



Overview - Robot Ready Interface

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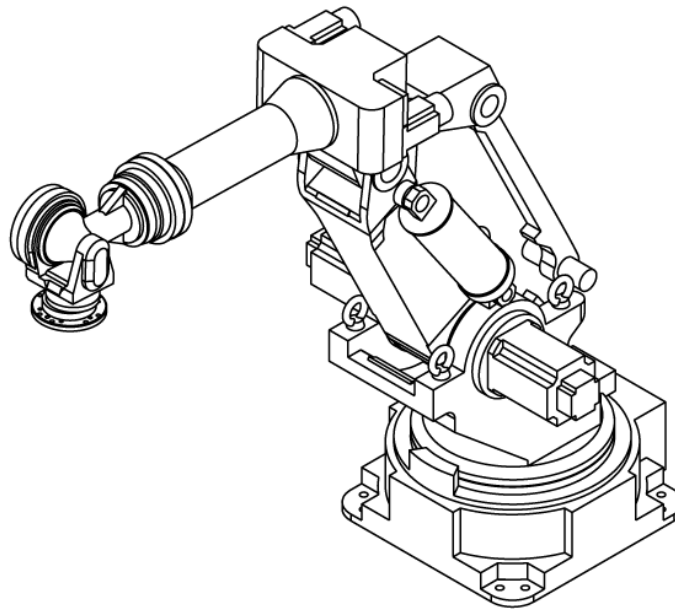
Translation Available



INTRODUCTION

This document tells you about the basic functions of the Robot-Ready Interface (RRI).

Responsibilities: It is the customer's responsibility to select a Robot Integrator to correctly connect the robot to the Haas equipment. Haas Service and Applications personnel can help to make sure that the CNC machine operates correctly. Haas personnel are not responsible for robot configuration or robot cell setup.



Note: It is recommended that each machine in a robot cell be equipped with an Automatic Door. This lets the robot get access to the internal work space of the CNC machine. Haas Automation recommends the use of the Haas optional Servo Auto Door.

- All Haas CNC machines are suitable for use in robot cells. Haas Automation has made a single-point interface that lets the Haas control and a robot send and receive signals between them. You can order a selection of Haas CNC machines with the optional RRI. This includes the necessary hardware, I/O modules, and software.
- The optional RRI lets you easily add a Haas CNC machine to a robot cell. It is a flexible solution that lets you add, remove, and replace CNC machines as work requirements change. The I/O and word structure is the same for all installations.
- Your Robot Integrator can help you design a robot cell for your application.

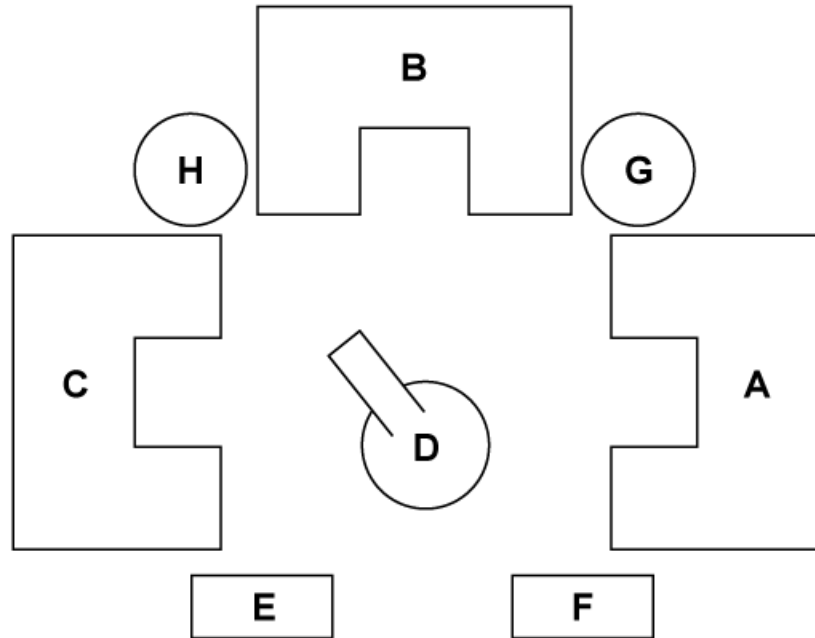
Robot Cell

Robot Cell Configuration

Select an area for the robot cell. Make a drawing of the equipment positions on the floor. A 3 ft (1 m) space on all sides of

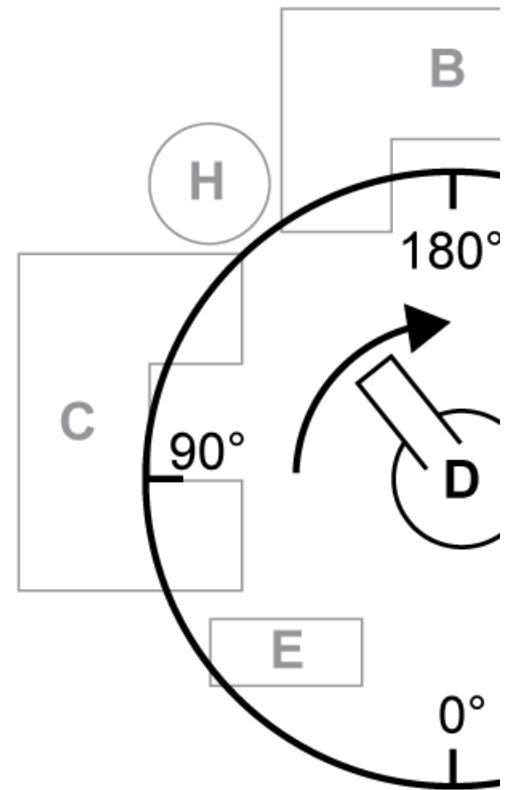
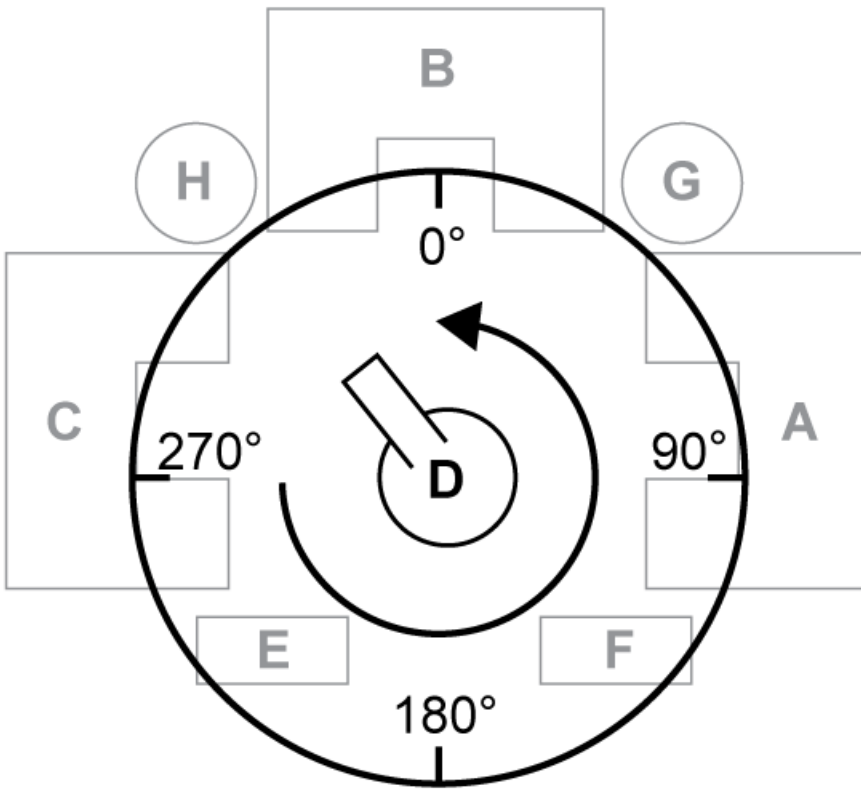
each CNC machine is recommended for usual maintenance access.

This illustration shows a typical robot cell. Put the CNC machines in a half-circle configuration with the robot in the center. Include an area to put un-finished parts, and an area to put finished parts. You can also use optional stations to prepare the parts for a change of position, if necessary.



Stations	
A - CNC Machine A	E - Completed Parts
B - CNC Machine B	F - Un-finished Parts
C - CNC Machine C	G - Optional Station 1
D - Robot	H - Optional Station 2

Robots are made to turn 0 - 360 degrees. Robots cannot turn through the zero (0 degrees) mark. Think about this when you design the robot cell. These illustrations show the correct and incorrect positions for robot installation. Put the zero (0 degrees) position in an area that the robot does not travel to. The first illustration shows an incorrect installation. The robot must turn 270 degrees to get to CNC machine B. The second illustration shows a correct installation. The robot must turn only 90 degrees to get to CNC machine B.



