Please read the following document in its entirety before purchasing materials and assembling.

Design of an ISWP Standards Caster Test
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University of Pittsburgh scientists are working with the U.S. Agency for International Development (USAID) under a multi-year sub-award to develop the International Society of Wheelchair Professionals, a global network to ensure a level of standardization, certification and oversight, to teach and professionalize wheelchair services, and to build affiliations to put better equipment in the right hands. Since 2002, USAID has granted more than $45 million to improve wheelchairs and wheelchair services worldwide. This sub-award – Agreement No. APC-GM-0068 – was presented by Advancing Partners & Communities, a cooperative agreement funded through USAID under Agreement No. AIDOAA-A-12-00047, beginning Oct. 1, 2012.

For further information on use of the ISWP Wheelchair Caster Test assembly instructions, contact the University of Pittsburgh’s Innovation Institute at 412-383-7670 or the International Society of Wheelchair Professionals at intlsocietywheelchairprof@gmail.com.
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Notes:

These instructions are to be paired with the dimensioned and assembly drawings for part names and details about each part or assembly.

Assembly instructions may only dictate about one part, but welding and placement directions apply to all parts of the same name.

All the Rec Bar parts are made up of 2-inch (50.8 mm) Square Tubing. The different part names imply different hole patterns.

All hardware used in this assembly are in ANSI Inch, however ANSI Metric are acceptable alternatives.

All dimensions within this set of instructions is given in inches and millimeters.

A part guide has been included at the end of this document.

File down all exposed edges and corners to avoid any nicks or scratches.

Cutting Notes:

All parts should be cut, and holes drilled before the assembly is started. Please follow the tolerances listed on the dimensioned drawings.

Assembly Notes:

All nuts and bolts should be loosely attached to allow for some adjustment and movement during the assembly.

Legend:

Flange Corner Weld Flange Corner Weld Around

Tools Required

Box or open-end wrench set / socket set / adjustable wrenches (2)
Allen Wrench Set
Welder (ARC or MIG)
Drill and drill bits
Tape measure
Bandsaw
3-Axis Mill

Additional tools that would be helpful:
Water Jet
Building the Base Frame

Base Legs Assembly

Figure 1. Corner weld the base leg angle iron to the mounting plate to assemble to base legs.

Start by welding together the Base Leg Angle Iron and the Base Leg Mounting Plate. To make the four [4] Base Legs, you need two [2] Base Leg Angle Iron (right), two [2] Base Leg Angle Iron (left), and four [4] Mounting Supports. Figure 1 and 2 show the setup of a Base Leg. Note, the Right and Left Base Leg Angle Irons have different hole arrangements.

To assemble, corner weld the angle iron in the center of the mounting plate on all edges. The hole in the mounting plate should be on the inside of the angle iron. The outside of the angle iron should be 2.5-inches (63.5 mm) from the sides of the mounting plate. Repeat this for all four [4] Base Legs.

In Figure 2, the Base Leg pictured on the left is for the front-left leg and the back-right leg. The leg pictured on the right is for the front-right leg and the back-left leg.

Figure 2. Base Leg Orientation

Frame Table Assembly

Figure 3 shows the basic layout and orientation of the frame table assembly. The four [4] Base Legs will be oriented such that the inside of the angle iron is facing outward, as shown in Figure 3. The angle iron of the legs should be mirroring the other on all sides.

The base frame table can now begin construction.

Use Figure 4 and the description below to follow the proper orientation of all the pieces used in the base table frame. All connections with the Rec Bar Tubing are made using ½-13 by 3-inch (76.2 mm) hex head screws and ½-13 locknuts while all connections with the angle iron pieces are made using ½-13 by 1.75-inch (44.45 mm) hex head screws and ½-13 locknuts. In addition, L Connectors are used at every joint to further connect and stabilize the base frame table, as shown in Figure 4. Note that all connections should be loosely secured. Once the attachment has been made, the table needs to be leveled and

Figure 3. Base frame table orientation
squared so that that everything can fit together properly. Once this is done, tightly secure the table together.

