Eggshell, Urethane Alkyd Enamel)

1st coat:	BRPR00 Bloc-Rust Premium
2nd coat:	ASHL30 Aristoshield
3rd coat:	ASHL30 Aristoshield

I. Steel - Primed or Unprimed (Semi-Gloss Urethane Alkyd Enamel)

1st coat:	BRPR00 Bloc-Rust Premium
2nd coat:	ASHL50 Aristoshield
3rd coat:	ASHL50 Aristoshield

J. Steel - Primed or Unprimed (Gloss Urethane Alkyd Enamel)

1st coat:	BRPR00 Bloc-Rust Premium
2nd coat:	ASHL70 Aristoshield
3rd coat:	ASHL70 Aristoshield

K. Steel - Galvanized and Aluminum (Flat Acrylic)

1st coat:	ULGM00 Ultrashield Galvanized Metal Primer
2nd coat:	SPMA10 Suprema
3rd coat:	SPMA10 Suprema

L. Steel - Galvanized and Aluminum (Eggshell, Urethane Alkyd Enamel)

1st coat:	ULGM00 Ultrashield Galvanized Metal Primer
2nd coat:	ASHL30 Aristoshield
3rd coat:	ASHL30 Aristoshield

M. Steel - Galvanized and Aluminum (Semi-Gloss Urethane Alkyd Enamel)

1st coat:	ULGM00 Ultrashield Galvanized Metal Primer
2nd coat:	ASHL50 Aristoshield
3rd coat:	ASHL50 Aristoshield

N. Steel - Galvanized and Aluminum (Gloss Urethane Alkyd Enamel)

1st coat:	ULGM00 Ultrashield Galvanized Metal Primer
2nd coat:	ASHL70 Aristoshield
3rd coat:	ASHL70 Aristoshield

O. Gypsum Board (Eggshell Acrylic)

1st coat:	VNPROO Vinylastic Premium
2nd coat:	SPMA30 Suprema
3rd coat:	SPMA30 Suprema

P. Gypsum Board (Semi-Gloss Acrylic)

1st coat:	VNPROO Vinylastic Premium
2nd coat:	SPMA50 Suprema
3rd coat:	SPMA50 Suprema

Q. Gypsum Board (Gloss Acrylic)

1st coat:	VNPROO Vinylastic Premium
2nd coat:	SSHL60 Spartashield
3rd coat:	SSHL60 Spartashield

END OF SECTION

SECTION 12 24 13

ROLLER SHADES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Room darkening shades for the Type B exterior windows on the north wall of Computer Lab G101 & Workroom G102 only. No roller shades for the Type B exterior windows in Office G104 & Storage G103.

B. Manual operation .

C. Accessories and attachment hardware.

1.2 REFERENCES

A. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. CEC – California Electrical Code.

C. NFPA 701 - Fire Tests for Flame-Resistant Textiles and Films.

D. UL325 – Listed Solution covering all controls, electrical accessories and motors.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Provide manufacturer's data sheets on each product used.

C. Shop Drawings: Provide plans, elevations, sections, product details, installation details, operational clearances and relationship to adjacent work.

D. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.

E. Samples: Provide 4 sets of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.

F. Maintenance Data: Provide methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company with a minimum of ten years experience and a minimum of five projects of similar scope and size to those specified in this section.

B. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of five years experience in installing products comparable to those specified in this section.

1.5 REGULATORY REQUIREMENTS

A. Fire-Test-Response Characteristics: Shall pass NFPA 701, small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Anti-Microbial Characteristics: ASTM G 21, 'No Growth' results for fungi ATCC9642, ATCC 9644, ATCC9645.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect products to site under provisions of Section 01 61 00.

B. Deliver shades in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Verify dimensions by field measurements before fabrication.

1.9 WARRANTY

A. Provide warranties under provisions of Section 01 77 00.

B. Roller Shade Hardware and Standard Shadecloth: Manufacturer's non-depreciating twenty-five-year limited warranty.

C. Roller Shade Installation: One year from date of Substantial Completion.

2. PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis-of -Design Product: Subject to compliance with requirement, provide products manufactured by MechoShade Systems, Inc. www.mechoshade.com.

B. Comparable products manufactured by one of the following manufacturers are acceptable:

1. Draper Inc., www.draperinc.com.

2. Hunter Douglas/Nysan Shading Systems Ltd., www.hunterdouglascontract.com.

3. Lutron Electronics Co., Inc. www.lutron.com.

4. Skyco Shading Systems, Inc., www.skycoshade.com.

5. Spring Window Fashions, www.swfcontract.com.

C. Substitutions: Under provisions of Section 01 25 13.

2.2 APPLICATION

A. Roller Shade Schedule:

1. Shade Type: Manual operating, chain drive, room darkening blackout roller shades.

2.3 OPERATION

A. Manual Operated Shades:

1. Universal, regular and offset drive capacity. Allow drive chain to fall at front, rear or non-offset for drive end brackets.

2. Hardware to be minimum of 1/8 inch thick plated steel capable of supporting 150 percent of weight of each shade.

3. Installation to be designed for a removable fascia for both regular and reverse roll. Fascia to be installed with no exposed fasteners.

4. Fascia to be mounted continuously across two or more shade bands.

5. System to allow operation of multiple shade bands by single chain operator.

6. Shade roller tube to have positive mechanical engagement for drive mechanism.

7. Drive Bracket / Brake Assembly: MechoShade Model M/5.

8. Drive Chain: No. 10 stainless steel chain rated at a minimum of 90 lb. breaking strength.

2.4 SHADE CLOTH

A. Vinyl Room Darkening Shadecloth: MechoShade Systems, Inc., "0700 Series", blackout material, laminated and embossed vinyl coated fabric, 0.012 inches thick blackout material weighing 0.81 lbs. per square yard, with a minimum of 62 threads per square inch.

1. Color: Selected from manufacturer's standard colors.

2.5 SHADE BAND

A. Shade Bands: Includes fabric, enclosed hem weight, shade roller tube, and attachment of shade band to roller tube. Sewn hems and open hem pockets are not acceptable.

1. Concealed Hembar: Continuous extruded aluminum for entire width of shade band heat sealed on all sides.

2. Shade Band and Shade Roller Attachment:

(a) Extruded aluminum shade roller tube of diameter and wall thickness required to support shade fabric without deflection.

(b) Positive mechanical attachment of shade band to roller tube; shade band to be removable / replaceable with a "snap-on" "snap-off" spline mounting, without having to remove shade roller from shade brackets.

(c) Mounting spline shall not require use of adhesives, adhesive tapes, staples, or rivets.

2.6 SHADE FABRICATION

A. Shadecloth to hang flat without buckling or distortion.

B. Heat-sealed trimmed edges to hang straight without curling or raveling.

C. Unguided shadecloth to roll true and straight without shifting sideways more than 1/8 inch in either direction per 8 feet of shade height due to warp distortion or weave design.

D. Fabricate hem as follows:

1. Concealed hemtube.

2. Exposed blackout hembar with light seal.

E. Provide battens in standard shades to assure proper tracking and uniform rolling of the shadebands. Battens shall be roll-formed stainless steel or tempered steel.

F. Battens shall be concealed in an integrally-colored fabric to match the inside and outside colors of the shadeband.

G. Provide battens for railroaded shades when width-to-height ratios meet or exceed manufacturer's standards.

H. Blackout shadebands, when used in side channels, shall have horizontally mounted, roll-formed stainless steel or tempered-steel battens not more than 3 feet on center extending fully into the side channels.

2.7 COMPONENTS

A. Access and Material Requirements:

1. Provide shade hardware that allows the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.

2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.

3. Use only Delran engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester shall not be used.

2.8 ACCESSORIES

A. Fascia:

1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets with no exposed fasteners.

2. Install across two or more shade bands in one piece.

3. Fully conceal brackets, shade roller and fabric on the tube.

4. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.

5. Do not notch fascia for manual chain.

B. Room Darkening Side and Sill Channels:

1. Extruded aluminum with polybond edge seals and SnapLoc-mounting brackets with concealed fastening.

2. Channels shall accept one-piece exposed blackout hembar with vinyl seal to assure side light control and sill light control.

3. Side channels 2-5/8 inches may be used as center supports for manually operated room darkening shades over 8 feet in height.

4. Color: Selected from manufacturer's standard colors by Architect.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify field measurements are as shown on shop drawings.

C. Notify Architect of unsatisfactory preparation before proceeding.

D. Beginning of installation means installer accepts existing conditions.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces as recommended by the manufacturer.

3.3 INSTALLATION

A. Install roller shades in accordance with manufacturer's instructions and in compliance with Section 01 73 00.

B. Install roller shades level, plumb, square, and true.

C. Locate shade band no closer than 2 inches to interior face of glass.

D. Allow proper clearances for window operation hardware.

3.4 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.5 CLEANING

A. Clean roller shade surfaces after installation according to manufacturer's written instructions.

3.6 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 27 13 43

COMPUTER NETWORKING SYSTEM

1 PART1-GENERAL

1.1 Include all labor, equipment and materials necessary for providing a complete expansion of the existing data networking system as described herein and/or as indicated on the drawings. Work includes, but is not limited to the following:

1.1.1 Provide computer cabling system including fiber optic cables, copper cables, main and intermediate distribution frames, racks, connectors, accessories, testing, and extended manufacturer's warranty as described herein and on the drawings.

a. Utilizing the conduit system indicated on the plans, provide a minimum of 12 strands of multimode fiber optic cable from MDF to the new IDF.

b. Provide copper wire connectors at each telephone and computer outlet shown on plans. Utilizing conduits and raceways indicated on the plans, provide copper 4-pair Category-6 unshielded twisted pair cable from each connector to the designated IDF.

c. Provide Fiber Optic Distribution Enclosures at the IDF. Provide copper wire patch panels and accessories at the IDF.

d. District shall provide and install the actual network switches to be used in this system.

1.2 Related specification sections.

1.2.1 Section 260000- General Requirements, Electrical

1.2.2 Section 260533.13 -Conduit and Fittings

1.2.3 Section 260519 - Conductors

1.2.4 Section 260533 - Boxes

1.3 Quality Assurance

1.3.1 Manufacturers' qualifications: Acceptable manufacturers are as follows:

Damac
Ortronics
Quicktron
HellermanTyton
Superior Essex
APC

Systems or components manufactured by any other manufacturers, which are not specifically listed herein, are not approved for use on this project.

1.3.2 Installing contractor qualifications: Firms and their personnel must be regularly engaged in the installation of data networking cabling and equipment for systems of similar type and scope, The contractor must have a full service office able to respond to emergency call outs during the warranty period. The contractor must provide documentation from acceptable manufacturers, indicating their qualifications for installation of this system in compliance with the manufacturers warranty requirements. The contractor must also provide complete installation of all wiring and devices or equipment. Subcontracts with electrical contractors of other warranted contractors for supervised installation of any part of this system is not approved. All conduit and standard back boxes will be furnished and installed by the electrical contractor. Specialty boxes will be furnished by the equipment supplier and installed by the electrical contractor.

1.3.3 Equipment qualifications: It is the intent of these specifications that each bidder provide all hardware, components and installation services that are necessary to ensure a fully operational Category 6 wiring system as specified in the EIA/TIA 568A. The system shall also be certified to meet TSB-67 and ISO/I EC 11801 "Link Performance Criteria." Fiber optic links shall be warranted against the link and segment performance minimum expected results defined in the TIA/EIA SP-2840A, Annex H. Installers shall be factory trained technicians with a factory trained supervisor overseeing the project.

1.3.4 Warranty: All components, installation, and 'Link Performance Criteria" shall be warranted by acceptable manufacturers to the school district for a period of 20 years after District acceptance and sign-off of the completed system.

1.4 Phase I Submittal shall be made within (10) working days after the award of the contract. This submittal shall include the following:

1.4.1 Complete bills of quantities, including all materials, components, devices, and equipment required for this work. The bills of quantities shall be tabulated respective of each and every system as specified, and shall contain the following information for each item listed:

1.4.1.1 Description and quantity of each item

1.4.1.2 Manufacturer's Name and Model Number

1.4.1.3 Manufacturer's Specification Sheet

1.4.2 Include with submittals all warranty information and a description of support and maintenance services to be provided. Also include all licenses and maintenance agreements required for continued operation of the equipment.

1.5 Phase II Submittal shall be provided within (15) working days after the approval of the Phase I submittals and prior to any fabrication of field conduit installations. All shop drawing shall be engineered and drawn on a CAD System. Approved software is the latest version for Autocad. Each submission shall include 'D' size print copies, and (1) data disk copy. Building floor plans must be created by the contractor copies of architects or engineers CAD files will not be made available. Phase II submittals drawings shall include the following.

1.5.1 Complete floor plans, at scale of contract documents, showing the Locations throughout the project of all receptacles, conduits, wireways, tray, pullboxes, junction boxes, equipment racks, and other devices.

1.5.2 Complete system riser diagrams, showing all elevations, room numbers, conduit sizes, types and fills, box sizes and types, devices, equipment and rack designations.

1.5.3 MDF and IDF diagrams including cable routing, position of all components, and labeling plan.

2 PART 2-PRODUCTS

2.1 All termination equipment, outlets, fiber optic cable, UTP cable, and required hardware shall be as manufactured by acceptable manufacturers.

2.2 Equipment floor mounted free standing racks shall be as manufactured by Panduit or equals.

2.3 Intermediate Distribution Frame (IDF)

2.3.1 The intermediate distribution frame shall be a secondary wiring and equipment location for the data networking system. The contractor shall include the following items at this location.