Stations	
A - CNC Machine A	E - Completed Parts
B - CNC Machine B	F - Un-finished Parts
C - CNC Machine C	G - Optional Station 1
D - Robot	H - Optional Station 2

Structure

You must install a permanent structure to keep personnel out of the robot cell. This structure is very important. You must install physical and electronic locks on the structure entrance.

Give access to the keys for the physical locks only to authorized personnel.

The electronic lock must send a signal to stop the robot when the structure door opens.

Below is a list of fencing manufacturers.

<i>Jokab Safety</i> (888) 282-2123	<i>Folding Guard</i> (800) 622-2214
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Material Movement and Optional Stations

Include areas where the robot can pick up un-finished parts and put completed parts.

Some applications require a place to put a partially completed part, possibly to change its position or to wait for a CNC machine. Typically, this is a strong stand. Make sure that the stands do not interfere with the robot's movement as it works in other areas of the cell. The Robot Integrator has more information about these components. Haas Automation does not supply them.

The Robot Integrator can help you find the best solution for material movement in your robot cell.

Chip Removal

Many machines have a conveyor or auger that puts chips in a receptacle. If the receptacle is inside of the robot cell, you must have a procedure to remove these chips.

Robot / CNC Machine

Un-finished part Type

Be sure to select a robot with sufficient capacity for the size and weight of the un-finished part.


Grippers

The robot arm has a standard mounting point for a gripper. The grippers are usually made to hold a specific un-finished part. Make sure that the gripper can move the un-finished part as it changes through the machining process. For gripper manufacturers, see the table below:

<i>Techno Sommer Automatic</i> (800) 282-2123	<i>RAD</i> (937) 667-5705
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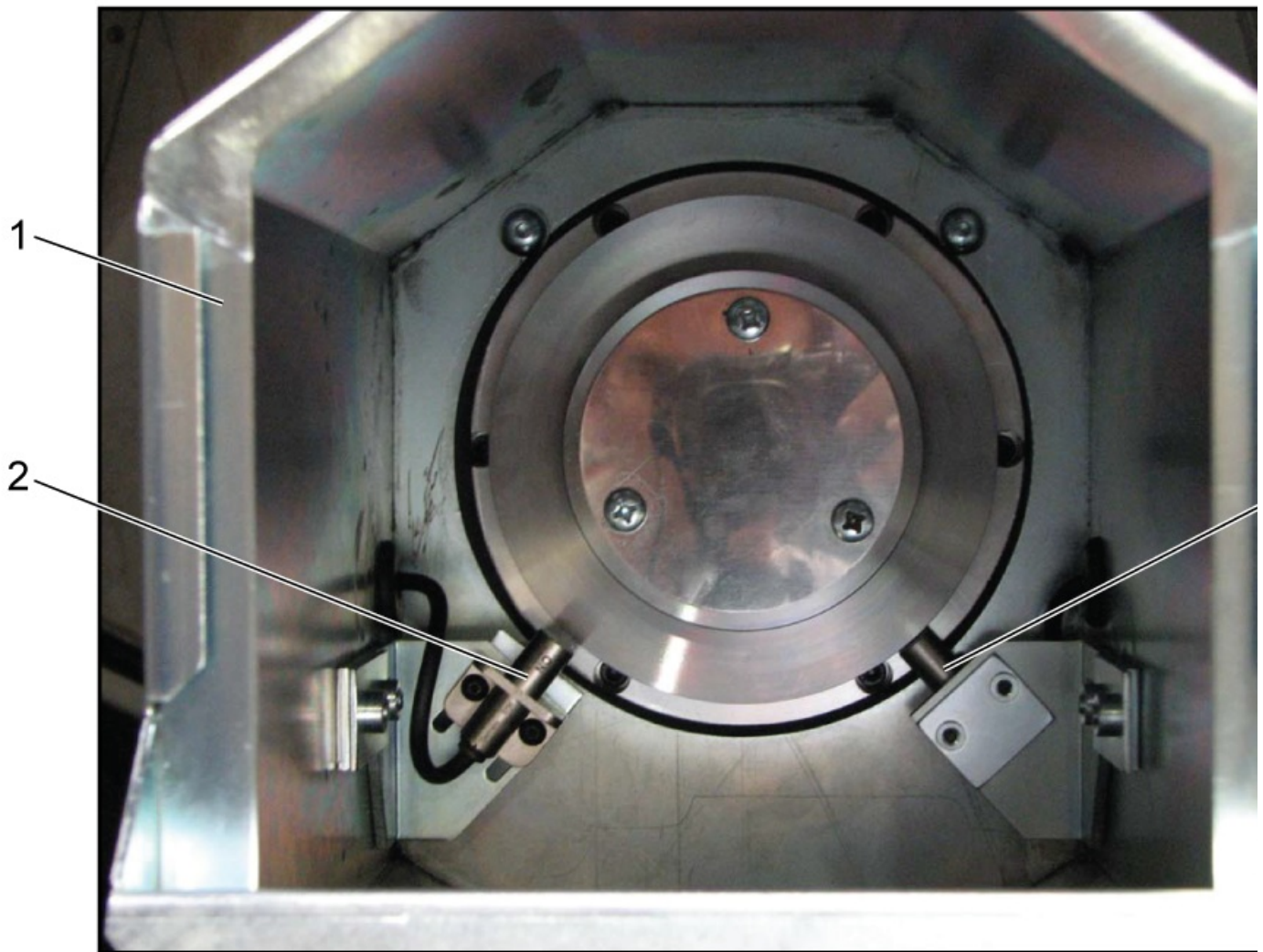
Workholding: Mills

Hydraulic Pump/Fixture - RRI includes cables and connectors for the hydraulic switches and the unclamp solenoid. The customer must supply the workholding fixture and sensors.

 **Note:** Pneumatic fixtures are recommended for pressures below 150 psi (10.3 bar). For hydraulic fixtures, a hydraulic power unit (HPU) is available from Haas Automation

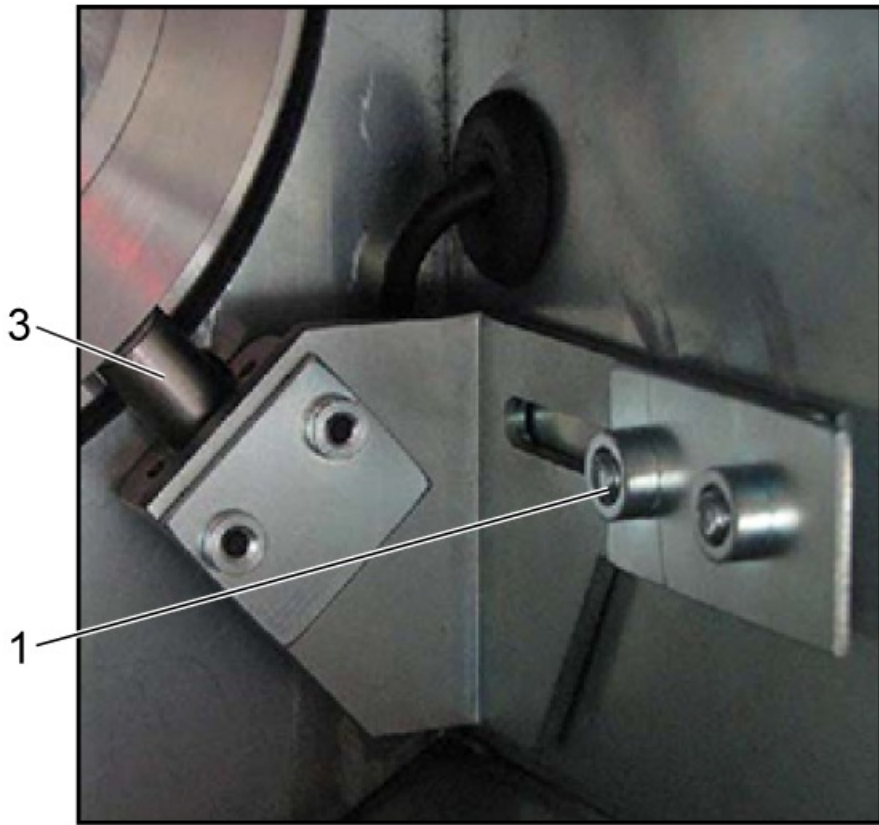
Connect more clamps to the available relays on the I/O PCB or to the (4) relays on the 8M relay PCB. The customer must supply the cables for these relays.

Workholding: Lathes



The Haas factory installs and aligns the chuck sensors. The sensors are in the coolant collector [1]. The "clamped" sensor [2] must activate when the chuck is fully closed. The "unclamped" sensor [3] must activate when the chuck is fully open. When the chuck holds an un-finished part, neither sensor will be active.

