Building Connections That Last™

ASC Engineered Solutions

# Shop-Gruv™ Automated Roll Groover

## Installation, Operation, and Maintenance Manual




NAP
An ASC Engineered Solution

# Description

The **NAP Shop-Gruv** is an automated shop grooving machine designed to groove 1" to 20" pipe with wall thicknesses up to 3/8" by grooving on the bottom of the pipe. Shop-Gruv utilizes a servo-controlled electric actuator to perform the grooving process which equates to greater positional accuracy and repeatability than a standard hydraulic system. The actuator can be adjusted 0.001" increments for fine tuning.

Shop-Gruv holds three different roller sets (tools) at once, which gives the operator the ability to groove a larger range of pipe sizes without having to change out a tool. The pre-loaded tools can be replaced by tools with different pipe ranges if needed.

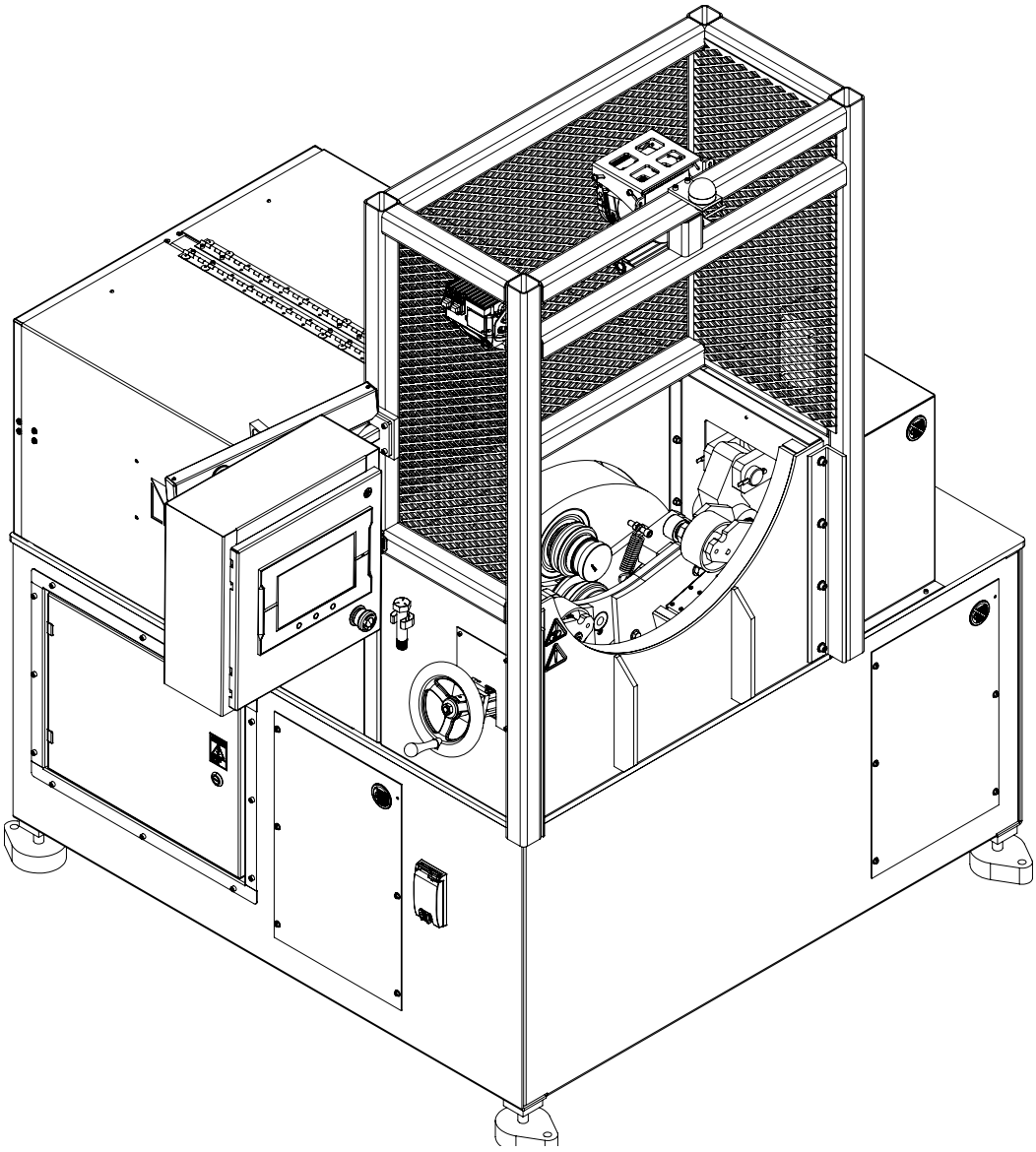
A touchscreen is used to select between tool sizes, perform the grooving process, and adjust the groove depth as well as other grooving parameters.

With the standard setup, the operator selects the desired pipe size to be grooved, and the pipe is grooved using a list of preset parameters that is specific to the selected pipe size.

## Caution

Read and understand all safety precautions contained in this manual before operating the machine. Failure to do so may result in personal injury.

**Note:** ASC Engineered Solutions continuously endeavors to improve our products; your equipment may not completely match the contents of this manual. This manual is accurate at the time of publication. ASC Engineered Solutions will not accept liability for any inaccuracies or omissions.



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# ISO Safety Symbols – Definitions



## CAUTION – GENERAL

NOT OPERATE MACHINE UNTIL INSTRUCTION MANUAL HAS BEEN READ.
USE FORKLIFT OR MANUAL LIFT TO MOVE MACHINE SECTIONS INTO PLACE DURING ASSEMBLY.
THERE IS A RISK OF PERSONAL INJURY IF ATTEMPTED TO LIFT OR MOVE BY HAND.
BE SURE MACHINE IS CONNECTED TO BUILDING SAFETY GROUND.
BE SURE TO DISCONNECT THE POWER BEFORE PERFORMING MACHINE MAINTENANCE.
DO NOT OPERATE MACHINE WITH GUARDS REMOVED.
DO NOT OPERATE MACHINE IN A MANNER FOR WHICH IT WAS NOT INTENDED.

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## CAUTION – ELECTRIAL

HIGH VOLTAGES PRESENT INSIDE THE CONTROL CABINET, WELDER POWER UNIT AND PLASMA POWER UNIT.
TO REDUCE THE RISK OF ELECTRICAL SHOCK, DO NOT ATTEMPT TO OPEN THESE ENCLOSURES.
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL ONLY..

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## CAUTION – MOVING PARTS

MOVING PARTS CONTAINED BEHIND GUARDS.
DO NOT TOUCH MOVING PARTS.
SEVERE PINCHING AND/OR DISMEMBERMENT MAY OCCUR.

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## CAUTION – EAR PROTECTION

DO NOT OPERATE MACHINE WITHOUT PROPER HEARING PROTECTION.
THE MEASURED NOISE LEVEL EXCEEDS THE 80 dB(A) THRESHOLD AT THE WELD HEAD.

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## CAUTION – GLOVES

GLOVES MUST BE WORN AT ALL TIMES WHILE OPERATING THIS MACHINE.
FAILURE TO WEAR GLOVES COULD RESULT IN PERSONAL INJURY.

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## CAUTION – DO NOT REMOVE GUARDS

MOVING PARTS CONTAINED BEHIND GUARDS.
DO NOT OPERATE MACHINE WITH GUARDS REMOVED.

---



## CAUTION – MANDATORY

THE MACHINE MUST BE LOCKED OUT BEFORE PROCEEDING.

# 1 Installation

## 1.1 Shop-Gruv Shipment Check List

- Shop-Gruv Machine
- Box #1
  - Roller Pin Removal Tool
  - Spare Tension Springs (3)

## 1.2 Shop-Gruv Shipment Check List

Power: 240 VAC 3-Phase, 33 Amp
Air: 100 psi (¼" NPT Female)

## 1.3 Installation Instructions

Upon receiving the machine, carefully uncrate and inspect for physical damage, caused during shipping. Remove the lag bolts that secure the machine to the pallet and move the machine with a forklift. The forks can go under the bottom frame members of the machine. Place the machine in the required location.

Please note that the machine should not be placed closer than 3ft (915mm) to any object that will interfere with the maintenance of the electrical panel. Anchoring of the machine to the floor is to be done in accordance with shop requirements.

Adjust the leveling feet to the required height and level the machine as follows. Loosen the ¾" hex nuts on the leveling stud and rotate the leveling stud to raise or lower the machine. Tighten the hex nuts when the machine is set. See Section 1.4 Installation Dimensions Section A-A for mounting hole locations.

Connect 100 psi shop air to the pneumatic connection, at the rear of the machine.

The following is to be done by qualified service personnel only. Connect 240 VAC 3 Phase power into the power control cabinet, located on the right side of the machine. The power cable should enter the disconnect box through the strain relief fitting on the back of the machine. Please note that any opening in the cabinet must not reduce the Ingress Protection rating of the box. Purchaser is to provide the power cord to connect from their power source to the machine.

## 1.4 Installation Instructions

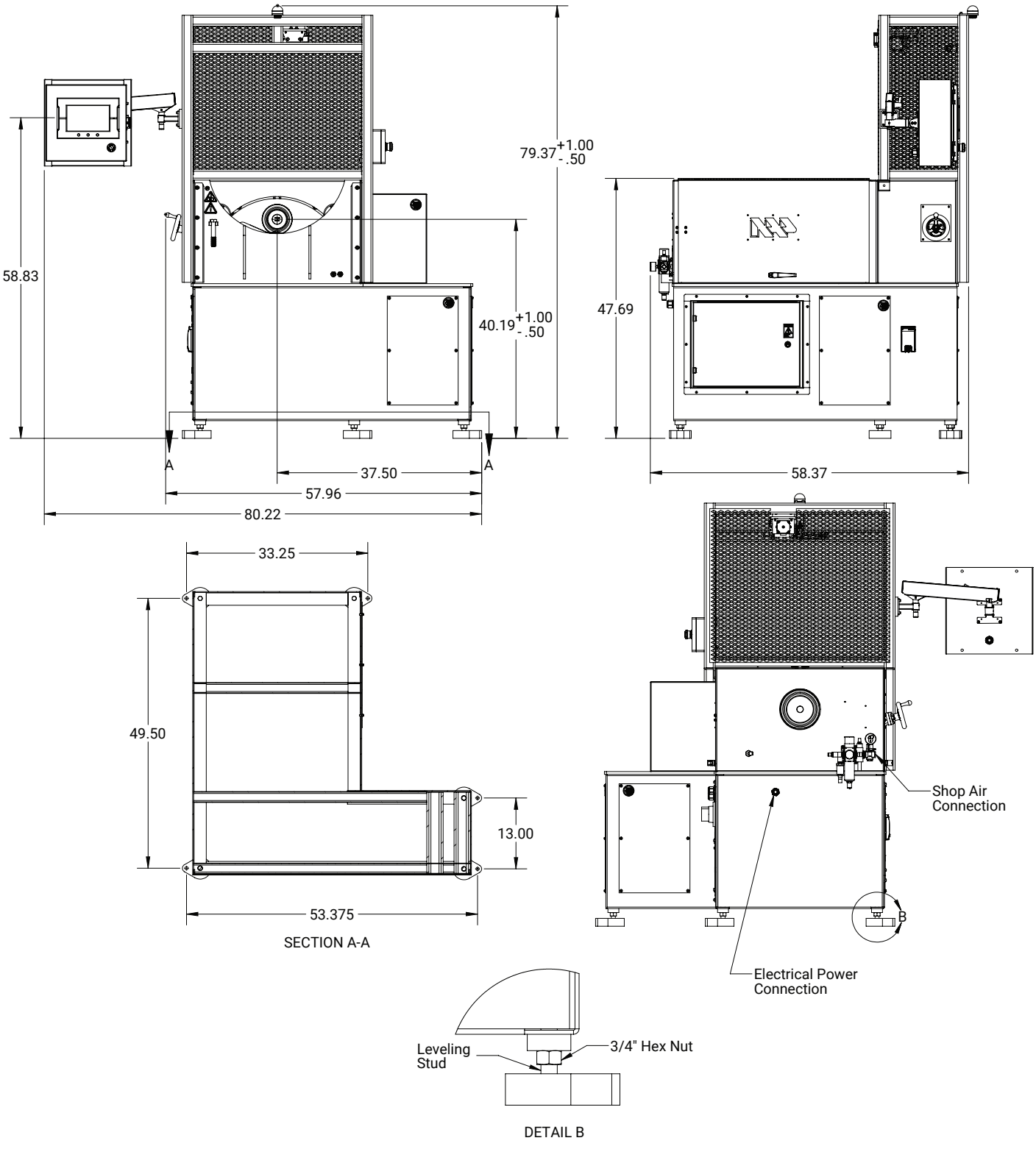
Anchor with (5) ⅜" bolts through holes in leveling feet. See Section A-A below for hole locations.

See diagram on page 6.

# 1 Installation

## 1.4 Installation Instructions

Anchor with (5) ⅜" bolts through holes in leveling feet. See Section A-A below for hole locations.



# 2 Safety

## 2.1 E-Stop Buttons

There are two E-Stop buttons located on the machine. These are red mushroom-shaped buttons with a yellow background. The first E-Stop button is located on the left side of the machine under the touchscreen. The second E-Stop button is located on the right side of the machine mounted on the safety tower. When either E-Stop button is pressed, all motion on the machine is stopped, the motor drives enter a safe state, and the air pressure is dumped from the machine. Before the machine can be reset, the E-Stop must be rotated counter-clockwise until the button is released.

## 2.2 Door Switches

There are two RFID door switches located on the inside of each rear door. When either door is opened, all motion on the machine is stopped, the motor drives enter a safe state, and the air pressure is dumped from the machine. Before the machine can be reset, both doors must be closed.

## 2.3 Indicator Light

A RYG light is located at the top of the safety tower and is used to indicate the state of the machine. The three states of the machine are as follows:

1. Green, slow blink – Machine is not in motion or in process of any kind.
2. Yellow, fast blink – Machine is in motion or in process.
3. Red, slow blink – Machine is in an error state.

## 2.4 Work Light

An LED work light is located at the top inside of the safety tower. The work light is operated by a toggle switch with three settings: High, Low, and Off. It is recommended that the work light be kept on the High setting for maximum visibility while operating the groover.

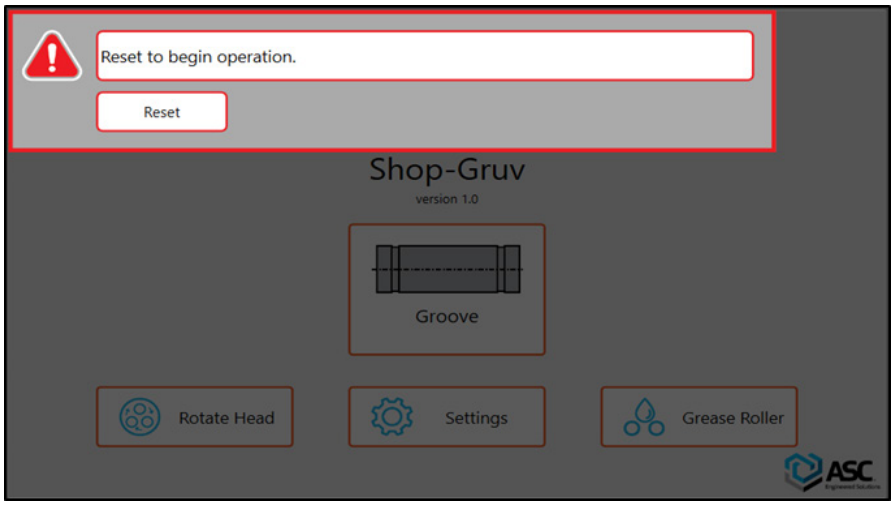
# 3 Operation

## 3.1 Start Procedure

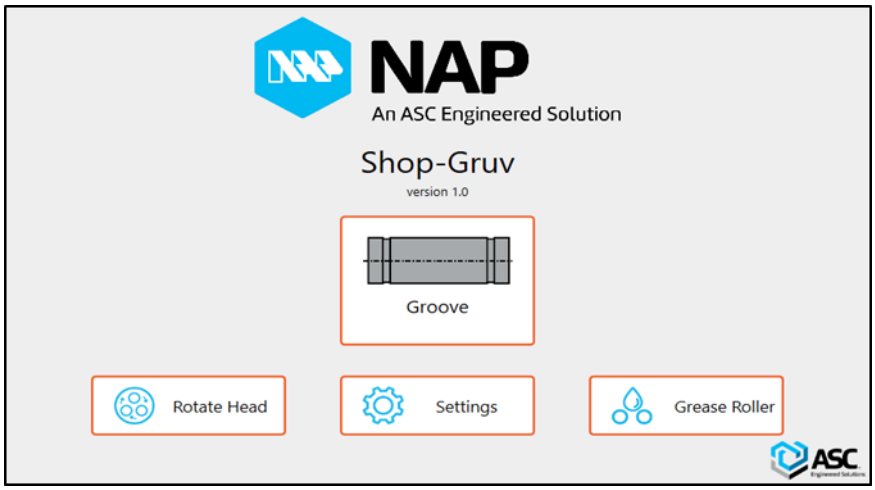
Turn the red air pressure relief valve 90° clockwise to enable the pneumatic supply to the machine. Turn the main power on with the Main Circuit Breaker on the right Power Control Cabinet and allow the system to boot up. The screen will show the Home screen indicating that the machine is ready.

There will be an error message displayed on the Home screen requesting the operator to “Reset to begin operation” and the indicator light will be blinking red. Press the Reset button to continue. The Ram will move to the home position. The indicator light will blink green when the machine is ready to groove.

### 3.1.1 Reset (Screen)




### 3.1.2 Home (Screen)▪



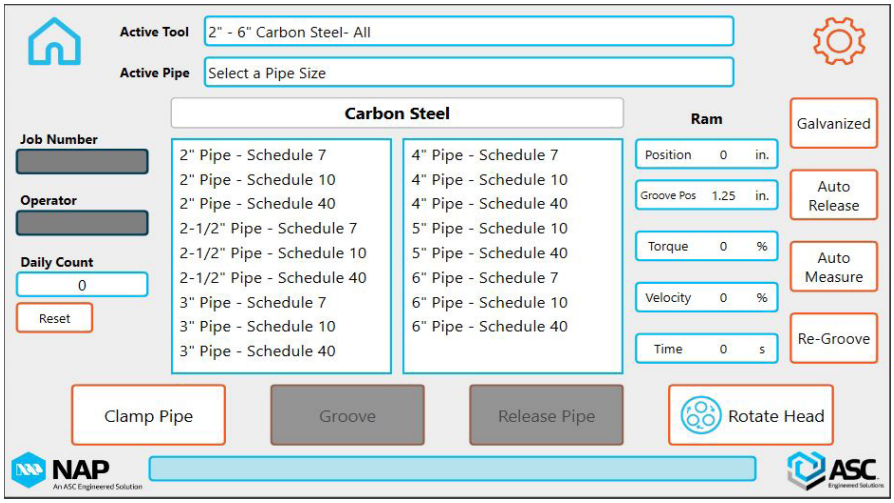

Buttons

- **Groove** Displays the Groove screen.
- **Rotate Head** Displays the Rotate Head popup screen.
- **Settings** Displays the Settings screen.
- **Grease Roller** Lowers the groove arm to allow access to the lower roller pin grease fitting.

# 3 Operation (continued)

## 3.2 Groove

### 3.2.1 Screen (Select Pipe)




Buttons

- **Clamp Pipe** Raises the lower groove roller and clamps the pipe. The pipe cannot be grooved until the pipe is clamped.
- **Groove** Initiates the Groove cycle. Once the pipe is clamped, the Groove button is enabled allowing the operator to groove the pipe.
- **Release Pipe** Releases the pipe when clamped. Once the pipe is clamped, the Release Pipe button is enabled allowing the operator to release the pipe and cancel the groove process. When the Groove cycle is in progress, the Release Pipe button is again disabled. Once the Groove cycle is complete, the Release Pipe button is enabled to allow the operator to release the pipe.
- **Rotate Head** Allows the operator to rotate to one of the other two tools in the machine.
- **Galvanized** Toggle button to change the pipe material from carbon steel pipe to galvanized pipe. The button turns orange when in the ON state. This is important when grooving galvanized pipe so that the appropriate pipe settings are used during the grooving process.
- **Auto Release** The Auto Release function bypasses the need to press the Release Pipe button when the groove is complete. The pipe will be released automatically.
- **Auto Measure** Displays the Auto Measure screen.
- **Re-Groove** Displays the Re-Groove popup screen. Allows the operator to adjust the groove depth.

# 3 Operation (continued)

## 3.2 Groove

### 3.2.2 Operation (Select Pipe)

**1.** Select the appropriate pipe size from the list of pipe sizes displayed on the touchscreen. The list displayed on the touchscreen will only show pipe sizes that are associated with the Active Tool (the Active Tool is the tool that is located in the grooving position.) The lower roller will move to a position specific to the selected pipe size to allow enough room for the pipe wall to fit between the upper and lower roller.

**2.** Raise the pipe so that the bottom inside surface of the pipe is roughly level with the bottom surface of the upper groove roller. Ensure that the guide wheels are wide enough so that the pipe can slide into the machine. Use the hand wheel on the left side of the machine if adjustment is needed.

**3.** Insert the pipe into the machine. The bottom of the pipe should be inserted between the upper and lower groove roller so that the end face of the pipe contacts the back flange on the upper roller. See Figure 3.2A for proper pipe placement. Do not slam the pipe into the machine or roller.

**4.** With pipe held against the flange of the upper roller, press the Clamp Pipe button on the touchscreen. The lower roller will move up and clamp the pipe. Once the pipe is clamped, the Groove button will light up indicating that the pipe is ready to groove. The pipe should be level after clamping.

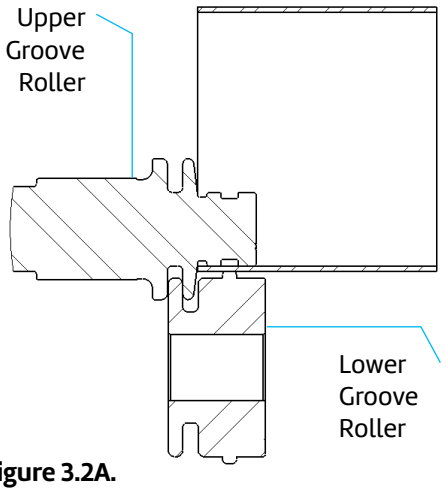



**Figure 3.2A.**
Correct location of pipe between groove rollers.

**5.** Before grooving, tighten the guide wheels against the pipe using the hand wheel on the left side of the machine. The guide wheels should be tight enough against the pipe so that there is no play in either wheel.

**6.** Remove both hands from the pipe and press the Groove button on the touchscreen. The machine will begin grooving the pipe. When complete, the pipe will stop rotating and the Release Pipe button will light up indicating that the pipe is ready to be released.

**7.** Press the Release Pipe button to unclamp the pipe. If the Auto Release function is turned on (solid orange) the machine will automatically release the pipe after the pipe stops rotating.

**8.** Loosen the guide wheels, remove the pipe from the machine, and check the groove. If the groove diameter is within spec, repeat steps 2-8 for pipes of the same size and schedule. If a new pipe size or schedule is to be grooved, repeat steps 1-8 for the new pipe size. If the groove diameter is out of spec, see Section 3.3 Regroove to adjust the groove depth and/or re-groove the pipe. If the pipe to be grooved does not fall within the acceptable pipe range of the Active Tool, see Section 3.4 Rotate Head to rotate to a different tool size or Section 3.6 Tool Change to change one of the resident tools to a different tool size

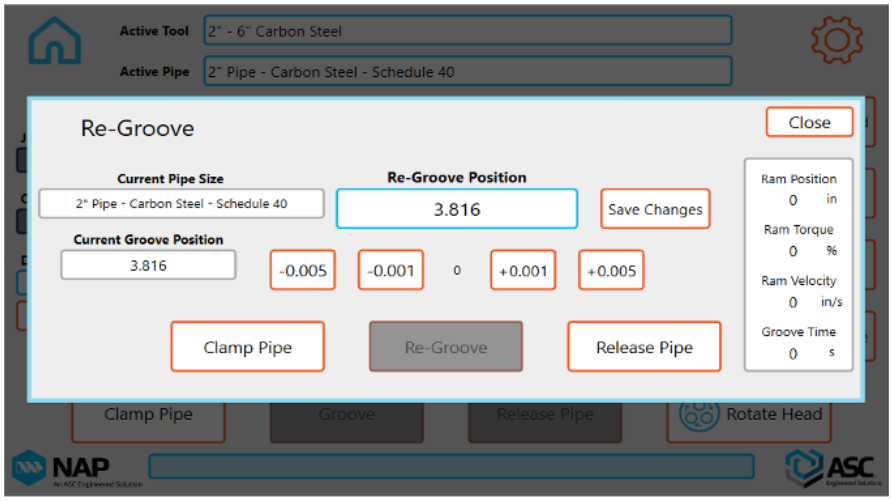
# 3 Operation (continued)

## 3.3 Re-Groove (Adjust Groove Depth)

The Re-Groove function is used to adjust the groove depth setting for the current pipe size and/or re-groove the pipe if the groove is too shallow. The Re-Groove Position and Current Groove Position refer to the linear position of the ram (linear actuator) along its axis and not the actual groove depth. Adjustments made to the Re-Groove Position do NOT equate to the same change in the groove depth. For example, adding 0.005" to the Re-Groove Position will not add 0.005" to the groove depth. It is important to note that changes made to the Current Groove Position only affect the Groove Position setting for the pipe size shown in the Current Pipe Size box. All other pipe sizes will not be affected.

For reference only, the operator can assume a roughly 2:1 ratio between the change in Re-Groove position to the change in actual groove depth. It is important to note that this ratio is largely a function of roller size, pipe size, material, groove force, and groove speed and should not be considered exact for all pipe size and roller combinations.

### 3.2.1 Screen




Buttons

- **Clamp Pipe** Raises the lower groove roller and clamps the pipe. The pipe cannot be re-grooved until the pipe is clamped.
- **Re-Groove** Initiates the Groove cycle. Once the machine has clamped the pipe, the Re-Groove button is enabled allowing the operator to re-groove the pipe.
- **Release Pipe** Releases the pipe when clamped. Once the machine has clamped the pipe, the Release Pipe button is enabled allowing the operator to release the pipe and cancel the groove process. When the Re-Groove cycle is in progress, the Release Pipe button is again disabled. Once the Re-Groove cycle is complete, the Release Pipe button is enabled to allow the operator to release the pipe.

# 3 Operation (continued)

## 3.3 Re-Groove (Adjust Groove Depth)

### 3.2.1 Screen Continued

Button

- **–0.005 – Subtracts 0.005"** from the Re-Groove position.
- **–0.001 – Subtracts 0.001"** from the Re-Groove position.
- **+0.001 – Adds 0.001"** to the Re-Groove position.
- **+0.005 – Adds 0.005"** to the Re-Groove position.
- **Save Changes** Saves the Re-Groove position value to the Groove Position value for the pipe size indicated in the Current Pipe Size display box.
- **Close** Exits the Re-Groove popup screen.

### 3.2.1 Adjust Groove Depth

Button

- **–0.005 – Subtracts 0.005"** from the Re-Groove position.
- **–0.001 – Subtracts 0.001"** from the Re-Groove position.
- **+0.001 – Adds 0.001"** to the Re-Groove position.
- **+0.005 – Adds 0.005"** to the Re-Groove position.
- **Save Changes** Saves the Re-Groove position value to the Groove Position value for the pipe size indicated in the Current Pipe Size display box.
- **Close** Exits the Re-Groove popup screen.

# 3 Operation (continued)

## 3.3 Re-Groove (Adjust Groove Depth)

### 3.3.1 Operations

**Adjust Groove Depth**

**1.** Upon opening the Re-Groove screen, the Current Pipe Size and Current Groove Position will be displayed on the left side of the screen in the gray display boxes. The Re-Groove position will initially match that of the Current Groove Position.

**2**. To adjust the groove depth, use the -0.005, -0.001, +0.001, and +0.005 buttons to add or subtract from the Re-Groove Position.