2.3.1.1 36" wide x 60" high x 3/4" frame resistant plywood mounting background.

2.3.1.2 Fiber optic termination equipment rack mounted, including all associated installation hardware. The equipment must have sufficient number of ports to connect all fibers in every cable terminated at this location. Provide 25% spare capacity for future wiring requirements.

2.3.1.3 Category 6 Modular Patch Panels (rack mounted) with R J-45 style connectors, for terminating all twisted pair cable from each data outlet served from this location.

2.3.1.4 Provide a 21" wide x 48" high x 20' deep wall mounted lockable, painted steel cabinet. Damac WSR48ABP1VVV-3GP or equivalent, Cabinet shall be dual-hinged doors allowing rack mounted equipment to be accessed from the front or the rear, after installation is complete. The Cabinet shall be louvered on both sides for ventilation and have knockouts in the rear at the top and bottom. The front Cabinet door shall have an acrylic or plexi window insert and shall be furnished with the following accessories:

- (1) grounding kit: connect grounding conductor to nearest power receptacle ground.
- (1) rack mounted surge arrest style power strip APC#NET9RM with (9) outlets and (1) always on outlet, guarded master on-off switch
- (1) rack mounted UPS with 1000 va capacity.
- (1) 1U Cable manager
- (1) Single gang duplex 120v outlet.
- Provide (1) meter "minimum length" category 6 patch cords, one for each patch panel port provided.

2.4 Provide (1) Fiber optic cabinet capable of housing a minimum of (2) 3 duplex SC adapter panels. Fiber optic termination equipment rack mounted, including all associated installation hardware. The equipment must have sufficient number of ports to connect all fibers in every cable terminated at this location. Provide 25% spare capacity for future wiring requirements.

2.5 Fiber optic Cable

2.5.1 Provide one continuous fiber optic cable routed from the main distribution frame fiberpatch panel to each intermediate distribution frame fiber patch panel, and/or other options as shown on the drawings,

2.5.2 Fiber optic cable optical fibers (9/125) graded index single-mode 12 strand optical glass fibers for use with, but not limited to ETHERNET, TOKEN RING and FDDI communication systems; potential dual operation at 1310nm and 1550nm wave length.

2.5.3 All fibers in a multi fiber cable shall be fully operational within the required performance characteristics, if any individual fiber does not meet the minimum standards, the entire cable must be replaced, end to end, without any additional expense to the district.

2.5.4 Acceptable cables shall be: Superior Essex OFNP W4012J101.

2.6 Unshielded Twisted Pair (UTP) Cable

2.6.1 Provide one Category 6, unshielded twisted pair (UTP) cable from the IDF to each R J45 data outlet port indicated on the drawings. Dual port outlets will require two such cables. Four port outlets will require four cables.

2.6.2 Category 6 cables shall be copper wire, individually insulated and color coded.

2.6.3 Data cables shall be provided with grey colored jacket.

2.6.4 Video surveillance cables shall be provided with blue colored jacket, terminated with RJ45 connectors in the field and cabinet.

2.6.5 The cables shall be UL rated and U.L. verified category 6.

2.6.6 Category 6 cables shall be used for all building interior wiring installation.

2.6.7 Acceptable cables shall be: Superior Essex CMR 77-246-31 for interior locations. Superior Essex 04-001-68 for exterior locations.

2.7 Data outlets

2.7.1 Data outlets shall be an R J45 Enhanced performance type modular jacks, and shall comply with Category 6 performance requirements, single port, dual port or four port as noted on drawings. All outlets shall be wired in an EIA/TIA 568B configuration.

2.7.2 For single port data outlet locations, the faceplates shall have space for two connections with one port fully operational for connection to all of the specified protocols. The second port shall be covered by a blank plate.

2.7.3 For dual port data outlet locations, the faceplates shall have space for two connections with both ports fully operational for connection to all of the specified protocols.

2.7.4 For quad port data outlet locations, the faceplates shall have space for four connections with all four ports fully operational for connection to all of the specified protocols.

2.7.5 All data outlet faceplates shall be (white) and shall have a unique sequential identification number applied to faceplate. Hand written labels are not permitted.

2.8 FIBER OPTIC DISTRIBUTION ENCLOSURES (ATDU)

2.8.1. The ATDU enclosure shall mount in a EIA standard 19 inch wide enclosed or open frame equipment rack assembly. The ATDU enclosure shall be metal, painted finish, manufacturer's standard color. The ATDU shall provide the following self-contained functions internal to the ATDU assembly.

a. Fiber cable termination.

b. Fiber cable patch panel.

c. Fiber cable management, training and strain relief,

d. Individual fiber and patching port identification numbers, color coding of incoming trunk and out- going distribution fiber ports.

2.8.2. Fiber cable patch panels shall be metal with patch ports for each fiber to be terminated at the ATDU.

2.9 GROUND

2.9.1 Provide a ground bus at each rack bonded to the ground conductor shown on plans.

2.9.2 Provide a separate 12AWG copper stranded green insulated ground conductor from each individual equipment element in the rack to the respective rack ground bus.

2.10 IDENTIFICATION

2.10.1 Fiber optic and copper wire cables shall be identified in each pull box, equipment rack and computer workstation outlet. Identification tags shall include the following information:

a. Installation month and date (i.e. 3/92, 4178 etc.).

b. Conductor size conductor type (i.e. loose tube fiber; (#24 AWG UTP Category 5, 200 pair, telephone/voice etc.).

c. Provide polypropylene tag holders with interchangeable, yellow polypropylene tag with black alpha/numeric characters sets. Characters shall be approximately .25" high. As manufactured by Almetek industries "EZTAG" - Ledgewood, New Jersey.

2.10.2 Equipment and outlet naming identification and color coding shall comply with ANSI/EIA/TIA latest revision.

2.10.2 Equipment and outlet naming identification and color coding shall comply with ANSI/EIA/TIA latest revision.

2.10.3 The labeling system shall clearly identify all components of the system: racks, cables, panels and outlets. The labeling system shall designate the cables origin and destination and a unique identifier for the cable within the system. Racks and patch panels shall be labeled to identify the location within the cable system infrastructure. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.

2.10.4 All label printing will be machine generated using indelible ink ribbons or cartridges. Self laminating labels will be used on cable jackets, approximately sized to the OD of the cable, and placed within view at the termination point on each end. Outlet labels will be the anufacturer's label provided with the outlet assembly.

3 PART 3 - INSTALLATION

3.1 Every fiber in every fiber optic cable must be terminated at both ends on a fiber patch panel. Termination shall be accomplished using LC type connectors with strain relief boot.

3.2 Fiber cables shall be enclosed by Innerduct when ran in open areas or free aired above ceiling spaces.

3.3 All LC connectors shall be of the same manufacture to ensure compatibility.

3.4 Each cable shall be identified at both ends with a unique label.

3.5 Where open wiring cables are run through the ceiling space (only permitted where specifically noted on the drawings), the wire shall be bundled together and supported above the ceiling. All cables must be fastened to the building structure via 'J' hooks.

a. The"j-hooks" shall provide multitiered "treed" 'j' shared hooks, with wide flat cable support base (0.5"W minimum) and smooth rounded comers, specifically designed for Category-6 and fiber optic cable support. As manufactured by Erico Inc.

b. The individual 'j-hook" attachment to the building structure shall be'beam clamp', "hanger rod", clevis hanger styles.

c. Install "j-hooks" not more than 36 inches on center along the entire cable length, at each cable change in direction, to insure less than 6 inches of cable sag between adjacent hooks. Secure cables to 'j-hooks" with cable tie wraps. "J-hooks" supported cables, bundle cables together with tie wraps.

d. "Bridle rings" shall not be used to support cables.

e. Cables shall not lay directly on ceilings, ceiling hangers, lighting fixtures, air ducts, piping, or equipment.

3.6 Where cables pass through a fire-resistant portion of the structure. Conduit sleeves shall be provided to maintain the rating of the wall penetrated.

3.7 Fiber optic and copper wire cables connecting to equipment racks shall be installed with not less than 10 feet of slack cable between the rack and the terminal backboard.

3.8 Provide 6 inches of cable slack at computer data system outlets.

3.9 The minimum bending radius for all cables and the maximum pulling tension shall not exceed manufacturer's recommendations.

3.10 Cables installed in manholes and pullboxes on terminal backboards shall be installed on wall mounted cable support racks.

3.11 Provide a full 360 degree loop of cable around manhole and pullbox interiors.

3.12 Cable pulling shall use a split mesh grip over the cable jacket. Connection directly to optical fibers and copper wire conductors shall not occur.

3.13 When pulled through conduits, cable pulling lubricants shall be continuously applied to all cables and be specifically approved by the manufacturer.

3.14 Where cables are pulled through or pulled from a center of runty pull without splices or termination's, lead out the cables at all manholes, pullboxes, and conduits, taking care to feed them in again by
hand for the next run.

3.15 For each cable pull where a cable direction change is required, flexible feed-in tubes, pullout devices, multi-segmented sheaves, etc., shall be used to ensure proper cable pulling tensions and side wall pressures. Cables shall not be pulled directly around a short right angle bend. Any device or surface the cable comes in contact with when under pull-in tension shall have a minimum radius 50% greater than the final specified minimum installed cable bending radius. The maximum possible size radius sheaves and feed-in tubes, usable in the available working space, shall be provided in all situations, to ensure the minimum possible cable sidewall pulling pressure. Do not use devices with multi-segment "roller" type sheaves.

3.16 Cable lengths over 250 feet shall be machine pulled, not hand pulled. Cables shall be pulled in a continuous, smooth operation without jerking or stop-start motion after initiation of pull. Maximum cable pulling speed shall be less than 50 feet per minute. Minimum pulling speed shall be greater than 15 feet per minute.

3.17 When pulling cable through conduit, cables shall be pulled straight into or out of the raceway without bends at the raceway entrance or exit. Pull in cable from the end having the sharpest bend (i.e., bend shall be closest to the reel.) Keep pulling tension to minimum by liberal use of lubricant, hand turning of reel, and slack feeding of cable into duct entrance. Employ not less than one man at reel and one at manhole or pull box during this operation. Cables shall be pulled directly from cable reels.

3.18 All cables shall be new and extend continuous from each MDF or IDF backboard to all data outlet or other equipment locations.

3.19 Where cables are not installed in a conduit or other raceway system, they shall not be routed parallel with other line voltage equipment or wiring (120 volt and above) within 36" or within 12" of line voltage equipment or wiring where crossing. Where Flooded cat6 cables or fiber optic cables are routed exposed through ceilings for more than 50'-0", install in interduct or EMT conduit system.

3.20 Each cable run shall permanently labeled at each end with a unique equential number, which corresponds to a similar number provided for each data outlet and punch down point. Hand written labels are not permitted.

3.21 Cat 6 cables installed underground shall be Cat 6 OSP.

3.22 Terminations made at cabinet locations shall be keystone jacks on patch panel.

3.23 All AP jacks will be green with green Cat6 jumpers, all other jacks will be Ivory with blue Cat6 jumpers.

3.24 Cat 6 field terminations shall be Ivory.

3.25 AP field terminations shall be terminated in 2 port biscuits with green keystones and green patch cables to the AP.

3.26 Video surveillance cables shall be terminated with RJ45 connectors in the field and cabinet.

4 PART 4 -TESTING

4.1 CABLE SYSTEM TESTING

a. All cables and termination hardware shall be 100% tested for defects in installation to verify cable performance under installed conditions. All conductors of each installed cable shall be verified useable by the contractor prior to system acceptance. Any defect in the cable system installation including but not limited to cable, connectors, feed-through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.

b. Each copper cable shall be tested for continuity on all pairs and/or conductors. Twisted-pair data cables shall be tested for the all of the above requirements, plus tests that indicate installed cable performance. All category 6 cables shall be tested to ensure the category 6 standard performance to 35OMhtz is complied with. All tests shall be printed out in hard copy in the quantity called out in the general specifications for O&M turn over documents as well as one disc copy for the owners use. Data cables shall be tested using a (Class II) cable analyzer.

c. Continuity

1. Each pair of each installed cable shall be tested using a'green light' test set that shows opens, shorts, polarity and pair-reversals. Shielded/screened cables shall
be tested with a device that verifies shield continuity in addition to the above stated tests. The test shall be recorded as pass/fail as indicted by the test set in
accordance with the manufacturers recommended procedures, and referenced to
the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.

d. Length

1. Each installed cable shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in identification number and circuit or pair
number. For multi-pair cables, the longest pair length shall be recorded as the length for the cable.

2. Near End Cross-Talk (NEXT)

3. Attenuation

4. Ambient Noise

5. Attenuation to Cross-Talk Ratio (ACR)

6. Test results shall be automatically evaluated by the equipment, using the most up-to-date criteria from the TIA/EIA Standard, and the result shown as pass/fail. Test results shall be printed directly from the test unit or from a download file using an application from the test equipment manufacturer. The printed test results shall include all tests performed, the expected test result and the actual test result achieved.

e. Fiber

1 All fiber terminations shall be visually inspected with a minimum 200 X microscope to ensure that no surface imperfections exist after final polishing. In addition, each fiber strand shall be tested for attenuation with an optical power meter and light source as well as an OTDR. Cable length and splice attenuation shall be verified using and OTDR.

f. Attenuation

1 Horizontal distribution multimode optical fiber attenuation shall be measured at either 850 manometers (nm) or 1300 nm using and LED light source and power meter. Backbone multimode fiber shall be tested at both 850 nm and 1300 nm in one direction. Test set-up and performance shall be conducted in accordance with ANSI/EIAITIA-526-14 Standard, Method B. One 2-meter patch cord shall be used for the test reference and two 2-meter patch cords shall be used for the actual test. This test method uses a one jumper reference, two jumper test to estimate the actual link loss of the installed cables plus the loss of two connectors. This measurement is consistent with the loss which network equipment will see under normal installation and use. Test evaluation for the panel to panel (backbone) or panel to outlet (horizontal) shall be based on the values set forth in the EIA/TIA-568-A Annex H, Optical Fiber Link Performance Testing.