On mills, the two chuck switches are provided to the customer for their own use. They can be used when the customer makes a custom workholding. On lathes, they are pre-installed.



The (2) sensors are factory adjusted. They do not need to be adjusted unless they have been unintentionally moved.

The (2) sensors are adjustable in (2) directions: toward the workholding [1] and toward the middle of the spindle [2]. There is a light on each sensor that illuminates when the sensor switches to the "ON" condition. Position the sensors so that the sensor lights come on at each end of drawtube travel. This sets the fully open and fully closed positions of the chuck. The switch nearest to the workholding [3] must illuminate when the workholding is open (unclamped). The second switch [4] must illuminate when the workholding is closed (clamped). Adjust the switches until these two conditions are set.

To test the sensors, do these steps:

1. Unclamp the workholding.
2. Put an un-finished part in the workholding.
3. Clamp the workholding.
4. Check the condition of the sensors. Both lights must not be illuminated. This tells the control that an un-finished part is in the workholding and is clamped.

Below is a list of automated workholding manufacturers.

<i>Kurt</i> (877) 226-7823	<i>Chick</i> (800) 332-4425	<i>Carr Lane Roemheld</i> (636) 386-8022
<i>Master Workholding</i> (828) 427-0011	<i>Quikloc PVT</i> +91 802 666 8822	<i>Abbot Toolfast</i> +91 129 227 6497
<i>Romheld</i> +02 9721 1799		

Tool Life

Think about the length of time a tool is used when you operate a robot cell. Time must be scheduled to examine and replace tools. Use the Haas Advanced Tool Management to increase the time between tool maintenance. This function allows for backup tools. This function is standard on new Haas mills.

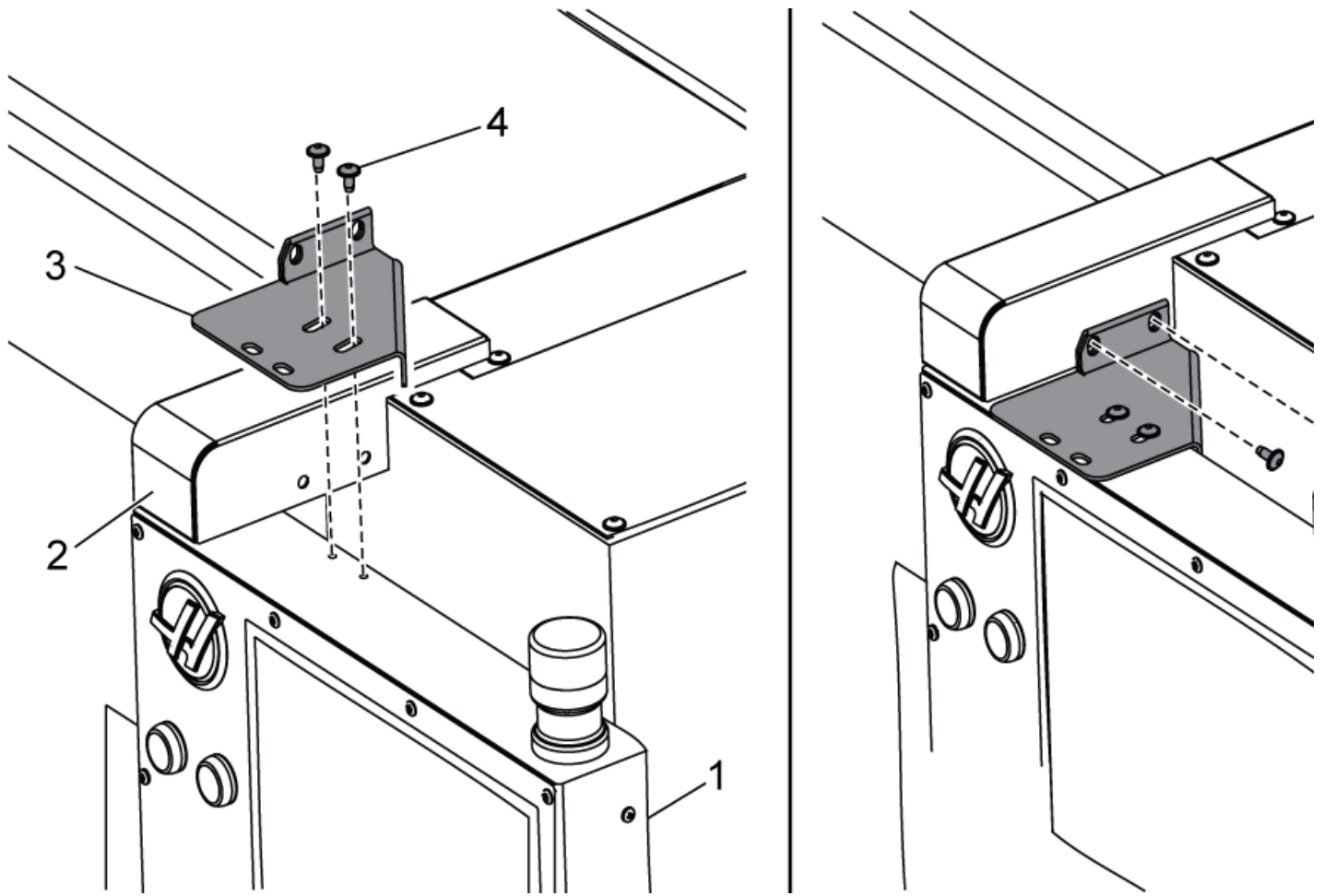
Robot Manufacturer Resources

Below are links to robot manufacturers. The links provide information about the companies. Haas Automation does not provide this information.

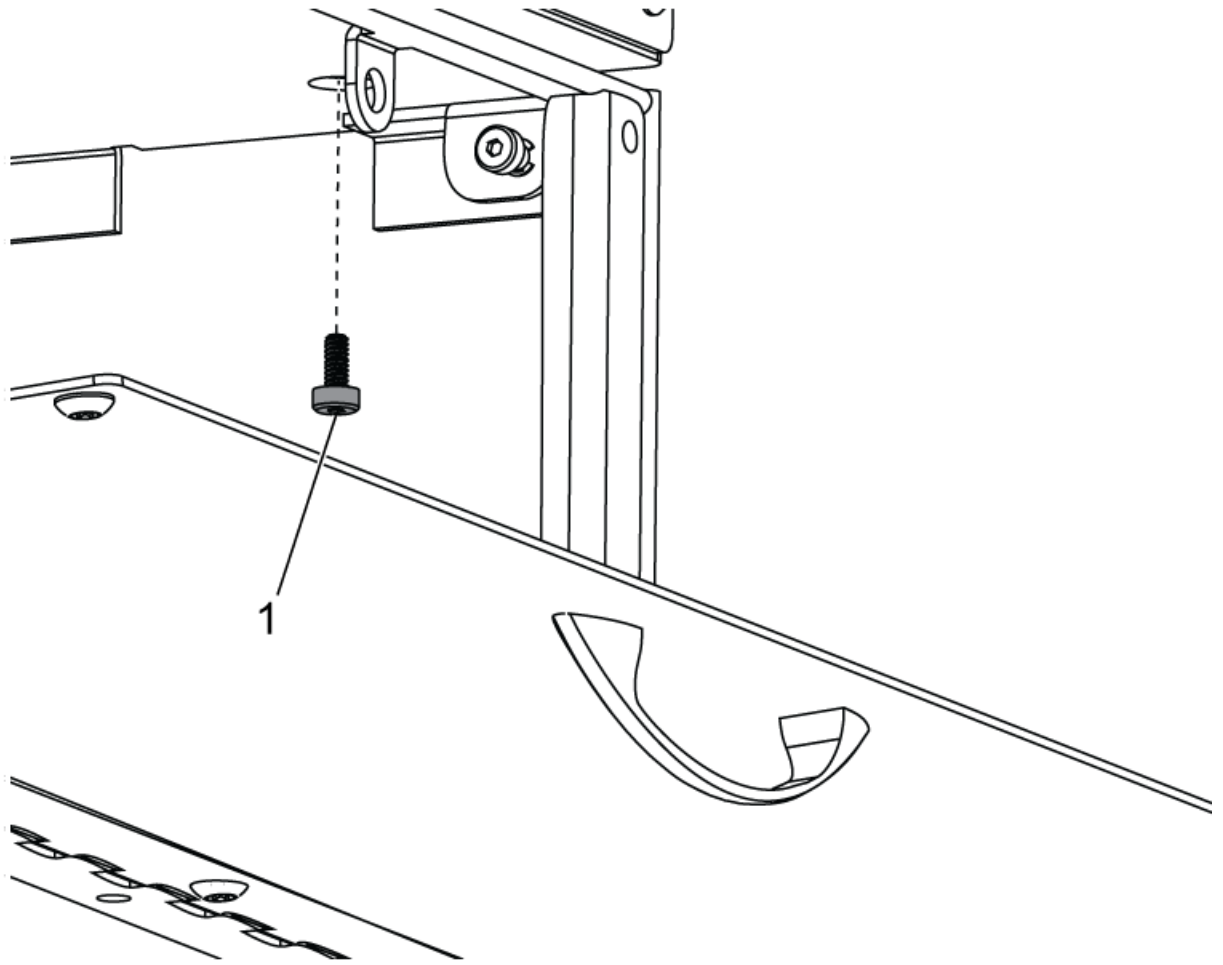
<p>Motoman 805 Liberty Lane West Carrollton, Ohio 45449 Phone: (937) 847-6200 Fax: (937) 847-6277</p>	<p>Nachi Robotic Systems, Inc. 42775 W. 9 Mile Rd. Novi, Michigan 48375 Phone: (248) 305-6545 Fax: (248) 305-6542 info@nachirobotics.com</p>	<p>Stäubli Robotics 201 Parkway West, Hillside Park PO Box 189 Duncan, SC 29334 (Greenville) Phone: (864) 433-1980 Fax: (864) 486-5497 r.robot.usa@staubli.com</p>
<p>Kulda Robotics 22500 Key Drive Clinton Township Michigan 48036 Phone: (866) 873-5852 Fax: (866) 329-5852</p>	<p>Kawasaki Robotics 28140 Lakeview Drive Wixom, Michigan 48393 Phone: (248) 446-4100 Fax: (248) 446-4200 kri-sales@kri-us.com</p>	