**3.** Once changes are made, the operator must press the Save Changes button in order to save the Re-Groove Position value to the Current Groove Position value before closing the Re-Groove screen. Otherwise, the Current Groove Position will remain the same and the changes will be lost. After saving, the current groove position will be updated to the new value.

**Re-Groove**

1. Use the -0.005, -0.001, +0.001, and +0.005 buttons to add or subtract from the Re-Groove Position.

2. Once changes are made, press the Clamp Pipe button to clamp the pipe.

3. Once clamped, tighten the guide wheel against the pipe. The pipe should be level.

4. Press the Re-Groove button to groove the pipe using the Re-Groove Position value. When the Re-Groove Position is reached, the pipe will stop rotating, and the operator can release the pipe with the Release Pipe button.

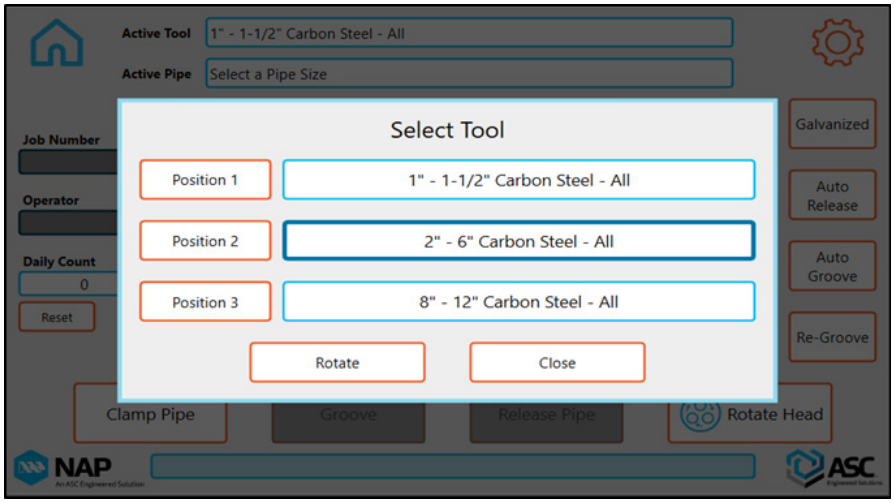
5. Loosen the guide wheels, remove the pipe, and check the groove diameter. If the groove diameter is within specification, press Save Changes to save the Re-Groove Position value to the Current Groove Position value. If not in spec, repeat steps 1-5 until the desired groove diameter is reached.

# 3 Operation (continued)

### 3.4 Rotate Head

Shop-Gruv comes with three pre-installed groove rollers, each capable of grooving a different range of pipe diameter/schedule/material combinations. See Section 5. Tool and Pipe Combinations. Each groove roller is installed in one of the three positions located in the circular spindle head. The Rotate Head function is used to rotate the spindle head to a different position so that the operator can utilize one of the other two roller sets installed in the machine without the need to physically replace a roller set each time a different roller size is needed.

#### 3.4.1 Screen




Buttons

- **Position 1** Sets Position 1 as the target position for rotation.
- **Position 2** Sets Position 2 as the target position for rotation.
- **Position 3** Sets Position 3 as the target position for rotation.
- **Change** Position Initiates the Head Rotation process.
- **Close** Exits the Rotate Head screen.

#### 3.4.2 Operation

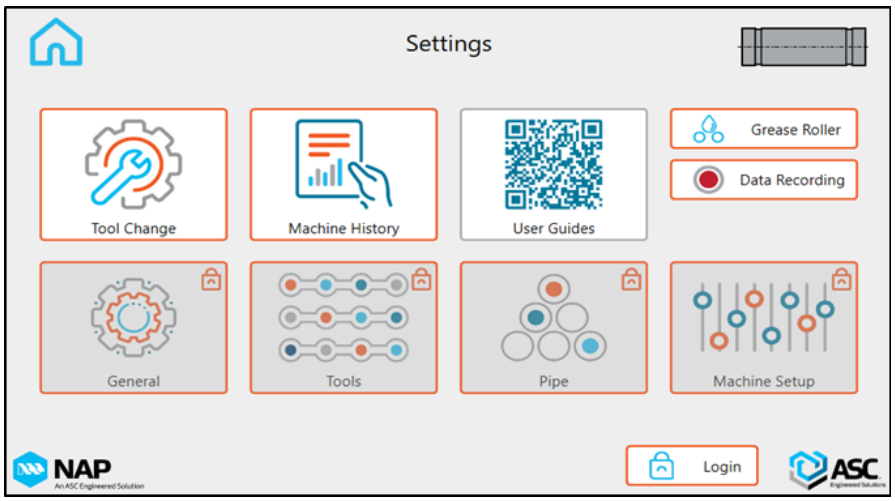
**1.** When the pipe to be grooved does not fall within the applicable pipe range of the Active Tool, press the Rotate Head button. A screen will pop up showing the three tool sizes that are installed in the machine. The Active Tool will be identified by a dark blue border.

**2.** Select the Position button that corresponds to the desired tool size. The button will turn orange to identify the selected position. If the required tool size is not displayed in one of the three positions, a Tool Change is required. See Section 4.1 Tool Change.

**3.** Once a position is selected, press the Rotate button. The spindle head will rotate to the selected position. All buttons will turn gray and be disabled.

**4.** When the rotation is complete, the buttons will light up indicating that they are enabled. The operator can either close the screen and continue grooving or repeat steps 2-4 to rotate to another position.

# 4 Settings




Icons

- **House** (Top Left) Returns the operator to the Home Screen.
- **Grooved Pipe** (Top Right) Returns the operator to the Groove screen.

Buttons

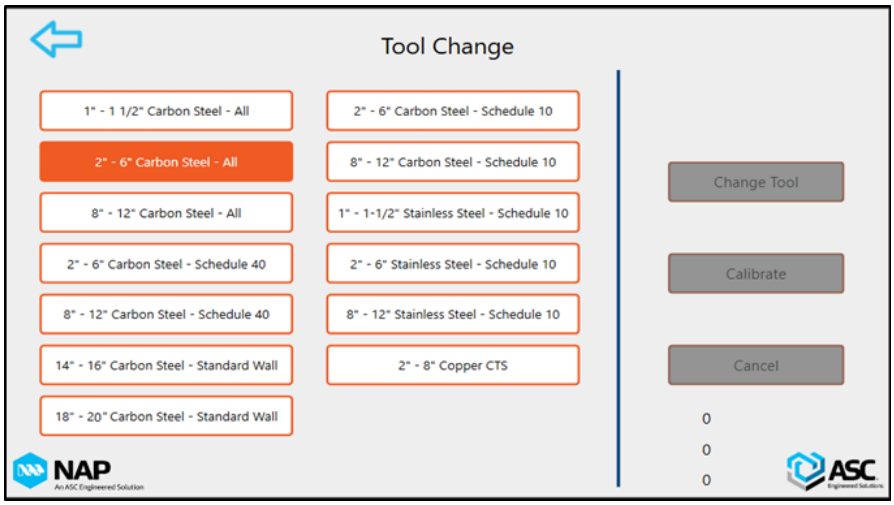
- **Tool Change** Displays the Tool Change screen. See Section 4.1 Tool Change.
- **Machine History** – Displays the Machine History screen. See Section 4.2 Machine History.
- **Grease Roller** Lowers the groove arm to allow access to the lower roller grease fitting. *See Section 6. Recommended Maintenance.*
- **Data Recording** Enables the Data Recording function. See Section 4.3 Data Recording.
- **General** Displays the General Settings screen. Password Protected.
- **Tool Settings** Displays the Tool Settings screen. Password Protected.
- **Pipe Settings** Displays the Pipe Settings screen. Password Protected.
- **Machine Setup** Displays the Machine Setup screen. Password Protected.
- **Login** Displays the Login popup to allow input of Username and Password. See Section 4.4 Security.

# 4 Settings

## 4.1 Tool Change

The Tool Change screen is used when the operator needs to replace one of the resident tool sizes with another tool of a different size. The Active Tool is the only tool that can be changed during this process, so it is necessary to use the Rotate Head process to rotate to the desired position for replacement before beginning the tool change process outlined in this section.

### 4.1.1 Screen




Buttons (refer to the previous section for all other button and icon descriptions)

- **Tool Buttons** The buttons on the left show the different tool sizes that are available. These buttons are used to identify the new tool that the operator will change to.
- **Change Tool** Initiates the Change Tool process.
- **Calibrate** Initiates the Calibration process.
- **Cancel** Cancels the Change Tool process.

# 4 Settings (continued)

### 4.1.2 Operation

Upon opening the Tool Change screen, the button representing the tool size that is currently installed in the Active position will be highlighted in orange. The Change Tool, Calibrate, and Cancel buttons on the right will be disabled until a new tool size is selected from the list.

**1.** To begin the Tool Change process, select the new tool size that needs to be installed in the machine. The Change Tool button will be enabled when a new tool size is selected.

**2**. Press Change Tool. The ram and groove arm will drop out of the way to allow for the tool change. When the ram stops, a message will appear on the screen indicating that it is safe to change out the tool.

**3**. For redundancy, press the red ESTOP button under the touchscreen to disable the motor drives.

**4**. Open the motor cover door on the left side of the machine by rotating the lock handle counterclockwise and gently lifting the door up until the weight is fully supported by the support chain.

**5**. Using a 3⁄16" hex key (Allen wrench), remove the shaft collar that is securing the upper roller shaft to the spindle head assembly. *See Figure 4.1A*.

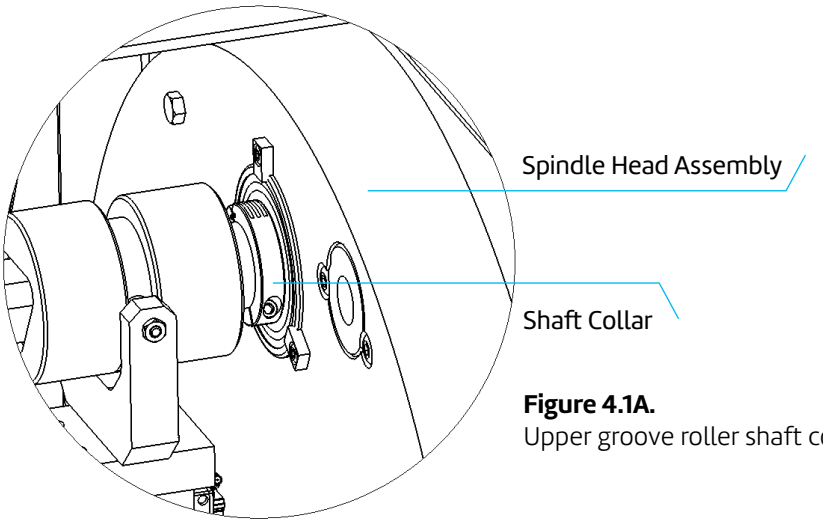



**Figure 4.1A.**
Upper groove roller shaft collar location.

**6**. Move to the front of the machine and remove the upper roller shaft.

**7**. Locate the retention screw positioned directly under the lower groove roller shaft. A flat edge is machined into the screw head. Using a 1⁄8" hex key, rotate the screw counterclockwise (roughly an 1⁄8 – 1⁄4 turn) so that the flat edge faces the 12 o'clock position. This will allow removal of the lower groove roller pin.

See Figure 4.1B.

# 4 Settings (continued)

### 4.1.2 Operation

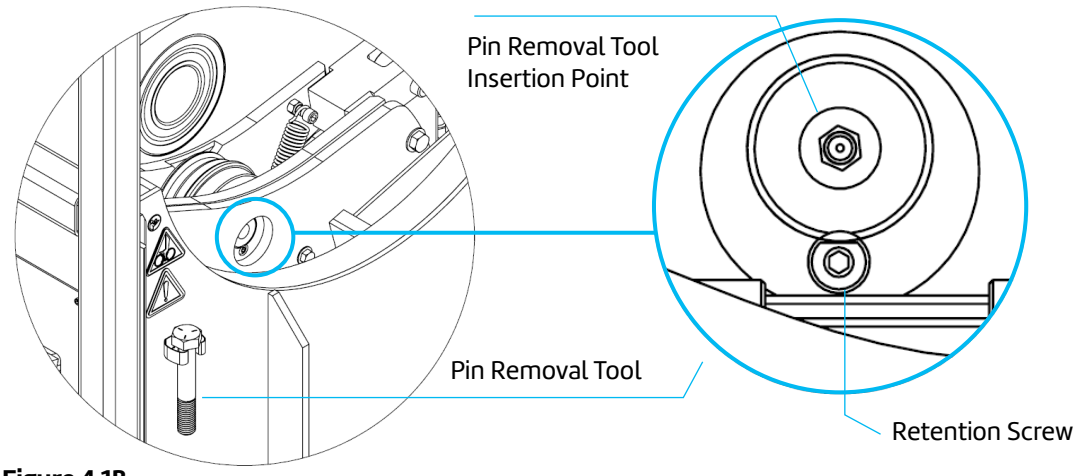



**Figure 4.1B.**
Retention screw location and orientation for lower groove roller pin removal.

**9.** Locate the pin removal tool on the front of the machine. Screw the pin removal tool into the lower groove roller pin until seated. While holding the lower groove roller with one hand, remove the pin by pulling outward. Lift up and remove the lower roller from the groove arm.

**10**. Ensure that both the new lower roller bushings and roller pin are clean and free of debris. Use a rag to wipe down both surfaces if needed.

**11.** Position the new lower roller between the groove arm plates and align the center hole with the holes in the groove arm. The flange on the roller should be toward the back of the machine and should align with the flanges in the upper roller shaft when installed.

**12**. Insert the pin into the groove arm and roller with the notch facing the 6 o'clock position. Push until the shoulder of the pin seats against the back of the groove arm. The front of the groove arm plate and pin should be flush, and the notch should be aligned with the retention screw. Using a 1/8" hex key, rotate the retention screw clockwise until finger tight. Make sure that the pin is retained by the screw head. Do not overtighten.

**13**. Insert the new upper roller shaft into spindle head assembly until the shaft fully seats against the bearing. Move to the open motor compartment and fix the shaft collar onto the roller shaft using a 3⁄16" kex key. Tighten the hex screw until snug and then loosen an 1⁄8 – 1⁄4 turn so that the collar can freely rotate around the shaft. It is important for the collar to freely rotate so that the operator can gain access to the hex head next time a tool change is performed. Close the door.

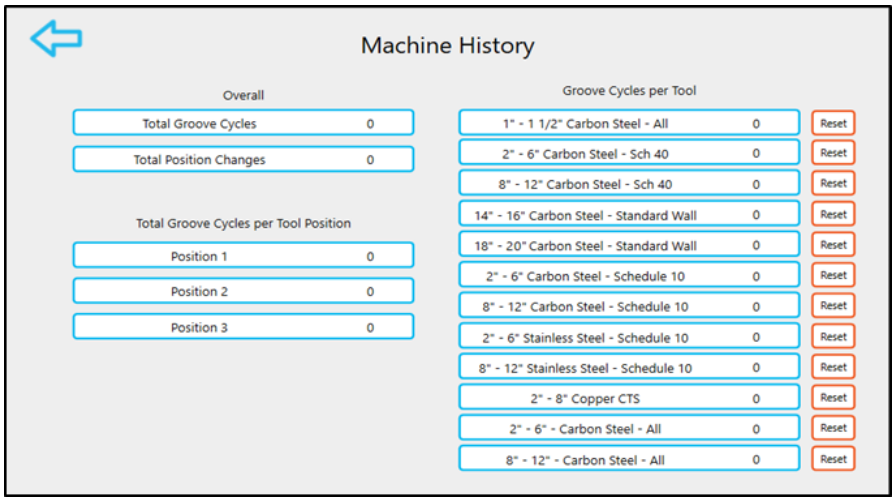
**14**. Move to the front of the machine and release the ESTOP. On the touchscreen, press the Reset button in the top right corner, then press Calibrate. The lower groove roller will be raised until it contacts the upper groove shaft. When complete, the lower roller will move to its home position for grooving.

**15**. Press the Back arrow to navigate back to Settings.

# 4 Settings (continued)

## 4.2 Machine History

The Machine History screen is used to track the total number of cycles the machine has performed throughout its life. This information will primarily be used by the manufacturer to track bearing and tool life as well as the overall machine life. When a tool set is replaced due to wear, a Reset button is available for that tool size so the count can be reset when the tool is replaced.




## 4.3 Data Recording

The Data Recording function allows the operator to record the data of all grooves to an SD card that is inserted into the PLC. An SD card must be inserted into the SD slot of the PLC for this function to operate properly. When the Data Recording function is on, the PLC will create a .csv file associated with the current Job Number that is displayed on the Groove screen. The name of the file will be whatever is entered into the Job Number field. If the Job Number is changed, a new file will be created with the new Job Number as the file name. The information that will be recorded is as follows:

| Job Number | Operator | Tool Size | Groove Type | Pipe Size | Ram Groove Position | Groove Trime |
|---|---|---|---|---|---|---|

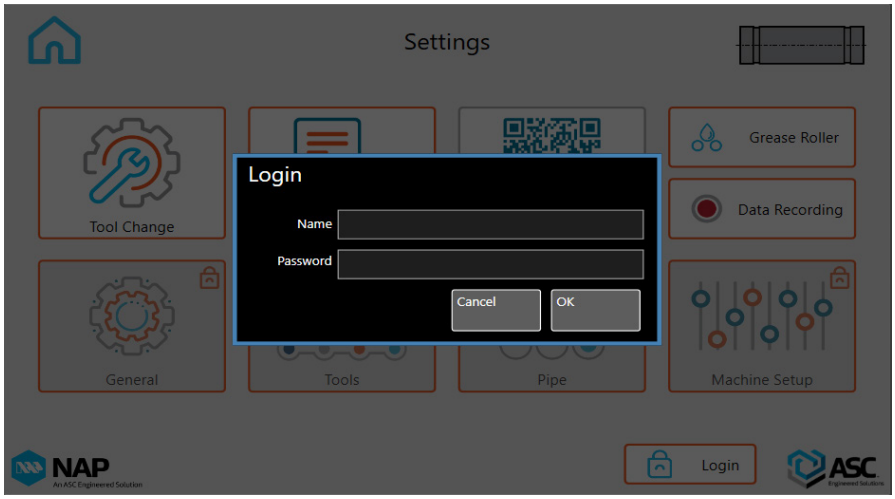
Categories

- **Job Number** – Name of file. Change by selecting the Job Number field on the Groove screen.
- **Operator** Name/number of the operator that is using the machine. Change by selecting the Operator field on the Groove screen.
- **Tool Size** Tool size that was used to create the groove.
- **Groove Type** Groove or Regroove
- **Pipe Size** Pipe size that was grooved.
- **Ram Groove Position** Current Ram Groove Position setting for the groove or regroove.
- **Groove Time** Time from when the Groove button is pressed to when the groove cycle is complete.

# 4 Settings (continued)

### 4.4 Security

On the Settings screen, buttons that are grayed out with an orange lock icon in the top right corner are password protected. These buttons are used to access screens that are primarily used by NAP during machine setup and testing. Pressing the Login button will display a popup screen that will request input of a username and password. Contact NAP if there is a need to gain access to one of these screens.



# 5 Tool and Pipe Combinations

| Nominal Size | Nominal Size Pipe | Wall | Material |
|---|---|---|---|
| 1" – 1-½" Carbon Steel – All<br>Roller Shaft: GMT-001<br>Outside Roller: GMT-005 | 1" – 1½" | Schedule 7 | Carbon Steel |
| | | | Galvanized |
| | | Schedule 10 | Carbon Steel |
| | | | Galvanized |
| | | | Stainless Steel |
| | | Schedule 40 | Carbon Steel |
| | | | Galvanized |
| 1¼" – 1-½" Carbon Steel – All<br>Roller Shaft: GMT-011<br>Outside Roller: GMT-005 | 1" – 1½" | Schedule 7 | Carbon Steel |
| | | | Galvanized |
| | | Schedule 10 | Carbon Steel |
| | | | Galvanized |
| | | Schedule 40 | Carbon Steel |
| | | | Galvanized |
| 2" – 6" Carbon Steel – All<br>Roller Shaft: GL11114<br>Outside Roller: GMT-008 | 2" – 6" | Schedule 7 | Carbon Steel |
| | | | Galvanized |
| | | Schedule 10 | Carbon Steel |
| | | | Galvanized |
| | | Schedule 40 | Carbon Steel |
| | | | Galvanized |
| 8" – 12" Carbon Steel – All<br>Roller Shaft: GL11119<br>Outside Roller: GMT-010 | 8" – 10" | Schedule 10 | Carbon Steel |
| | | Schedule 40 | Galvanized |
| | 12" | Standard Wall | Carbon Steel |
| | | | Galvanized |
| 2" – 6" Carbon Steel – Schedule 40<br>Roller Shaft: GL11114<br>Outside Roller: GL11110 | 2" – 6" | Schedule 40 | Carbon Steel |
| | | | Galvanized |
| 8" – 12" Carbon Steel – Schedule 40<br>Roller Shaft: GL11119<br>Outside Roller: GL11117 | 8" – 12" | Schedule 40 | Carbon Steel |
| | | | Galvanized |
| 14" – 16" Carbon Steel – Standard<br>Roller Shaft: GL11337<br>Outside Roller: GL11335 | 14" – 16" | Standard Wall | Carbon Steel |
| 18" – 20" Carbon Steel – Standard<br>Roller Shaft: GMT-003<br>Outside Roller: GMT-006 | 18" – 20" | Standard Wall | Carbon Steel |
| 2" – 6" Carbon Steel – Schedule 10<br>Roller Shaft: GL11530<br>Outside Roller: GL11527 | 2" – 6" | Schedule 10 | Carbon Steel |
| | | | Galvanized |
| | | | Stainless Steel |
| 8" – 12" Carbon Steel – Schedule 10<br>Roller Shaft: GL11540<br>Outside Roller: GL11539 | 8" – 12" | Schedule 10 | Carbon Steel |
| | | | Galvanized |
| | | | Stainless Steel |
| 2" – 8" Copper CTS – Standard<br>Roller Shaft: GL13801<br>Outside Roller: GL13799 | 2" – 8" | Type L | Copper |

# 6. Recommended Maintenance

## 6.1 Lubrication

It is important to apply grease regularly to all grease points on the machine at the recommended intervals to maintain proper function of the machine and prevent damage. Unless otherwise specified, grease should be applied with a grease gun. The following subsections outline the schedule and location of all lubrication points on the machine. Failure to adhere the following requirements will result in component failure and machine downtime.

Recommended Grease: Molykote G-0051 FM White EP Bearing Grease (McMaster-Carr #1208K33)

### 6.1.1 Schedule

The recommended lubrication schedule is outlined in Table 6.1.

Table 6.1 Lubrication Schedule

| Location | Reference Section | Type of Bearing | Interval |
|---|---|---|---|
| Lower Roller Pin | 6.1.2<br>Figure 6.1A | Garlock DU PTFE Coated Bushing & 1144 TGP Shaft | Daily / When Directed (See Section 6.1.2) |
| Guide Wheel Assembly | 6.1.3<br>Figure 6.1C | 4" Dia. Steel Wheels Needle Bearings | Weekly |
| Yoke Assembly | 6.1.4<br>Figure 6.1D | 1¾" Dia. Radial Ball Bearing Pillow Block | Quarterly |
| Yoke Assembly | 6.1.4<br>Figure 6.1D | Rotation Slide Shaft & Sliding Rotation Coupling | Daily, by hand |
| Yoke Assembly | 6.1.4<br>Figure 6.1D | Slide Carriage Bearing Unit | Monthly |
| Spindle Lock Assembly | 6.1.5<br>Figure 6.1E | Lock Rod 1144 TGP Shaft | Bi-Weekly |

## 6. Recommended Maintenance (continued)

### 6.1.2 Lower Roller Pin

The lower roller pin is the most critical lubrication point on the machine. It is important to keep this pin lubricated throughout daily use to help prevent damage to the pin and bushings inside the lower groove roller. When grease is required, navigate to the Home screen or Settings screen, and press the Grease Roller button. The ram will drop down until the groove arm rests against the support pin. The roller pin will align with the hole in the front plate. Insert the tip of the grease gun into the lubrication access hole in the roller pin (See Figure 6.1A) until the grease gun is securely connected to the grease fitting. Pumping 3–4 times will be enough to lubricate the pin and roller. Remove the grease gun and press the Grease Roller button again to raise the groove arm back up to the home position and continue operation. Lubrication intervals for the lower roller pin are listed below.

**1.** Daily – Grease the roller pin every morning on machine startup.

**2**. When Directed – After a set number of groove cycles, the machine will notify the operator to grease the lower roller. Press the Acknowledge button on the screen and immediately grease the roller before continuing.

**3.** Head Rotation and Tool Change – Immediately after a head rotation or tool change, grease the roller before grooving.