To form the table, Rec Bar Table Support and Rec Bar Table Support 2 make up the right and left sides of the frame, respectively. These are directly attached to the 3rd hole from the bottom on the Base Legs, as shown in Figure 5. The Table Support Side angle iron pieces make up the front and back outside frame of the table. The holes on the side of the angle iron face inward toward the center. Next, two [2] Table Support Center angle iron pieces are used in the center of the table and extend from front to back. The side with less holes faces outward from the center. The two [2] middle holes on these center pieces align with the L Connectors that attach to the Table Support Short pieces in the middle of the frame. These pieces extend from the center to either Rec Bar Table Supports on the left and right side of the frame. Figure 5 shows the location for the attachment of the rec bar table support pieces to the base legs. Although the base legs are set up in different orientations, the rec bar attachment occurs on the same side for all four [4] base legs. The four [4] holes below this are used for the cross brace attachment to the frame.
Cross Brace Assembly

Four [4] cross braces in two [2] different lengths are used to provide support for the frame. Two [2] sets of Cross Brace F&B are used in the front and back sides and two [2] sets of Cross Brace L&R are used on the left and right sides.

To make the cross brace, both the cross braces in a set are loosely secured through the center hole using a $\frac{1}{2}$-13 by 1.75-inch (44.45 mm) hex head screw, two [2] $\frac{1}{2}$-inch (12.7 mm) washers, and a $\frac{1}{2}$-13 locknut. The Cross Braces are attached to the Base Legs in a diagonal orientation using $\frac{1}{2}$-13 by 1.75-inch (44.45 mm) hex head screws, two [2] $\frac{1}{2}$-inch (12.7 mm) washers, and $\frac{1}{2}$-13 locknuts. Each hole uses one [1] screw and nut and two [2] washers straddling the cross brace. Because of the stacked orientation of the cross braces, a 3/8-inch Cross Brace Spacer is added between the Base Leg and the Cross Brace and is attached using a $\frac{1}{2}$-13 by 2-inch (50.8 mm) hex head screw, two [2] $\frac{1}{2}$-inch (12.7 mm) washers, and a $\frac{1}{2}$-13 locknut. This process is repeated for all the remaining sides.

Top Frame Assembly

The top frame assembly consists of four [4] rec bars placed in a square lattice. The right side is made up of Rec Bar Top Frame 4. The left side uses Rec Bar Top Frame 3 and the front and back use Rec Bar Top Frame 1-2.

Start by attaching the Rec Bar Top Frame 4 to the right side Base Legs. Orient the rec bar such that the holes are facing up. The rec bar attaches to the top holes on the Base Legs using a $\frac{1}{2}$-13 by 3-inch (76.2 mm) hex head screw and a $\frac{1}{2}$-13 locknut. This pattern is continued on all the other sides using their respective rec bars. Note, the right and left side rec bars’ holes should align, and the front and back rec bars should be oriented such that the single holes on each bar are opposite each other.

Figure 6. Cross Brace assembly and attachment to the Base Legs

Figure 7. Proper orientation of the top frame
The next step is to add the gear reducer and bearing mount rec bars. Figure 8 labels which rec bar is used and where. Use this figure and the description below to follow the proper orientation of the top frame assembly.

The Rec Bar Gear Reducer is the front most rec bar used. It is attached on top of the left and right rec bar through the 2nd hole from the front. This leaves one [1] open hole between the front rec bar and the Rec Bar Gear Reducer. The Rec Bar Bearing Mount 2 is next and is attached in the same way using the next consecutive hole (3rd hole from front). Following that, both Rec Bar Gear Reducer and Rec Bar Bearing Mount are both attached through the next consecutive hole (4th hole from front). The Rec Bar Gear Reducer is attached on top and the Rec Bar Bearing Mount is attached under the left and right-side bars.

To attach the single tubes (Rec Bar Gear Reducer and Rec Bar Bearing Mount 2) to the outside frame, use a ½-13 by 5-inch (127 mm) hex head screw, two [2] ½-inch washers, and a ½-13 locknut. When connecting two [2] tubes (Rec Bar Gear Reducer and Rec Bar Bearing Mount) to the outside frame through a single hole, use a ½-13 by 7-inch (177.8 mm) hex head screw, two [2] ½-inch washers, and a ½-13 locknut. Next, screw in four [4] 1-inch (25.4 mm) eye bolts, one on each side of the rec bar top frames, as shown in figure 8.
Figure 10. Combining all the assemblies above should yield a frame assembly as shown above
Building the Turntable

Start by screwing in the grease fitting into the side hole of the Bearing Housing. Secure the Bearing Housing to the Bearing Housing Mount using ¼-20 by ¾-inch (19.05 mm) flat head screws. Next, secure this assembly to the Table Support Center pieces using 10-24 x 1.25-inch (31.75 mm) button head screws, a ¼-inch (6.35 mm) flat washer, and a 10-24 locknut. The Bearing Housing should maintain a tight tolerance and be press fit based on the Thrust Bearing (Part# 6678K14 at McMaster Carr). Insert the Thrust Bearing into the Bearing Housing. Next, screw in the Grease Fitting into the side hole of the Bearing Housing.