Pendant Storage

Some machines have a pendant [1] mounted on a strut [2]. The pendants ship out with a bracket [3] installed. The bracket fixes the location of the pendant. With the pendant fixed to one location, it prevents anyone from moving the pendant into the path of the robot, and forgetting to move it back before commanding the robot. Use the hardware [4] and shipping bracket that was supplied with the CNC machine.



CNC machines with a pendant mounted have a shipping bolt [1] installed through the storage container under the pendant. If you removed it, install the shipping bolt so the storage container will have a fixed position, also.



Do not remove the bracket or bolt. Order replacement brackets from Haas Automation.

The Robot Integrator can add an optional sensor near the pendant. This will make sure it is tightly attached before robot movement occurs. The sensor serves the same purpose as pendant shipping bracket and the shipping bolt.

! **Caution:** Having the pendant shipping bracket or the shipping bolt installed does not prevent the robot from hitting the pendant. That is the responsibility of the programmer of robot.

CNC Machine Options

You can use optional probes (LPRO-R and WIPS-R) to examine the un-finished part position and machined elements (bored holes, for example). If the probe finds that a dimension is not to specifications, it stops CNC machine operation and robot movement.

Optional tables with decreased height supply more clearance for the robot to hold and release un-finished parts. These tables are available on VF-3 and VF-4 models. These tables are good choices for large fixtures and un-finished parts.

M-Codes

Make sure that the CNC machine program and the robot program are synchronized. Load the robot with an operation program. Make sure the correct robot M-code is in the CNC machine program. Make sure the robot movement is correct.

The optional RRI includes (8) more M functions. The RRI uses (4) M functions. The robot integrator can use the other (4) M functions.

The CNC machine sends an M-code signal to the robot. Each robot M-code starts a specified robot operation. There are two types of robot M-codes: a direct mode and an encoded mode. The direct mode has (4) signals. The encoded mode has

(8) signals. The encoded mode is the recommended if you need more than (4) signals.

- Direct mode: **M25 - M28** for mills and **M125 - M128** for lathes
- Encoded mode: **M171 - M178**

This table shows an encoded robot request that uses an **M171 - M178** code. **M171 - M178** selects macro programs 9002 - 9009. These macros are pre-installed on the machine. The macro program sets the conditions of **M26**, **M27**, and **M28**. The **M25 Request** signal is next. The **Request** signal (**M25**) waits for an **M-FIN** signal. The macro program then goes back to the primary program.

M-Code Used in Program	M25	M26	M27	M28	Request Name
M171	Request with M-FIN	Off	Off	Off	Load
M172	Request with M-FIN	On	Off	Off	Unload
M173	Request with M-FIN	Off	On	Off	Reseat Part
M174	Request with M-FIN	On	On	Off	Exit Request
M175	Request with M-FIN	Off	Off	On	User 1
M176	Request with M-FIN	On	Off	On	User 2
M177	Request with M-FIN	Off	On	On	User 3
M178	Request with M-FIN	On	On	On	User 4

The macros are pre-installed on your machine. If you removed these macros from your machine, you can get them from the Haas Service Guide. Below are links to the macros and programming examples for the Robot-Ready Interface.

- [Robot-Ready Interface - Macros - Mill \(NC file\)](#)
- [Robot-Ready Interface - Macros - Lathe \(NC file\)](#)
- [Robot-Ready Interface - Programming Examples - Mill \(txt file\)](#)
- [Robot-Ready Interface - Programming Examples - Lathe \(txt file\)](#)

Parameters

Emergency Stop

Haas CNC machines started to include secondary **EMERGENCY STOP** circuitry in July 2011. Make sure Parameter **1275**, **PENDANT E-STOP**, is set to **1026** to make this function available. A secondary **EMERGENCY STOP** connected to the CNC machine from the robot must provide a normally open (NO) and a normally closed (NC) signal.

You must set Parameter **1278**, **AUXILARY #2 E-STOP**, to **53** if the external **EMERGENCY STOP** circuit is installed to stop the CNC machine. No parameter change is necessary if the external **EMERGENCY STOP** is installed to stop the robot only.

The secondary **EMERGENCY STOP** circuit has been installed incorrectly if you cannot reset Alarms **2001** or **2005** after you change the parameter values.

Workholding

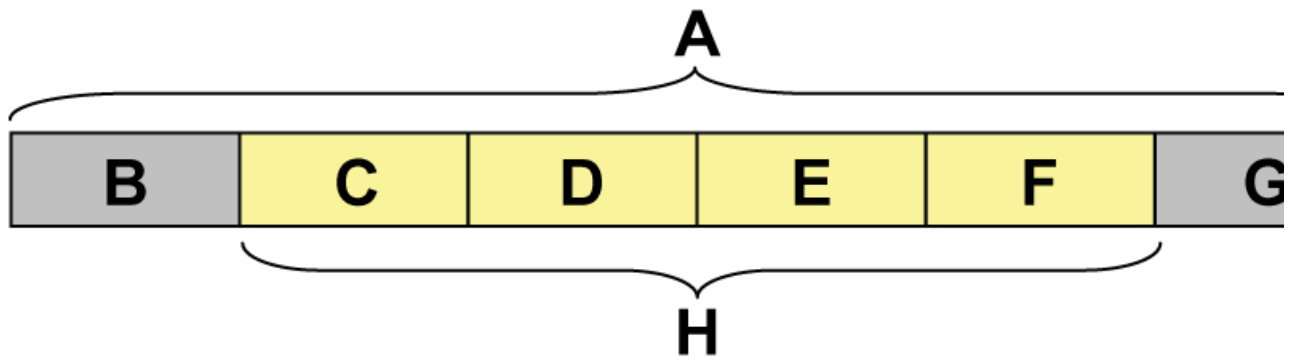
You can add sensor switches to the workholding. This helps to make sure that the un-finished part is correctly set in the workholding. Set Parameter **738**, **FIXTURE CLAMP INPUT**, to the input number where the switch is connected. For example, set Parameter **738** to **22** if the switch cable is connected to input 22. Connect the switch so that it is closed during normal operation (high pressure) and open if a clamp failure occurs (low pressure). The CNC machine stops with Alarm **973**, **FIXTURE CLAMP FAILURE** if the spindle activates while this input is open.

DeviceNet™ Setup

The BL20 DeviceNet™ I/O Station in the CNC machine control sends sensor data to a DeviceNet™ network. It also receives instructions from the network. Each device (or node) on the network must be set to a different address, or MAC ID. Use the (2) **[ADDRESS]** rotary switches on the BL20 gateway to set the device address. The H (High) and L (Low) rotary switches set the first (H) and second (L) digits of a two-digit decimal number. A DeviceNet™ network may have up to (64) devices. The available addresses range from 0 to 63 (equivalent to a (6)-bit binary number). The robot or cell automatic system also communicates on this network. The robot uses the information from the sensors to know the status of the CNC machine and calculate its next move. The robot or master system controller may also send some instructions and signals to the CNC machine.