2. Where concatenated links are installed to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. After the link performance test has been successfully completed, each link shall be concatenated and tested. The test method shall be the same used for the test described above. The evaluation criteria shall be established between the Owner and the Contractor prior to the start of the test.

3. Test evaluation for the panel to panel (backbone) shall be based on the values set forth in the EIA/TIA-568-A Annex H, Optical Fiber Link Performance Testing.

g. Length and Splice Loss

1 Each cable shall be tested with an Optical Time Domain Refrectometer (OTDR) to verify installed cable length and splice losses. The OTDR measurements for length shall be performed in accordance with EIA/TIA-455-60. The measurements to determine splice loss shall be performed in accordance with manufactures recommendations and best industry practices. These tests shall be employed on all cables after installation and in addition where one or more of the following conditions exist.

2. OTDR and power meter testing is specifically requested by the Owner.

3. Each strand shall be tested on all outsite plant and tight-buffered cables and/or where splices exist.

4. A representative strand of each fiber cable shall be tested to verify length if the estimated cable length is within 10% of the maximum length specified, respective to cable function, in the TIA/EIA-568-A Standard.

h. Test Documentation

1 Test documentation shall be provided in a three-ring binder(s) within three weeks after the completion of the project. The binder(s) shall be clearly marked on the outside front cover and spine with the words "Test Results', the project name, and the date of completion (month and year). The binder shall be divided by major heading tabs, Horizontal and Backbone. Each major heading shall be further sectioned by test type. Within the horizontal and backbone sections, scanner test results (Category 3, 4, or 5), fiber optic attenuation test results, OTDR traces, and green light test results shall be segregated by tab. Test data within each section shall be presented in the sequence listed in the administration records. The test equipment by name, manufacturer, model number and last calibration date will also be provided at the end of the document. Unless a more frequent calibration cycle is specified by the manufacturer, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test.

2. Scanner tests shall be printed on 8-1/2" x 11' 1. Hand written test results (attenuation results and green light results) shall be documented on and Excel spreadsheet. OTDR test results shall be printed or attached and copied on 8-1/2° x 11" paper for inclusion in the test documentation binder.

3. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall collocated in the binder.

5 PART 5 -RECORD DRAWING

5.1 The installation contractor will be provided with two sets of drawings at the start of the project. One set will be designated for the central location to document all as-built information as it occurs throughout the project. The central set will be maintained by the Contractor's Foreman on a daily basis, and will be available to the Technical representative upon request during the course of the project, Anticipated variations from the building drawings may be for such things as cable routing and actual outlet placement. No variations will be allowed to the planned termination positions of horizontal and backbone cables, and grounding conductors unless approved in writing by the Owner. Contractor shall also redraw, with the latest AutoCAD version, the site and floor plans showing all fiber, copper, racks, and information outlets as well as the labeling scheme for all items. These CAD drawings shall be on 81/2" x 11" sheets of paper and disk, and be turned over to the owner with the O&M manuals.

5.2 The Contractor shall provide the central drawing set to the owner at the conclusion of the project. The marked up drawing set will accurately depict the as-built status of the system including termination locations, cable routing, and all administration labeling for the cable system. In addition, a narrative will be provided that describes any areas of difficulty encountered during the installation that could potentially cause problems to the telecommunications system.

END OF SECTION

Standardized Data Cabling Parts		
Cabinet and Grounding		
DAMAC	CS84EDB1BSS3	DAMAC 7ft Cabinet Kit
DAMAC	WSR48ABP1VVV-3GP	48" Wall Mount Rack
DAMAC	P0828GM201	20 AMP Power Strip
DAMAC	ARGB019	19" Rack Mount Ground Bar
DAMAC	ARRFCK-58	Concrete Floor Rack Kit
DAMAC	ATFK2	Fan Kit Enclosure
DAMAC	PLA12GK	Grounding Strap Kit
DAMAC	PLR1210-3	12" Ladder Rack 10'
DAMAC	PLAEC	Ladder Rack Protective End Caps
DAMAC	PLB12RS-3	Junction Plate
DAMAC	PLBA12-3	Wall Angle Support 12"
Twisted Pair Products		
Ortronics	ORSPKSU24	24 Port Keystone Patch Panel
Ortronics	ORSPKSU48	48 Port Keystone Patch Panel
Ortronics	ORKS613	Ivory Jacks for DATA
Ortronics	ORKS645	Green Jacks for DATA to WAPs
Ortronics	ORKSSMB2	2 Port Surface Mount Box
Ortronics	ORKSFP299	HOLDS TWO KEYSTONE JACKS
Ortronics	ORKSFP499	SINGLE GANG PLASTIC FACEPLATE, HOLDS FOUR KEYSTONE JACKS
Ortronics	ORKSB1099	BLANK, KEYSTONE,
Superior Essex	CMR 77-246-3A	Superior Essex CAT6 Gray
Superior Essex	CMP 77-246 3B	Superior Essex CAT6 Gray
Superior Essex	CMR 77-246-2A	Superior Essex CAT6 Blue (CCTV)
Superior Essex	04-001-68	Superior Essex CAT6 OSP
Quicktron	576-110-010	10ft Blue CAT6 Jumper
Quicktron	576-110-003	3ft Blue CAT6 Jumper
Quicktron	576-120-003	3ft Green CAT6 Jumper
Ortronics	OR-30200145	110 Wiring Block, 100-Pair With Legs
Ortronics	OR-805003292	MODULAR PREWIRED 66 BLOCK, 12 T568B WIRED JACKS
Wire Management		
HellermanTyton	WMB2	Horizontal Wire Manager, Dual Sided
HellermanTyton	WMB1	Horizontal Wire Manager
Quiktron	2601-29854-11IN	11 Inch Hook & Loop Cable Straps Black 12pk
Fiber Products		
Ortronics	ORFC01UC	1U Fiber Tray
Ortronics	ORFC03UC	3U Fiber Tray
Superior Essex	W4012J101	Indoor/Outdoor
Ortronics	OR205KAN9GASM	LC FIELD TERMINATING ANAEROBIC CONNECTORS, SINGLE MODE, 900 MICRON BUFFER,
Ortronics	OROFPLCD12AC	ADAPTERS WITH CERAMIC ALIGNMENT
Ortronics	OR-61500858	Fan Out Kit

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SECTION 28 13 00

CARD ACCESS SYSTEM

PART 1 - GENERAL

1.01 SCOPE OF WORK:

A. All applicable portions of Section 26 00 00 shall apply to this section as though written herein completely.

B. Provide a complete and operable Access Control System, including, but not limited to, readers, IP based controllers, request to exit sensors, magnetic door contacts, management software, power supplies, boxes/enclosures, wiring, terminations and required programming.

C. The work under this section includes all labor, materials, equipment, and accessories required to furnish and install complete system, connected to the School's network, functioning in compliance with the manufacturer's specifications and the School District's requirements.

D. The system shall be commissioned by the manufacturer's representative.

E. In addition to the standard system programming, the manufacturer's representative shall be responsible for meeting with the School District to obtain specific programming requirement. The system programming must meet all School District requirements.

1.02 RELATED WORK:

Document affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and sections of Divisions 1 and 26 of these specifications.

A. The work described by this part includes the furnishing of all materials, equipment, supplies, labor and the performing of all operations necessary for the installation of complete and operating systems.

B. All conduits, outlet boxes, back boxes, junction boxes, terminal cabinets, backboards, wiring, cables, equipment, devices, etc., shall be furnished and installed complete under this section. Conduit and junction box sizes shall be determined by the Installing Contractor for the particular wire and cable fills required for the systems installed. (Conduit sizes shall comply with the California Electrical Code). The entire responsibility of the system, including the installation, operation, function, testing and maintenance for one (1) year after final acceptance under this section shall be the responsibility of the communications contractor.

C. The Installing Contractor shall furnish and install all equipment, cables, devices, and other materials even though not specifically mentioned herein, which are necessary for the proper integration of the system so that the system shall perform the functions listed herein in compliance with all specified requirements.

1.03 GENERAL REQUIREMENTS

A. The Installing Contractor shall hold a valid State of California C-7 License, shall have completed at least 20 projects of equal scope, shall have been in business of furnishing and installing communication systems of this type for at least five years, and capable of being bonded to assure the owner of performance and satisfactory service during the guarantee period.

B. The Installing Contractor shall provide a letter with submittals from the manufacturer of the system, or the major components of the system, to the Owner stating that the Contractor is a certified representative and that manufacturer has a service representative assigned to provide repair and mitigation to the system(s) within a 24 hour time period.

C. The Installing Contractor shall hold all other licenses required by the legally constituted authorities having jurisdiction over the work. Such as Alarm Company and Agent licenses.

D. The Installing Contractor shall be a factory authorized distributor and warrantee station for the brand of equipment specified and shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment. The Installing Contractor shall maintain a spare set of all major parts for the system at all times. All circuit boards, amplifiers and control sub systems shall be 100% backed up with stock at contractor's shop.

1.04 QUALITY ASSURANCE:

A. It is the intent of these specifications to establish a standard of quality for labor and material to be installed. The Base Bid shall include materials as specified without exception. For any proposed substitution, complete descriptive, technical and cost comparison data and test reports shall be submitted for review during the bidding period. The Contractor shall reimburse the Architect for any additional engineering charges and shall pay all charges of other trades resulting from substitutions. Proposed substitutions shall be listed on the bid form, stating the reasons for substitution and the amount to be deducted from the bid if the substitution is allowed. Final approval of the alternate system shall be determined at the time of job completion. Failure to provide the "precise functional equivalent" shall result in the removal of the alternate system and installation of the specified system at the contractors expense.

B. If a substitution item is given final acceptance by the Owner, the contractor shall pay all costs (including travel, lodging, meals, computers, etc….) required to provide factory certification, equal to that of a Factory Authorized Distributor of the substituted item, for two (2) selected Owners representatives. This training shall occur at the primary factory of the substituted item in question and shall allow the selected Owners representatives to provide any and all Factory / Manufacturer approved repairs, services, software upgrades, etc… without affecting any available or applicable Manufacturer Warranties.

C. All of the Electronic Systems Equipment shall be furnished and installed by the Authorized Factory Distributor of the equipment. The Contractor shall furnish a letter from the manufacturer of all major equipment, which certifies that the Installing Communication Contractor is the Authorized Distributor and that the equipment has been installed according to factory intended practices. The Contractor shall also furnish a written guarantee from the manufacturer that they will have a service representative assigned to this area for the life of the equipment.

D. All card access systems supplied shall be listed by Underwriter's Laboratories under UL Standard 1459. A copy of the UL listing card for the proposed system shall be included with the contractor's submittal.

E. The material in this section will be covered by a five year material warranty policy.

1.05 SUBMITTAL AND MANUALS

A. Comply with all requirements of the General Conditions, Supplementary Conditions and applicable sections of Divisions 1 and 26 of these specifications.

B. Additional requirements of this section are:

1. Within thirty-five (35) calendar days after the date of award of the Contract, the Contractor shall submit to the Architect for review, eight copies of a complete submission.

2. The submission shall consist of five major sections with each section separated with index tabs. Each page in the submission shall be numbered chronologically and shall be summarized in the index.

3. The first section shall be the "Index" which shall include the project title and address, name of the firm submitting the proposal and name of the Architect.

4. The second section shall include a copy of the Installing Contractors valid C-7 California State Contractors License, letters of factory authorization and guaranteed service, list of 20 projects of equal scope and list of proposed instrumentation to be used by the Contractor.

5. The third section shall contain the comparative specification listing, including a complete listing of the characteristics of the equipment to be furnished next to all of the specified equipment's features and functions as stated in the specifications and data sheets.

6. The fourth section shall contain an original factory data sheet for every piece of equipment in the specifications.

7. The fifth section shall contain a wiring designation schedule for each circuit leaving each piece of equipment and drawings showing system wiring plans.

8. The submittal shall also include, but not be limited to, a site plan indicating site distribution of system wire/cable, floor plans indicating location of equipment, system devices, required wire/cable between equipment and devices, wiring/connection diagrams, zoning for alarms and paging and a written description of the system operation and functions.

C. The Contractor shall provide two copies of an "Operating and Servicing Manual" for the system. The manuals shall be bound in flexible binders. All data shall be printed material or typewritten. Each manual shall include the following: Instructions necessary for the proper operation and servicing of the system; complete as-built installation drawings of the system; a wiring destination schedule for each circuit leaving for each piece of equipment; a schematic diagram of major components with all transistor and IC complements and replacement number.

PART 2- PRODUCTS

2.01 CARD ACCESS SYSTEM

A. Readers: Allegion #MT15.

B. Magnetic Door Contacts: Aritech #2507AD-L.

C. Request To Exit Detectors: Bosch #DS150i / TP160 trim plate.

D. Single Door Intelligent Controllers: Mercury Security #EP1501.

E. Dual Door Intelligent Controllers: Mercury Security #EP1502.

F. Single Door Network Controllers: Mercury Security Access Platform #MR50.

G. Dual Door Network Controllers: Mercury Security Access Platform #MR52.

H. Door Access Power Supply (2-4 Doors): Life Safety Power #FP075-D8PE2M.

I. Multi-Purpose Power Supply: Life Safety Power #E1M.

J. Cards: Allegion #8250. 13.56 Mhz smart credentials. Provide minimum 50 cards.

K. Management Software: Avigilon Access Control Manager (ACM).

L. CAT 6 cable shall be as recommended by the system manufacturer. Cables shall be copper wire, individually insulated and color coded, with an overall non-conductive outer jacket.