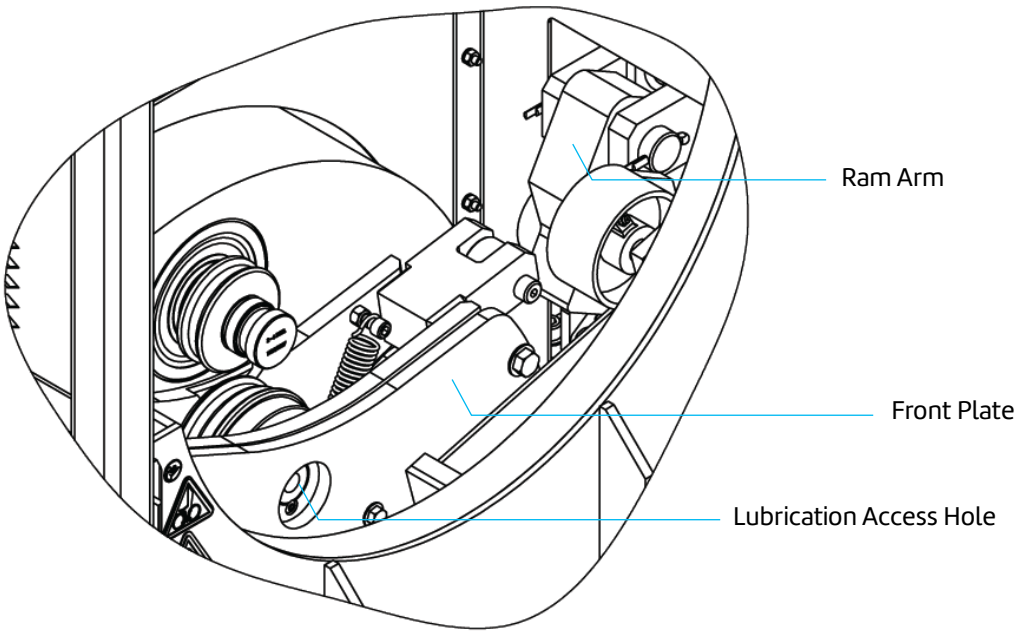



**Figure 6.1A.**
Lubrication access hole in lower roller pin.

## 6. Recommended Maintenance (continued)

### 6.1.3 Guide Wheels

### 6.1.4 Yoke Assembly

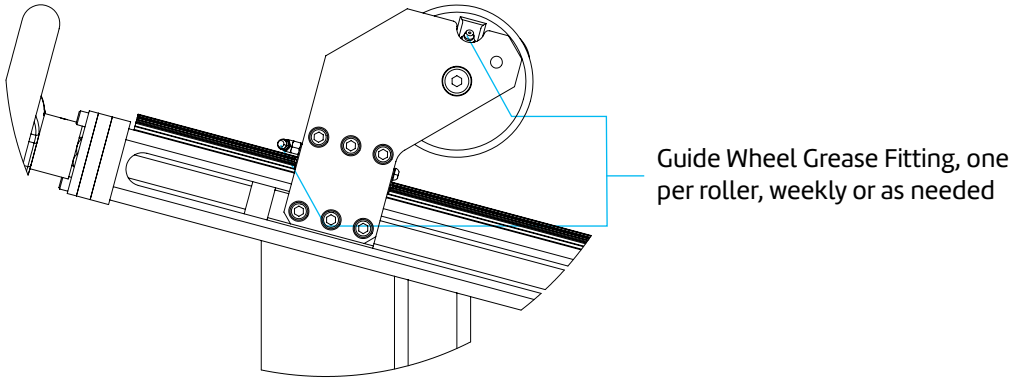



**Figure 6.1C.**
Guide wheel grease fitting location

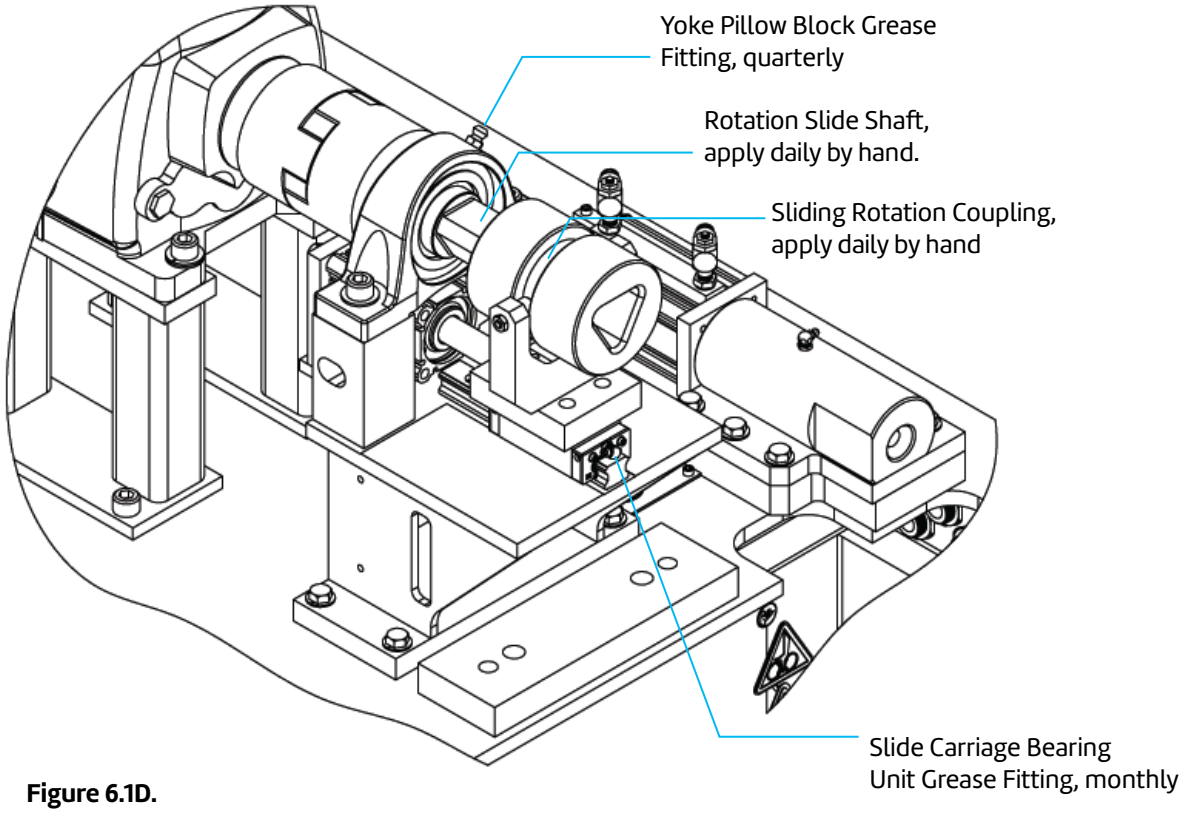



**Figure 6.1D.**
Yoke Assembly grease fitting locations.

# 6. Recommended Maintenance (continued)

### 6.1.5 Lock Assembly

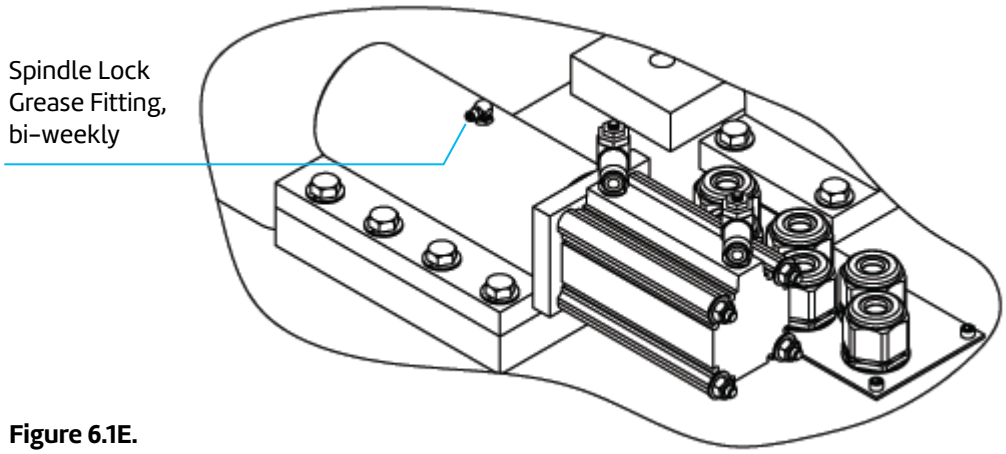



**Figure 6.1E.**
Lock Assembly grease fitting location.

## 6.2 Switches and Sensors

It is recommended to periodically wipe down all proximity switches and the measurement sensor to remove any debris that may cause the switch or sensor to not function properly.

## 6.3 Groove Arm Tension Springs

To increase the life of the tension springs on the groove arms, it is recommended to lower the groove arm before turning off power to the machine. Before shutting off power to the machine, navigate to the Home Screen or Settings screen and press the Grease Roller button. This will drop the groove arm down and remove tension from the spring. The machine is now ready to turn off. Leaving the spring under tension for extended periods of inactivity will decrease the spring life.

If one of the springs becomes loose or damaged, it is time to replace the spring. Navigate to the Home screen or Settings screen and press the Grease Roller button to drop the groove arm down and remove tension from the spring. Using a set of pliers or vise grips, unhook the spring from the bolt located inside the groove arm. The spring can now be removed. Install a new spring in the same manner.

## 6.4 Regular Spare Parts Listing

| Original Supply Quantity | Description | Part Number |
|---|---|---|
| 1 | High Pressure / Temp Grease | MSC-665 |
| 6 | Extension Springs | MSC-653 |

# 7. Troubleshooting

## 7.1 Error Messages

**1. Loss of air pressure. Check air supply**. – Air is turned off, or air pressure is too low.

**2. Pipe not in range of active tool**. – The calculated pipe size does not fall within the allowable pipe size range of the active tool. Rotate head to change tool to appropriate tool size for the pipe to be grooved.

**3. Pipe size not found**. – The calculated pipe size does not call within the range of any of the programmed pipe sizes. Adjustments to the pipe range may be required. Call NAP Sales representative for assistance.

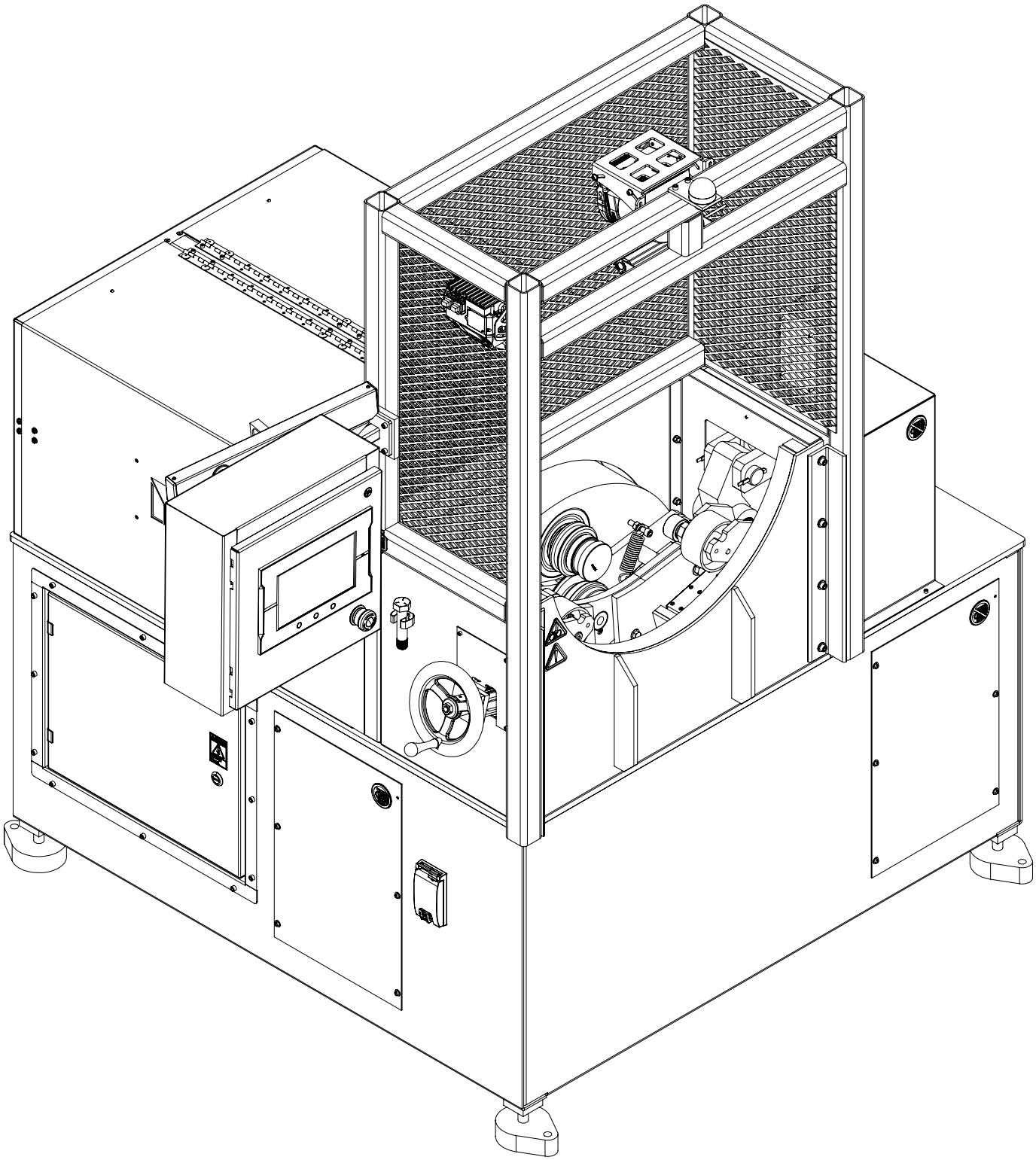
## 7.2 Head Rotate Cycle

**1. Manually rotate upper roller to seat yoke**. – With one hand, grasp the upper groove roller shaft and rotate clockwise or counterclockwise until the yoke is seated. The operator will hear and feel the yoke seat onto the tool. When the yoke is seated, the message will disappear.

**2. Check Yoke** – The yoke is stuck and/or has not cleared the tooling. Press the ESTOP and lubricate or adjust the yoke assembly as needed for smooth operation. Contact NAP Sales representative for assistance.

3. **Check Lock** – The lock is stuck or has not fully released from the spindle head. Press the ESTOP and lubricate or adjust the lock assembly as needed for smooth operation. Contact NAP Sales representative for assistance.

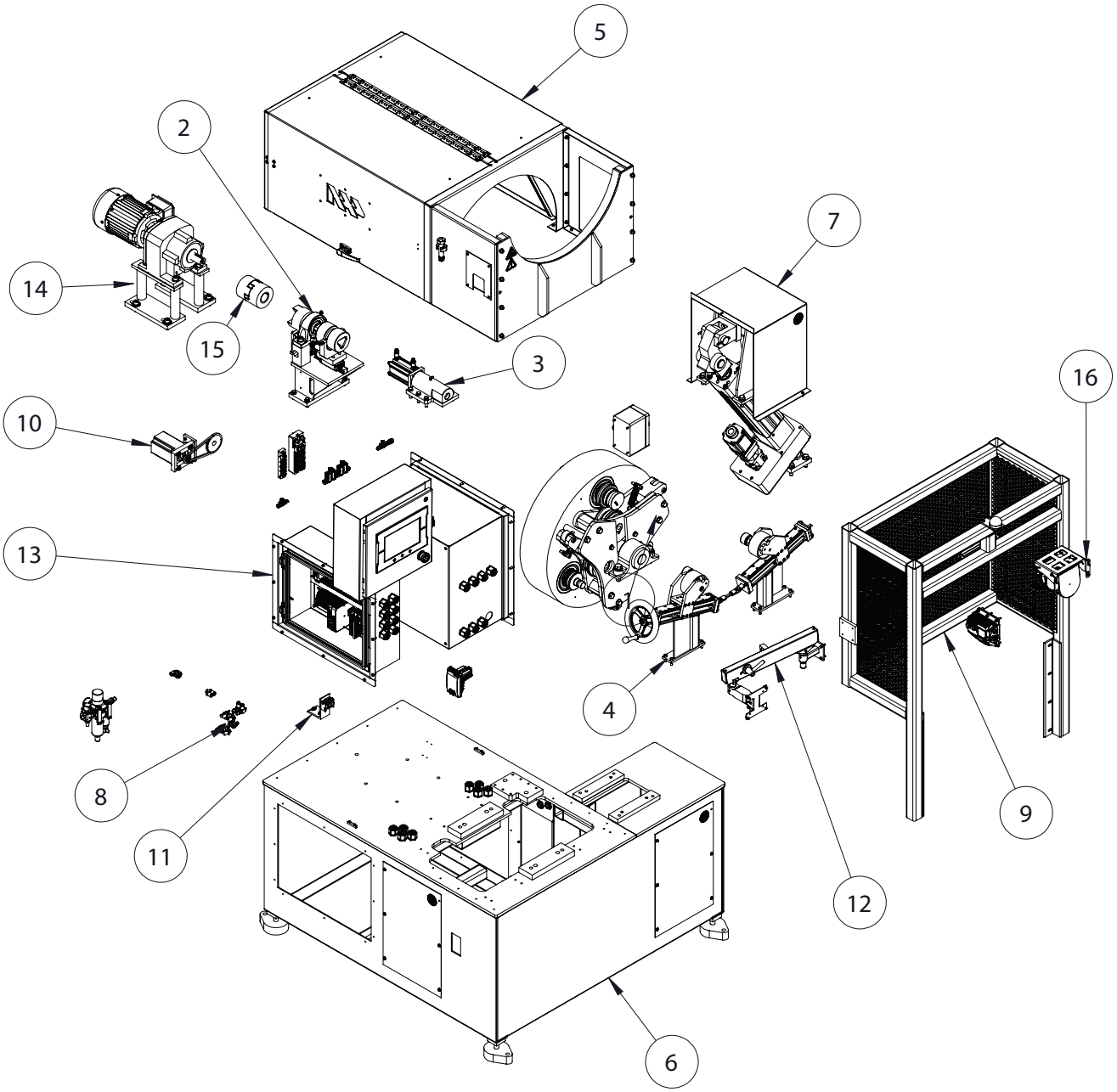
## 8. Assembly and Shop–Gruv Parts List



# 8. Assembly and Shop–Gruv Parts List

## 8.1 Shop–Gruv Main Assembly (GAS)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.1 Shop-Gruv Main Assembly (GAS)

Parts List

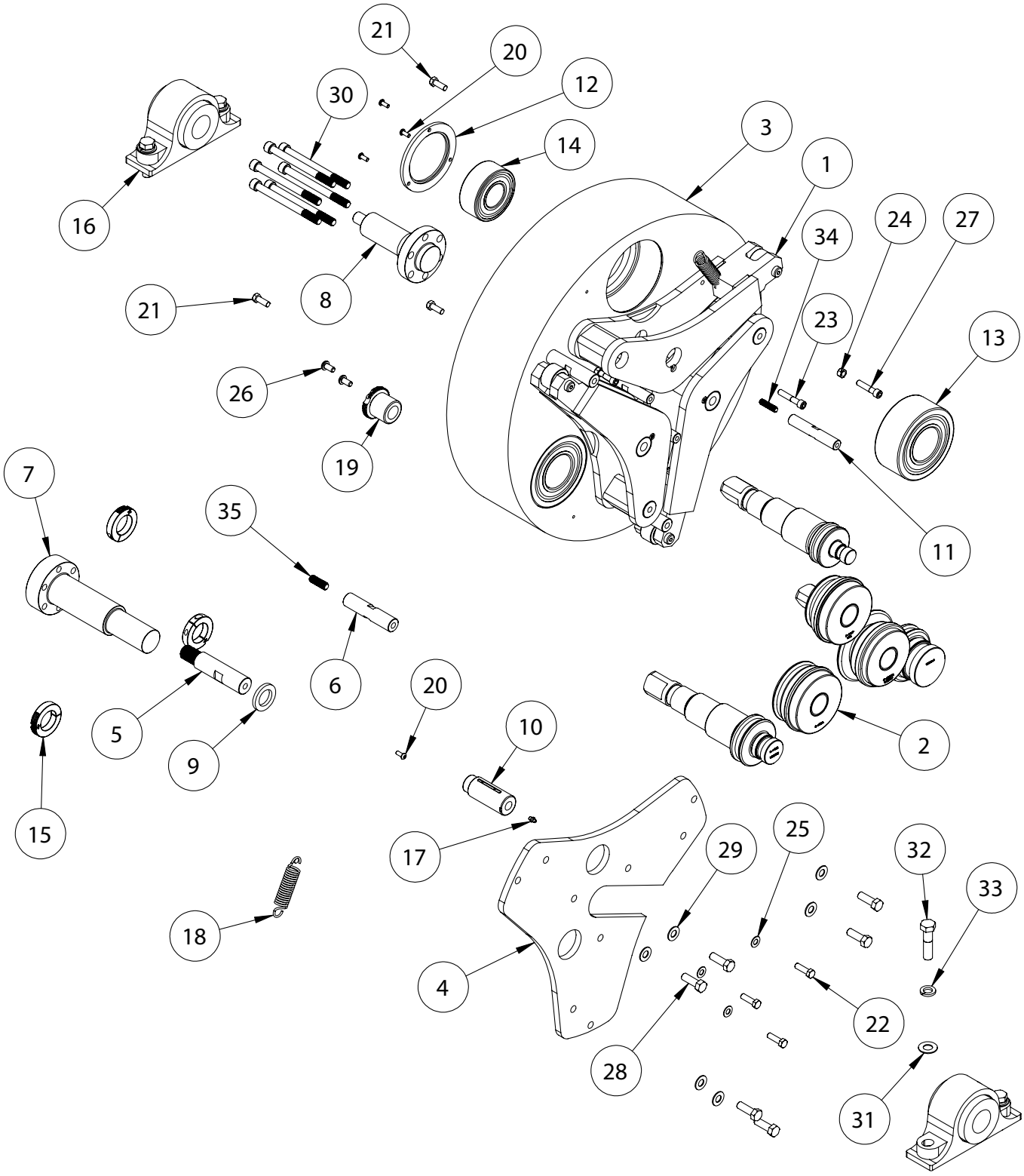
Shop-Gruv Assembly (GAS) Parts List

| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | GAS-01 | 1 | 3 Head Rotating Spindle Assembly |
| 2 | GAS-02 | 1 | Yoke Assembly |
| 3 | GAS-03 | 1 | Spindle Lock Assembly |
| 4 | GAS-04 | 1 | Guide Wheel Assembly |
| 5 | GAS-05 | 1 | Top Enclosure Assembly |
| 6 | GAS-06 | 1 | Groover Base |
| 7 | GAS-07 | 1 | Spindle Ram Assembly |
| 8 | GAS-08 | 1 | Pneumatic Assembly |
| 9 | GAS-09 | 1 | Pipe Sensor Assembly |
| 10 | GAS-10 | 1 | Spindle Rotation Assembly |
| 11 | GAS-11 | 1 | Spindle Position Assembly |
| 12 | GAS-12 | 1 | HMI Swing Arm Assembly |
| 13 | GAS-13 | 1 | Electrical Assembly |
| 14 | GAS-14 | 1 | Rotation Motor Assembly |
| 15 | GAS-15 | 1 | Shaft Coupling Assembly |
| 15 | GAS-15 | 1 | Safety Scanner Assembly |

# 8. Assembly and Shop–Gruv Parts List

## 8.2 Spindle Assembly (GAS–01)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.2 Spindle Assembly (GAS-01)

Parts List

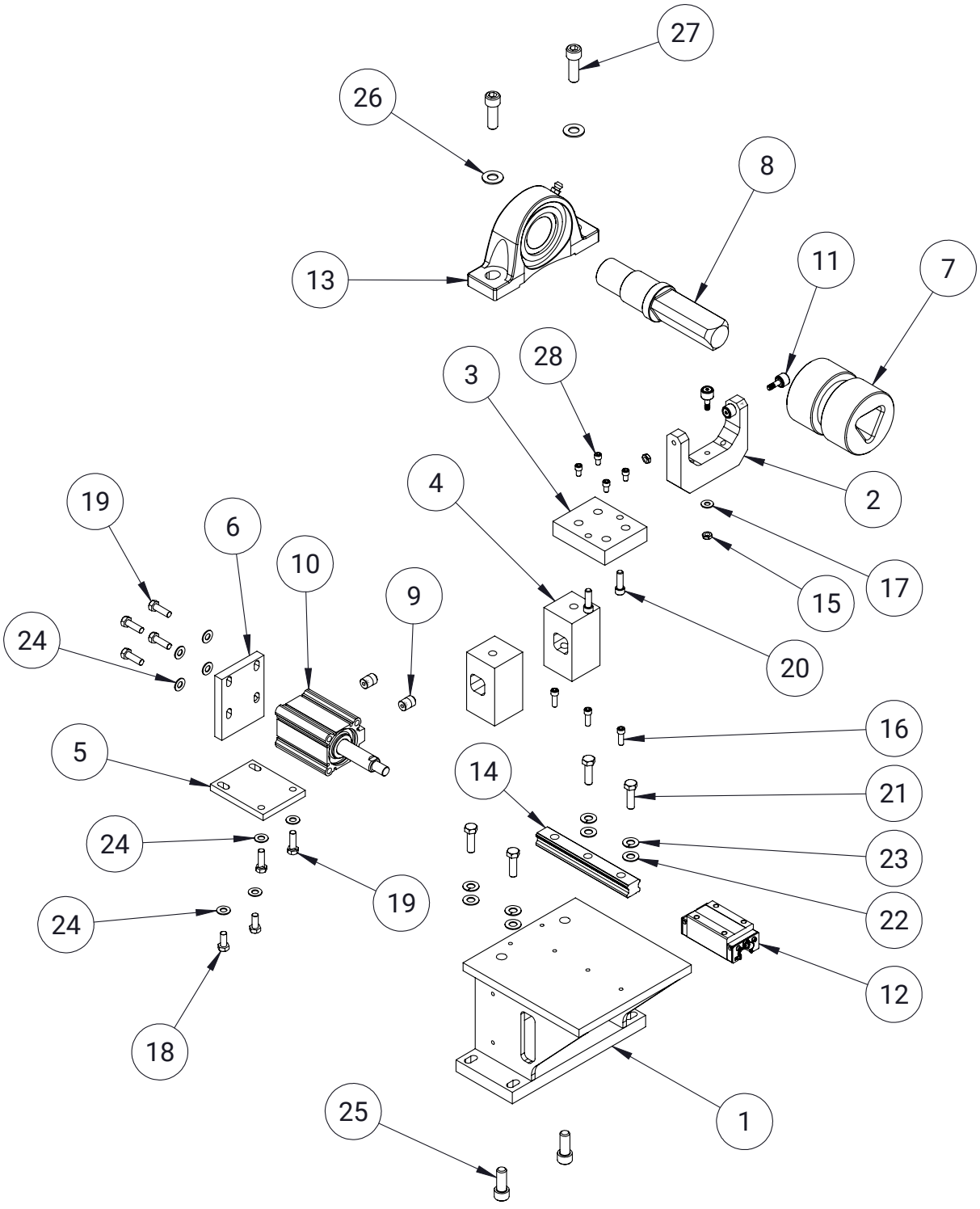
Spindle Assembly (GAS-01) Parts List

| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | GAS-0101 | 3 | Pivot Arm |
| 2 | GAS-0102 | 1 | Tooling Assembly |
| 3 | GMP-004 | 1 | Rotation Plate |
| 4 | GMP-005 | 1 | Face Plate |
| 5 | GMP-006 | 3 | Pivot Pin |
| 6 | GMP-007 | 3 | Support Pin |
| 7 | GMP-008 | 1 | Front Rotation Shaft |
| 8 | GMP-009 | 1 | Rear Rotation Shaft |
| 9 | GMP-011 | 3 | Spacer |
| 10 | GMP-013 | 3 | Roller Pin |
| 11 | GMP-127 | 3 | Support Pin |
| 12 | GMP-144 | 9 | Bearing Keeper Ring |
| 13 | GL-11053 | 3 | Double Angular Bearing, 5313 MFF |
| 14 | GL-11054 | 3 | Double Angular Bearing, 5309MFF |
| 15 | GL11194 | 3 | Hinged One-Piece Clamp-ON Shaft Collar |
| 16 | BRG-1042 | 2 | Pillow Block Bearing |
| 17 | 20-MSC-602 | 3 | Grease Fitting - M6 |
| 18 | MSC-653 | 3 | Extension Spring |
| 19 | MSC-654 | 3 | 1" OD Drill Bushing |
| 20 | 20-FAS-F01 | 12 | BHSHCS ¼-20 x 0.625 x 0.625 - Black Oxide |
| 21 | 20-FAS-H01 | 3 | HHCS ⅜-16 x 1.000 x 1.000 - YZN Gr8 |
| 22 | 20-FAS-H02 | 3 | HHCS ⅜-16 x 1.250 x 1.250 - YZN Gr8 |
| 23 | FAS-H13 | 3 | SHCS ⅜-16 X 2.000 X 1.250 - Black Oxide |
| 24 | FAS-H19 | 6 | ⅜-16 Hex Nut, YZN, GR8 |
| 25 | FAS-H22 | 15 | ⅜" Flat Washer, Zn |
| 26 | 20-FAS-H28 | 6 | BHSHCS ⅜-24 x 0.750 x 0.750 - Black Oxide |
| 27 | FAS-H34 | 3 | SHCS ⅜ -16 X 1.750 X 1.250 - Black Oxide |
| 28 | 20-FAS-I01 | 6 | HHCS ½ -13 x 1.500 x 1.500 - YZN Gr8 |
| 29 | FAS-I22 | 6 | ½" Flat Washer, Zn |
| 30 | FAS-I35 | 6 | ½ - 20 x 6" Lg. SHCS, 1-1/2" Thread |
| 31 | FAS-J05 | 4 | ⅝" Flat Washer, Zn |
| 32 | FAS-J06 | 4 | HHCS ⅝"-11 x 2.500 x 1.500 - YZN Gr8 |
| 33 | FAS-J10 | 4 | ⅝" Split Lock Washer, Zn |
| 34 | FAS-H39 | 3 | ⅜"-16 Threaded Stud, 1.5" Long |
| 35 | FAS-I38 | 3 | ½"-13 Threaded Stud, 1.5" Long |