The information that follows gives you the digital data format used by the BL20 Station. For additional information on BL20 network configuration and interface, refer to document: D300460: BL20 DeviceNet™ Hardware and Engineering Guide, available at: <http://www.turck-usa.com/Support/Networks/Documentation.htm>.

The DeviceNet™ system uses the CAN-bus as its primary technology. Data in each transmission packet is up to 4 words in length. Each word is (2)-bytes or (16)-bits long. The illustration and tables that follow show how the specific robot ready and cell safe data is formatted for access and control.



Data Words	
A - CAN-Bus Data Packet (Fieldbus Data)	E - Word 1
B - Footer	F - Word 0
C - Word 3	G - Header
D - Word 2	H - Process Data: Up to (4) Words (16 bits each)

CAN-Bus Data Structure

Process Data	Byte	Output: BL20 > Network	Input: BL20 < Network
Word 0	Bytes 0 and 1	Reserved for Network Control Data	Reserved for Network Control Data
Word 1	Byte 2	Bit 0: M25 (LSB) Bit 1: M26 Bit 2: M27 Bit 3: M28 Bit 4: Workholding Unclamped Bit 5: Workholding Clamped Bit 6: Auto-Door Fully Open Bit 7: Not Used	Bit 0: M-FIN (LSB) Bit 1: Cycle Start Bit 2: Cell Safe "Heartbeat" Bit 3: Not Used Bit 4: Not Used Bit 5: Not Used Bit 6: Not Used Bit 7: Not Used
Word 1	Byte 3	Not Used	Not Used
Word 2	Bytes 4 and 5	Not Used	Not Used
Word 3	Bytes 6 and 7	Not Used	Not Used

Data Word Examples:

Data Word	Status
Output Byte 2 0101 1100 (Hexadecimal: 5C)	M27 is Active M28 is Active Workholding is Unclamped Auto-Door is Fully Open
Input Byte 2 0000 0101 (Hexadecimal: 05)	M-FIN Cell Safe Toggle "Heartbeat" Signal High

Cell Safe Signal

A Haas CNC machine can disarm some safety modes to let a robot cell operate automatically. These safety modes must be disarmed to let normal operation continue while the CNC machine operator door is open. The CNC machine must receive a signal (**Cell Safe**) from the robot to do this. The **Cell Safe** signal indicates that the cell is in a safe state.

The system monitors the **Cell Safe** signal when the program commands an **Auto Door Open** instruction (mill: **M80** / lathe: **M85**). If the system cannot find a **Cell Safe** signal when the door opens, the CNC machine goes into a door hold state and shows the message **Automatic Door Open Commanded While Machine is Not Cell Safe**. A **[CYCLE START]** signal is necessary to continue normal operation.

The CNC machine stops monitoring **Cell Safe** at an **Auto Door Close** instruction, **M30**, or when you press **[RESET]**.

There are three ways to send a **Cell Safe** to the CNC machine: M-Net, RS-232, or discrete input. Robots that use M-Net and RS-232 send the CNC machine an instruction to change a piece of macro data. The CNC machine monitors the macro data that changes. The CNC machine reads a correct **Cell Safe** signal when the macro data number continues to change. Parameter **1272, CELL SAFE PORT**, shows the monitored macro data when you use this procedure. Parameter **1273, CELL SAFE TIMER**, gives the amount of time before the CNC machine enters a door hold condition when **Cell Safe** is

interrupted (in milliseconds, up to 5000).

The optional RRI supports only the discrete input method. Robots that use the discrete input method must send a 2 -10 Hz pulse signal to P90 on the I/O board. Parameter **1272** must have a value of **54**. The RRI option includes the **Cell Safe** cables.

Discrete Input Method: Mill software version 18.11B or higher / Lathe software version 11.08B or higher.

Consult the robot integrator to find the best method to use for the robot cell.

Interface Cables

You can make cables and incorporate them into the CNC machine control's logic for added security. This section shows cables schematics and tells why each cable is necessary.

 **Note:** Use these safety circuits to make sure personnel and machinery are safe.

Cable Positions

Put cables into the CNC machine control cabinet through the bottom opening. Put cables through the cable channels inside the cabinet to keep the cabinet clean.


External Emergency Stop Interface

This circuit lets the robot cell operator change the **[EMERGENCY STOP]** operation if the robot cell door opens. This **[EMERGENCY STOP]** interface connects to the robot cell door or light curtain. The interface automatically stops the movement of the robot if someone enters the cell.

The secondary **[EMERGENCY STOP]** must have two contacts. The "In NC" contact stops the CNC machine. The "In NO" contact is for the secondary **[EMERGENCY STOP]**. This is necessary to monitor the function of the primary **[EMERGENCY STOP]** circuit.


This interface consists of three circuits in one connector:

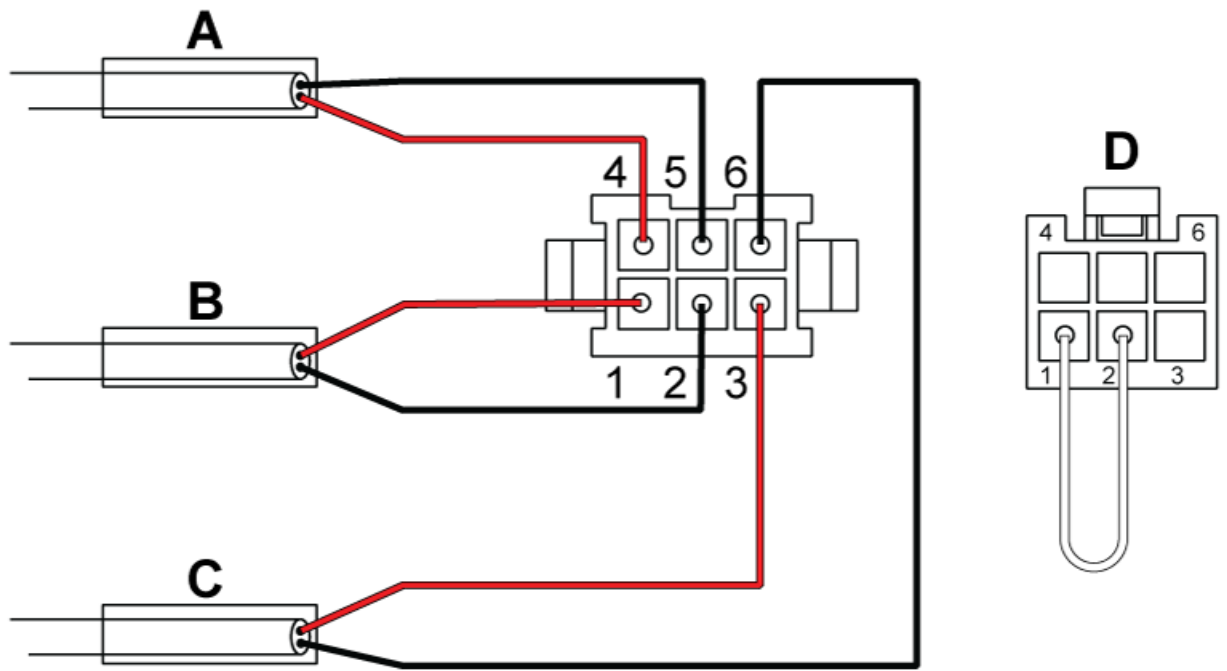
- The first circuit **[A]** connects the pendant **[EMERGENCY STOP]** to the robot (labeled "Out").
- The second circuit **[B]** connects the robot **[EMERGENCY STOP]** "NC" contact to the CNC machine (labeled "In NC").
- The third circuit **[C]** connects the robot secondary **[EMERGENCY STOP]** "NO" contact to the CNC machine (labeled "In NO").

 **Note:** The factory-installed jumper **[D]** connects the "In NC" circuit pins 1 and 2 together.

It is possible to install the "Out" circuit only. This stops the robot only when you press **[EMERGENCY STOP]** on the pendant. The factory-installed jumper **[D]** must be installed in the "In NC" circuit if you select this configuration.

It is possible to install the "In" circuits only. This stops the CNC machine only when the robot cell door opens.

 **Caution:** The factory-installed jumper in the "In NC" circuit must stay in position for the CNC machine to operate correctly if you do not use the **[EMERGENCY STOP]** interface cable.



Pin/Signal Connections

A - RRI External E-Stop Out, P/N 33-0299

C - Redundant E-Stop In NO, P/N 33-0299

B - External E-Stop In NC, Cable 770, P/N 33-0299

D - Jumper, External E-Stop, P/N 33-0298

Pin 4 - Connect this pin (red wire) to one side of an auxiliary set of contacts on the pendant **[EMERGENCY STOP]** switch.

Pin 5 - Connect this pin (black wire) to the other side of an auxiliary set of contacts on the pendant **[EMERGENCY STOP]** switch.