To secure the Base Plate on to the center shaft, a 1.5-inch (38.1 mm) Shaft Flange will be attached to both sides of the Base Plate. These shaft flanges are secured using three ¼-20 by 2-inch (50.8 mm) tap bolts, three ¼-20 by 2-inch (50.8 mm) shoulder bolts, twelve ¼-inch (6.35 mm) flat washers, and six [6] ¼-20 hex nuts. The tap bolts and shoulder bolts alternate as they are secured around the shaft flange. The tap bolts are outfitted with three ¼-inch (6.35 mm) flat washers while the shoulder bolts are outfitted with only one [1] per bolt.

Next, add in the Center Shaft Key to the bottom of the lowermost key slot on the Center Shaft. The bottom of the Center Shaft is characterized by the smaller diameter. Additionally, add the Center Shaft to Love Joy Key to the topmost key slot.
The entire key should perfectly fit into the slot.

When the shaft flanges are tightly secured to both sides of the Base Plate, stick the Center Shaft through the center hole of the Base Plate, aligning the key and keyway. Tighten both shaft flanges to the Center Shaft using two [2] ¼-28 by ¾-inch (19.05 mm) socket head screws per shaft flange such that the Base Plate sits at least 5-inches (127 mm) from the bottom of the Center Shaft. Add the Tapered Bearing Shield to the bottom of the Center Shaft. Keep the shield loosely secured to the shaft so that later it can be tightened to rest on the Thrust Bearing.

Take this entire turntable assembly and stick the bottom of the Center Shaft into the Thrust Bearing secured on the base frame table. Tighten the Tapered Bearing Shield such that it rests on the Thrust Bearing using two [2] ¼-28 by ¾-inch (19.05 mm) socket head screws in the shaft collar of the shield. Once tightened, loosen the shaft flange collars on the Center Shaft and lower the Base Plate such that it is resting on the Roller Casters.

Next, start by assembling the Top of Shaft Bearing Assembly. Using a ½-13 by 1.75-inch (44.45 mm) hex head screw, two [2] ½-inch flat washers, and a ½-13 locknut, secure the Top of Shaft Bearing to the Top of Shaft Bearing Mounts. Repeat in all four [4] corners of the Top of Shaft Bearing.

Take this assembly and slip it onto the top of the Center Shaft. For this, you will need to go between the Bearing Mount and Bearing Mount 2 Rec Bars. Go far enough down the Center Shaft to be able to twist the Top of Shaft Bearing Assembly to the proper orientation. Level the assembly before securing to the top frame.

To finish the turntable assembly, add the pie pieces to the Base Plate. Two [2] Angled Pie Piece Assemblies and six [6] Slat Plate New pieces will be used. To make the Angled Slat Pie Piece Subassemblies, use a Slat Plate V4, Slat V2, and two [2] ¼-20 ¾-inch (19.05 mm) socket head screws per subassembly. The slotted end of the slat screws into one of the numbered holes of the pie piece based off the intended angle of impact. The other end of the Slat secures to the open hole toward the middle of the Slat Plate, as shown in Figure 16.
These plates will all be placed on the base plate in a circular pattern. Slats can later be added to these pie pieces to conduct different kinds of impact testing. The Angled Slat Pie Piece Assemblies will sit opposite each other and split the remaining pie pieces. Line up the outside grooves such that a 3/8-16 by 2-inch (50.8 mm) flange hex head screw and a 3/8-16 flange locknut can be used to secure the pie piece to the base plate. The Quick Release Clamps will sit in the inside groove of the pie piece and screw into the outer circle of holes on the Base Plate. Screw in the Quick Release Clamps with the clamp open. Once tightened, close the clamp to further hold the two [2] pieces together. Note that these clamps had their handles cut down. This step is not completely necessary depending on how you orient the tightened clamp.