M. RS-485 cable shall be as recommended by the system manufacturer.

N. 18 gage multi-conductor copper cables as recommended by the system manufacturer.

O. System, including wire/cable, shall be provided, installed and terminated by the low-voltage system contractor.

P. Provide required quantity of licenses. Coordinate licensing information with the School District's I.T. Department.

Q. LAN electronics equipment to be Owner furnished and installed.

PART 3 EXECUTION

3.01 INSTALLATION

A. The wiring of the system shall be executed in accordance with the drawings and the equipment manufacturer's wiring diagrams. Should any variations in these requirements occur, the contractor shall notify the architect before making any changes. It shall be the responsibility of the factory authorized distributor of the specified equipment to install the equipment and guarantee the system to operate as per plans and specifications.

B. Route Cat 6 cables between the network switch (at the MDF/IDF) and the intelligent controllers (EP1501/EP1502).

C. Route RS-485 cables between the intelligent controllers (EP1501/EP1502) and the network controllers (MR50/MR52).

D. Route #18 conductors/cables between the intelligent and network controllers and the peripheral devices.

E. Furnish all conductors, equipment plugs, terminal strips, etc., and labor to install a complete and operable system.

F. The cables within the rack or cabinets shall be carefully cabled and laced with ty-raps. All cables shall be numbered for identification.

G. Splices in conductors is not permitted.

H. The labor employed by the contractor shall be regularly employed in the installation and repair of communication systems and shall be acceptable to the owner and architect to engage in the installation and service of this system.

I. The contractor shall thoroughly clean all equipment and materials. All exposed parts of the equipment, cabinets, and other equipment shall be left in a clean condition, unblemished and free of all dirt, dust, smudges, spots, fingerprints, etc., The contractor shall remove all debris and rubbish occasioned by the electronic systems work from the site. The contractor shall thoroughly clean all buildings of any dirt, debris, rubbish, marks, etc., Caused by the performance of this work.

J. The contractor shall provide not less than eight (8) hours for instruction of personnel in the operation and maintenance of the systems. This instruction time shall be divided as directed by the Owner.

3.02 WARRANTY

A. The entire system shall be warranted free of mechanical or electrical defects for a period of one (1) year after final acceptance of the installation. Any material showing mechanical or electrical defects shall be replaced promptly at no expense to the purchaser.

B. The contractor shall maintain a competent service organization and shall, if requested, submit a service maintenance agreement to the owner after the end of the guarantee period.

C. A typewritten notice shall be posted at the equipment rack which shall indicate the firm, address and telephone number to call when service is necessary. The notice shall be mounted in a neatly finished metal frame with a clear plastic window and securely attached to the inside of the door.

3.03 TESTING

A. Provide all instruments for testing and demonstrating in the presence of the owner's inspector that the frequency response is as stated in the factory data sheets. Check all circuits and wiring to verify they are free of shorts and grounds. Perform all tests stated in each separate system specification.

B. The owner reserves the right to make independent tests of all equipment furnished to determine whether or not the equipment complies with the requirements specified herein and to accept or reject any or all of the equipment on the basis of the results thereby obtained.

END OF SECTION

-

SECTION 28 23 00

VIDEO SURVEILLANCE SYSTEM

PART 1 - GENERAL

1.01 SCOPE OF WORK:

A. All applicable portions of Section 26 00 00 shall apply to this section as though written herein completely.

B. Provide a complete and operable expansion of the existing Video Surveillance System, including, but not limited to, IP cameras, Ethernet single mode transceivers, circuit protectors, Ethernet PoE switch, boxes/enclosures, wiring, terminations and required programming.

C. The work under this section includes all labor, materials, equipment, and accessories required to furnish and install complete system expansion, connected to the School's existing system, functioning in compliance with the manufacturer's specifications and the School District's requirements.

D. The system shall be commissioned by the manufacturer's representative.

E. In addition to the standard system programming, the manufacturer's representative shall be responsible for meeting with the School District to obtain specific programming requirement. The system programming must meet all School District requirements.

1.02 RELATED WORK:

Document affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and sections of Divisions 1 and 26 of these specifications.

A. The work described by this part includes the furnishing of all materials, equipment, supplies, labor and the performing of all operations necessary for the installation of complete and operating systems.

B. All conduits, outlet boxes, back boxes, junction boxes, terminal cabinets, backboards, wiring, cables, equipment, devices, etc., shall be furnished and installed complete under this section. Conduit and junction box sizes shall be determined by the Installing Contractor for the particular wire and cable fills required for the systems installed. (Conduit sizes shall comply with the California Electrical Code). The entire responsibility of the system, including the installation, operation, function, testing and maintenance for one (1) year after final acceptance under this section shall be the responsibility of the communications contractor.

C. The Installing Contractor shall furnish and install all equipment, cables, devices, and other materials even though not specifically mentioned herein, which are necessary for the proper integration of the system so that the system shall perform the functions listed herein in compliance with all specified requirements.

1.03 GENERAL REQUIREMENTS

A. The Installing Contractor shall hold a valid State of California C-7 License, shall have completed at least 20 projects of equal scope, shall have been in business of furnishing and installing communication systems of this type for at least five years, and capable of being bonded to assure the owner of performance and satisfactory service during the guarantee period.

B. The Installing Contractor shall provide a letter with submittals from the manufacturer of the system, or the major components of the system, to the Owner stating that the Contractor is a certified representative and that manufacturer has a service representative assigned to provide repair and mitigation to the system(s) within a 24 hour time period.

C. The Installing Contractor shall hold all other licenses required by the legally constituted authorities having jurisdiction over the work. Such as Alarm Company and Agent licenses.

D. The Installing Contractor shall be a factory authorized distributor and warrantee station for the brand of equipment specified and shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment. The Installing Contractor shall maintain a spare set of all major parts for the system at all times. All circuit boards, amplifiers and control sub systems shall be 100% backed up with stock at contractor's shop.

1.04 QUALITY ASSURANCE:

A. It is the intent of these specifications to establish a standard of quality for labor and material to be installed. The Base Bid shall include materials as specified without exception. For any proposed substitution, complete descriptive, technical and cost comparison data and test reports shall be submitted for review during the bidding period. The Contractor shall reimburse the Architect for any additional engineering charges and shall pay all charges of other trades resulting from substitutions. Proposed substitutions shall be listed on the bid form, stating the reasons for substitution and the amount to be deducted from the bid if the substitution is allowed. Final approval of the alternate system shall be determined at the time of job completion. Failure to provide the "precise functional equivalent" shall result in the removal of the alternate system and installation of the specified system at the contractors expense.

B. If a substitution item is given final acceptance by the Owner, the contractor shall pay all costs (including travel, lodging, meals, computers, etc….) required to provide factory certification, equal to that of a Factory Authorized Distributor of the substituted item, for two (2) selected Owners representatives. This training shall occur at the primary factory of the substituted item in question and shall allow the selected Owners representatives to provide any and all Factory / Manufacturer approved repairs, services, software upgrades, etc… without affecting any available or applicable Manufacturer Warranties.

C. All of the Electronic Systems Equipment shall be furnished and installed by the Authorized Factory Distributor of the equipment. The Contractor shall furnish a letter from the manufacturer of all major equipment, which certifies that the Installing Communication Contractor is the Authorized Distributor and that the equipment has been installed according to factory intended practices. The Contractor shall also furnish a written guarantee from the manufacturer that they will have a service representative assigned to this area for the life of the equipment.

D. All system components supplied shall be listed by Underwriter's Laboratories. A copy of the UL listing card for the proposed system shall be included with the contractor's submittal.

E. The material in this section will be covered by a five year material warranty policy.

1.05 SUBMITTAL AND MANUALS

A. Comply with all requirements of the General Conditions, Supplementary Conditions and applicable sections of Divisions 1 and 26 of these specifications.

B. Additional requirements of this section are:
1. Within thirty-five (35) calendar days after the date of award of the Contract, the Contractor shall submit to the Architect for review, eight copies of a complete submission.
2. The submission shall consist of five major sections with each section separated with index tabs. Each page in the submission shall be numbered chronologically and shall be summarized in the index.
3. The first section shall be the "Index" which shall include the project title and address, name of the firm submitting the proposal and name of the Architect.
4. The second section shall include a copy of the Installing Contractors valid C-7 California State Contractors License, letters of factory authorization and guaranteed service, list of 20 projects of equal scope and list of proposed instrumentation to be used by the Contractor.
5. The third section shall contain the comparative specification listing, including a complete listing of the characteristics of the equipment to be furnished next to all of the specified equipment's features and functions as stated in the specifications and data sheets.
6. The fourth section shall contain an original factory data sheet for every piece of equipment in the specifications.
7. The fifth section shall contain a wiring designation schedule for each circuit leaving each piece of equipment and drawings showing system wiring plans.
8. The submittal shall also include, but not be limited to, a site plan indicating site distribution of system wire/cable, floor plans indicating location of equipment, system devices, required

wire/cable between equipment and devices, wiring/connection diagrams, zoning for alarms and paging and a written description of the system operation and functions.

C. The Contractor shall provide two copies of an "Operating and Servicing Manual" for the system. The manuals shall be bound in flexible binders. All data shall be printed material or typewritten. Each manual shall include the following: Instructions necessary for the proper operation and servicing of the system; complete as-built installation drawings of the system; a wiring destination schedule for each circuit leaving for each piece of equipment; a schematic diagram of major components with all transistor and IC complements and replacement number.

PART 2- PRODUCTS

2.01 VIDEO SURVEILLANCE SYSTEM

A. Cameras: Panasonic #WV-S2531LN.

B. Ethernet Single Mode Transceiver: Antaira #SFP-S10, 1.25 Gigabit.

C. Circuit Protector: Mean Well #SDR-240-24. 240W single output industrial DIN RAIL with PFC function.

D. PoE Swith: Antaira #LMP-1002G-SFP series.

E. CAT 6 cable shall be as recommended by the system manufacturer. Cables shall be copper wire, individually insulated and color coded, with an overall non-conductive outer jacket.

F. CAT 6 patch cords as recommended by the system manufacturer.

G. System, including wire/cable, shall be provided, installed and terminated by the low-voltage system contractor.

H. Provide required quantity of licenses. Coordinate licensing information with the School District's I.T. Department.

PART 3 EXECUTION

3.01 INSTALLATION

A. The wiring of the system shall be executed in accordance with the drawings and the equipment manufacturer's wiring diagrams. Should any variations in these requirements occur, the contractor shall notify the architect before making any changes. It shall be the responsibility of the factory authorized distributor of the specified equipment to install the equipment and guarantee the system to operate as per plans and specifications.

B. Route Cat 6 cables between the PoE switch (at the IDF) and the IP cameras.

C. Furnish all conductors, equipment plugs, terminal strips, etc., and labor to install a complete and operable system.

D. The cables within the rack or cabinets shall be carefully cabled and laced with ty-raps. All cables shall be numbered for identification.

E. Splices in conductors is not permitted.

F. The labor employed by the contractor shall be regularly employed in the installation and repair of video surveillance systems and shall be acceptable to the owner and architect to engage in the installation and service of this system.

G. The contractor shall thoroughly clean all equipment and materials. All exposed parts of the equipment, cabinets, and other equipment shall be left in a clean condition, unblemished and free of all dirt, dust, smudges, spots, fingerprints, etc., The contractor shall remove all debris and rubbish

occasioned by the electronic systems work from the site. The contractor shall thoroughly clean all buildings of any dirt, debris, rubbish, marks, etc., Caused by the performance of this work.

H. The contractor shall provide not less than eight (8) hours for instruction of personnel in the operation and maintenance of the systems. This instruction time shall be divided as directed by the Owner.

3.02 WARRANTY

A. The entire system shall be warranted free of mechanical or electrical defects for a period of one (1) year after final acceptance of the installation. Any material showing mechanical or electrical defects shall be replaced promptly at no expense to the purchaser.

B. The contractor shall maintain a competent service organization and shall, if requested, submit a service maintenance agreement to the owner after the end of the guarantee period.

C. A typewritten notice shall be posted at the equipment rack which shall indicate the firm, address and telephone number to call when service is necessary. The notice shall be mounted in a neatly finished metal frame with a clear plastic window and securely attached to the inside of the door.

3.03 TESTING

A. Provide all instruments for testing and demonstrating in the presence of the owner's inspector that the frequency response is as stated in the factory data sheets. Check all circuits and wiring to verify they are free of shorts and grounds. Perform all tests stated in each separate system specification.

B. The owner reserves the right to make independent tests of all equipment furnished to determine whether or not the equipment complies with the requirements specified herein and to accept or reject any or all of the equipment on the basis of the results thereby obtained.