## 8. Assembly and Shop-Gruv Parts List

### 8.3 Yoke Assembly (GAS-02)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.3 Yoke Assembly (GAS-02)

Parts List

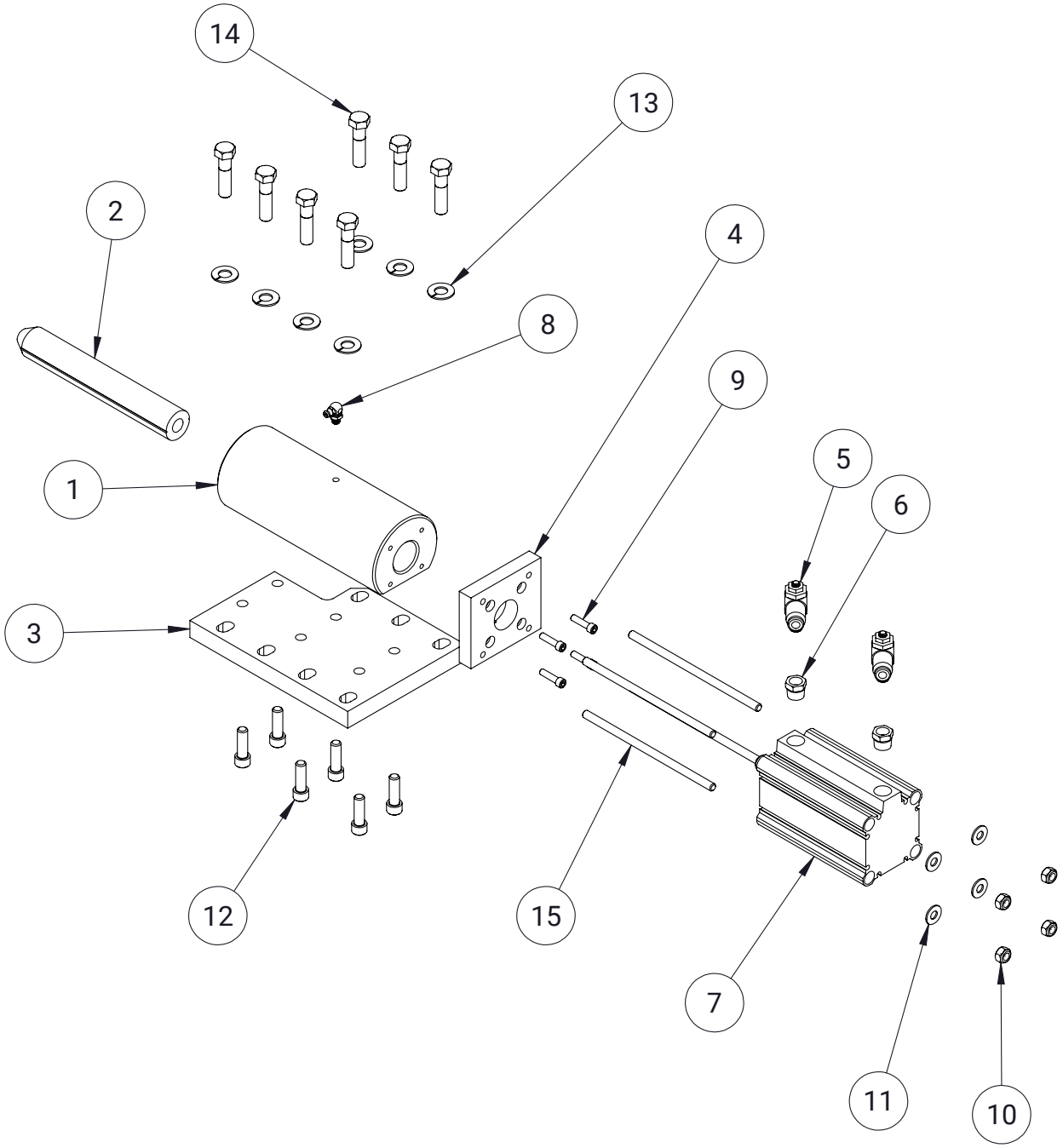
Yoke Assembly (GAS-02) Parts List

| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | GAS-0201 | 1 | Yoke Mount Weldment |
| 2 | GMP-014 | 1 | Coupling Yoke |
| 3 | GMP-015 | 1 | Slide Plate |
| 4 | GMP-017 | 2 | Bearing Spacer |
| 5 | GMP-018A | 1 | Cylinder Mount |
| 6 | GMP-018B | 1 | Cylinder Mount |
| 7 | GMP-034 | 1 | Sliding Rotation Coupling |
| 8 | GMP-036 | 1 | Rotation Slide Shaft |
| 9 | 20-AIR-413 | 2 | 1/4T X 1/4NPT Male Connector |
| 10 | AIR-602 | 1 | Pneumatic Cylinder 50mm Bore X 50mm Stroke |
| 11 | BRG-1036 | 3 | Cam Roller, 1/4-28 |
| 12 | BRG-1043 | 1 | Carriage Assembly |
| 13 | BRG-1044 | 1 | 1-3/4" Dia. Pillow Block Bearing |
| 14 | BRG-1050 | 1 | Rail |
| 15 | FAS-F19 | 3 | 1/4-28 Hex Jam Nut, ZN |
| 16 | FAS-F24 | 3 | SHCS 1/4-20 X 0.750 X 0.750 - Black Oxide |
| 17 | FAS-F38 | 1 | 1/4" Flat Washer, Zn |
| 18 | 20-FAS-G03 | 2 | HHCS 5/16-18 x 0.750 x 0.750 - YZN Gr8 |
| 19 | 20-FAS-G04 | 6 | HHCS 5/16-18 x 1.000 x 1.000 - YZN Gr8 |
| 20 | FAS-G08 | 2 | SHCS 5/16-18 X 1.000 X 1.000 - Black Oxide |
| 21 | 20-FAS-H02 | 4 | HHCS 3/8-16 x 1.250 x 1.250 - YZN Gr8 |
| 22 | FAS-H22 | 4 | 3/8" Flat Washer, Zn |
| 23 | FAS-H23 | 4 | 3/8" Split Lock Washer, Zn |
| 24 | FAS-G21 | 8 | 5/16" Flat Washer, Zn |
| 25 | FAS-I17 | 2 | SHCS 1/2-13 X 1.250 X 1.250 - Black Oxide |
| 26 | FAS-I22 | 2 | 1/2" Flat Washer, Zn |
| 27 | FAS-I32 | 2 | SHCS 1/2-13 X 1.5 X 1.5 - Black Oxide |
| 28 | FAS-M21 | 4 | SHCS M6-1.0 X 10 X 10 - Black Oxide |

# 8. Assembly and Shop–Gruv Parts List

## 8.4 Lock Assembly (GAS–03)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.4 Lock Assembly (GAS-03)

Parts List

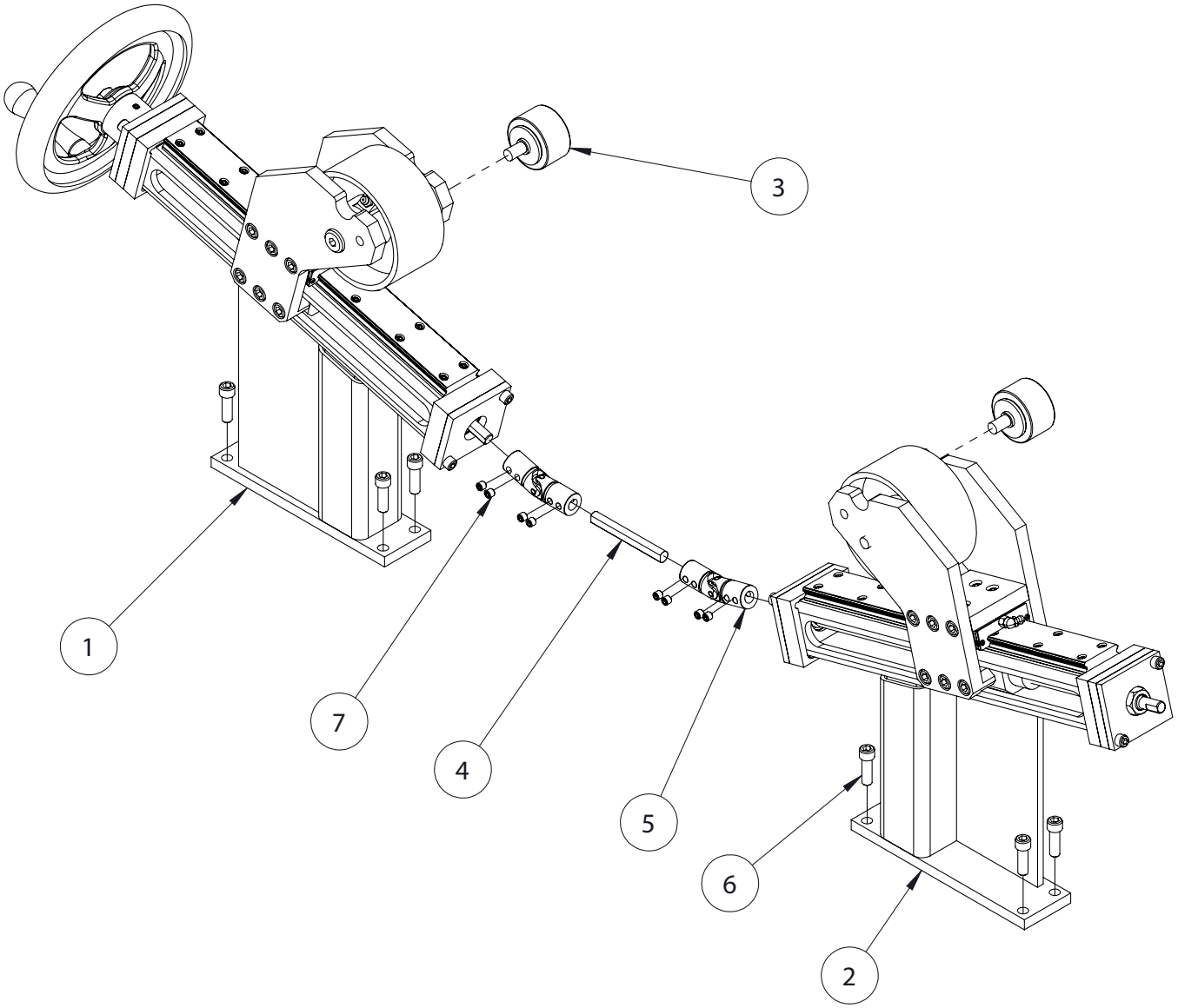
Lock Assembly (GAS-03) Parts List

| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | GMP-031 | 1 | Lock Housing |
| 2 | GMP-032 | 1 | Lock Rod |
| 3 | GMP-033 | 1 | Lock Mount Plate |
| 4 | GMP-120 | 1 | Cylinder Adapter Plate |
| 5 | 20-AIR-412 | 2 | Flow Control Valve, 1/8 NPT x 1/4T |
| 6 | 20-AIR-433 | 2 | 1/8 FNPT X 1/4 MNPT Reducer Bushing |
| 7 | AIR-600 | 1 | Pneumatic Cylinder 50mm Bore x 75mm Stroke |
| 8 | MSC-608 | 1 | Zinc-Plated Steel Grease Fitting |
| 9 | FAS-E18 | 4 | SHCS 10-24 X 0.750 X 0.750 - Black Oxide |
| 10 | FAS-F29 | 4 | 1/4-20 Hex Lock Nut, ZN |
| 11 | FAS-F38 | 4 | 1/4" Flat Washer, Zn |
| 12 | FAS-G08 | 6 | SHCS 5/16-18 X 1.000 X 1.000 - Black Oxide |
| 13 | FAS-H23 | 7 | 3/8" Split Lock Washer, Zn |
| 14 | 20-FAS-H31 | 7 | HHCS 3/8-16 x 1.500 x 1.000 - YZN Gr8 |
| 15 | 20-RRAT-1_4-20 B7 | 4 | 1/4"-20 AT x 5.500" Long |

# 8. Assembly and Shop-Gruv Parts List

## 8.5 Guide Wheel Assembly (GAS-04)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.5 Guide Wheel Assembly (GAS-04)

Parts List

Guide Wheel Assembly (GAS-04) Parts List

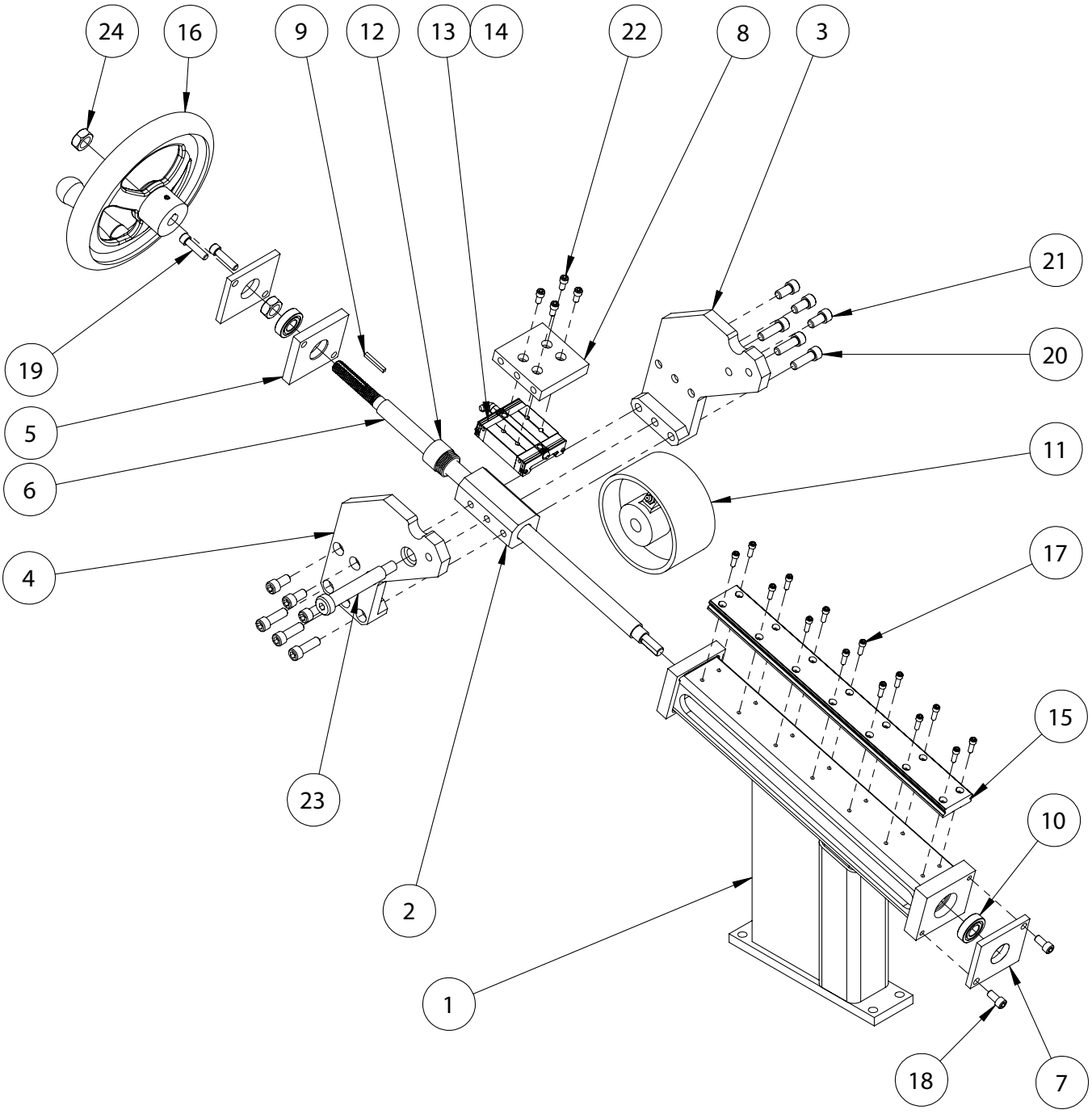
| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | GAS-0401 | 1 | Guide Wheel Weldment - Left |
| 2 | GAS-0403 | 1 | Guide Wheel Weldment - Right |
| 3 | GAS-0404 | 2 | Short Pipe Guide Assembly |
| 4 | GMP-046 | 1 | Union Joint Shaft |
| 5 | GMP-142 | 2 | Guid Wheel Universal Joint |
| 6 | FAS-G08 | 8 | SHCS 5/16"-18 x 1.000 x 1.000 - Black Oxide |
| 7 | FAS-F50 | 8 | SHSS 1/4"-28 x 0.250 LG. |

# 8. Assembly and Shop-Gruv Parts List

## 8.5 Guide Wheel Assembly (GAS-04)

### 8.5.1 Left Guide Wheel Assembly (GAS-0401)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.5 Guide Wheel Assembly (GAS-04)

### 8.5.1 Left Guide Wheel Assembly (GAS-0401)

Parts List

Guide Wheel Assembly (GAS-0401) Parts List

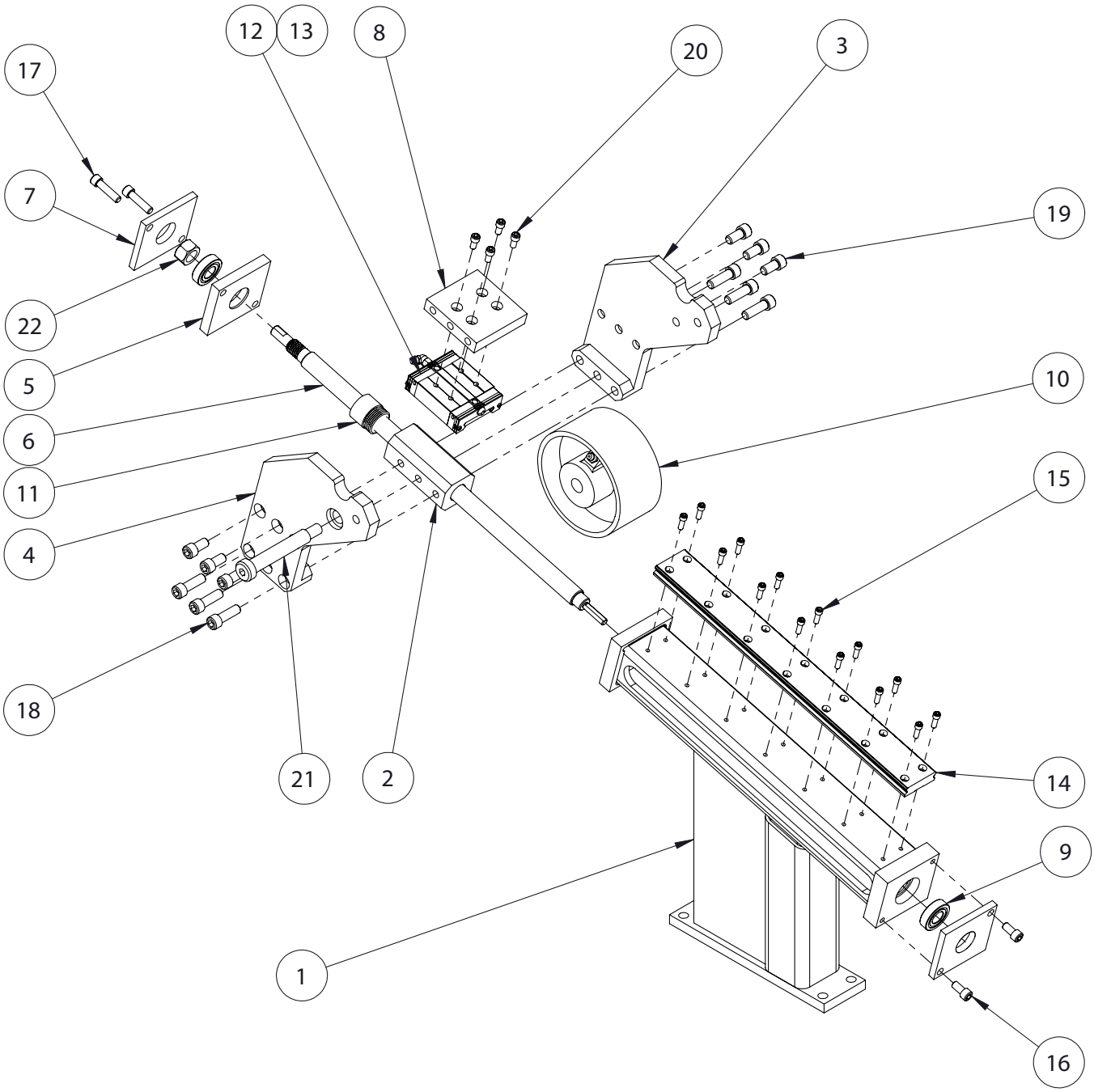
| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | GAS-0402 | 1 | Guide Wheel Weldment |
| 2 | GMP-038 | 1 | Nut Mount |
| 3 | GMP-039 | 1 | Guide Plate L.H. |
| 4 | GMP-040 | 1 | Guide Plate R.H. |
| 5 | GMP-045A | 1 | Guide Tube End Plate |
| 6 | GMP-068 | 1 | Adjustment Screw R.H. Threads |
| 7 | GMP-092 | 2 | Bearing Plate |
| 8 | GMP-141 | 1 | Guide Roller Carriage Mount |
| 9 | 20-BLK-675 | 1 | Keystock - 1/8" Oversized - 1.000" L.G. |
| 10 | 20-BRG-907 | 2 | Bearing Plate |
| 11 | BRG-937 | 1 | 4"Steel Wheel |
| 12 | BRG-1053 | 1 | 5/8"-8 Acme Nut 2:1 R.H. |
| 13 | BRG-1057 | 1 | WEH-21 Carriage Block |
| 14 | BRG-1058 | 1 | WEH-21 Seals/Scrappers |
| 15 | BRG-1059 | 1 | WEH-21 Low Profile Rail |
| 16 | MSC-662 | 1 | Hand Wheel - 7 inch |
| 17 | FAS-D09 | 14 | SHCS 8-32 x 0.500 x 0.500 - Black Oxide |
| 18 | FAS-F23 | 2 | SHCS 1/4"-20 x 0.500 x 0.500 - Black Oxide |
| 19 | FAS-F25 | 2 | SHCS 1/4"-20 x 1.000 x 1.000 - Black Oxide |
| 20 | FAS-G31 | 6 | SHCS 5/16"-24 x 1.000 x 1.000 - Black Oxide |
| 21 | FAS-G33 | 6 | SHCS 5/16"-24 x 0.625 x 0.625 - Black Oxide |
| 22 | FAS-M06 | 4 | SHCS M5 -0.8 x 10 x 10 - Black Oxide |
| 23 | FAS-I25 | 1 | SHSB 0.5 x 2.750, 3/8"-16 Plain |
| 24 | FAS-I37 | 2 | 1/2"-13 Jam Nut, ZN, GR5 |

# 8. Assembly and Shop–Gruv Parts List

## 8.5 Guide Wheel Assembly (GAS–04)

### 8.5.2 Right Guide Wheel Assembly (GAS–0403)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.5 Guide Wheel Assembly (GAS-04)

### 8.5.2 Right Guide Wheel Assembly (GAS-0403)

Parts List

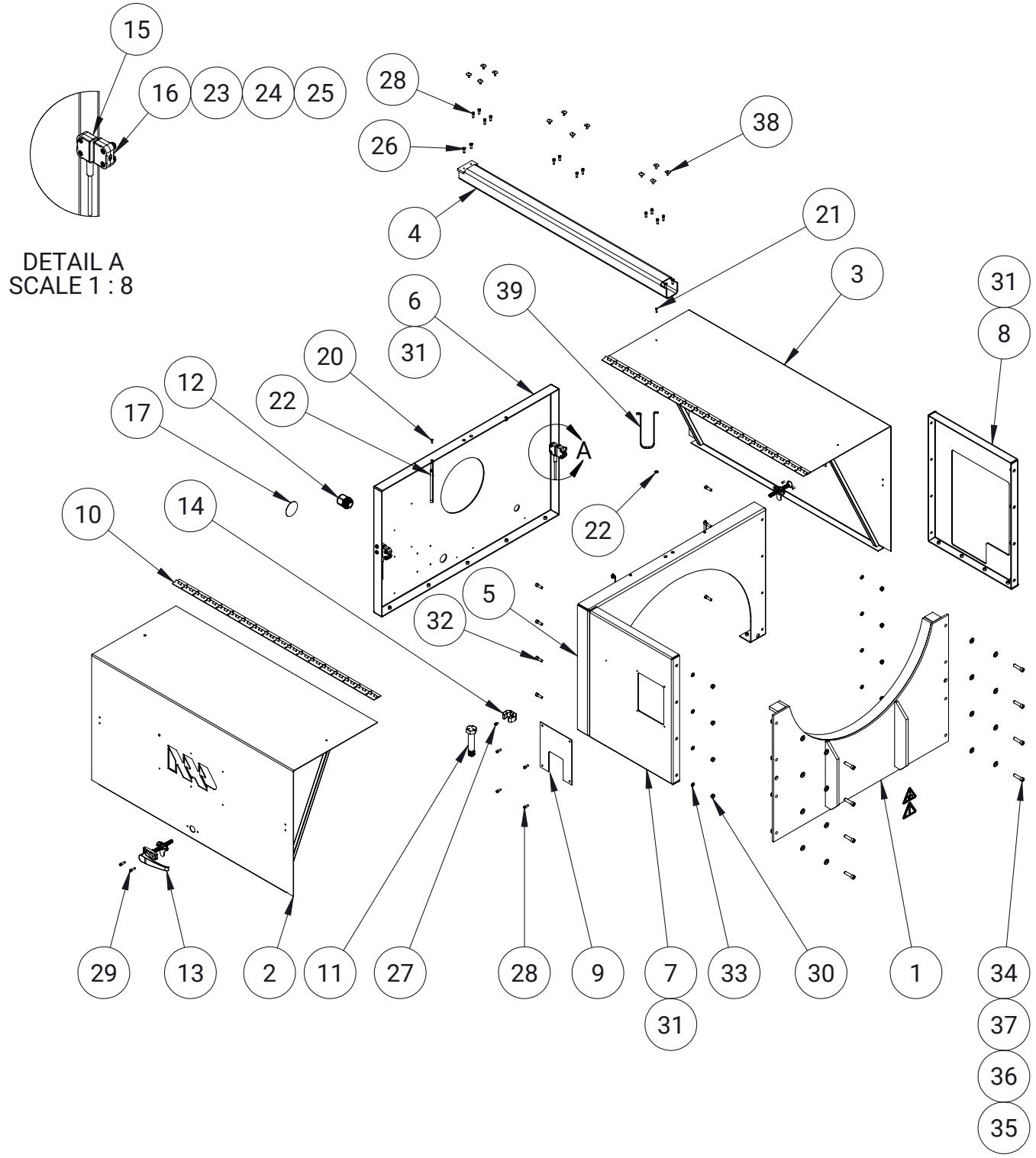
Guide Wheel Assembly (GAS-0403) Parts List

| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | GAS-0402 | 1 | Guide Wheel Weldment |
| 2 | GMP-038 | 1 | Nut Mount |
| 3 | GMP-039 | 1 | Guide Plate L.H. |
| 4 | GMP-040 | 1 | Guide Plate R.H. |
| 5 | GMP-045A | 1 | Guide Tube End Plade |
| 6 | GMP-069 | 1 | Adjustment Screw L.H. Threads |
| 7 | GMP-092 | 2 | Bearing Plate |
| 8 | GMP-141 | 1 | Guide Roller Carriage Mount |
| 9 | 20-BRG-907 | 2 | Bearing Plate |
| 10 | BRG-937 | 1 | 4"Steel Wheel |
| 11 | BRG-1054 | 1 | 5/8"-8 Acme Nut 2:1 L.H. |
| 12 | BRG-1057 | 1 | WEH-21 Carriage Block |
| 13 | BRG-1058 | 1 | WEH-21 Seals/Scrappers |
| 14 | BRG-1059 | 1 | WEH-21 Low Profile Raile |
| 15 | FAS-D09 | 14 | SHCS 8-32 x 0.500 x 0.500 - Black Oxide |
| 16 | FAS-F23 | 2 | SHCS 1/4"-20 x 0.500 x 0.500 - Black Oxide |
| 17 | FAS-F25 | 2 | SHCS 1/4"-20 x 1.000 x 1.000 - Black Oxide |
| 18 | FAS-G31 | 6 | SHCS 5/16"-24 x 1.000 x 1.000 - Black Oxide |
| 19 | FAS-G33 | 6 | SHCS 5/16"-24 x 0.625 x 0.625 - Black Oxide |
| 20 | FAS-M06 | 4 | SHCS M5 -0.8 x 10 x 10 - Black Oxide |
| 21 | FAS-I25 | 1 | SHSB 0.5 x 2.750, 3/8"-16 Plain |
| 22 | FAS-I14 | 2 | 1/2"-13 Hex Nut, YZN, GR8 |

# 8. Assembly and Shop-Gruv Parts List

## 8.6 Top Enclosure Assembly (GAS-05)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.6 Top Enclosure Assembly (GAS-05)