! Caution: Do not connect the pins that follow to the pendant **[EMERGENCY STOP]** circuit. This causes damage to the CNC machine and the interface.

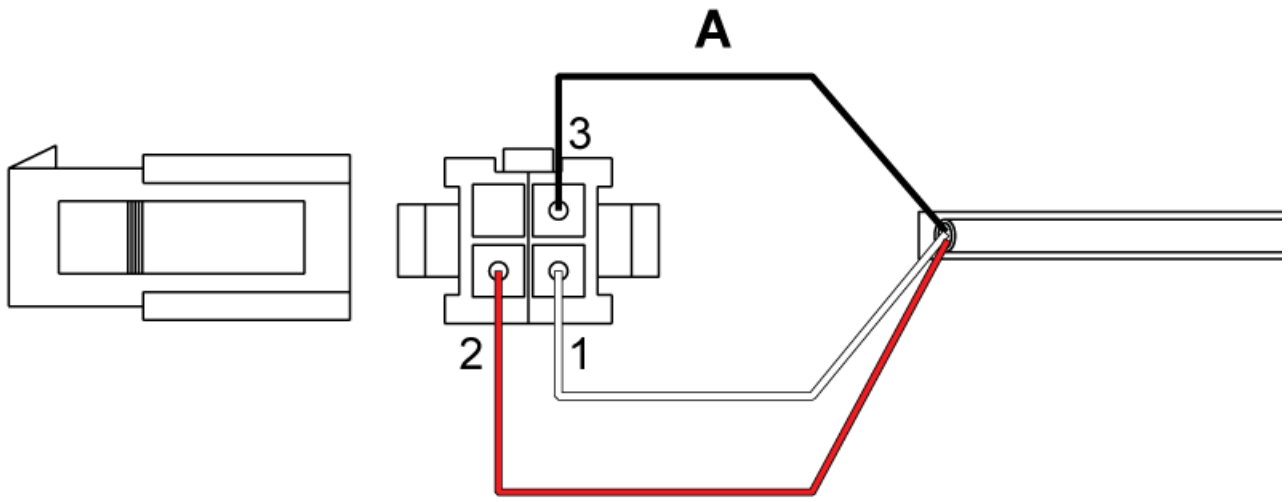
Pin 1 and 2 - Connect these pins (black and red wires) to the terminals of an auxiliary "NC" contact on the robot external **[EMERGENCY STOP]** switch.

Pin 3 and 6 - Connect these pins (black and red wires) to the terminals of an auxiliary "NO" contact on the robot external **[EMERGENCY STOP]** switch.

Door Open Cable Interface

Use "door open" switches for CNC machines in robot cells. "Door open" switches tell the robot that the door is open. The Haas Servo Autodoor option includes these switches. The door open cable and both workholding sensor cables connect directly to the DeviceNet™ I/O module. Refer to the Electrical Connections section.

The "door open" switch (in addition to a "door closed" switch) is necessary to make sure that the robot can get access to the un-finished part. The robot does not know when the door is completely open if the system has only a "door closed" switch. This could cause damage to the robot and the CNC machine.



Pin/Signal Connections

A - Door Fully Open Switch, P/N 32-2269 (for lathes with a consolidated air-lubrication module (CALM), connect the switch and control cable at the spindle head bracket).

Pin 1 - Connect this pin (white wire) to the switch ground connection.

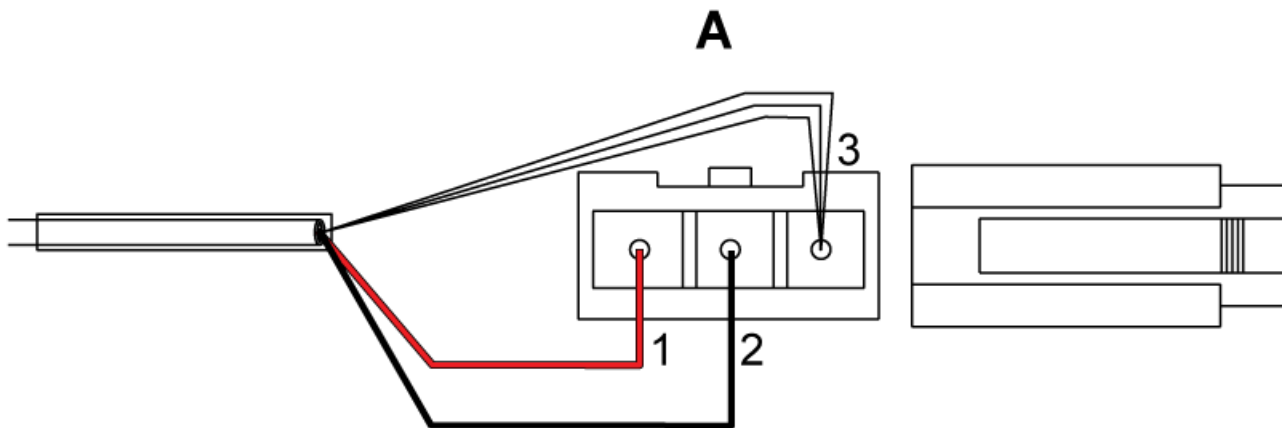
Pin 2 - Connect this pin (red wire) to +24 VDC power. This wire is used for a (3) wire proximity sensor.

Pin 3 - Connect this pin (black wire) to the switch signal connection.

Accessory Pump Enable Interface

This output activates a hydraulic or pneumatic solenoid at a maximum of 115 VAC and 100 mA.

! **Caution:** Do not operate at more than 115 VAC and 100 mA. Do not use this cable to power the hydraulic pump or any other high current device.



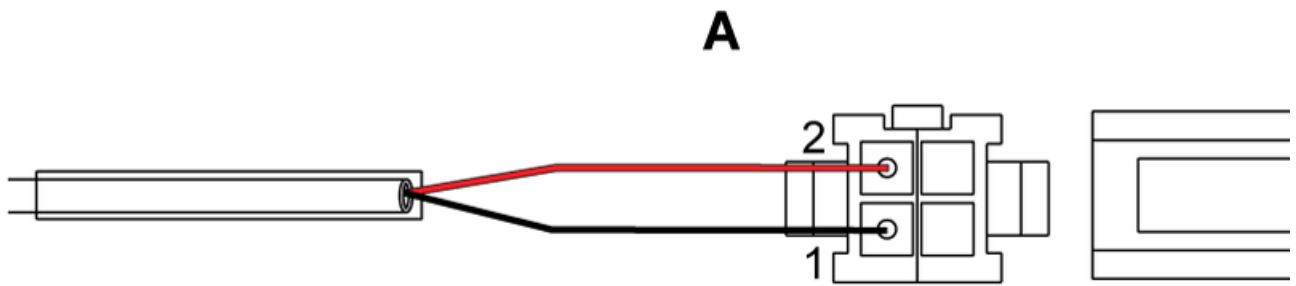
Pin/Signal Connections

A - Hydraulic 115 V Solenoid, P/N 33-10019

Pin 1 - Connect this pin (red wire) to the +115 V connection of the 115 VAC solenoid on the hydraulic pump.

Pin 2 - Connect this pin (black wire) to the ground connection of the 115 VAC solenoid on the hydraulic pump.

Accessory Pump Pressure Switch Interface



Pin/Signal Connections

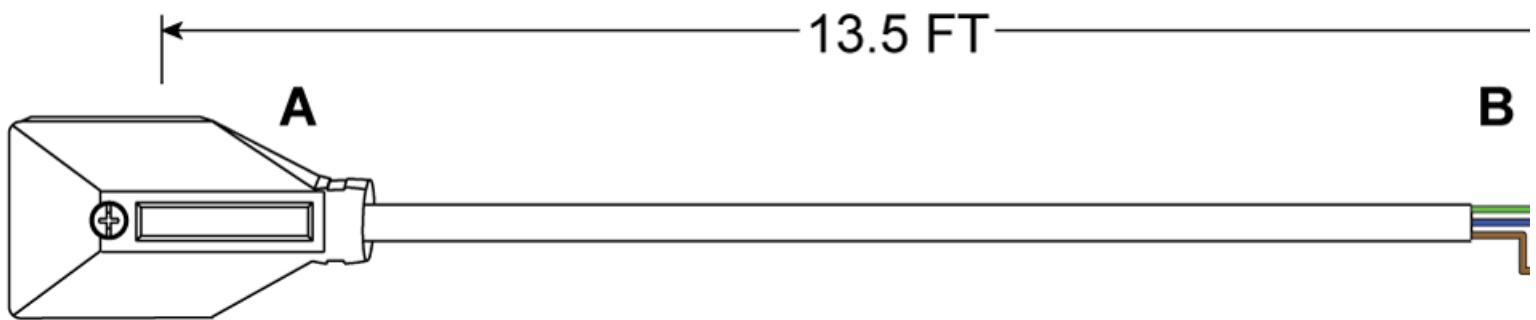
A - Hydraulic Pressure Switch, P/N 33-10020

Pin 1 and 2 - Connect these pins (black and red wires) to each connection of the pressure switch on the hydraulic pump.