END OF SECTION

WLC ARCHITECTS
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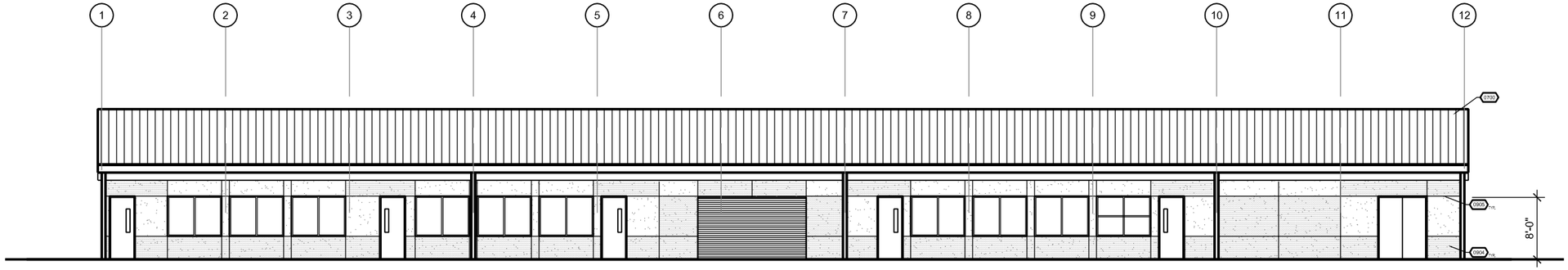
DRAWN BY:	JLY
CHECKED BY:	MIM
DATE:	10-19-2018
SCALE:	NTS
PROJECT NO.:	1724300.41

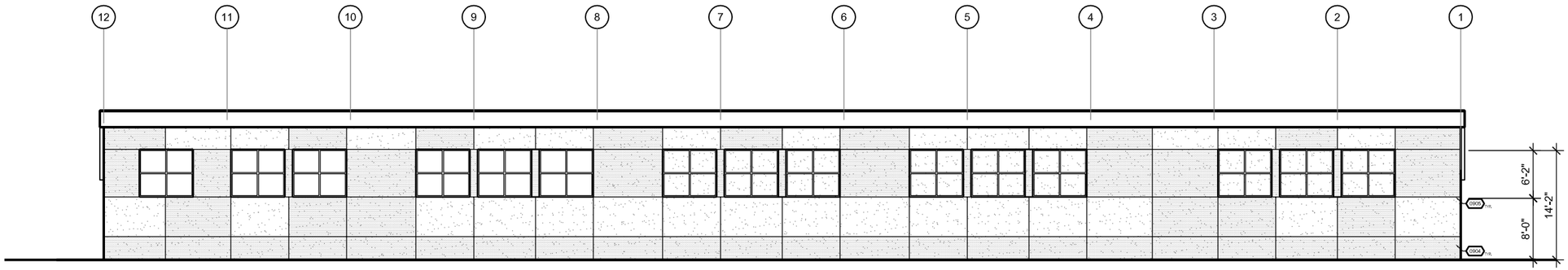
ADDENDA DWG. NO.
AD-A5.1-1

EXTERIOR PLASTER COLOR PATTERNS

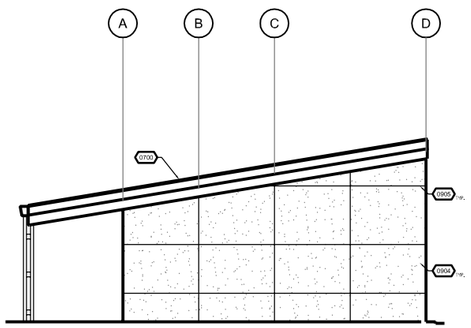
SCHOOL OF ENGINEERING & SCIENCES CLASSRM BLDG. ADDITION
SACRAMENTO CITY UNIFIED SCHOOL DISTRICT



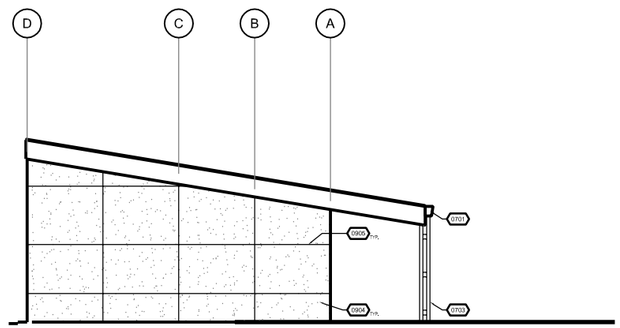
SOUTH ELEVATION



NORTH ELEVATION



EAST ELEVATION



WEST ELEVATION

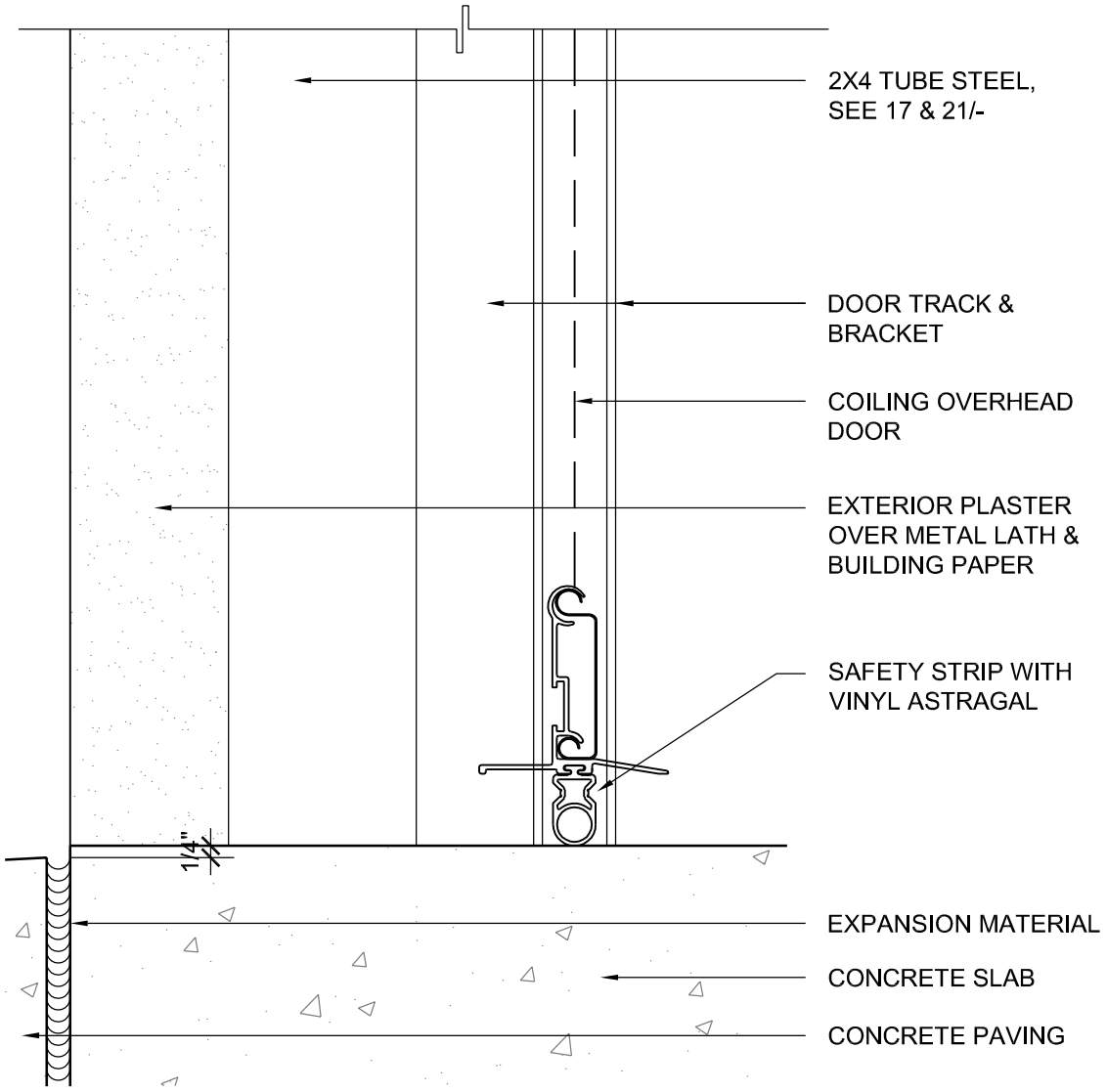
LEGEND:

PLASTER COLOR A

PLASTER COLOR B

NOTES:
1. VERIFY FINAL COLORS WITH THE SCHOOL DISTRICT.

ADDENDUM 1
DSA 02-116765
REFERENCE SHEET - A5.1



FILE/CSI NUMBER: 3A93 REVISION DATE: 08/11/09 JOB NUMBER: 0812200

COILING DOOR THRESHOLD

3" = 1'-0"

13

ADDENDUM 1
DSA 02-116765
REFERENCE SHEET - AD-A9.1-1

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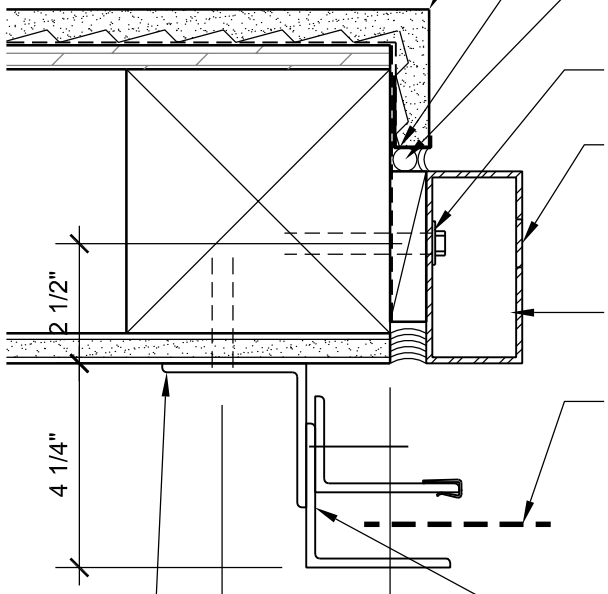
COILING DOOR DETAILS

SCHOOL OF ENGINEERING & SCIENCES CLASSRM BLDG. ADDITION
SACRAMENTO CITY UNIFIED SCHOOL DISTRICT

DRAWN BY:	JLY
CHECKED BY:	MIM
DATE:	10-19-2018
SCALE:	AS SHOWN
PROJECT NO.:	1724300.41

ADDENDA DWG. NO.

AD-A9.1-1



PLASTER FINISH O/ METAL LATH & BLDG. PAPER

J-MOLD

CONT. BACKER ROD & SEALANT

1/2" DIA. LAG SCREW @ 24" O.C.- 3" MIN. EMBED.

PUNCH HOLE TO ATTACH TUBE STEEL & SEAL WHEN ATTACHMENT IS COMPLETE. GRIND TO SMOOTH & PAINT

2X4 TUBE STEEL ON ALL EXPOSED SIDES

COILING DOOR, PER SCHEDULE

DOOR GUIDE AND STL. WALL ANCHOR BRACKET FOR WALL ATTACHMENT

ATTACH PER MANUFACTURER'S REQUIREMENTS

FILE/CSI NUMBER: 2A93 REVISION DATE: 08/11/09 JOB NUMBER: 0812200

COILING DOOR JAMB

3" = 1'-0"

17

ADDENDUM 1
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REFERENCE SHEET - AD-A9.1-1

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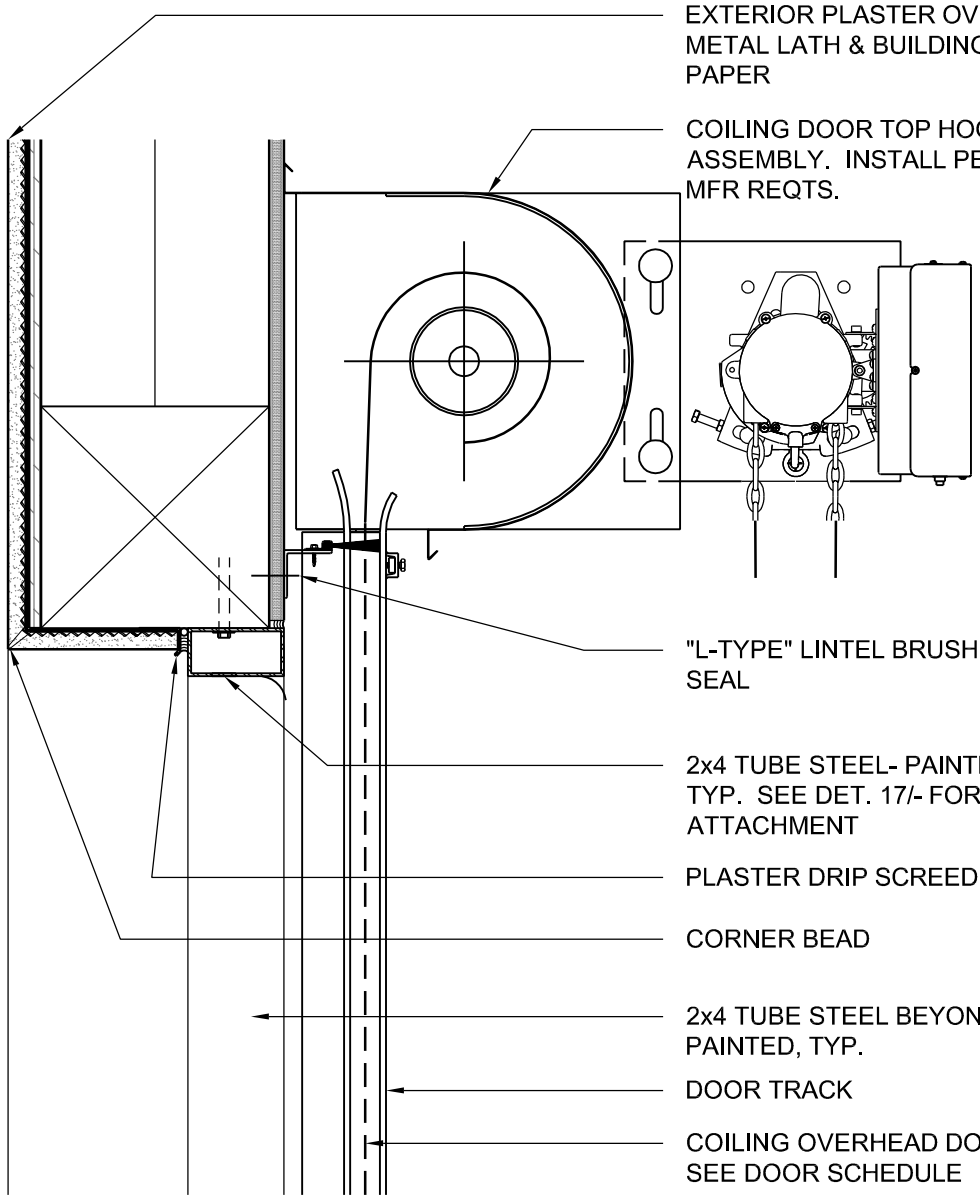
COILING DOOR DETAILS

SCHOOL OF ENGINEERING & SCIENCES CLASSRM BLDG. ADDITION
SACRAMENTO CITY UNIFIED SCHOOL DISTRICT

DRAWN BY:	JLY
CHECKED BY:	MIM
DATE:	10-19-2018
SCALE:	AS SHOWN
PROJECT NO.:	1724300.41

ADDENDA DWG. NO.