Parts List

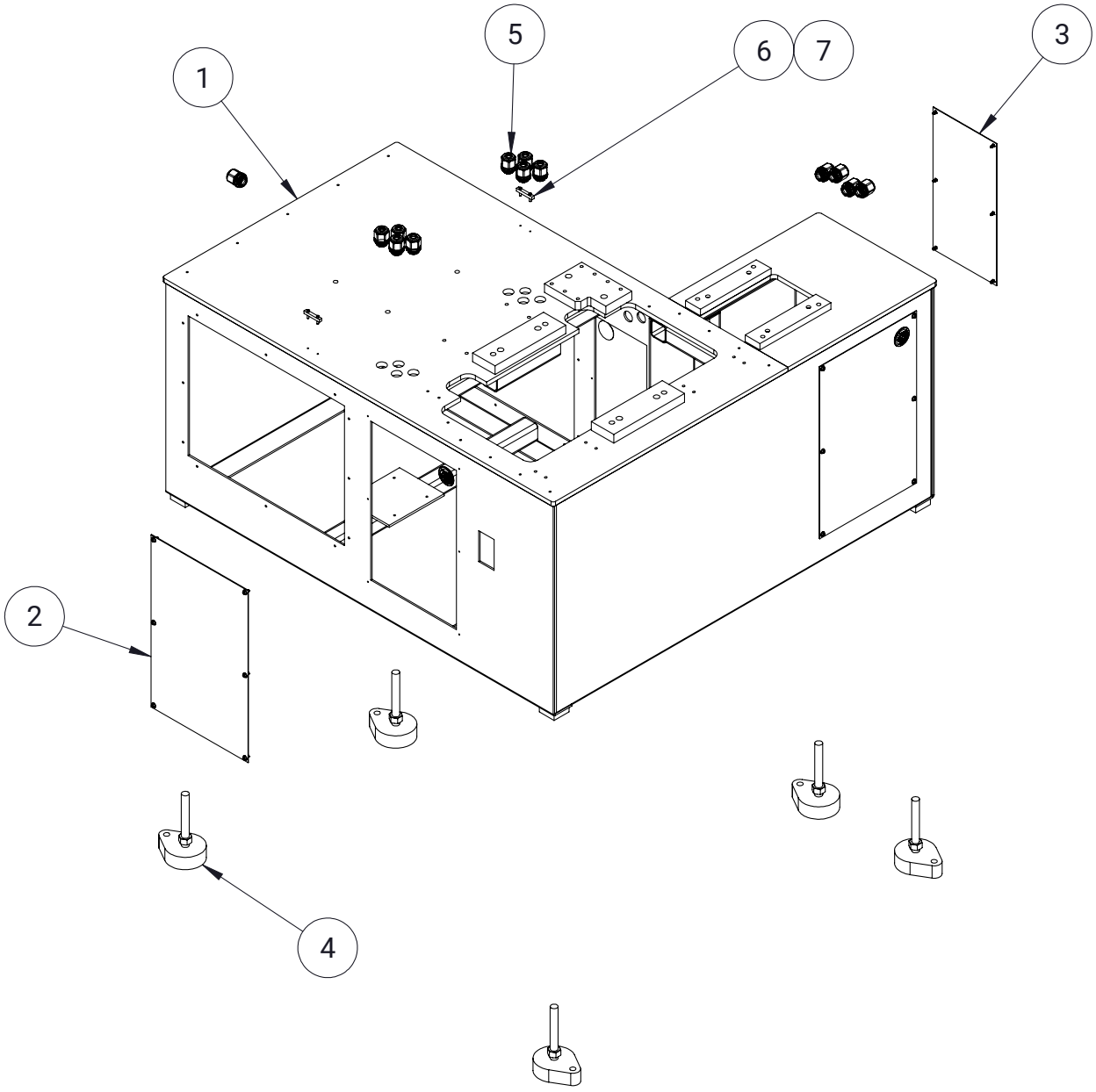
Top Enclosure Assembly (GAS-05) Parts List

| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | GAS-0501 | 1 | Front Guard Weldment |
| 2 | GAS-0502 | 1 | Left Door |
| 3 | GAS-0502 | 1 | Right Door |
| 4 | GAS-0503 | 1 | Mid Support Weldment |
| 5 | GMP-047 | 1 | Mid Guard Panel |
| 6 | GMP-048 | 1 | Rear Guard Panel |
| 7 | GMP-051 | 1 | Left Guard Plate |
| 8 | GMP-052 | 1 | Right Guard Plate |
| 9 | GMP-059 | 1 | Cover |
| 10 | GMP-075 | 2 | Door Hinge 35" Lg. |
| 11 | GMP-104 | 1 | Shaft Removal Tool |
| 12 | 20-EPP-0329 | 1 | 3/4" Cord Grip Connector |
| 13 | MSC-655 | 2 | L-Handle |
| 14 | MSC-661 | 1 | Shaft Removal Tool Holder |
| 15 | PLC-345 | 2 | Safety Switch Parallel |
| 16 | PLC-346 | 2 | Safety Interlock Switch |
| 17 | 20-SWT-IS6011-PB | 1 | ISO Symbol - Lock Out |
| 18 | 20-SWT-IS6014-PB | 1 | ISO Symbol - Caution - General |
| 19 | SWT-IS1035-PB | 1 | Hand Entanglement/Rollers Label |
| 20 | FAS-C03 | 4 | FHSHCS 6-32 x 0.375 x 0.375 - Black Oxide |
| 21 | FAS-C06 | 4 | RSLMS, 6-32 X 0.500 LG. |
| 22 | FAS-C12 | 8 | 6-32 Hex Nut, ZN |
| 23 | FAS-D10 | 8 | SHCS 8-32 X 0.750 X 0.750 - Black Oxide |
| 24 | FAS-D15 | 8 | 8-32 Hex Nut, ZN |
| 25 | FAS-D16 | 8 | #8 Flat Washer, Zn |
| 26 | FAS-E06 | 4 | FHSHCS 10-24 x 0.500 x 0.500 - Black Oxide |
| 27 | FAS-E10 | 1 | SHCS 10-24 X 0.250 X 0.250 - Black Oxide |
| 28 | FAS-E16 | 16 | SHCS 10-24 X 0.500 X 0.500 - Black Oxide |
| 29 | FAS-E21 | 4 | SHCS 10-32 x 0.625 - Black Oxide |
| 30 | FAS-F18 | 8 | 1/4-20 Hex Nut, YZN, GR8 |
| 31 | FAS-F23 | 15 | SHCS 1/4-20 X 0.500 X 0.500 - Black Oxide |
| 32 | FAS-F24 | 8 | SHCS 1/4-20 X 0.750 X 0.750 - Black Oxide |
| 33 | FAS-F40 | 8 | 1/4" Split Lock Washer, Zn |
| 34 | FAS-G12 | 8 | SHCS 5/16-18 X 1.250 X 1.250 - Black Oxide |
| 35 | FAS-G19 | 8 | 5/16-18 Hex Nut, YZN, GR8 |
| 36 | FAS-G22 | 16 | 5/16" Split Lock Washer, Zn |
| 37 | FAS-G21 | 16 | 5/16" Flat Washer, Zn |
| 38 | FAS-RIVET #3 | 12 | 3/16 X 1/8"-1/4" Aluminum Blind Rivet |
| 39 | Sash Chain | 4 | Sash Chain 12" Long |

# 8. Assembly and Shop-Gruv Parts List

## 8.7 Base Assembly (GAS-06)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.7 Base Assembly (GAS-06)

Parts List

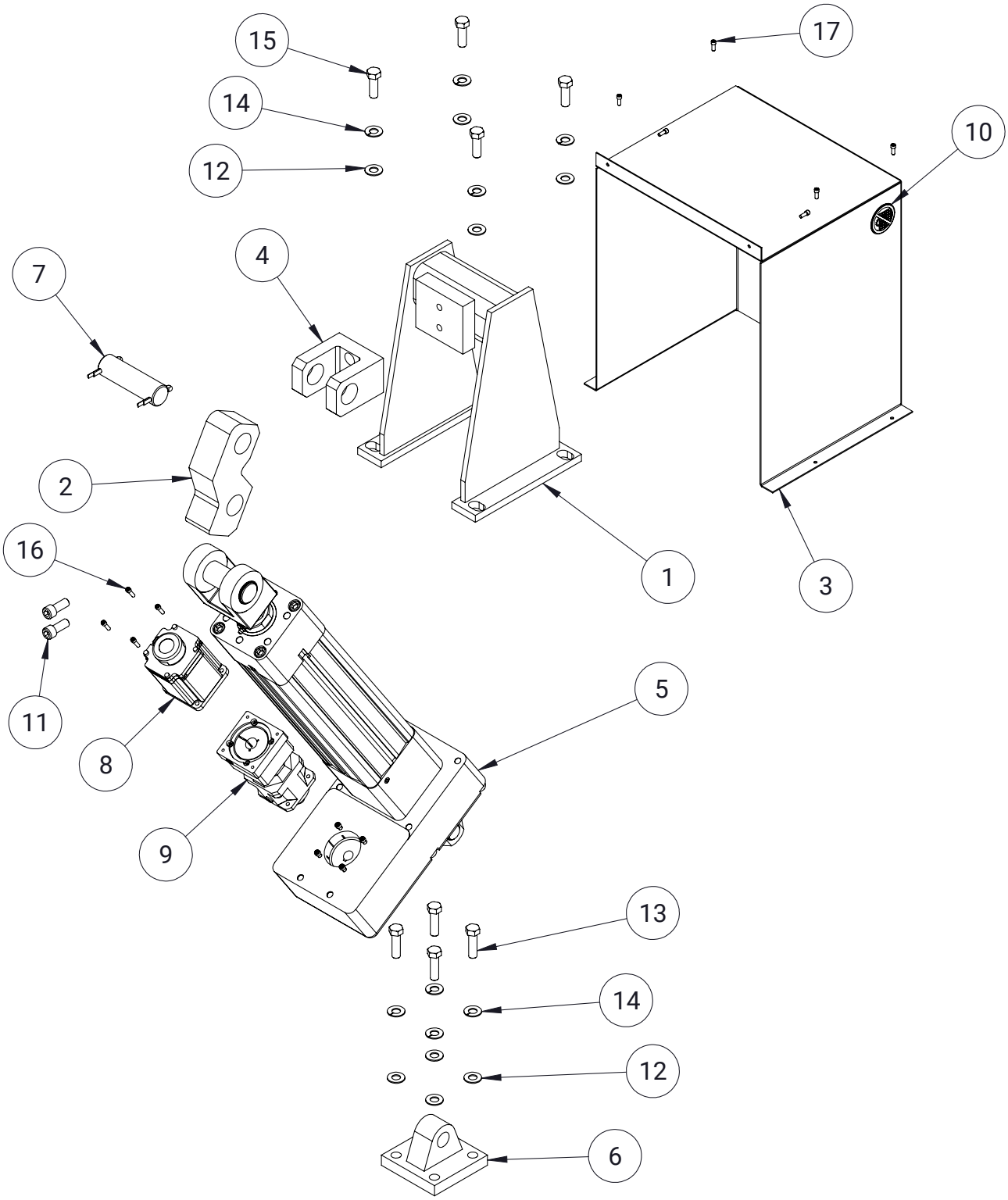
Base Assembly (GAS-06) Parts List

| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | GAS-0605 | 1 | Groover Base Weldment |
| 2 | GAS-0603 | 4 | Door Panel |
| 3 | GAS-0604 | 1 | Door Panel Small |
| 4 | 20-MSC-559 | 5 | Adj Nylathane Foot |
| 5 | 20-EPP-0329 | 13 | 3/4" Cord Grip Connector |
| 6 | WMP-1601 | 2 | Pipe Car Rail Joint |
| 7 | FAS-D10 | 4 | SHCS 8-32 X 0.750 X 0.750 - Black Oxide |
| 8 | 20-SWT-IS6061-PB | 5 | ISO Symbol - Guards Removed |

# 8. Assembly and Shop-Gruv Parts List

## 8.8 Ram Assembly (GAS-07)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.8 Ram Assembly (GAS-07)

Parts List

Ram Assembly (GAS-07) Parts List

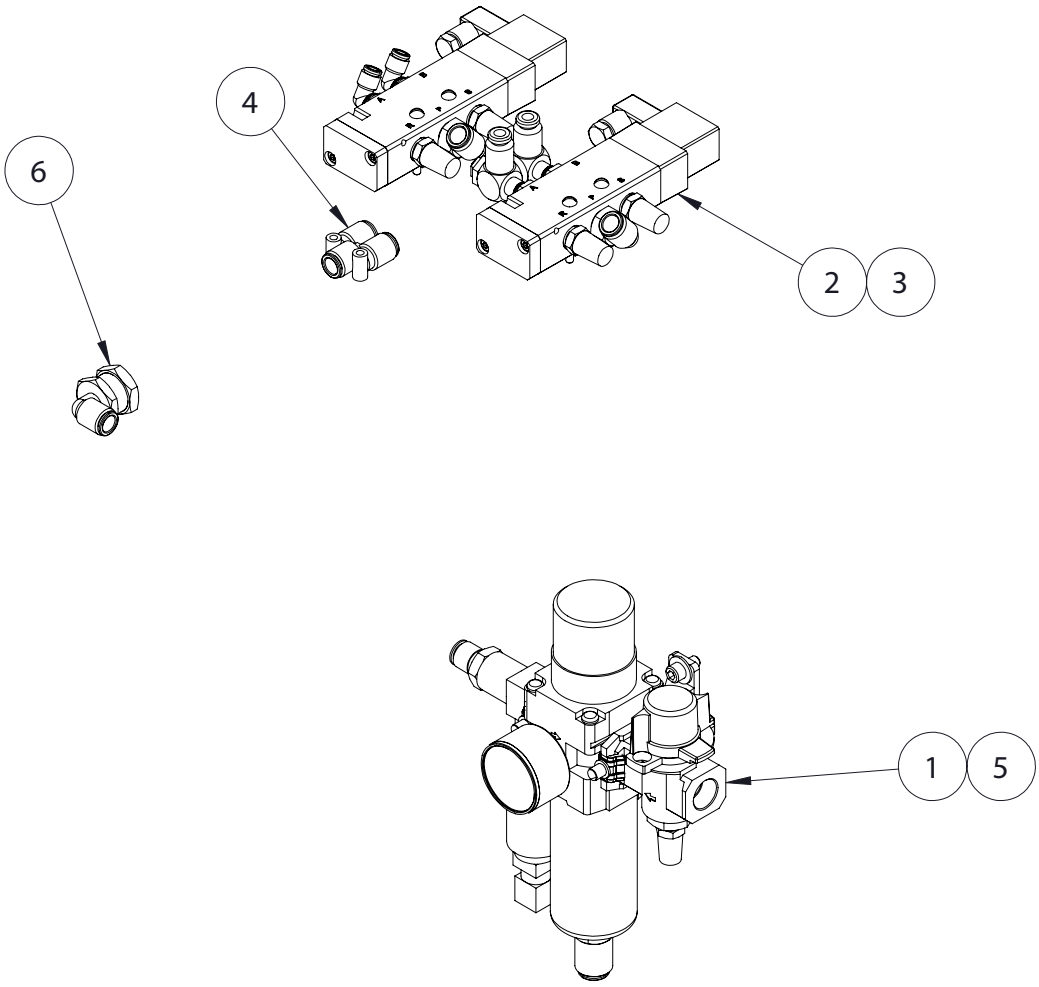
| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | GAS-0701 | 1 | Load Arm Mount Weldment |
| 2 | GMP-060 | 1 | Ram Load Arm |
| 3 | GMP-061 | 1 | Ram Enclosure |
| 4 | GMP-077 | 1 | Ram Load Arm Pivot Mount |
| 5 | ACT-001 | 1 | Ram Actuator |
| 6 | MSC-657 | 1 | Clevis Mount |
| 7 | MSC-658 | 1 | Pivot Pin |
| 8 | MTR-132 | 1 | Servo Motor, 1S series, 750W |
| 9 | MTR-133 | 1 | Gear Drive |
| 10 | 20-SWT-IS6061-PB | 1 | ISO Symbol - Guards Removed |
| 11 | FAS-I17 | 2 | SHCS 1/2-13 X 1.250 X 1.250 - Black Oxide |
| 12 | FAS-I22 | 8 | 1/2" Flat Washer, Zn |
| 13 | 20-FAS-I02 | 4 | HHCS 1/2-13 x 1.750 x 1.750 - YZN Gr8 |
| 14 | FAS-I23 | 8 | 1/2" Split Lock Washer, Zn |
| 15 | 20-FAS-I01 | 4 | HHCS 1/2-13 x 1.500 x 1.500 - YZN Gr8 |
| 16 | FAS-M23 | 4 | SHCS M5-0.8 X 18 X 18 - Black Oxide |
| 17 | FAS-E16 | 6 | SHCS 10-24 X 0.500 X 0.500 - Black Oxide |

# 8. Assembly and Shop–Gruv Parts List

## 8.9 Pneumatic Assembly (GAS–08)

### 8.9.1 Main Assembly (GAS–08)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.9 Pneumatic Assembly (GAS-08)

### 8.9.1 Main Assembly (GAS-08)

Parts List

Pneumatic Assembly (GAS-08) Parts List

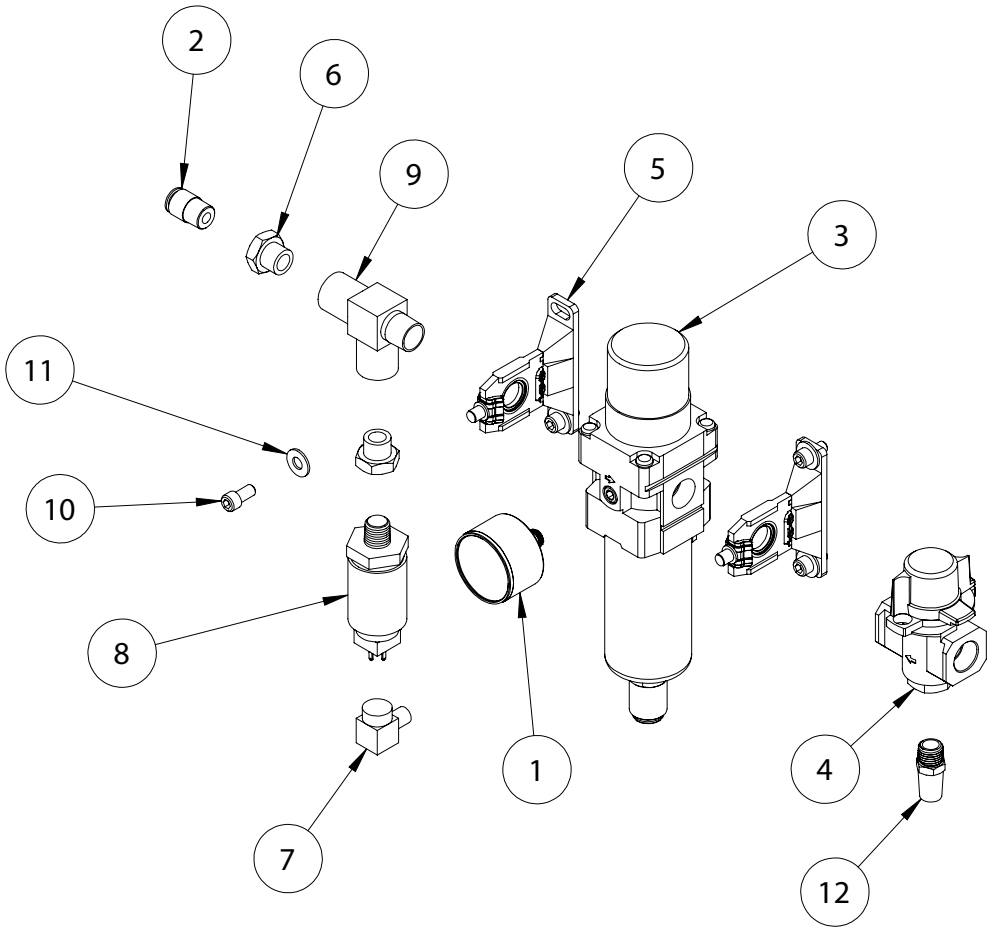
| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | GAS-0801 | 1 | Pneumatic Regulator Assembly |
| 2 | GAS-0802 | 1 | Pneumatic Valve Assembly |
| 3 | 20-AIR-403 | 1 | 1/4" Air Line, 6' Lg. |
| 4 | 20-AIR-561 | 1 | Union Y, 3/8" |
| 5 | AIR-562 | 1 | 3/8 OD 1/4 ID Airline, 24" |
| 6 | 20-AIR-558 | 1 | Bulkhead Male Elbow, 3/8" |

# 8. Assembly and Shop-Gruv Parts List

## 8.9 Pneumatic Assembly (GAS-08)

### 8.9.2 Regulator Assembly (GAS-0801)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.9 Pneumatic Assembly (GAS-08)

### 8.9.2 Regulator Assembly (GAS-0801)

Parts List

Ram Assembly (GAS-0801) Parts List

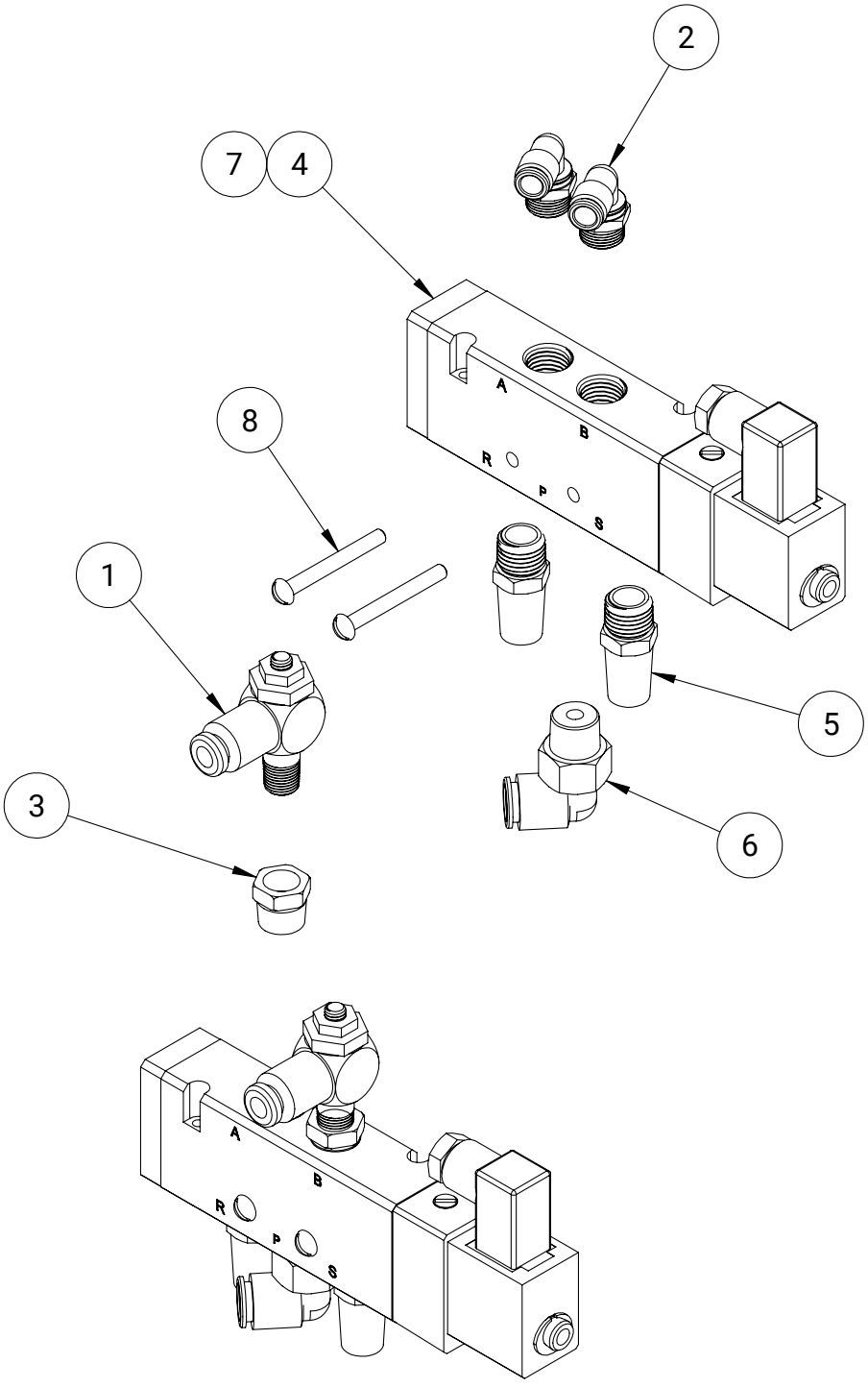
| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | AIR-460 | 1 | Pressure Gauge 0-160 psi |
| 2 | 20-AIR-559 | 1 | Hex Soc Hd Male Connector, 1/4" NPT - 3/8" Tube |
| 3 | AIR-565 | 1 | Air Regulator/Filter |
| 4 | AIR-566 | 1 | Pressure Relief Valve |
| 5 | AIR-567 | 2 | Mounting Bracket |
| 6 | 20-AIR-569 | 2 | Reducer, 38" NPT, 1/4" NPT |
| 7 | EPP-0319 | 1 | Linear Transducer DIN Connector |
| 8 | EPP-0359 | 1 | Pressure Switch |
| 9 | HYD-205 | 1 | Male Run Tee, 3/8" NPT |
| 10 | FAS-F23 | 4 | SHCS 1/4-20 X 0.500 X 0.500 - Black Oxide |
| 11 | FAS-F38 | 4 | 1/4" Flat Washer, Zn |
| 12 | 20-AIR-546 | 1 | 1/4" NPT Silencer |

# 8. Assembly and Shop–Gruv Parts List

## 8.9 Pneumatic Assembly (GAS–08)

### 8.9.3 Valve Assembly (GAS–0802)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.9 Pneumatic Assembly (GAS-08)

### 8.9.3 Valve Assembly (GAS-0802)

Parts List

Pneumatic Valve Assembly (GAS-0802) Parts List

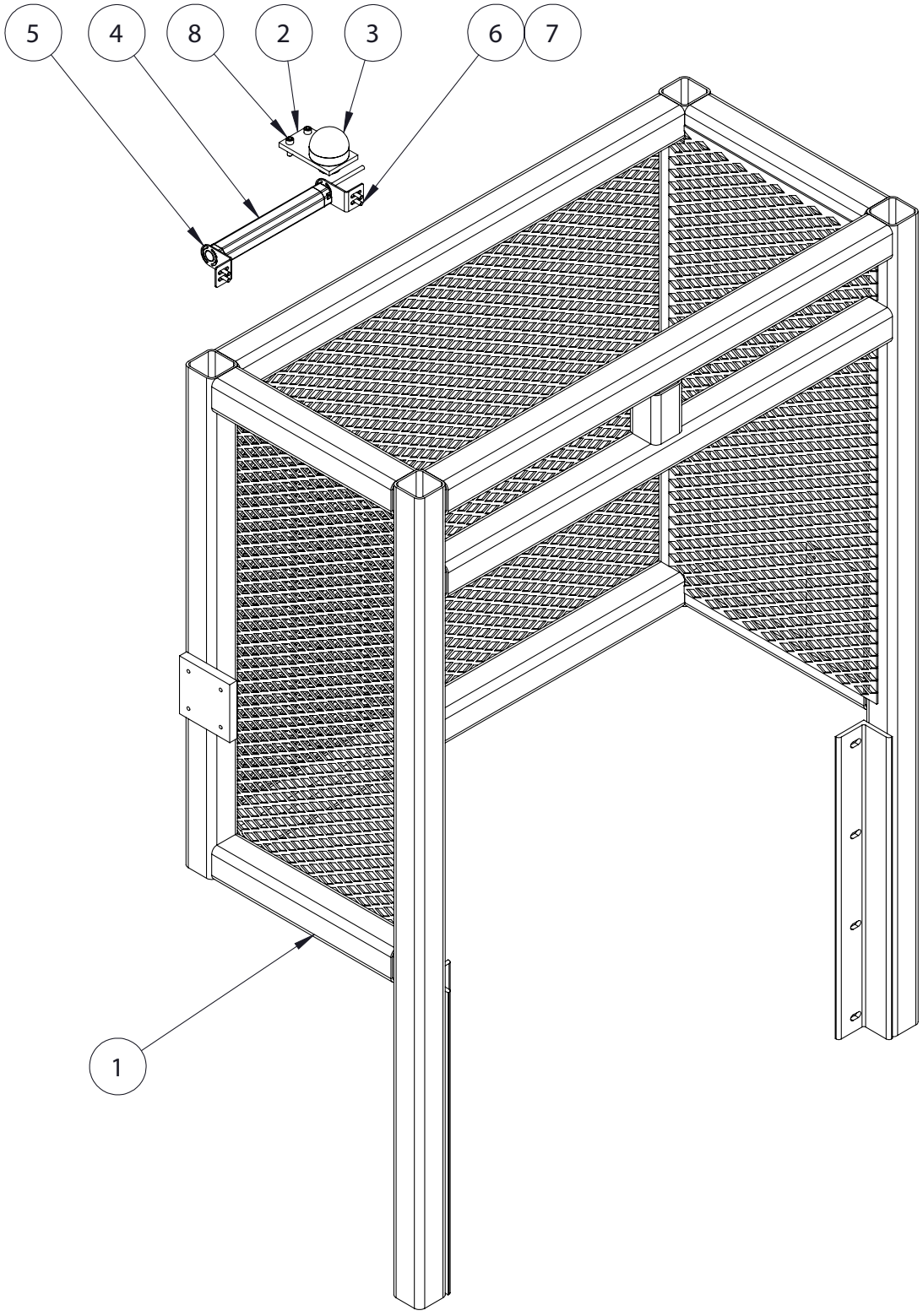
| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | 20-AIR-412 | 2 | Flow Control Valve, 1/8 NPT x 1/4 T |
| 2 | 20-AIR-416 | 2 | 1/4 T x 1/4 P Male Elbow |
| 3 | 20-AIR-433 | 2 | 1/8 FNPT X 1/4 MNPT Reducer Bushing |
| 4 | AIR-541 | 2 | 2 Position Air Valve |
| 5 | AIR-546 | 4 | 1/4" NPT Silencer |
| 6 | 20-AIR-573 | 2 | Male Elbow, 1/4" NPT - 3/8" Tube |
| 7 | PLC-339 | 2 | 11mm DIN to M12 Male Cable, 1m |
| 8 | FAS-D08 | 4 | RSLMS, 8-32 X 1.500 LG. |