Hydraulic Power Unit Cables

The two illustrations that follow show the cables to use with an HPU. These cables use a pressure switch to tell the CNC machine control the condition of the workholding. Get these two complete cables from Haas Automation, or you can order the parts from the manufacturer. You can assemble the cables.

The first cable (Haas P/N 33-1987) is used by the CNC machine control to energize and de-energize the HPU.



Pin/Signal Connections

A - Rapid (Tailstock) Tool Turret / Solenoid, Cable 270/880A, P/N 33-1987

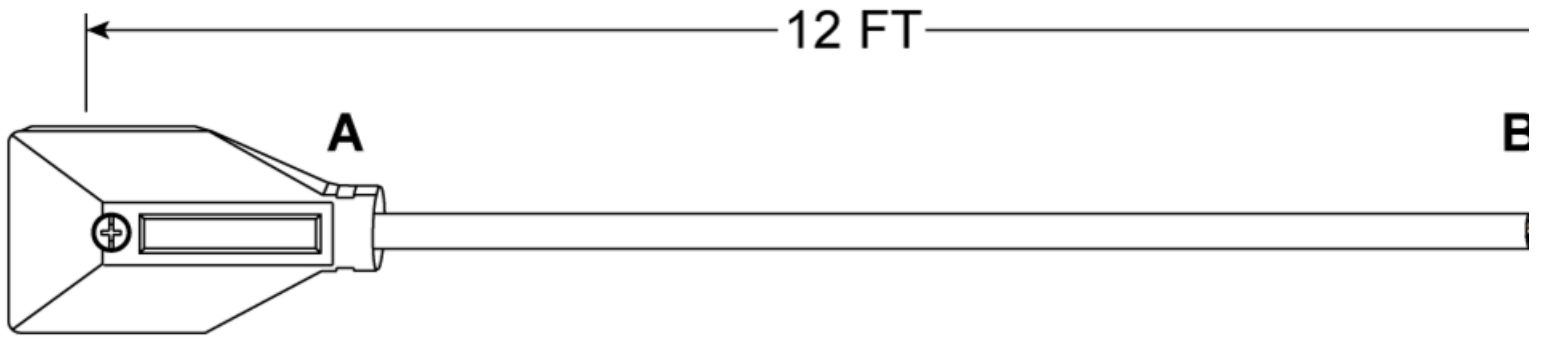
B - Rapid (Tailstock) I/O P33 / HPU Solenoid, Cable 270/880A, P/N 33-1987

Pin 1 - Connect the brown wire to pin 1 of the connector **B**.

Pin 2 - Connect the blue wire to pin 2 of the connector **B**.

Pin 3 - Connect the green wire to pin 3 of the connector **B**.

The second cable (Haas P/N 33-2952C) uses a pressure switch to signal to the CNC machine control that the workholding is clamped.



Pin/Signal Connections

A - Rapid (Tailstock) Tool Turret / Solenoid, Cable
270/880A, P/N 33-1987


B - Rapid (Tailstock) I/O P33 / HPU Solenoid, Cable
270/880A, P/N 33-1987

Pin 1 - Connect the black wire to pin 1 of the connector **B**.

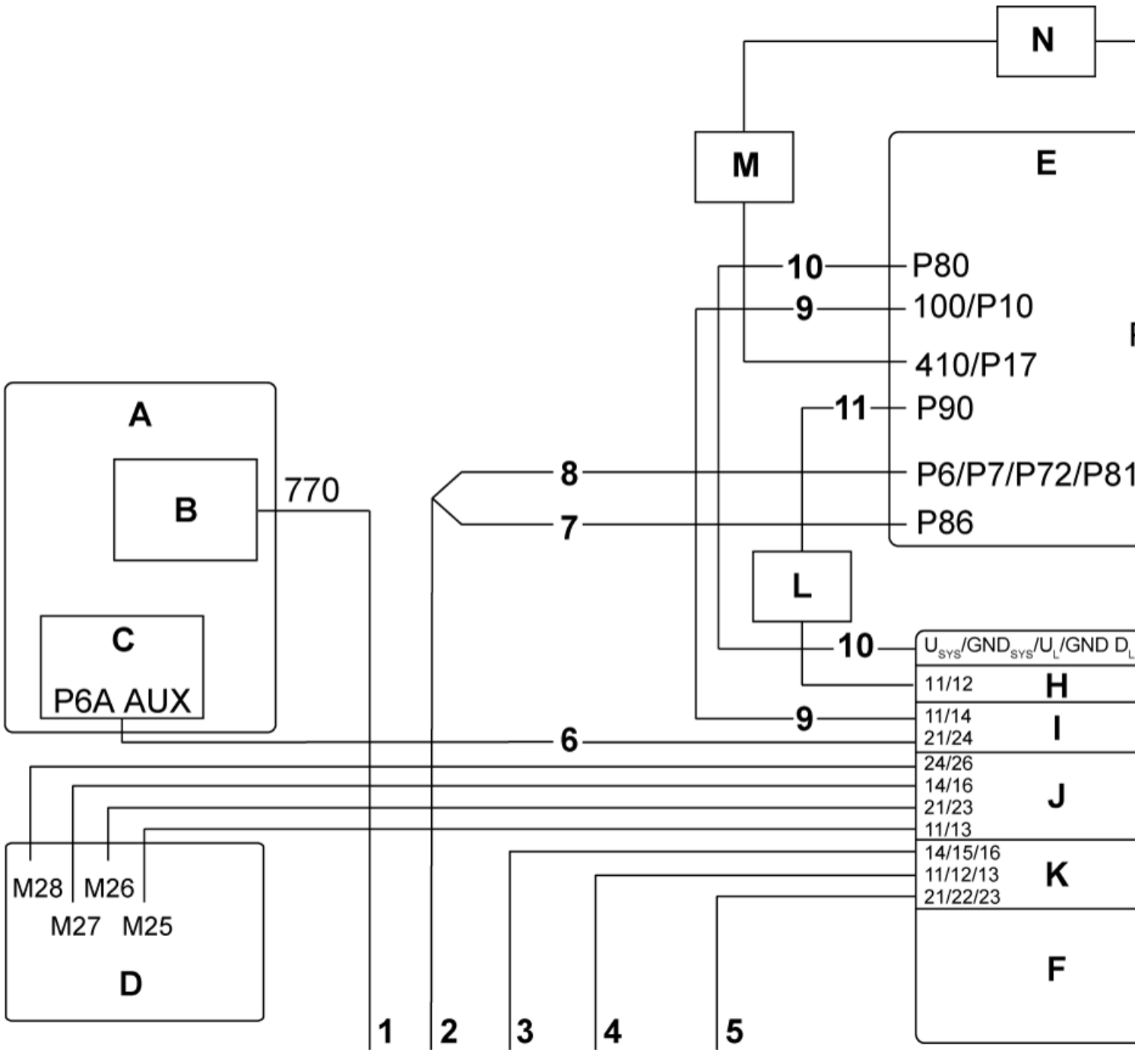
Pin 3 - Connect the brown wire to pin 3 of the connector **B**.

Electrical Connections

The RRI module is installed at the factory. The module is in the control cabinet of the CNC machine.