AD-A9.1-2



FILE/CSI NUMBER: 1A93 REVISION DATE: 08/11/09 JOB NUMBER: 0812200

COILING DOOR HEAD

1 1/2" = 1'-0"

21

ADDENDUM 1
DSA 02-116765
REFERENCE SHEET - AD-A9.1-1

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COILING DOOR DETAILS

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SACRAMENTO CITY UNIFIED SCHOOL DISTRICT

DRAWN BY:	JLY
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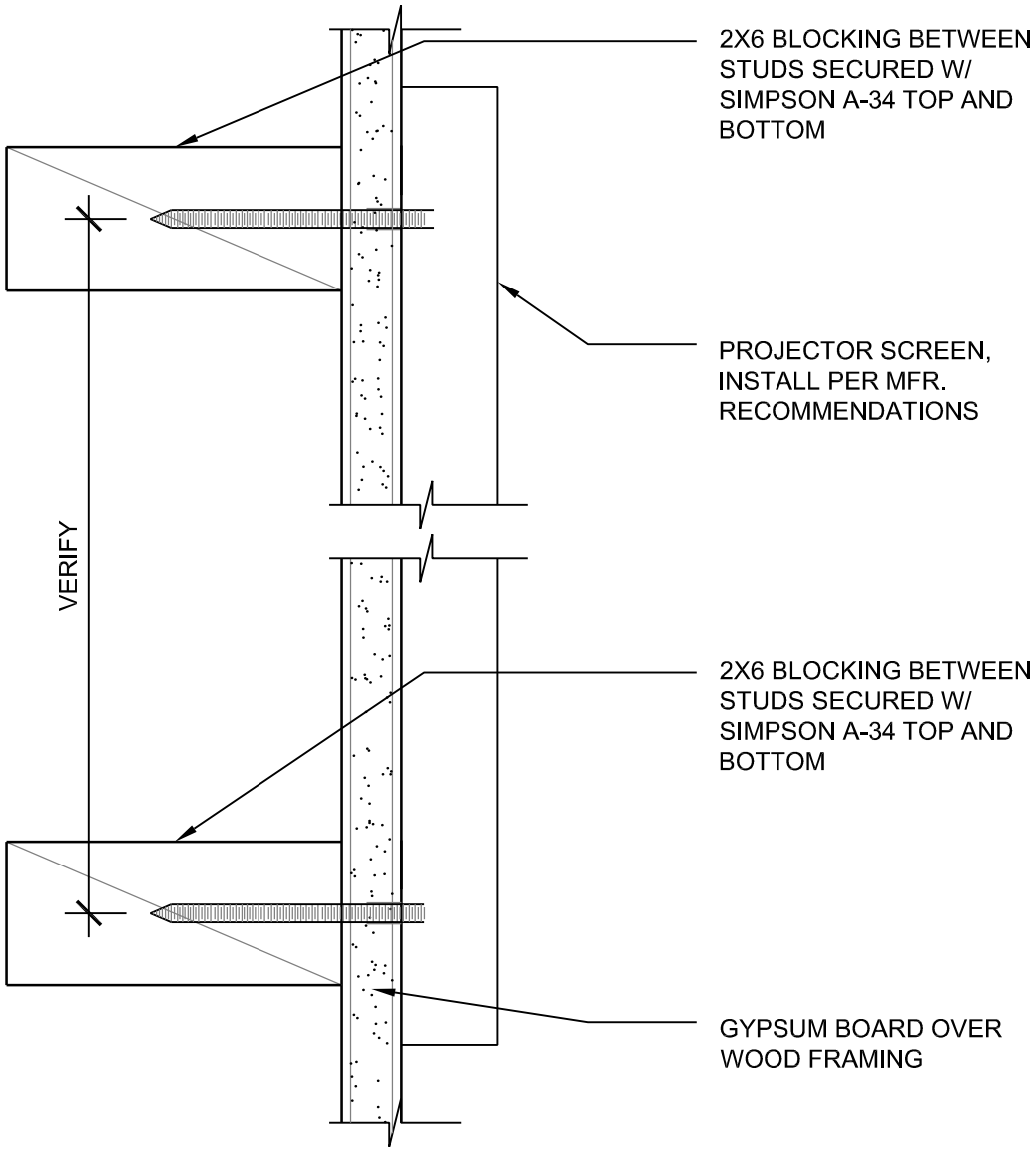
DATE:	10-19-2018
SCALE:	AS SHOWN
PROJECT NO.:	1724300.41

ADDENDA DWG. NO.

AD-A9.1-3



FILE/CSI NUMBER: 6A103 REVISION DATE: 12.12.04 JOB NUMBER: 0321200

PROJECTOR SCREEN

HALF

7

ADDENDUM 1
DSA 02-116765
REFERENCE SHEET - AD-A10.2-1

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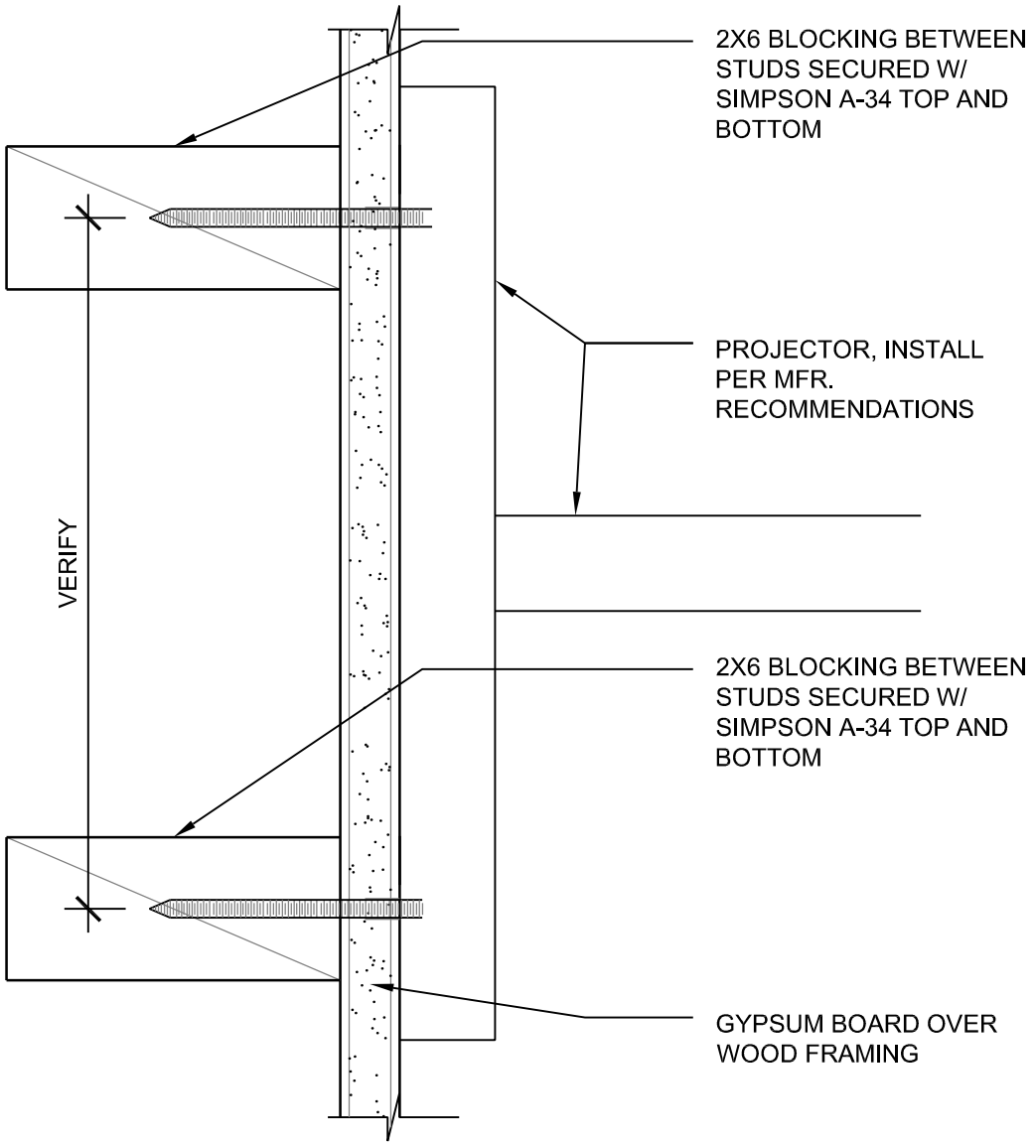
EQUIPMENT ANCHORAGE

SCHOOL OF ENGINEERING & SCIENCES CLASSRM BLDG. ADDITION
SACRAMENTO CITY UNIFIED SCHOOL DISTRICT

DRAWN BY:	JLY
CHECKED BY:	MIM
DATE:	10-19-2018
SCALE:	AS SHOWN
PROJECT NO.:	1724300.41

ADDENDA DWG. NO.

AD-A10.2-1



FILE/CSI NUMBER: 6A103 REVISION DATE: 12.12.04 JOB NUMBER: 0321200

PROJECTOR

HALF

11

ADDENDUM 1
DSA 02-116765
REFERENCE SHEET - AD-A10.2-1

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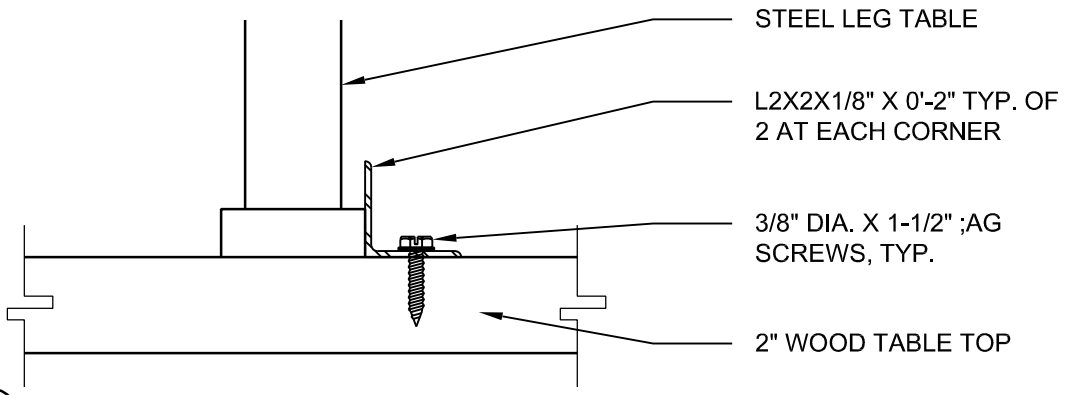
SACRAMENTO CITY UNIFIED SCHOOL DISTRICT

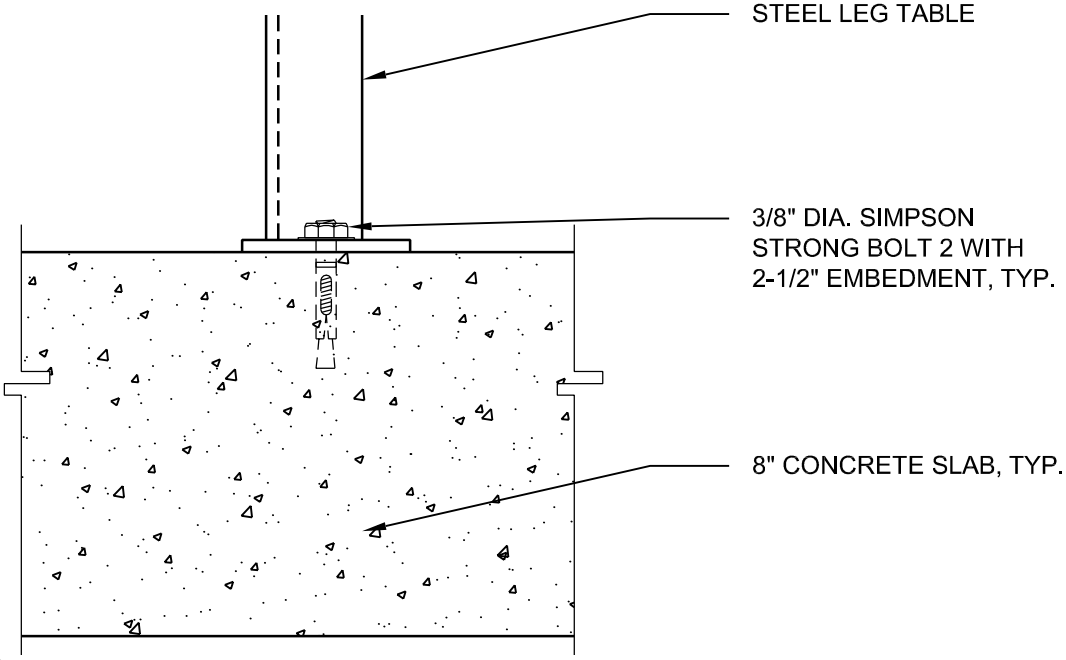
DRAWN BY:	JLY
CHECKED BY:	MIM
DATE:	10-19-2018
SCALE:	AS SHOWN
PROJECT NO.:	1724300.41

ADDENDA DWG. NO.