# 8. Assembly and Shop–Gruv Parts List

## 8.10 Tower Assembly (GAS–09)

### 8.10.1 Main Assembly (GAS–09)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.10 Tower Assembly (GAS-09)

### 8.10.1 Main Assembly (GAS-09)

Parts List

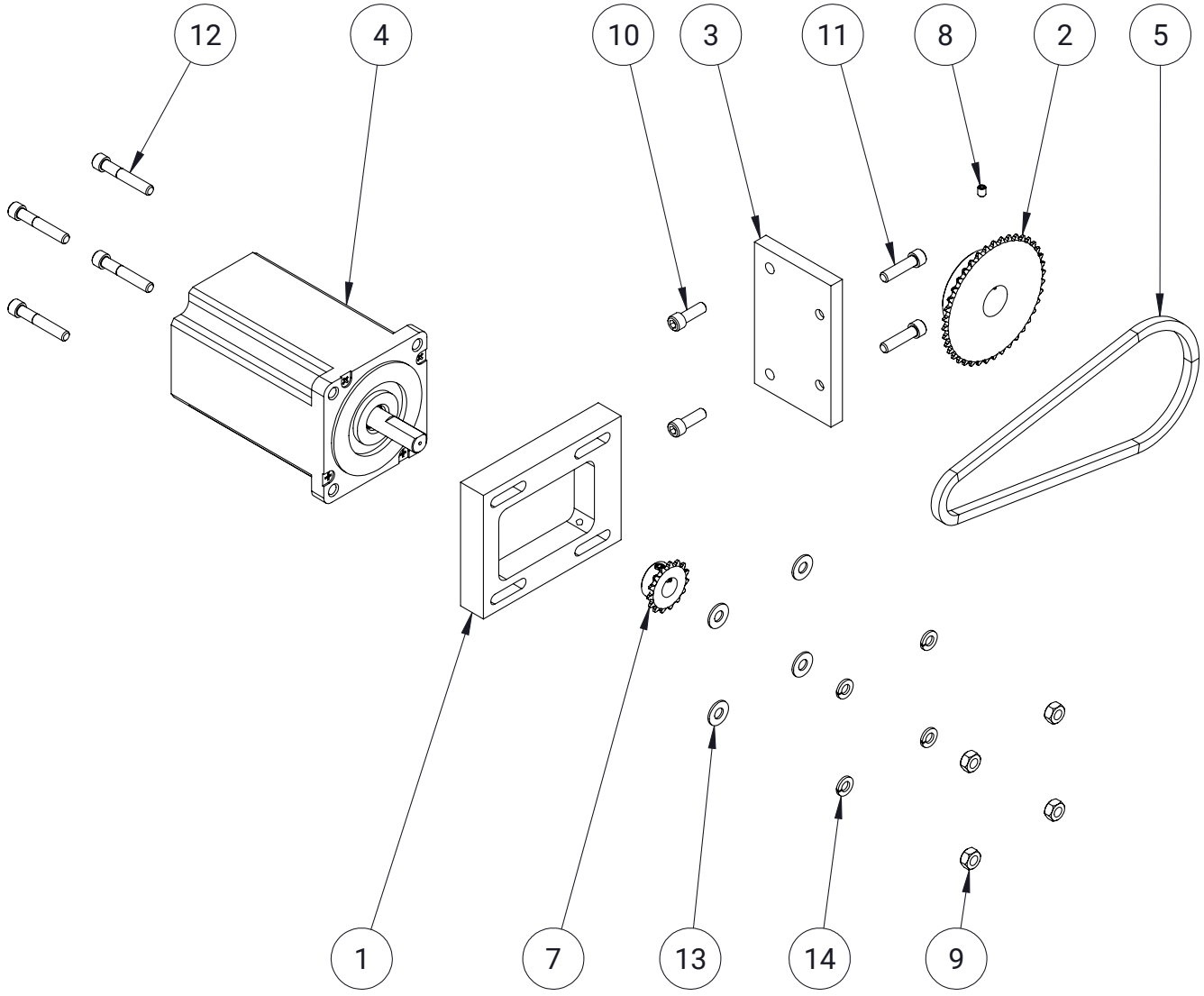
Tower Assembly (GAS-09) Parts List

| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | GAS-0901 | 1 | Pipe Sensor Weldment |
| 2 | GMP-125 | 1 | Light Mount |
| 3 | PLC-341 | 1 | LED Indicator Light |
| 4 | PLC-354 | 1 | LED Work Light |
| 5 | MSC-659 | 1 | Work Light Brackets |
| 6 | FAS-E16 | 4 | SHCS 10-24 X 0.500 X 0.500 - Black Oxide |
| 7 | FAS-E30 | 4 | #10 Flat Washer, Zn |
| 8 | FAS-F24 | 2 | SHCS 1/4-20 X 0.750 X 0.750 - Black Oxide |

# 8. Assembly and Shop–Gruv Parts List

## 8.11 Spindle Rotation Assembly (GAS–10)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.11 Spindle Rotation Assembly (GAS-10)

Parts List

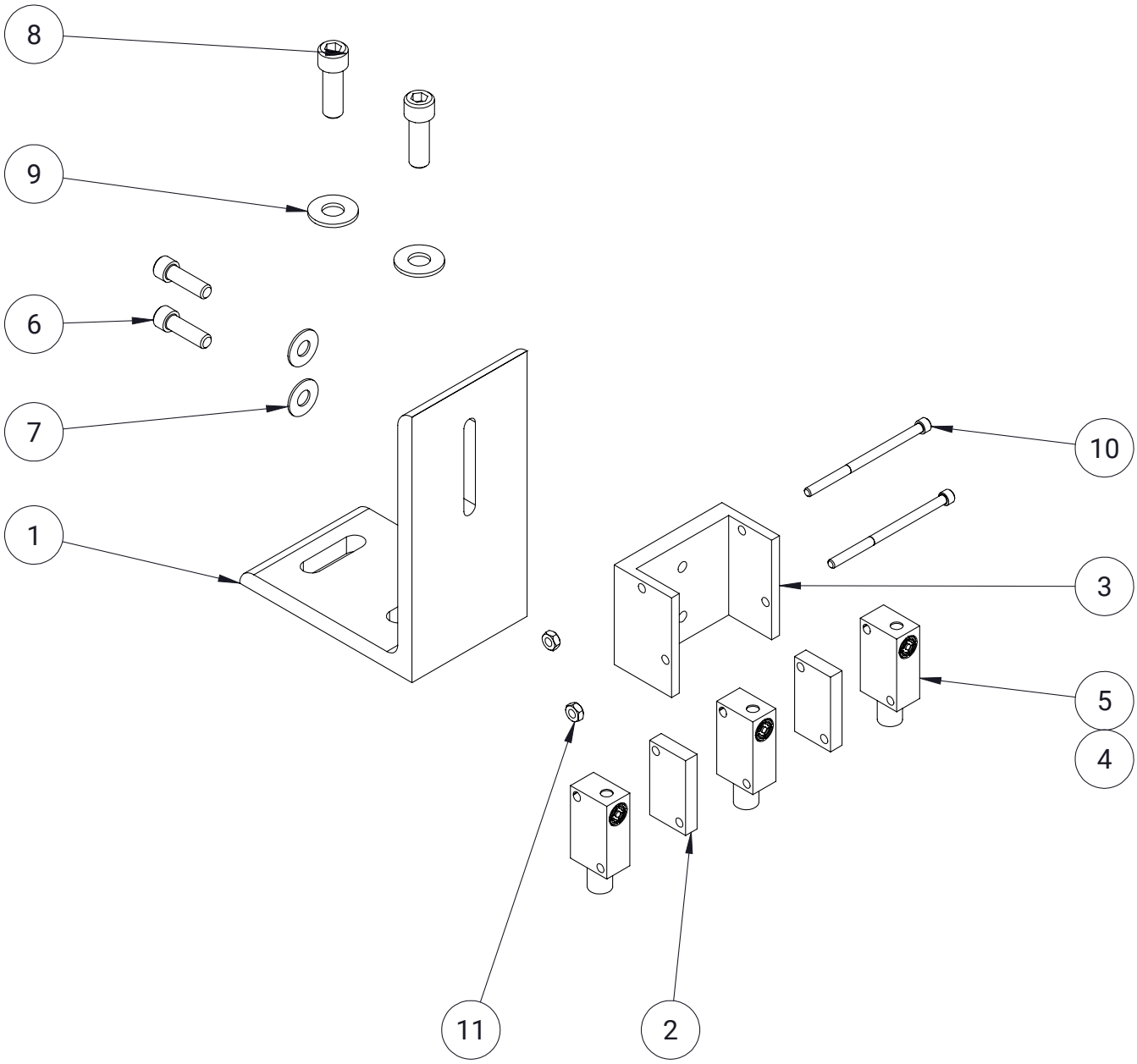
Spindle Rotation Assembly (GAS-10) Parts List

| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | GMP-030 | 1 | Stepper Motor Mount |
| 2 | GMP-078 | 1 | Shaft Sprocket |
| 3 | GMP-087 | 1 | Mount Plate |
| 4 | MTR-135 | 1 | High Torque Stepper Motor |
| 5 | PLY-310 - 19 | 1 | #25 Roller Chain, 19" Long |
| 6 | 20-PLY-311 | 1 | #25 Master Link |
| 7 | PLY-538 | 1 | Finished-Bore Sprocket #25 Chain |
| 8 | 20-FAS-E27 | 2 | SHSS #10-24 X 0.250 LG. |
| 9 | FAS-F18 | 4 | 1/4-20 Hex Nut, YZN, GR8 |
| 10 | FAS-F24 | 2 | SHCS 1/4-20 X 0.750 X 0.750 - Black Oxide |
| 11 | FAS-F25 | 2 | SHCS 1/4-20 X 1.000 X 1.000 - Black Oxide |
| 12 | FAS-F27 | 4 | SHCS 1/4-20 X 1.500 X 1.000 - Black Oxide |
| 13 | FAS-F38 | 4 | 1/4" Flat Washer, Zn |
| 14 | FAS-F40 | 4 | 1/4" Split Lock Washer, Zn |

# 8. Assembly and Shop–Gruv Parts List

## 8.12 Spindle Position Assembly (GAS–11)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.12 Spindle Position Assembly (GAS-11)

Parts List

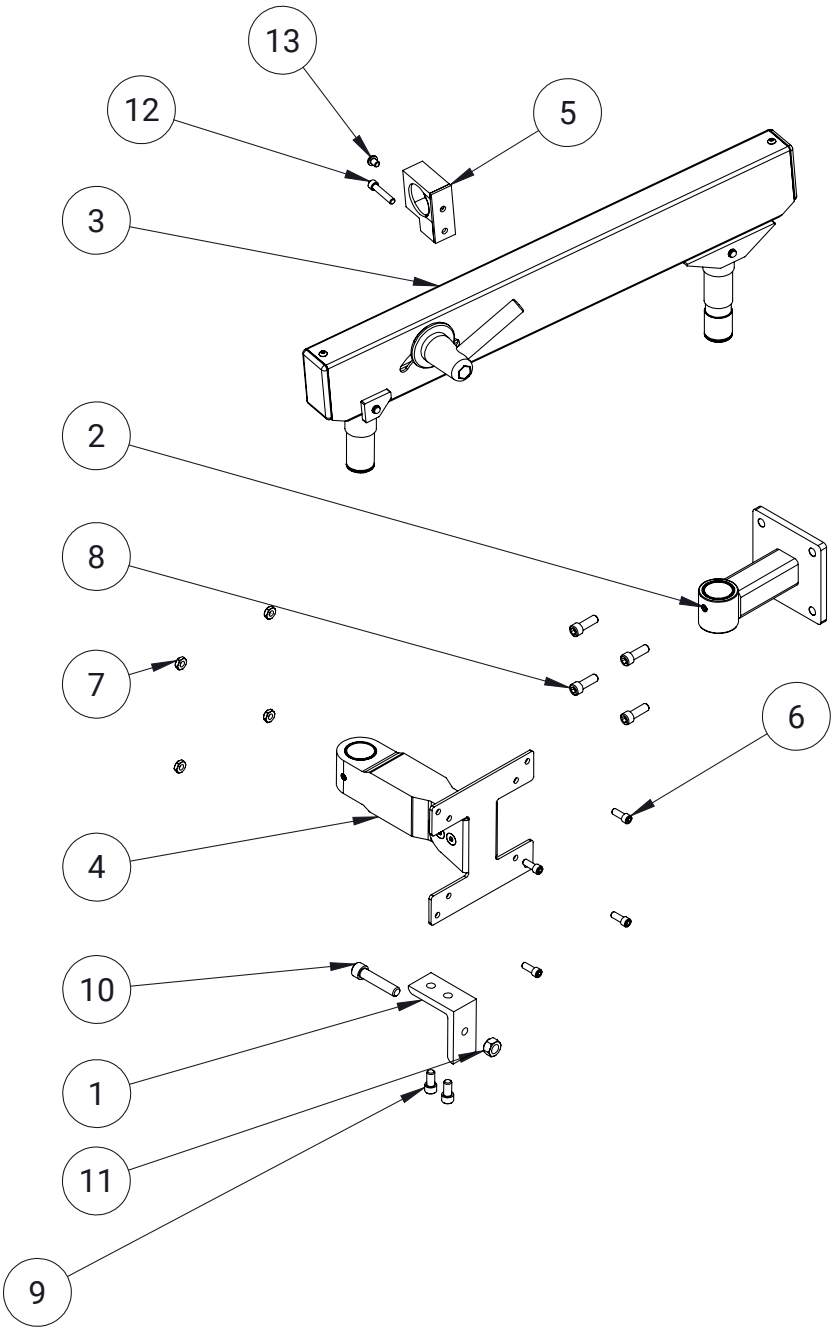
Spindle Position Assembly (GAS-11) Parts List

| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | GMP-080 | 1 | Switch Mount Angle |
| 2 | GMP-081 | 2 | Switch Spacer |
| 3 | WMP-1110 | 1 | Switch Mount |
| 4 | PLC-331 | 3 | 5M Double Ended Cordset |
| 5 | SWT-0102 | 3 | Proximity Switch |
| 6 | FAS-E17 | 2 | SHCS 10-24 X 0.625 X 0.625 - Black Oxide |
| 7 | FAS-E30 | 2 | #10 Flat Washer, Zn |
| 8 | FAS-F24 | 2 | SHCS 1/4-20 X 0.750 X 0.750 - Black Oxide |
| 9 | FAS-F38 | 2 | 1/4" Flat Washer, Zn |
| 10 | FAS-P01 | 2 | SHCS M3-0.5 X 50 X 18 - Black Oxide |
| 11 | FAS-P02 | 2 | M3-0.5 Hex Nut, Plain |

# 8. Assembly and Shop–Gruv Parts List

## 8.13 Swing Arm Assembly (GAS–12)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.13 Swing Arm Assembly (GAS-12)

Parts List

Swing Arm Assembly (GAS-12) Parts List

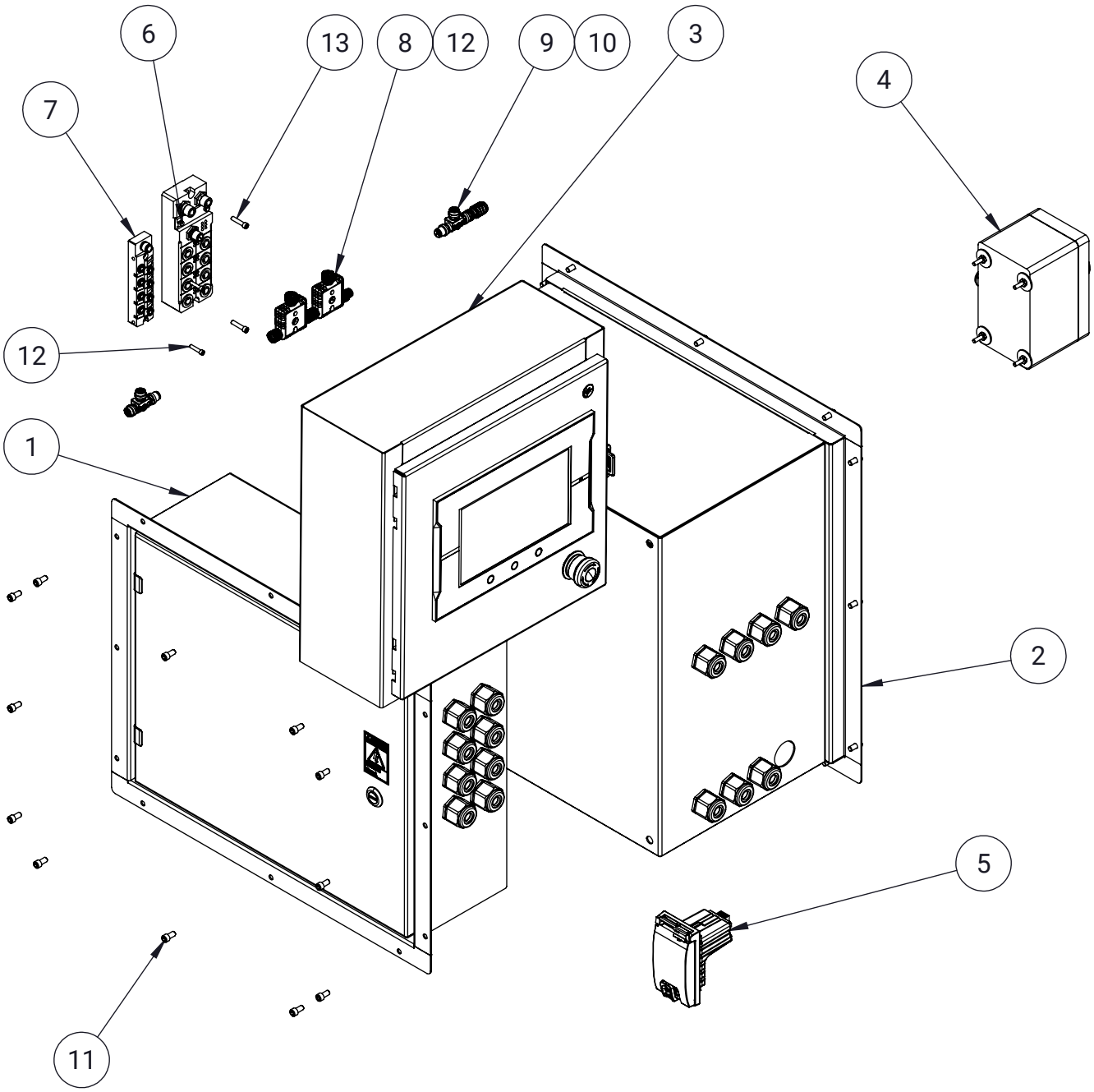
| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | GMP-140 | 1 | Swing Arm Angle Bracket |
| 2 | EPP-0443 | 1 | Mounting Plate Arm End |
| 3 | EPP-0444 | 1 | Positioning Arm Connector |
| 4 | EPP-0445 | 1 | Monitor Mounting Arm End |
| 5 | 20-EPP-0365 | 1 | 3/4" Conduit Snap Strap |
| 6 | FAS-E16 | 4 | SHCS 10-24 X 0.500 X 0.500 - Black Oxide |
| 7 | FAS-E23 | 4 | 10-24 Hex Nut, ZN |
| 8 | FAS-F24 | 4 | SHCS 1/4-20 X 0.750 X 0.750 - Black Oxide |
| 9 | FAS-F23 | 2 | SHCS 1/4-20 X 0.500 X 0.500 - Black Oxide |
| 10 | FAS-G11 | 1 | SHCS 5/16-18 X 1.500 X 1.500 - Black Oxide |
| 11 | FAS-G19 | 1 | 5/16-18 Hex Nut, YZN, GR8 |
| 12 | FAS-E26 | 1 | SHCS 10-24 X 1.000 X 1.000 - Black Oxide |
| 13 | 20-FAS-E01 | 1 | BHSHCS 10-24 x 0.250 x 0.250 - Black Oxide |

# 8. Assembly and Shop-Gruv Parts List

## 8.14 Electrical Assembly (GAS-13)

### 8.14.1 Main Assembly (GAS-13)

Schematic



# 8. Assembly and Shop-Gruv Parts List

### 8.14.1 Main Assembly (GAS-13) Schematic

Parts List

Electrical Assembly (GAS-13) Parts List

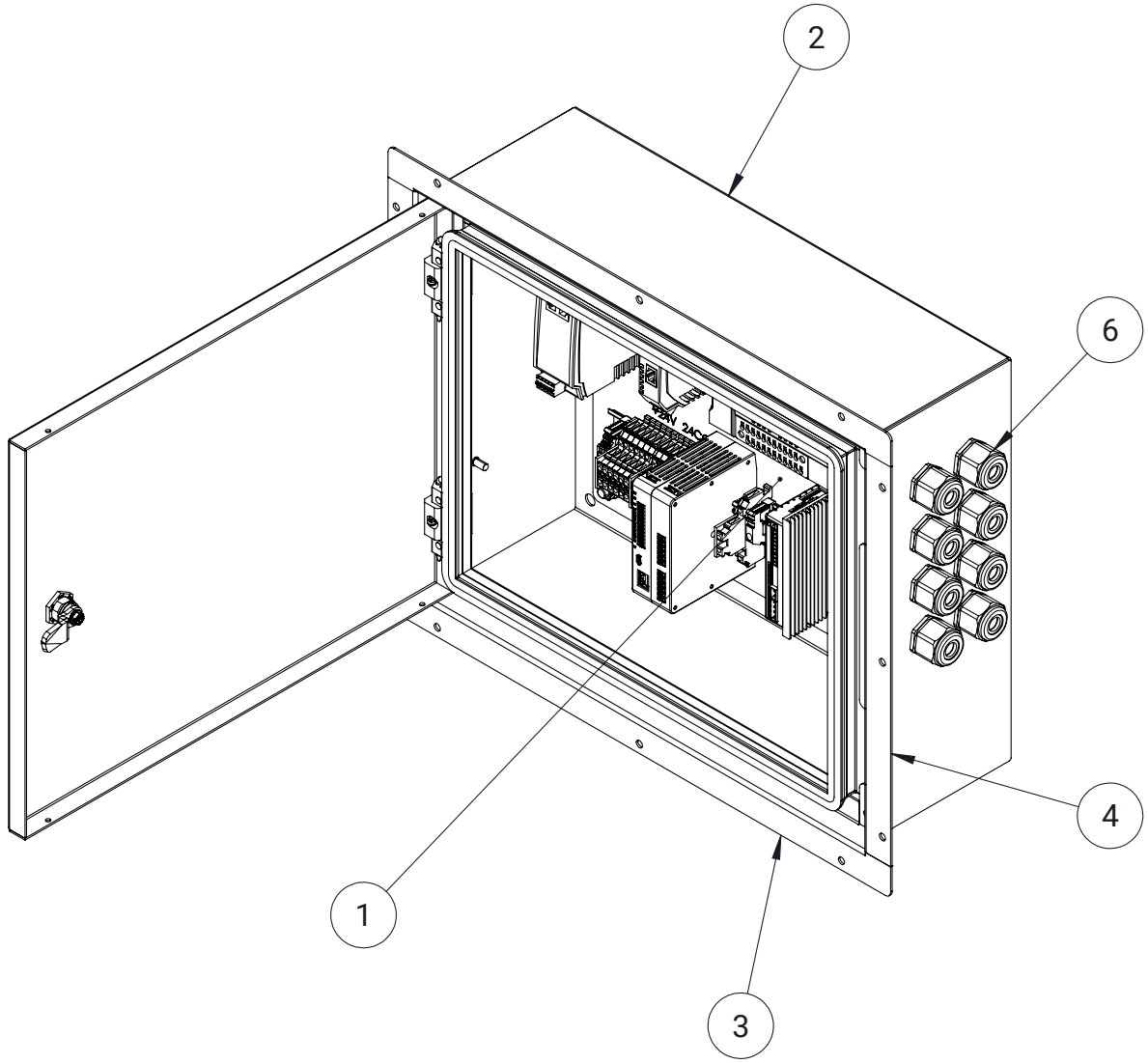
| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | GAS-1301 | 1 | Control Cabinet Assembly |
| 2 | GAS-1302 | 1 | Power Cabinet Assembly |
| 3 | GAS-1303 | 1 | HMI Assembly |
| 4 | GAS-1306 | 1 | Emergency Stop Button Assembly |
| 5 | EPP-0442 | 1 | NAP Standard Part File |
| 6 | PLC-325 | 1 | IO Link Master |
| 7 | PLC-326 | 1 | IO Link Discrete Input Module |
| 8 | PLC-347 | 2 | ISD Connect |
| 9 | PLC-348 | 2 | RFID T-Adapter |
| 10 | PLC-349 | 1 | M12 Termination Plug |
| 11 | FAS-F23 | 24 | SHCS $^{1}/_{4}$-20 X 0.500 X 0.500 - Black Oxide |
| 12 | FAS-D10 | 6 | SHCS 8-32 X 0.750 X 0.750 - Black Oxide |
| 13 | FAS-E22 | 2 | SHCS 10-32 x 0.875 - Black Oxide |