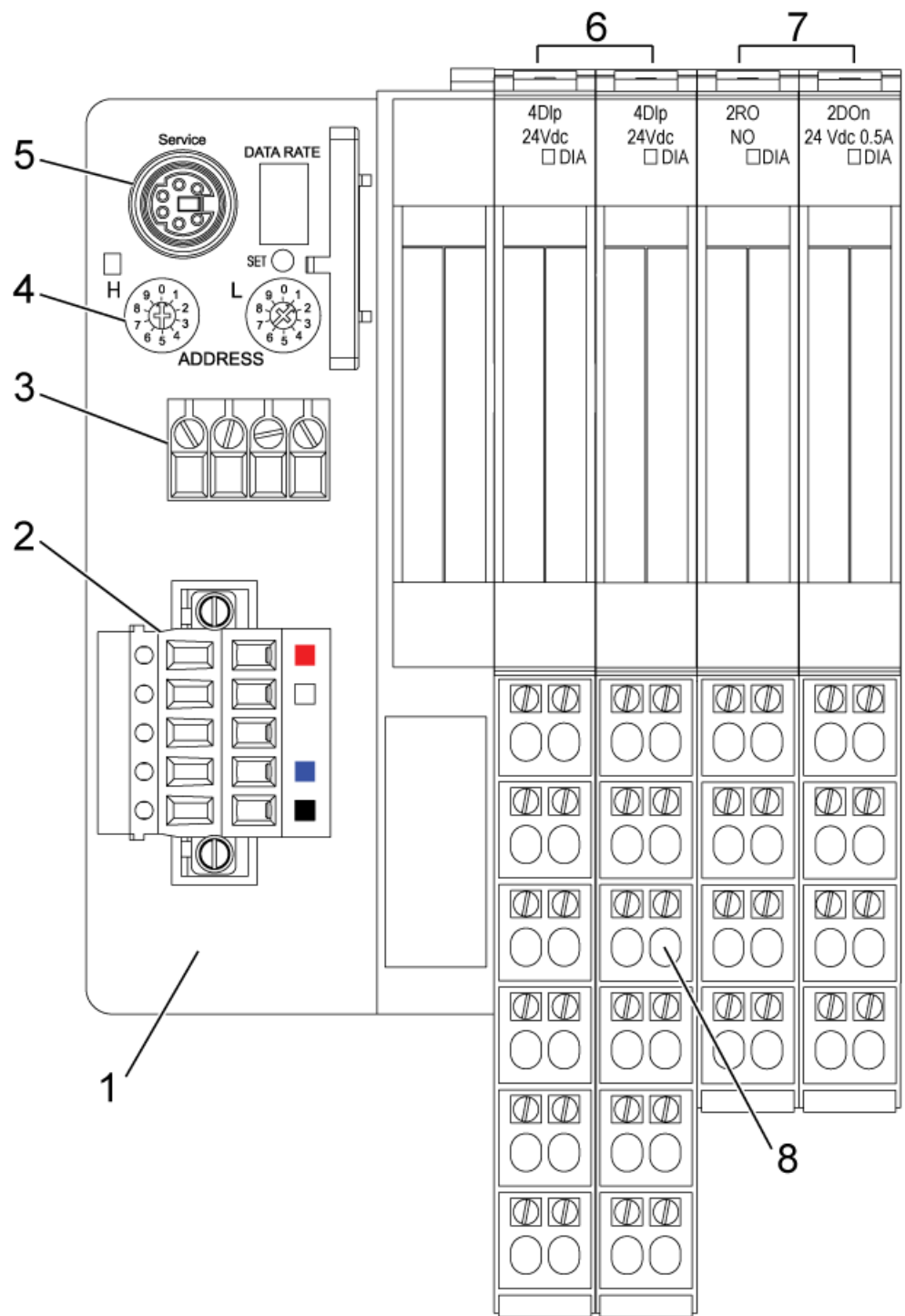
 **Danger:** The CNC machine control cabinet has lethal voltages when it is connected to shop power. Only certified service technicians should go into the control cabinet. Power off the CNC machine. Lockout/Tagout the main circuit breaker before unlocking and opening the cabinet door.

The illustration that follows shows the electrical connections necessary for correct RRI operation.



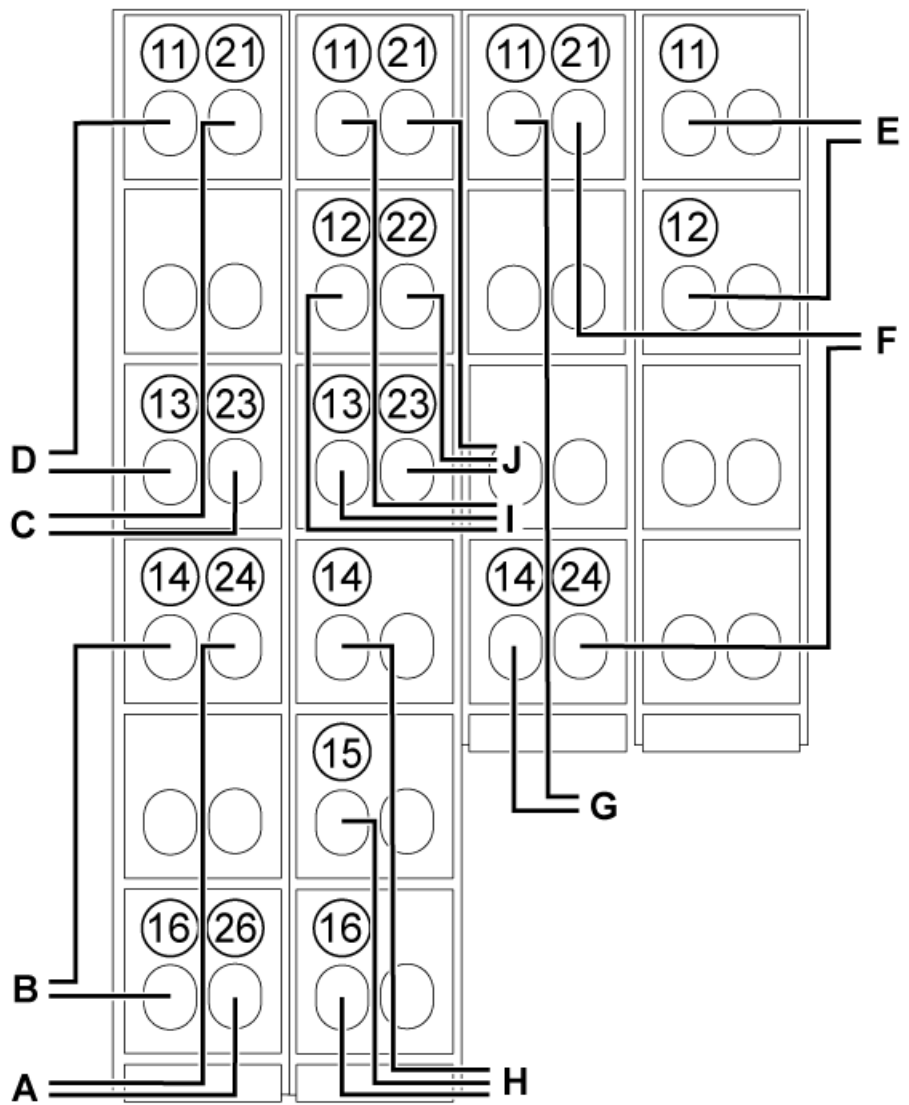
Modules	Signals
A - Operator Pendant	1 - To structure EMERGENCY STOP
B - [EMERGENCY STOP] Switch	2 - EMERGENCY STOP from structure
C - Serial Keyboard Interface (SKBIF)	3 - To "door open" switch, DOOR OPEN
D - 8M Relay PCB	4 - To "workholding closed" switch, CLAMPED
E - I/O PCB	5 - To "workholding open" switch, UNCLAMPED
F - DeviceNet Remote I/O Module	6 - [CYCLE START]
G - Terminal Connections	7 - SECONDARY EMERGENCY STOP
H - Slot 4	8 - EMERGENCY STOP
I - Slot 3	9 - M-FIN
J - Slot 1	10 - Primary Power
K - Slot 2	11 - CELL SAFE
L - Safe Signal Relay	12 - Workholding Clamp/Unclamp
M - HPU Pressure Switch	
N - Optional Hydraulic Pump (Mills Only)	
O - HPU Pump On/Off Solenoid	

The illustration that follows shows the BL20 DeviceNet™ I/O Station.




1. Gateway
2. DeviceNet™ Connector: Pin connections top to bottom: Red - V+ (24 VDC), White - CAN_H (high data signal), Clear - Shield, Blue - CAN_L (low data signal), Black - V- (Ground)
3. Power Connector: Connections left to right: U_{SYS} (24 VDC), GND_{SYS} (Ground), U_L (24 VDC), GND D_L (Ground)
4. Address Switches
5. Service Port
6. Inputs
7. Outputs
8. Terminals

The illustration that follows shows the BL20 DeviceNet™ I/O Station terminal connections.



Signals	
A - M28	F - [CYCLE START]
B - M27	G - M-FIN
C - M26	H - Door Open
D - M25	I - Unclamped
E - Cell Safe	J - Clamped

All cables are connected to the terminal block. You must install a DeviceNet™ cable from the robot to the BL20 DeviceNet™ I/O Station in the CNC machine control cabinet. Refer to the robot installation instructions.

 **Note:** If you need a network device other than DeviceNet™, purchase the correct gateway. Replace the installed gateway in the RRI I/O module. Remove the RRI I/O module from its DIN rail to install the new gateway. The new gateway must be made by the same manufacturer as the remaining RRI I/O module.

Reminder

It is the customer's responsibility to select a Robot Integrator to correctly connect the robot to the Haas equipment. The Haas Service and Applications personnel can help to make sure the CNC machine operates correctly. Haas personnel are not responsible for robot configuration or robot/machine interface.