AD-A10.2-2



A KEEPER AT TABLE TOP DETAIL



B TABLE-TO-CONCRETE SLAB

FILE/CSI NUMBER: 2A93 REVISION DATE: 08/11/09 JOB NUMBER: 0812200

EQUIPMENT ANCHORAGE DET.

3" = 1'-0"

14

ADDENDUM 1
DSA 02-116765
REFERENCE SHEET - AD-A10.3-1

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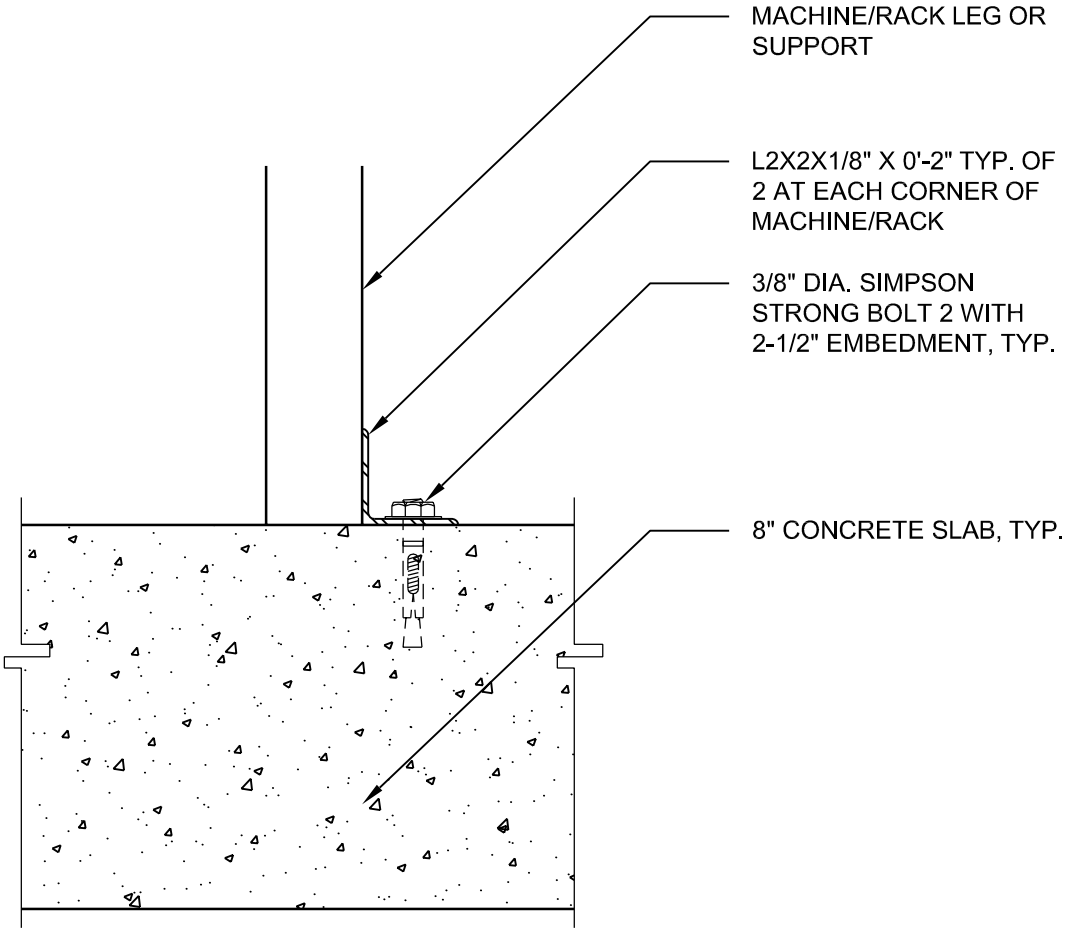
EQUIPMENT ANCHORAGE

SCHOOL OF ENGINEERING & SCIENCES CLASSRM BLDG. ADDITION
SACRAMENTO CITY UNIFIED SCHOOL DISTRICT

DRAWN BY:	JLY
CHECKED BY:	MIM
DATE:	10-19-2018
SCALE:	AS SHOWN
PROJECT NO.:	1724300.41

ADDENDA DWG. NO.

AD-A10.3-1



FILE/CSI NUMBER: 2A93 REVISION DATE: 08/11/09 JOB NUMBER: 0812200

TYPICAL KEEPER DETAIL

3" = 1'-0"

18

ADDENDUM 1
DSA 02-116765
REFERENCE SHEET - AD-A10.3-1

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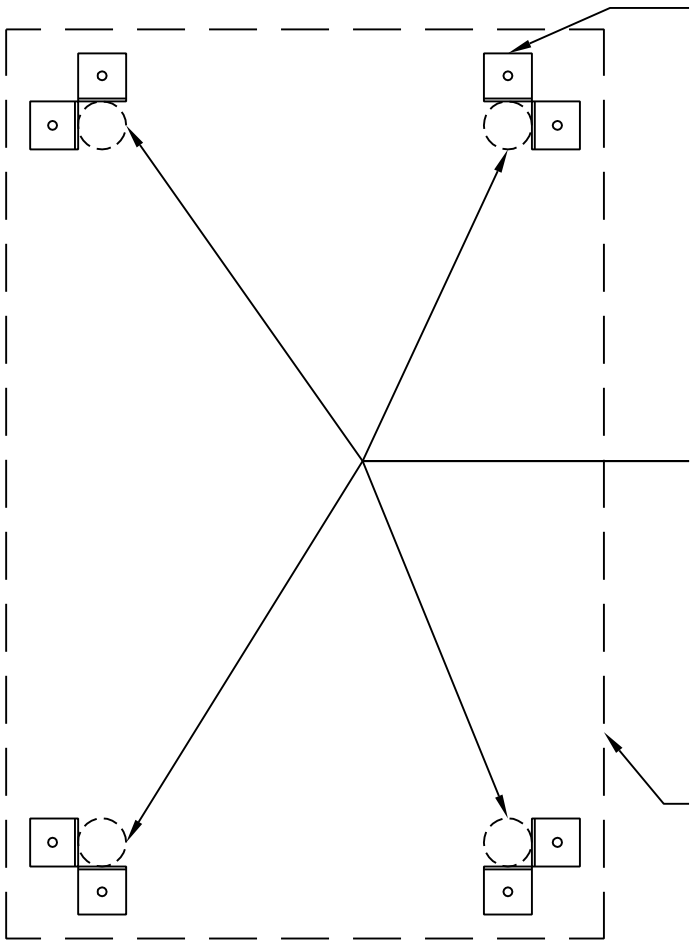
EQUIPMENT ANCHORAGE

SCHOOL OF ENGINEERING & SCIENCES CLASSRM BLDG. ADDITION
SACRAMENTO CITY UNIFIED SCHOOL DISTRICT

DRAWN BY:	JLY
CHECKED BY:	MIM
DATE:	10-19-2018
SCALE:	AS SHOWN
PROJECT NO.:	1724300.41

ADDENDA DWG. NO.

AD-A10.3-2



NOTE:
1. PROVIDE MACHINE ANCHORAGE FOR EQUIPMENT - REF NOTES 1100, 1102, 1103, 1104, 1105, 1106 & 1112 LISTED ON DWG. SHEET A2.1. CONDITION SIMILAR AT STORAGE RACK (REF NOTE 1111), STORAGE CABINET (REF NOTE 1201) AND THE AIR COMPRESSOR IN THE CUSTODIAN ROOM G106.

FILE/CSI NUMBER: 2A93 REVISION DATE: 08/11/09 JOB NUMBER: 0812200

TYP. MACHINE ANCHORAGE DET.

1-1/2" = 1'-0"

21

ADDENDUM 1
DSA 02-116765
REFERENCE SHEET - AD-A10.3-1

ARCHITECTS
WLC
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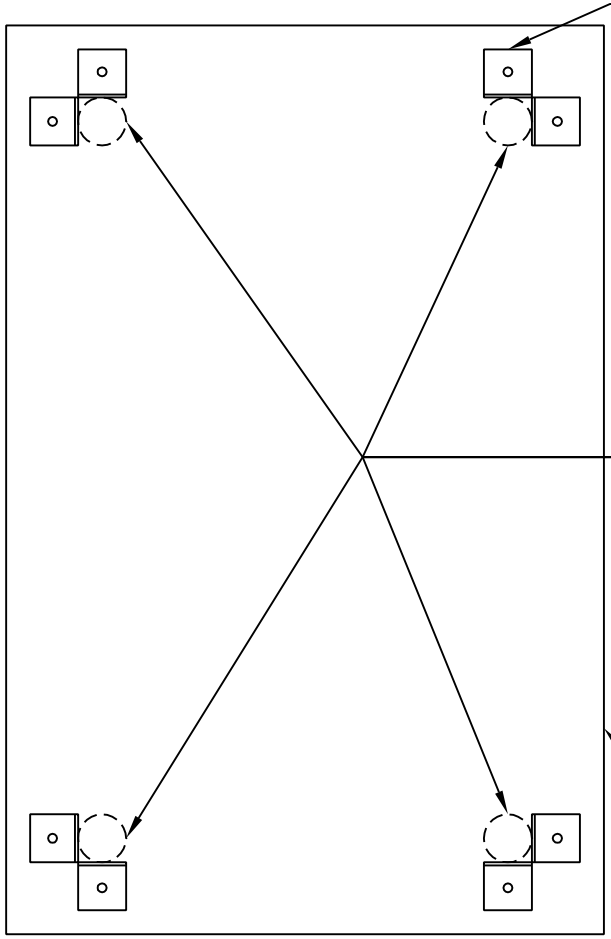
EQUIPMENT ANCHORAGE

SCHOOL OF ENGINEERING & SCIENCES CLASSRM BLDG. ADDITION
SACRAMENTO CITY UNIFIED SCHOOL DISTRICT

DRAWN BY:	JLY
CHECKED BY:	MIM
DATE:	10-19-2018
SCALE:	AS SHOWN
PROJECT NO.:	1724300.41

ADDENDA DWG. NO.

AD-A10.3-3



NOTE:
1. PROVIDE MACHINE-TO-TABLE & TABLE-TO-SLAB ANCHORAGE FOR EQUIPMENT - REF NOTE 1101 LISTED ON DWG. SHEET A2.1.

FILE/CSI NUMBER: 2A93 REVISION DATE: 08/11/09 JOB NUMBER: 0812200

CNC MACHINE-TO-TABLE ANCHORAGE

1-1/2" = 1'-0"

22

ADDENDUM 1
DSA 02-116765
REFERENCE SHEET - AD-A10.3-1

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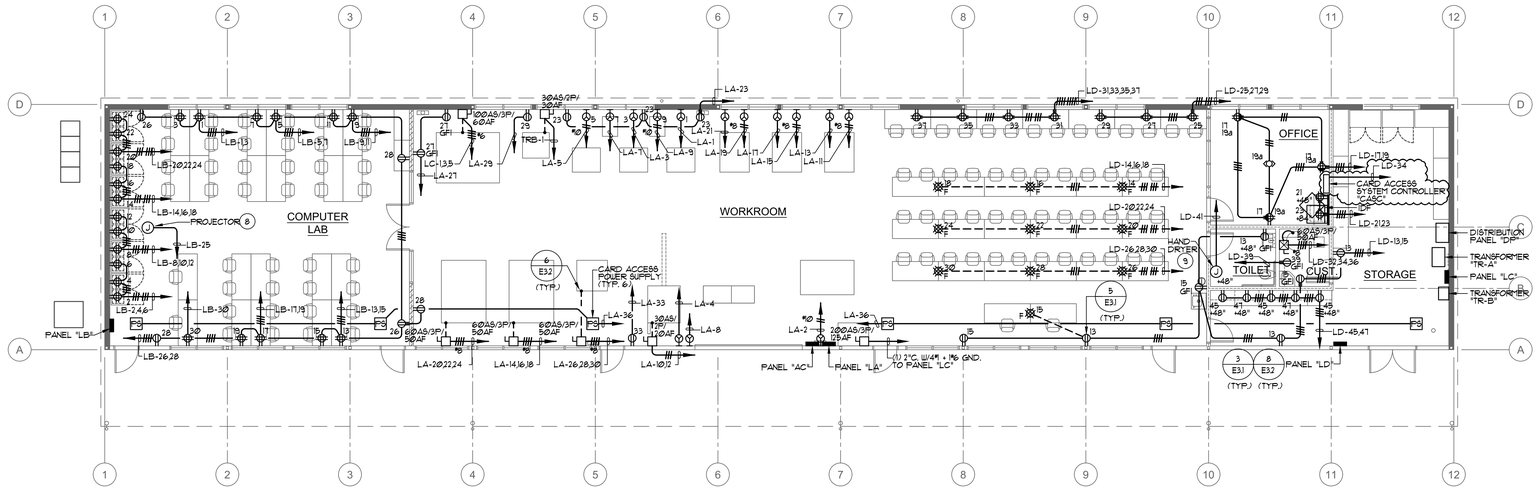
ADDENDA DWG. NO.