# 8. Assembly and Shop–Gruv Parts List

## 8.14 Electrical Assembly (GAS–13)

### 8.14.2 Control Cabinet Assembly (GAS–1301)

Schematic



# 8. Assembly and Shop–Gruv Parts List

## 8.14 Electrical Assembly (GAS–13)

### 8.14.2 Control Cabinet Assembly (GAS–1301) Schematic

Parts List

Electrical Assembly (GAS–13) Parts List

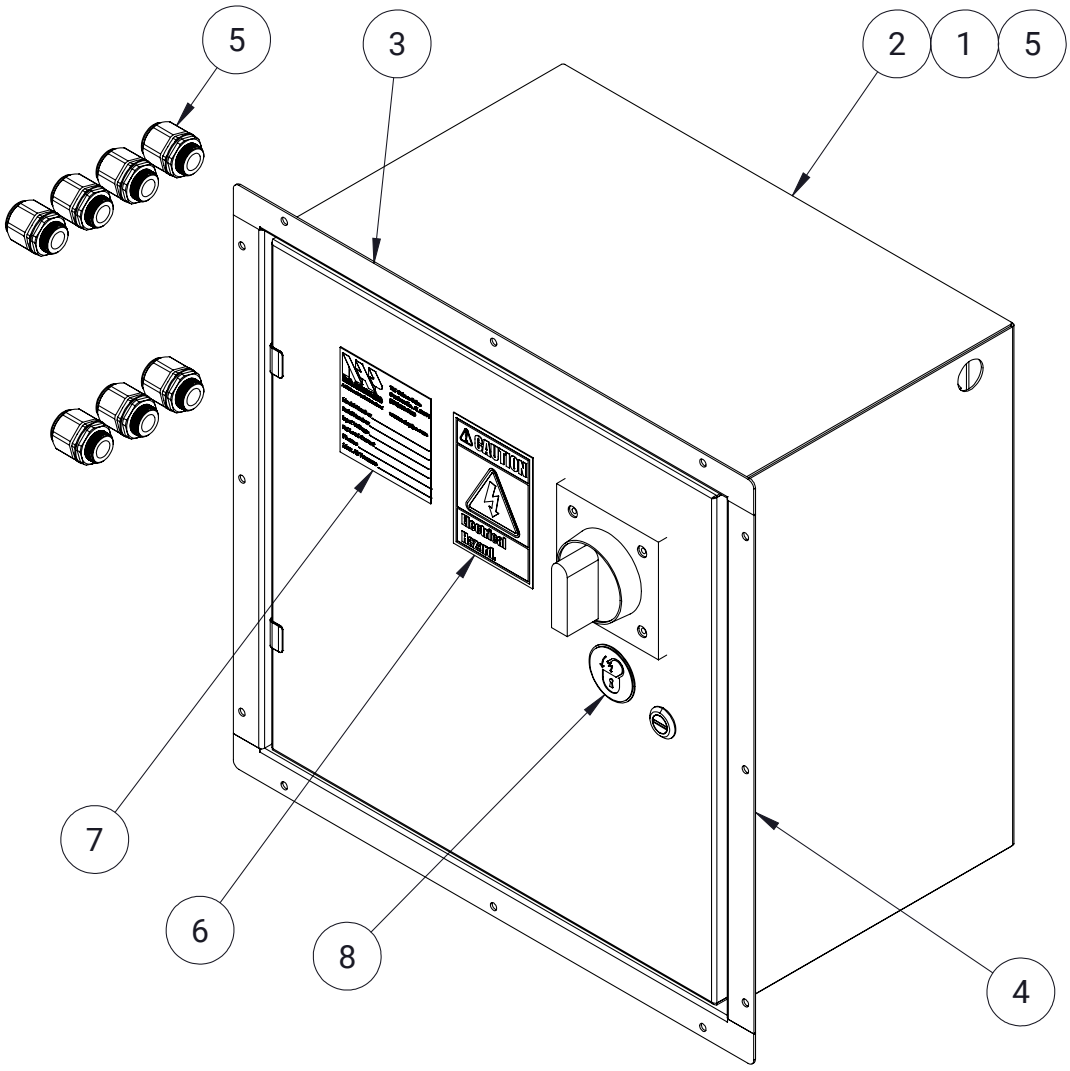
| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | GAS-1304 | 1 | Control Subpanel Assembly |
| 2 | EPP-0435 | 1 | Electrical Enclosure 16H x 20W x 6D |
| 3 | EPP-0437 | 1 | Flush Mount Brackets, 20" Wide |
| 4 | EPP-0438 | 1 | Flush Mount Brackets, 16" High |
| 5 | 20-EPP-0257 | 1 | ELECTRICAL HAZARD LABEL, SMALL |
| 6 | 20-EPP-0329 | 8 | 3/4" Cord Grip Connector |

# 8. Assembly and Shop-Gruv Parts List

## 8.14 Electrical Assembly (GAS-13)

### 8.14.3 Power Cabinet Assembly (GAS-1302)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.14 Electrical Assembly (GAS-13)

### 8.14.3 Power Cabinet Assembly (GAS-1302)

Parts List

Power Cabinet Assembly (GAS-1302) Parts List

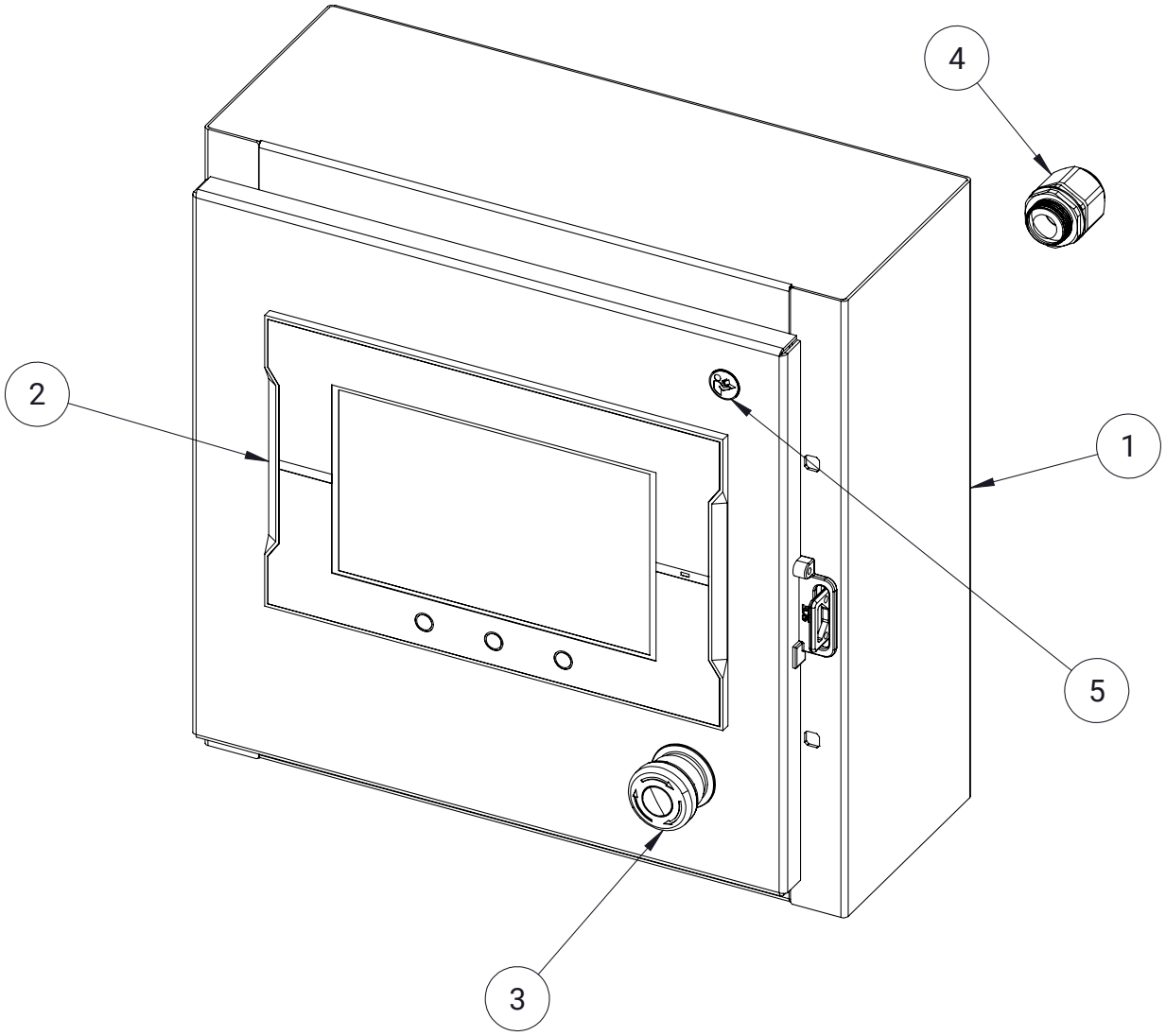
| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | GAS-1305 | 1 | Power Subpanel Assembly |
| 2 | EPP-0439 | 1 | Electrical Enclosure 20H x 20W x 12D |
| 3 | EPP-0437 | 1 | Flush Mount Brackets, 20" Wide |
| 4 | EPP-0440 | 1 | Flush Mount Brackets, 20" High |
| 5 | 20-EPP-0329 | 9 | 3/4" Cord Grip Connector |
| 6 | 20-EPP-0258 | 1 | Electrical Hazard Label |
| 7 | 20-MSC-512A | 1 | Serial Plate, New Sticker Style |
| 8 | 20-SWT-IS6011-PB | 1 | ISO Symbol - Lock Out |

# 8. Assembly and Shop-Gruv Parts List

## 8.14 Electrical Assembly (GAS-13)

### 8.14.4 HMI Assembly (GAS-1303)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.14 Electrical Assembly (GAS-13)

### 8.14.4 HMI Assembly (GAS-1303)

Parts List

8.14.4 HMI Assembly (GAS-1303)

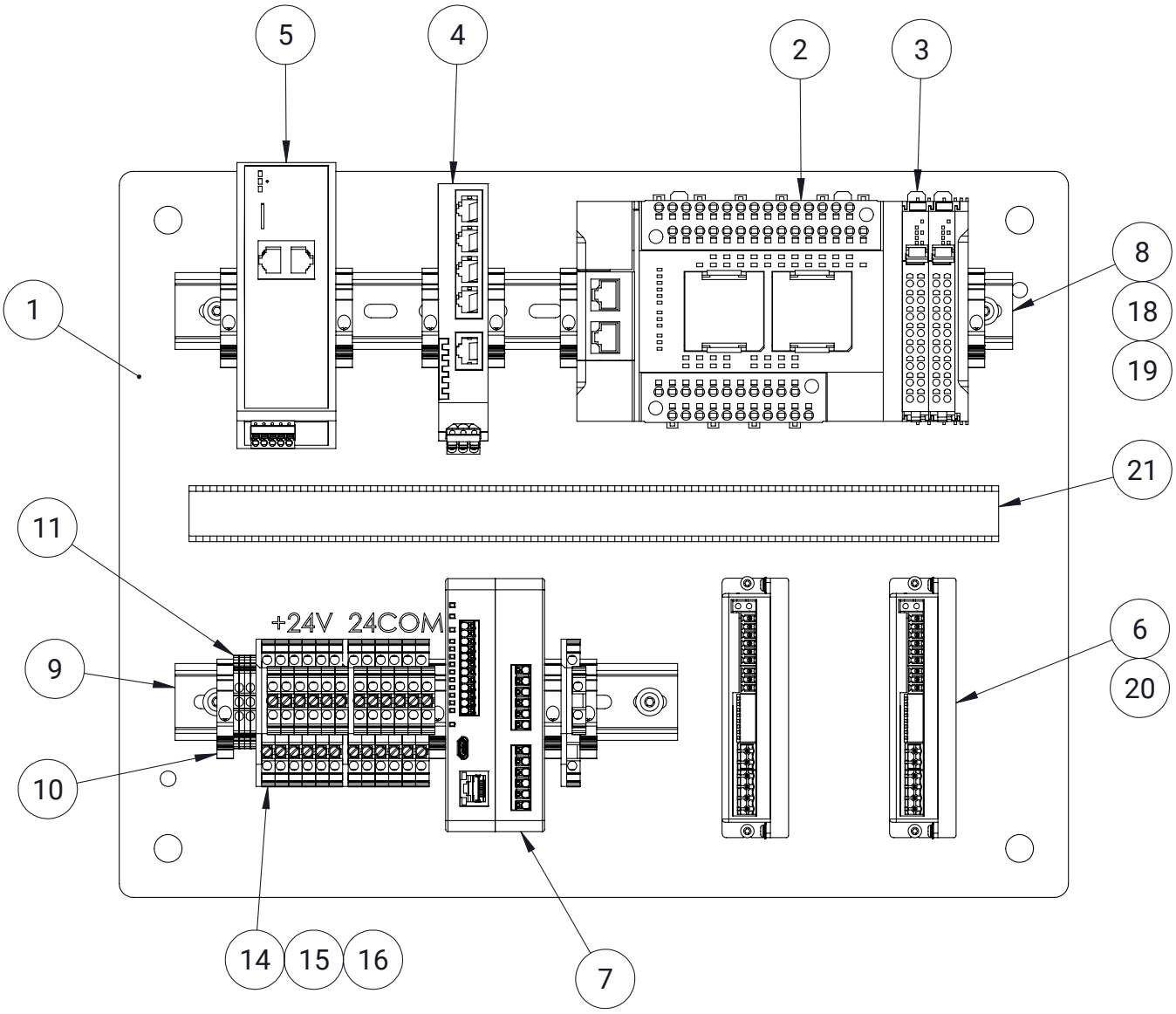
| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | 20-EPP-0398 | 1 | 16x16x6 Enclosure |
| 2 | 20-PLC-303 | 1 | HMI NA series 9" |
| 3 | PLC-344 | 1 | E-Stop Push Button 2NC |
| 4 | 20-EPP-0329 | 1 | $^{3}/_{4}$" Cord Grip Connector |
| 5 | SWT-IS6126-PD | 1 | Consult Operator's Manual Label |

# 8. Assembly and Shop-Gruv Parts List

## 8.14 Electrical Assembly (GAS-13)

### 8.14.5 Control Subpanel Assembly (GAS-1304)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.14 Electrical Assembly (GAS-13)

### 8.14.5 Control Subpanel Assembly (GAS-1304)

Parts List

Control Cabinet Subpanel Assembly (GAS-1304) Parts List

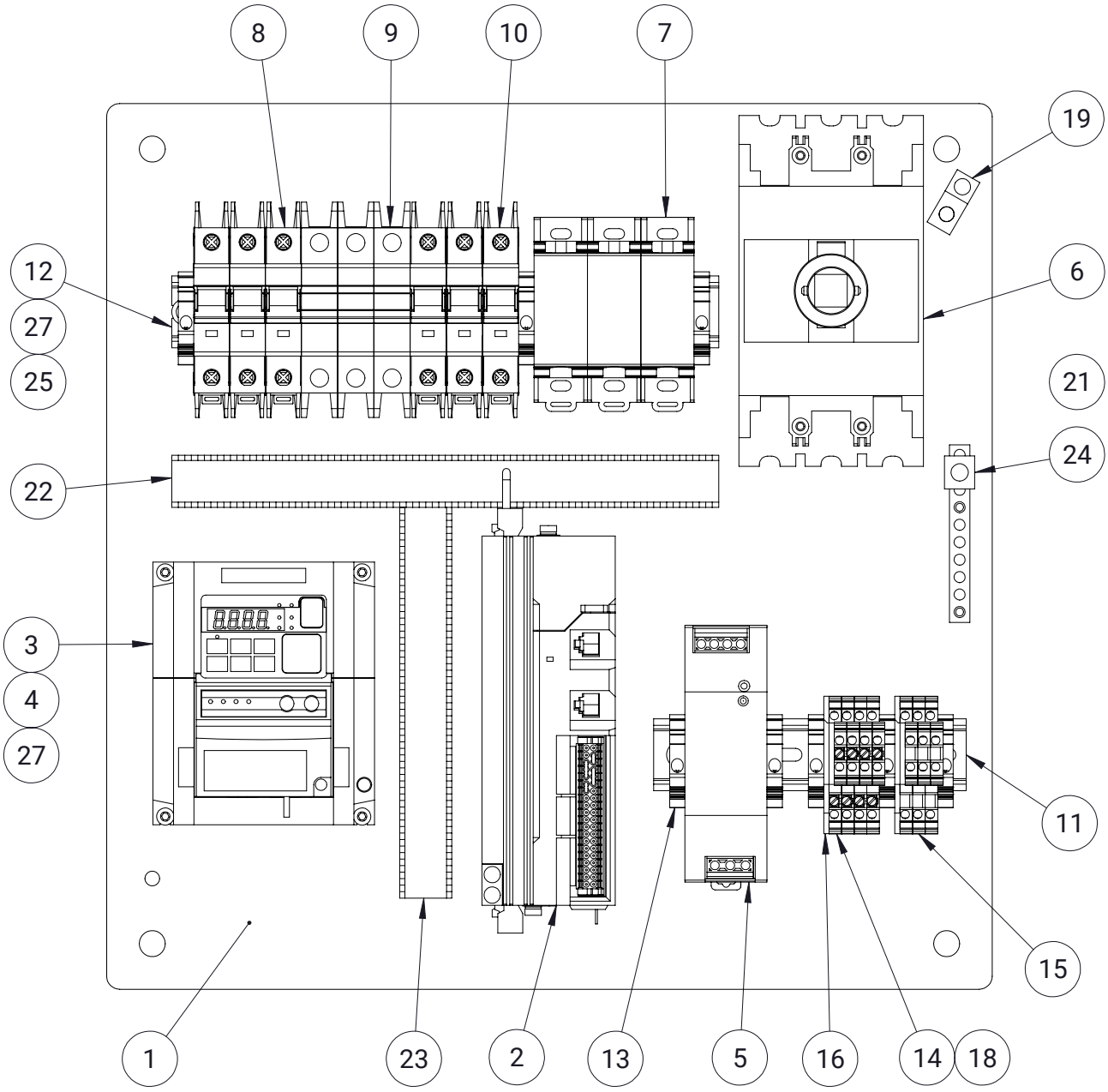
| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | EPP-0436 | 1 | Electrical Subpanel, 20" x 16" |
| 2 | PLC-317 | 1 | NX1P CPU, 40IO, 4 Axis |
| 3 | PLC-319 | 2 | Pulse Output Unit, Open Collector Output |
| 4 | PLC-302 | 1 | Ethernet Switch, 5 port |
| 5 | PLC-320 | 1 | VPN Gateway, TC Cloud Client |
| 6 | 20-DRV-185 | 2 | Microstepping Stepper Drive |
| 7 | PLC-343 | 1 | Safety Controller |
| 8 | 20-PLC-210 | 1 | DIN Rail 35mm - 15Inch |
| 9 | 20-PLC-210 | 1 | DIN Rail 35mm - 9Inch |
| 10 | 20-PLC-209 | 9 | Wei End Section |
| 11 | 20-PLC-255 | 2 | Ground Terminal Block |
| 12 | 20-PLC-307 | 3 | Ethernet Patch Cable, 1m , Yel |
| 13 | PLC-323 | 1 | Ethernet Cable, 15ft |
| 14 | 20-PLC-237 | 6 | MO Double Terminal Block, Grey |
| 15 | 20-PLC-238 | 2 | MO Double Terminal Block End Plate |
| 16 | 20-PLC-237-BLUE | 6 | Double Terminal Block, Blue |
| 17 | 20-EPP-0309 | 4 | Terminal Block Jumpers, 6 |
| 18 | 20-EPP-0311 | 1 | Cable Tray 1" Wide x 2" High - 14.5inch |
| 19 | FAS-E02 | 4 | BHSHCS 10-24 x 0.500 x 0.500 - Black Oxide |
| 20 | FAS-E30 | 4 | #10 Flat Washer, Zn |
| 21 | FAS-C02 | 4 | BHSHCS 6-32 x 0.625 x 0.625 - Black Oxide |

# 8. Assembly and Shop-Gruv Parts List

## 8.14 Electrical Assembly (GAS-13)

### 8.14.5 Power Subpanel Assembly (GAS-1305)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.14 Electrical Assembly (GAS-13)

### 8.14.5 Power Subpanel Assembly (GAS-1305)

Parts List

Power Subpanel Assembly (GAS-1305) Parts List

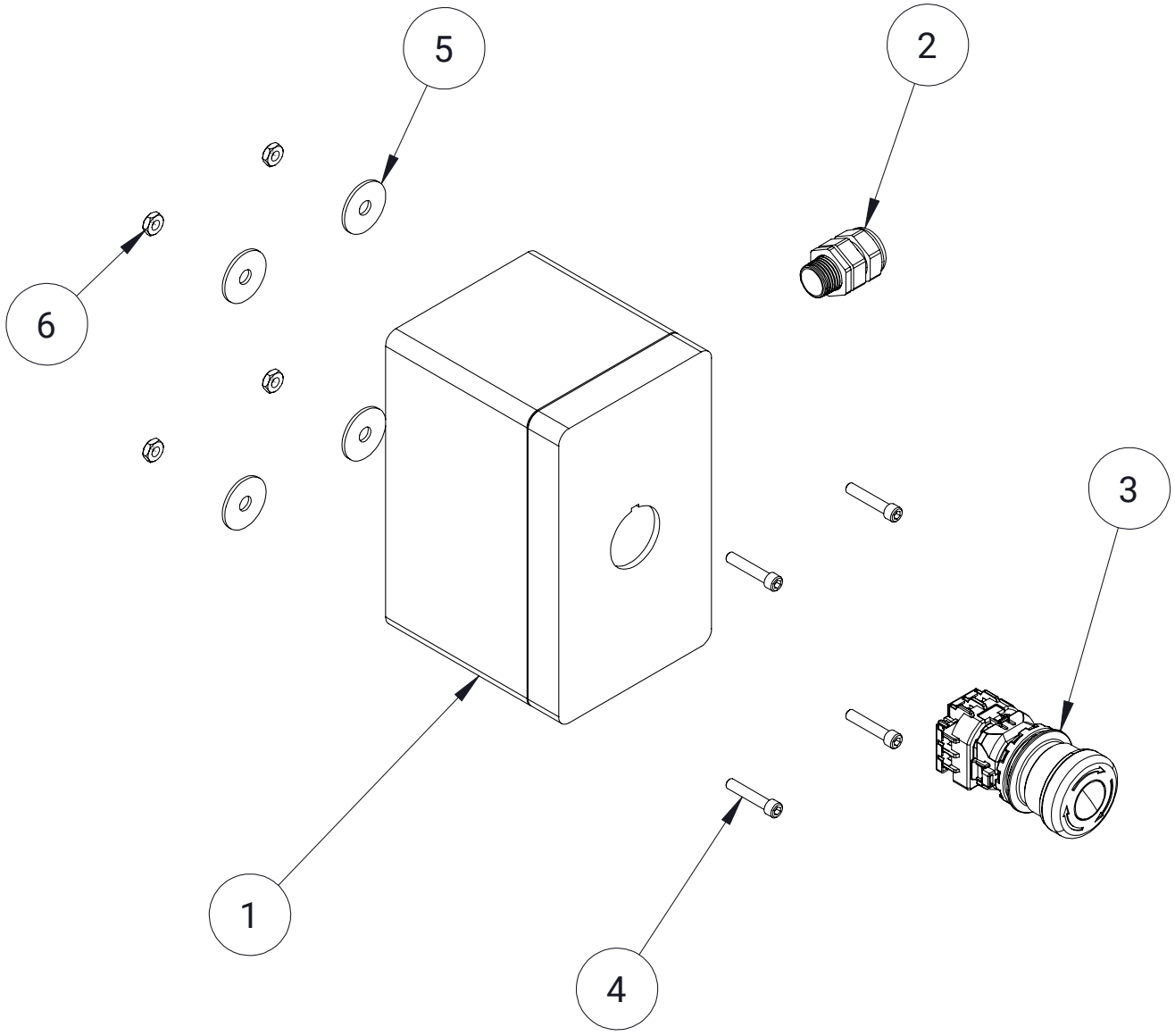
| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | EPP-0441 | 1 | Electrical Subpanel, 20H x 20W |
| 2 | DRV-203 | 1 | Servo Drive, 1S series, 800 W, 240V 3-phase |
| 3 | DRV-204 | 1 | AC VFD, 240V 3-phase, 2 HP, 1.5 kW |
| 4 | DRV-205 | 1 | EtherCAT Communication Module |
| 5 | 20-PLC-265 | 1 | Power Supply, 24V, 5A |
| 6 | 20-PLC-298 | 1 | MCCB, 3P, 20A |
| 7 | 20-PLC-289 | 3 | Distribution Block 175A, 1-In, 4-Out |
| 8 | 20-PLC-285 | 3 | Circuit Breaker, 1P, 3A |
| 9 | 20-PLC-288 | 1 | Circuit Breaker, 3P 15A |
| 10 | PLC-322 | 1 | Circuit Breaker, 3P, 16A |
| 11 | 20-PLC-210 | 1 | DIN Rail 35mm - 6Inch |
| 12 | 20-PLC-210 | 1 | DIN Rail 35mm - 10.5Inch |
| 13 | 20-PLC-209 | 8 | Wei End Section |
| 14 | 20-PLC-237 | 4 | MO Double Terminal Block, Grey |
| 15 | 20-PLC-237-BLUE | 3 | Double Terminal Block, Blue |
| 16 | 20-PLC-238 | 2 | MO Double Terminal Block End Plate |
| 17 | 20-PLC-304 | 1 | EtherCAT Cable, 0.5m, 18 inch |
| 18 | 20-EPP-0309 | 4 | Terminal Block Jumpers, 2 |
| 19 | 20-EPP-0164 | 1 | Cable Lug |
| 20 | 20-EPP-0276 | 1 | ROTARY HANDLE |
| 21 | 20-EPP-0396 | 1 | Shaft for BW9V0CA Rotary Handle, 24" |
| 22 | 20-EPP-0311 | 1 | Cable Tray 1" Wide x 2" High - 10.5inch |
| 23 | 20-EPP-0311 | 1 | Cable Tray 1" Wide x 2" High - 7.5inch |
| 24 | EPP-0447 | 1 | Ground Bar |
| 25 | FAS-E30 | 5 | #10 Flat Washer, Zn |
| 26 | FAS-D22 | 4 | BHSHCS 8-32 x 0.500 x 0.500 - Black Oxide |
| 27 | FAS-E02 | 7 | BHSHCS 10-24 x 0.500 x 0.500 - Black Oxide |

# 8. Assembly and Shop-Gruv Parts List

## 8.14 Electrical Assembly (GAS-13)

### 8.14.6 E-Stop Button Assembly (GAS-1306)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.14 Electrical Assembly (GAS-13)

### 8.14.6 E-Stop Button Assembly (GAS-1306)

Schematic

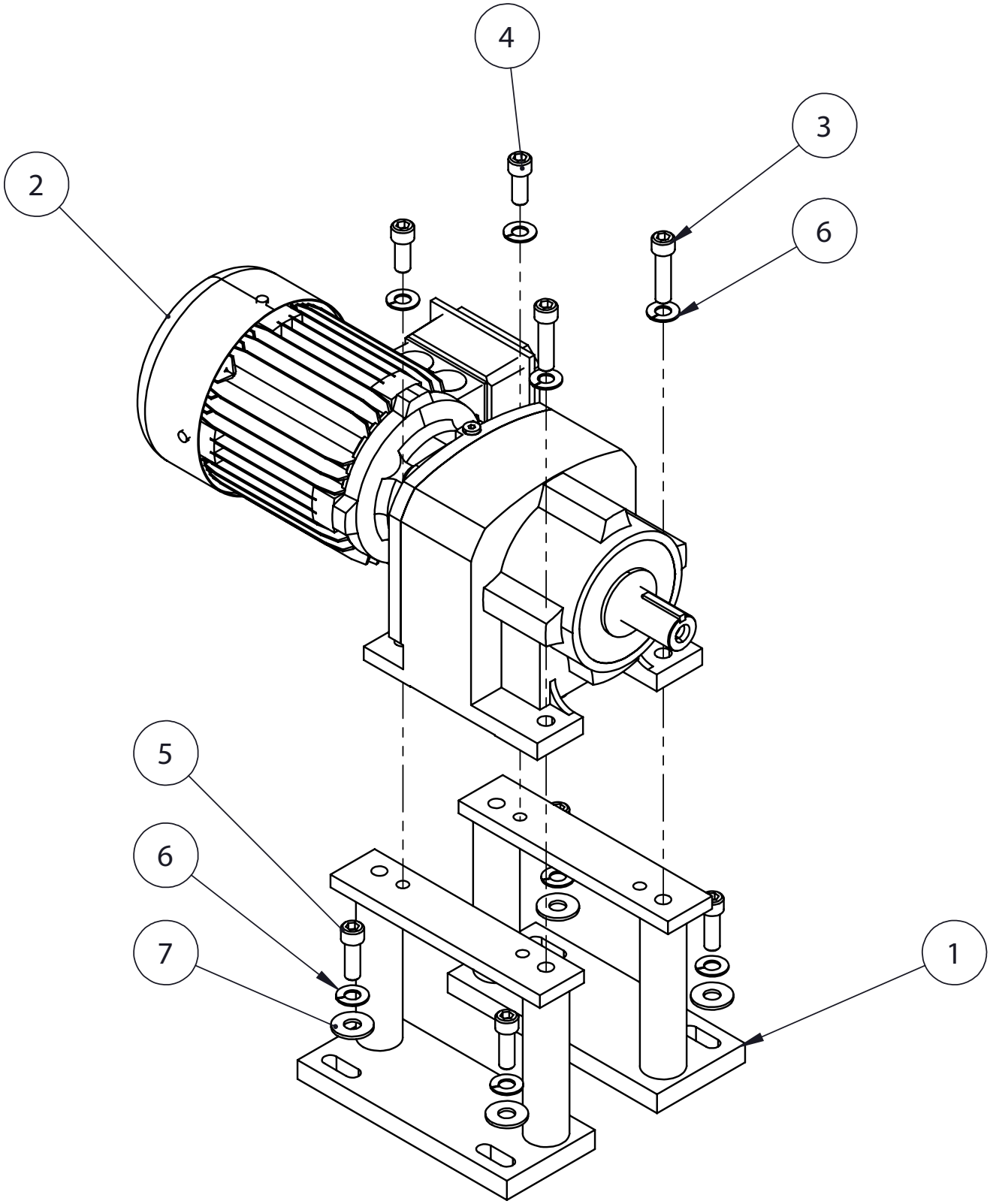
E-Stop Button Assembly (GAS-1306) Part List

| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | 20-EPP-0179 | 1 | L&T SWITCH BOX |
| 2 | 20-EPP-0135 | 1 | SMALL STRAIN RELIEF, 1/2" NPT, .39"-.56" Dia Cord |
| 3 | PLC-344 | 1 | E-Stop Push Button 2NC |
| 4 | FAS-E26 | 4 | SHCS 10-24 X 1.000 X 1.000 - Black Oxide |
| 5 | FAS-F59 | 4 | 1/4" Flat Washer, Zn |
| 6 | FAS-E23 | 4 | 10-24 Hex Nut, ZN |

# 8. Assembly and Shop–Gruv Parts List

## 8.15 Rotation Motor Assembly (GAS–14)

Schematic



# 8. Assembly and Shop-Gruv Parts List

## 8.15 Rotation Motor Assembly (GAS-14)

Parts List

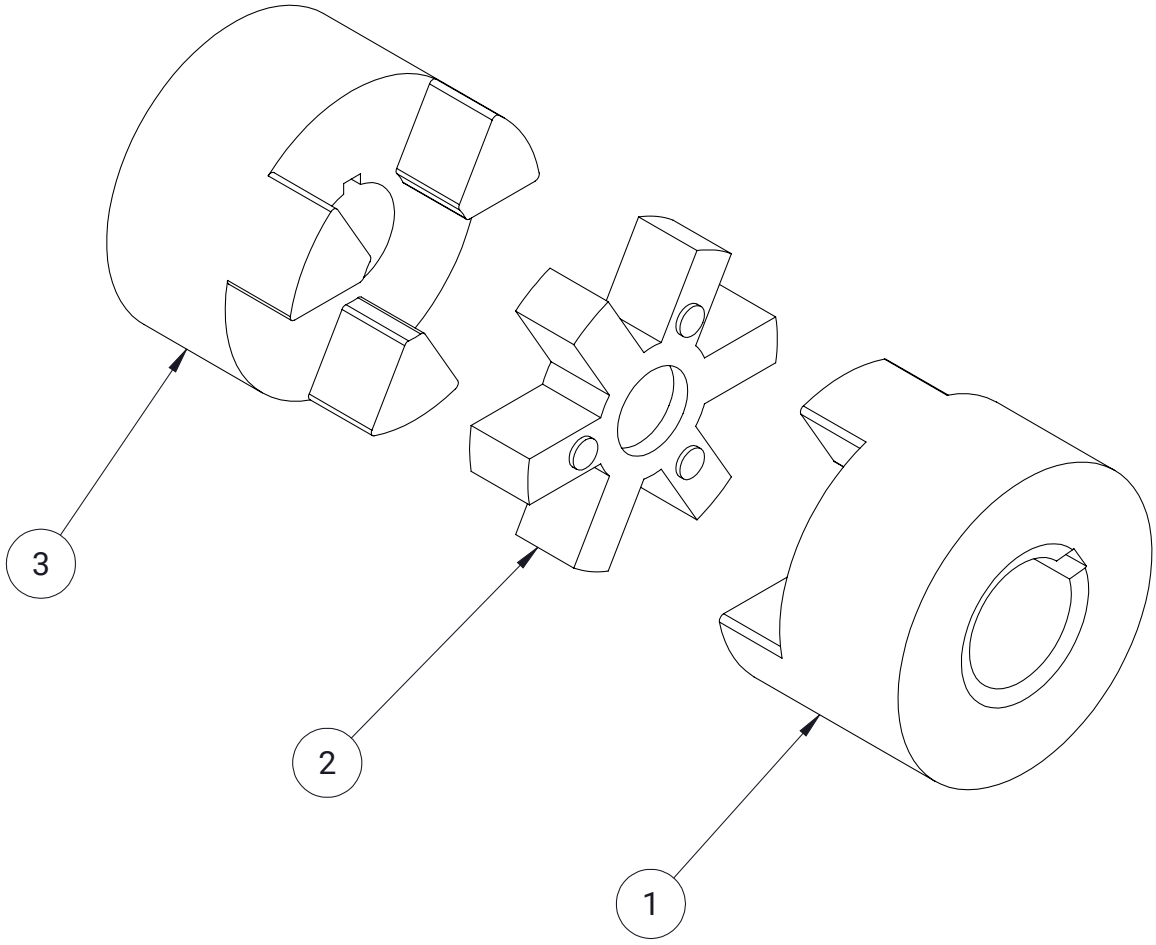
Rotation Motor Assembly (GAS-14) Part List

| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | GAS-1401 | 2 | Motor Support Weldment |
| 2 | MTR-134 | 1 | Helical Inline Gear Motor |
| 3 | FAS-I21 | 2 | SHCS- ½"-13 x 2.000 x 2.000 - Black Oxide |
| 4 | FAS-I17 | 2 | SHCS- ½"-13 x1.250 x 1.250 - Black Oxide |
| 5 | FAS-I31 | 4 | SHCS- ½"-20 x 1.500 x 1.500 - Black Oxide |
| 6 | FAS-I23 | 8 | ½" Split Lock Washer, Zn |
| 7 | FAS-I29 | 4 | ½" Flat Washer, Zn |

# 8. Assembly and Shop–Gruv Parts List

## 8.16 Shaft Coupling Assembly (GAS–15)

Schematic



# 8. Assembly and Shop–Gruv Parts List

## 8.16 Shaft Coupling Assembly (GAS–15)

Parts List

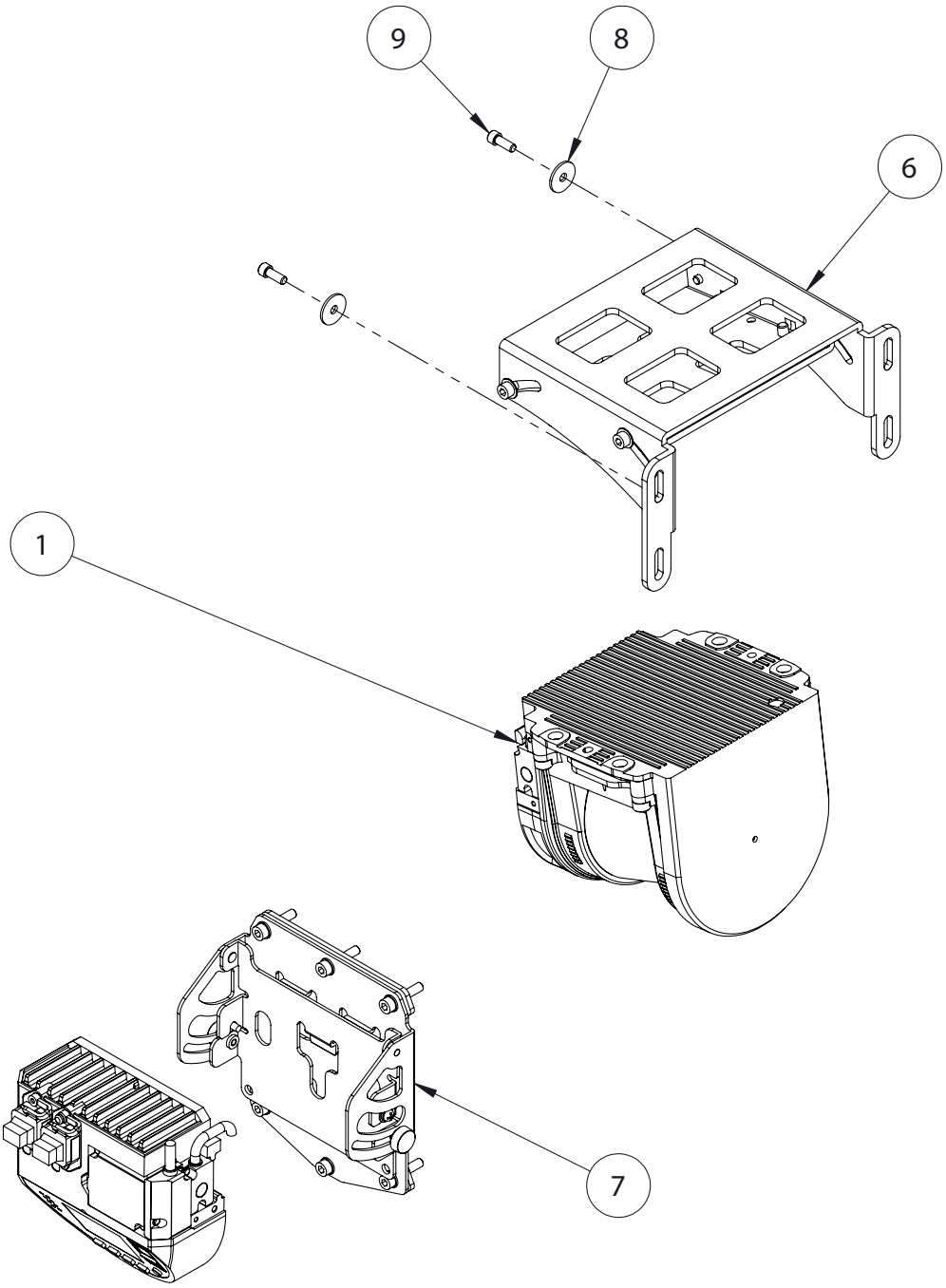
Shaft Coupling Assembly (GAS–15) Parts List

| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | GL–11171 | 1 | Shaft Coupling Modified |
| 2 | Gl–11173 | 1 | Hytrel Spider |
| 3 | GL–11172 | 1 | Shaft Coupling Body Unmodified |

# 8. Assembly and Shop–Gruv Parts List

## 8.17 Safety Scanner Assembly (GAS–16)

Schematic




NOT SHOWN: 2 3 4 5

# 8. Assembly and Shop-Gruv Parts List

## 8.17 Safety Scanner Assembly (GAS-16)

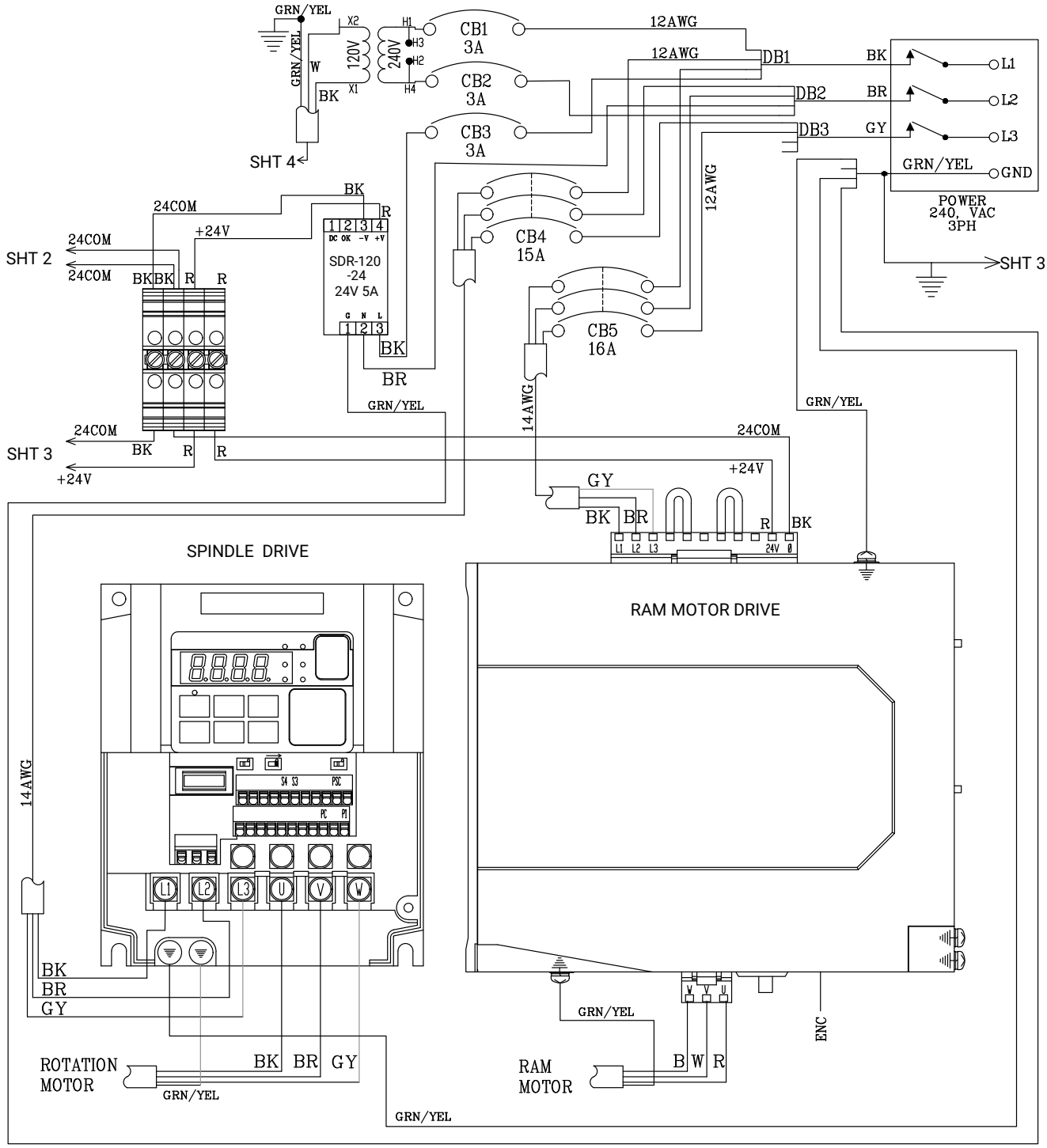
Parts List

Safety Scanner Assembly (GAS-16) Parts List

| Item No. | Part Number | Qty. | Description |
|---|---|---|---|
| 1 | PLC-357 | 1 | SZ-V Safety Scanner |
| 2 | PLC-358 | 1 | SZ-V Scanner Power Cable, 5m |
| 3 | PLC-359 | 1 | SZ-V Main Network Cable, 0.3m |
| 4 | PLC-360 | 1 | SZ-V Network Extension Cable, 5m |
| 5 | PLC-361 | 1 | SZ-V Scanner Connection Cable, 5m |
| 6 | MSC-667 | 1 | Safety Scanner Head Bracket |
| 7 | MSC-668 | 1 | Safety Scanner Display Bracket |
| 8 | FAS-E39 | 2 | #10 Fender Washer, ZN |
| 9 | FAS-E16 | 2 | SHCS 10-24 x 0.500 x 0.500 - Black Oxide |

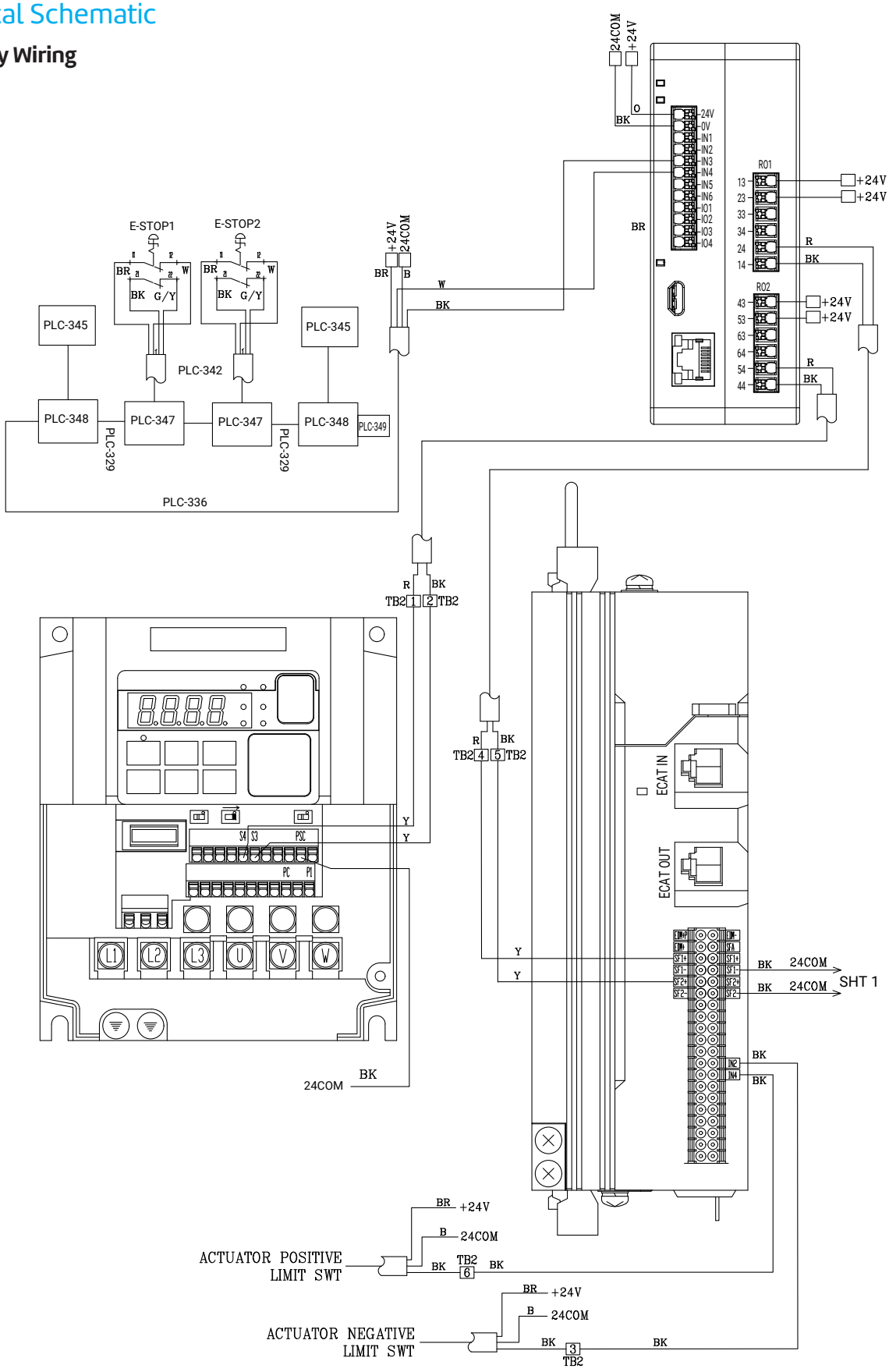
# 9. Electrical Schematic

## 9.1 Power Circuit Wiring



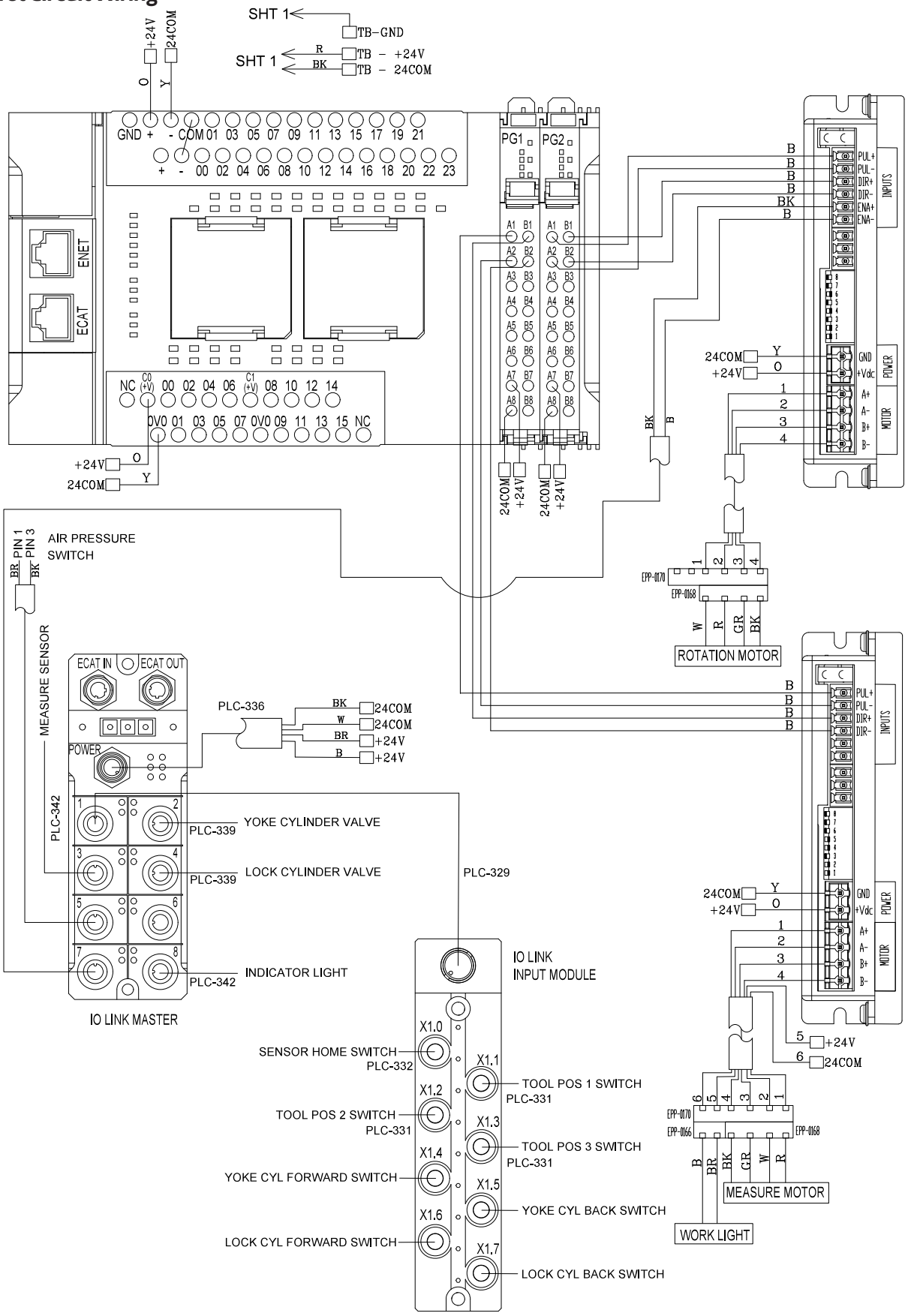
# 9. Electrical Schematic

## 9.2 Safety Wiring



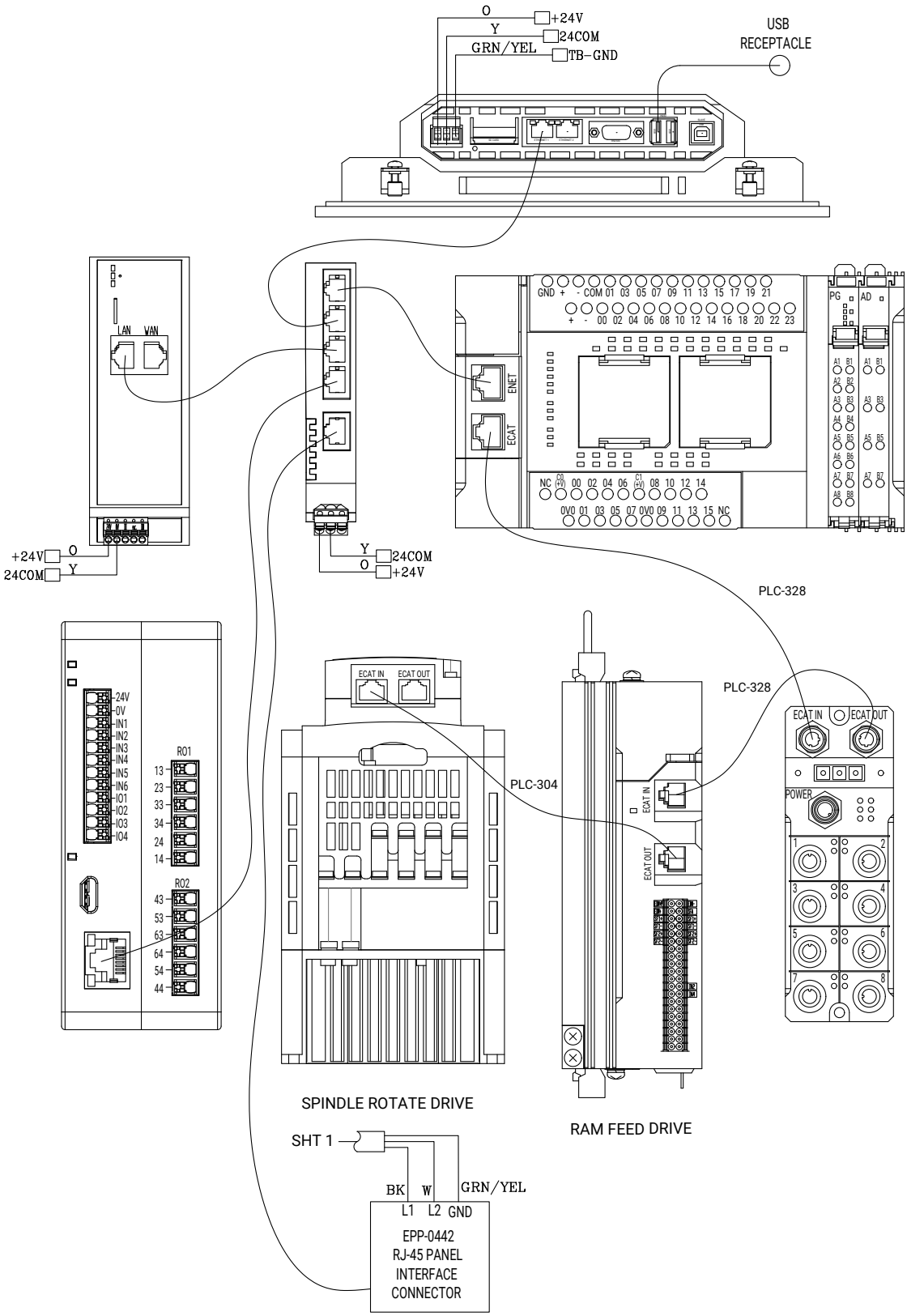
# 9. Electrical Schematic

## 9.3 Control Circuit Wiring



# 9. Electrical Schematic

## 9.4 Ethernet / EtherCAT Wiring



| Document Version | Revision Date | Originator | Revision Description |
|---|---|---|---|
| v01 | | | Initial release |
| v02 | 04/13/2023 | JAM | Added list of tools and pipe combinations |
| v03 | 04/04/2025 | JRY | Page 86: added revision table<br>Page 11: removed Auto Measure sections (3.2.3 and 3.2.4)<br>Page 24: replaced Guide wheels picture with Rev D picture<br>Page 28: update GAS exploded view with updated sub-assemblies<br>Page 30: update GAS-01.<br>Page 36: updated GAS-04 Rev C to GAS-04 rev D<br>Page 38-41: added GAS-0401, -0403, -0404 Assy and Part lists<br>Page 52: updated GAS-09. Removed GAS-0902 from manual.<br>Page 76: Updated GAS-14<br>Page 80: Added GAS-16 |
| v04 | 10/29/2026<br><br>10/30/2026 | | Page 2: Changed 24" pipe to 20" pipe<br>Page 21: Changed 18" - 24" Carbon Steel to 18" - 20" Carbon Steel<br>Changed 18" - 24" to 18" - 20"<br>Page 16: In the screenshot, changed 18" - 24" to 18" - 20"<br>Page 19: In the screenshot, changed 18" - 24" to 18" - 20" |

Notes:

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