AD-A10.3-4



N

POWER FLOOR PLAN | 1/8" = 1'-0" | 1

PLAN NOTES

1. REFER TO GENERAL NOTES, SHEET E0.1, FOR ADDITIONAL REQUIREMENTS.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING ALL CEILING MOUNTED DEVICES WITH THE ARCHITECTURAL REFLECTED CEILING PLAN.
3. EXACT LOCATION OF OUTLETS SHOWN ON THESE DRAWINGS SHALL BE COORDINATED WITH THE ARCHITECTURAL ELEVATIONS PRIOR TO ROUGH-IN AND SHALL BE LOCATED IN SUCH A MANNER TO AVOID INTERFERENCES WITH OTHER OUTLETS AND CASEWORK.
4. SEE SINGLE LINE DIAGRAM, FOR CONDUIT SIZE AND WIRE SIZE AND QUANTITIES REQUIRED FOR ALL ELECTRICAL EQUIPMENT.
5. CONDUIT AND WIRE INDICATED ON THE SINGLE LINE DIAGRAM, WHETHER SHOWN ON THIS DRAWING OR NOT, SHALL BE A PART OF THIS CONTRACT AND THE RESPONSIBILITY OF THIS CONTRACTOR TO PROVIDE REQUIRED ROUTING TO MEET THE INTENT OF THESE PLANS AND SPECIFICATIONS.
6. EXTERIOR MOUNTED DEVICES / RECEPTACLES SHALL BE PROVIDED COMPLETE WITH LOCKING TYPE WEATHERPROOF COVERS AND BE UL. LISTED FOR WET LOCATIONS WHEN IN USE. COVERS SHALL BE AS MANUFACTURED BY RACO OR APPROVED EQUAL. PLASTIC COVERS NOT ALLOWED.
7. ELECTRIC CIRCUITS SERVING CONTROLLED RECEPTACLES SHALL BE EQUIPPED WITH AUTOMATIC SHUT-OFF CONTROLS FOLLOWING THE REQUIREMENTS PRESCRIBED IN SECTION 130(k)(2)(A) THROUGH 5.; AND AT LEAST ONE CONTROLLED RECEPTACLE TO BE INSTALLED WITHIN 6 FEET FROM EACH UNCONTROLLED RECEPTACLE OR A SPLIT-WIRED DUPLEX RECEPTACLE WITH ONE CONTROLLED AND ONE UNCONTROLLED RECEPTACLE SHALL BE INSTALLED; AND CONTROLLED RECEPTACLES SHALL HAVE A PERMANENT MARKING TO TO DIFFERENTIATE THEM FROM UNCONTROLLED RECEPTACLES; AND FOR OPEN OFFICE AREAS, CONTROLLED CIRCUITS SHALL BE PROVIDED AND MARKED TO SUPPORT INSTALLATION AND CONFIGURATION OF OFFICE FURNITURE WITH RECEPTACLES THAT COMPLY WITH SECTION 130.5(d) 1, 2, AND 3.
8. CONTRACTOR TO COORDINATE THE EXACT LOCATION OF THE WALL MOUNTED RECEPTACLE (ABOVE RACKS) FOR THE PROJECTOR WITH THE ARCHITECTURAL PLANS PRIOR TO ROUGH-IN. WALL MOUNTED RECEPTACLE TO BE INSTALLED ADJACENT TO THE WALL MOUNTED DATA PORT FOR THE PROJECTOR.
9. CONTRACTOR TO COORDINATE THE EXACT LOCATION OF THE HAND DRYER WITH THE ARCHITECTURAL PLANS PRIOR TO ROUGH-IN.
10. CONTRACTOR TO PROVIDE CONNECTORS FOR ALL SPECIALTY RECEPTACLES. CONTRACTOR TO CONFIRM CONNECTOR TYPE TO BE PROVIDED WITH THE EQUIPMENT MANUFACTURE PRIOR TO PURCHASE.

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SCHOOL OF ENGINEERING & SCIENCES CLASSROOM BUILDING ADDITION

SACRAMENTO CITY UNIFIED SCHOOL DISTRICT
7345 GLORIA DRIVE, SACRAMENTO, CA 95831

LICENSED ARCHITECT — Max Ivan Medina — C-24882 — re:3o 06/30/19 — STATE OF CALIFORNIA
REGISTERED PROFESSIONAL ENGINEER — RAYMOND L. SOTELO — No. E17329 — 6/30/20 — STATE OF CALIFORNIA

CONSULTANT
A&F ENGINEERING GROUP, INC.
9520 BASELINE RD., SUITE C, RANCHO CUCAMONGA, CA 91701
TEL: (909) 941-3008 FAX: (909) 941-8251

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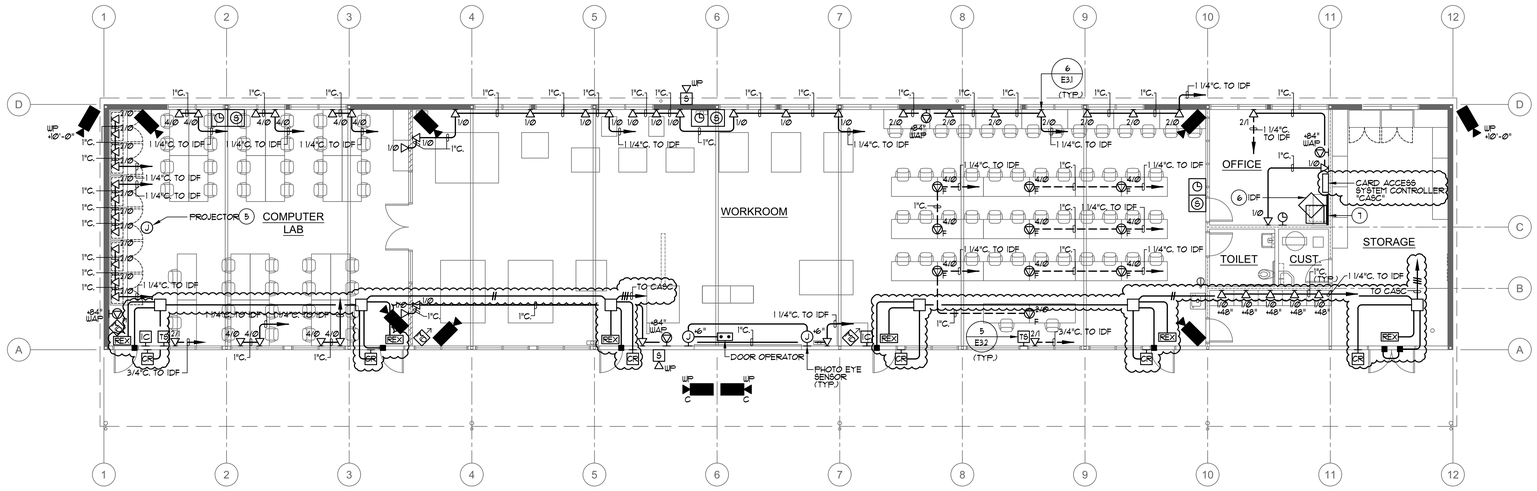
DIV. OF THE STATE ARCHITECT
OFFICE OF REGULATION SERVICES
APPL 02-116765
AC ____ FLS ____ SS ____
DATE ____
FILE: 34-H7

REVISION SCHEDULE			
NO	DATE	BY	DESCRIPTION

DRAWN: FL	CHECKED: RES
DATE: 07/02/2018	SCALE:
PROJECT NUMBER: 1724300	

POWER PLAN

DRAWING NUMBER: **E2.2**

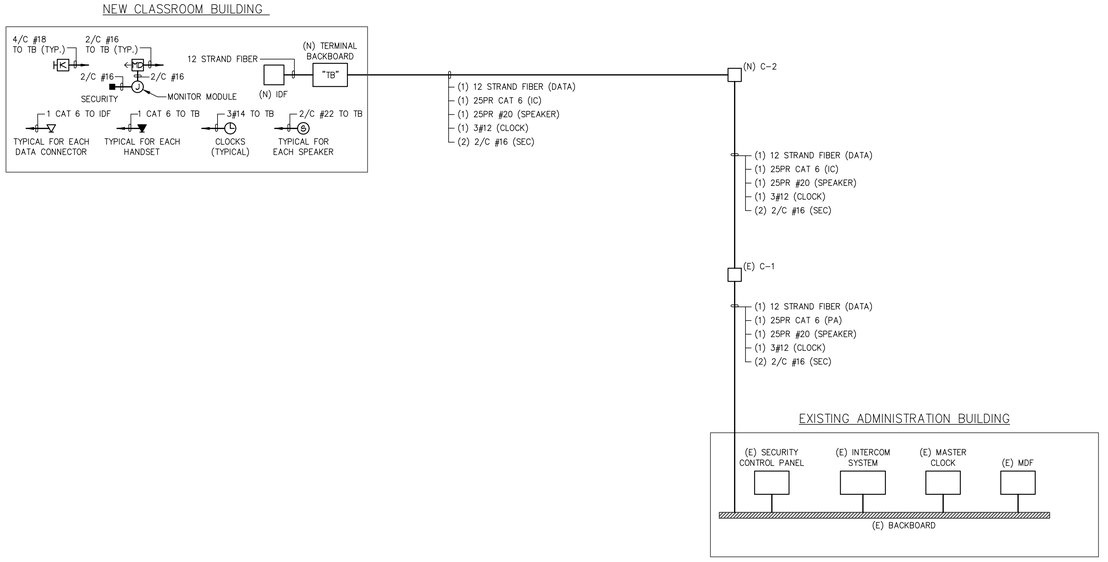


SIGNAL FLOOR PLAN | 1/8" = 1'-0" | 1

PLAN NOTES

1. REFER TO GENERAL NOTES, SHEET E0.1, FOR ADDITIONAL REQUIREMENTS.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING ALL CEILING MOUNTED DEVICES WITH THE ARCHITECTURAL REFLECTED CEILING PLAN.
3. EXACT LOCATION OF OUTLETS SHOWN ON THESE DRAWINGS SHALL BE COORDINATED WITH THE ARCHITECTURAL ELEVATIONS PRIOR TO ROUGH-IN AND SHALL BE LOCATED IN SUCH A MANNER TO AVOID INTERFERENCES WITH OTHER OUTLETS AND CASEWORK.
4. TO MEET THE ADA REQUIREMENTS FOR THE ASSISTIVE LISTING SYSTEMS, FURNISH THE FOLLOWING EQUIPMENT/DEVICES FOR EACH ASSEMBLY AREA AS DEFINED IN THE 2016 CALIFORNIA BUILDING CODE SECTIONS 11B-219, 11B-219.1, 11B-219.2, 11B-219.3, 11B-219.5 AND DSA-AC: A COMPLETE WIDE-BAND FM SYSTEM SHALL BE FURNISHED AND INSTALLED IN COMPLETE WORKING ORDER WITH RECEIVERS IN QUANTITIES EQUAL TO 4% OF THE SEATING CAPACITY, BUT IN NO CASE LESS THEN TWO RECEIVERS ARE TO BE PROVIDED. THE SYSTEM SHALL BE INTEGRATED INTO THE SOUND REINFORCEMENT SYSTEM AND THE TRANSMITTER MOUNTED AND ADJUSTED AS REQUIRED TO PROVIDE TOTAL COVERAGE OF THE SEATING AREA. SYSTEM SHALL BE AS MANUFACTURED BY WILLIAMS SOUND #FPA-45T (TRANSMITTER), #FPA-R3T (RECIEVERS) OR APPROVED EQUAL BY SENNHEISER.
5. CONTRACTOR TO COORDINATE THE EXACT LOCATION OF THE WALL MOUNTED DATA PORT (ABOVE RACKS) FOR THE PROJECTOR WITH THE ARCHITECTURAL PLANS PRIOR TO ROUGH-IN. WALL MOUNTED DATA PORT TO BE INSTALLED ADJACENT TO THE WALL MOUNTED RECEPTACLE FOR THE PROJECTOR.
6. CONTRACTOR TO COORDINATE THE EXACT MOUNTING HEIGHT THE IDF WITH THE ARCHITECT PRIOR TO ROUGH-IN.
7. CONTRACTOR TO PROVIDE 3/4" THICK FIRE RATED PLYWOOD BACKBOARD BETWEEN THE TOP OF THE COUNTER BACK SPLASH AND THE BOTTOM OF THE IDF. WIDTH OF THE FIRE RATED BACKBOARD NOT TO EXCEED THE WIDTH OF THE COUNTER.

NEW CLASSROOM BUILDING



COMMUNICATIONS BLOCK DIAGRAM

COMMUNICATIONS BLOCK DIAGRAM | NONE | 2

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REVISION SCHEDULE			
NO	DATE	BY	DESCRIPTION

DRAWN: FL	CHECKED: RES
DATE: 07/02/2018	SCALE:
PROJECT NUMBER: 1724300	

SIGNAL PLAN

DRAWING NUMBER: **E2.3**