Figure 16. Angled Slat Pie Piece Subassembly

Figure 17. Adding the Pie Pieces to the Turntable Assembly
Installing the Motor and Gear Reducer

Insert the Love Joy for Top of Shaft hub and Love Joy Spider for Shaft to GR to the top of the shaft until the bottom of the love joy hub is about ¼-inch (6.35 mm) above the Top of Shaft Bearing Mounts. Slide the Gear Reducer Output Key and Love Joy for GR Output on the output shaft of the Gear Reducer. Push the Love Joy all the way up the output shaft for easy Gear Reducer installmment.
Next, assemble the Gear Reducer Side Mount Subassembly by corner welding the Gear Reducer Side Mount 2 to the Gear Reducer Side Mount on the 3 sides indicated in Figure 20. Add these Gear Reducer Side Mount Assemblies to both sides of the Gear Reducer and secure using four [4] 7/16-14 by 3/4-inch (19.05 mm) hex head screws per side. Take this whole assembly and mount it onto both Gear Reducer Rec Bars.Secure from the inside of the Gear Reducer Side Mounts by using a 1/2-13 by 3-inch (76.2 mm) hex head screw, one [1] 1/2-inch (12.7 mm) flat washer, and a 1/2-13 locknut in each of the six [6] holes. Add two [2] 1/2-13 by 1.75-inch (44.45 mm) hex head screws and two [2] 1/2-13 hex nuts to each side of the gear reducer side mount 2 holes. These will be used for leveling the gear reducer. Once the Gear Reducer is secured slide down the Love Joy for GR Output hub and align with the Love Joy for Top of Shaft hub and the Love Joy Spider for Shaft to GR. Tighten the set screws in both the love joy hubs to hold the coupling in place.

Add the Gear Reducer Input Key and Love Joy for GR Input hub on the input shaft of the Gear Reducer and the Love Joy to Motor Key and the Love Joy for Motor hub on the Motor shaft. Loosely secure the Motor Mount to Frame pieces to the top of both Gear Reducer Rec Bars using 1/2-13 by 3-inch (76.2 mm) hex head screws and 1/2-13 locknuts. Place the Motor on top of the mounts and line up the slots on the Motor to the holes in the Motor Mount to Frame pieces and loosely secure the motor to the mounts with 5/16-18 by 7/8-inch (22.23 mm) hex head screws and 5/16-18 locknuts. Align the Motor shaft with the Gear Reducer input shaft and the love joy hubs and the Love Joy Spider Motor to GR. Bring together the love joy coupling and tighten the set screws on the love joy hubs to hold the coupling in place. Tighten all nuts and bolts once the motor is in proper location.
Figure 22. This figure shows what the final frame assembly, turntable assembly, and gear reducer and motor assembly should resemble.
Building the Arms

Arm Support Subassembly

Start by assembling the arm support clamp assemblies. For this, you will need two [2] ¼-20 by 1.75-inch (44.45 mm) socket head screws, an Arm Support Clamp, an Arm Support Clamp Round Piece, and a 3/8-16 by 2-inch (50.8 mm) flange hex head screw. Loosely secure the ¼-20 by 1.75-inch (44.45 mm) socket head screws in the two [2] side holes. These will be used to tighten the clamp on the Arm Support Rod. Feed the flange hex head screw through the hole and screw it into the Arm Support Clamp Round Piece. This is what holds the entire arm up on the frame. Repeat this until you have two [2] arm support clamp assemblies. Add the rod into to the centered hole of one of the arm support clamp assemblies. Tighten the socket head screws such that the end of the rod is 0.5-inches (12.7 mm) from the side of the Arm Support Clamp.

Figure 23. Arm Support Subassembly

Figure 24. Exploded Arm Support Clamp Assembly

Figure 25. Arm Support Clamp Assembly

Slide a 1-inch (25.4 mm) shaft collar onto the rod. Loosely secure the ¼-28 by 5/8-inch (15.89 mm) socket head screw on the shaft collar. Slide two [2] Arm Flange Bushings into the center hole of the Arm Holder, one [1] on either side, and slide this whole assembly onto the rod until it is up against the shaft collar. Add another 1-inch (25.4 mm) shaft collar on the other side of the other bushing and another Arm Support Clamp to the other end of the rod and tighten 0.5-inches (12.7 mm) from the end of the rod. Next, secure this Arm Support Assembly to the Base Legs. The 3/8-16 flange hex head screw and the Arm Support Clamp Round Piece are tightened to hold the arm assembly up against the frame.

Secure the Arm Holder such that the distance from the Arm Holder to the Arm Support Clamp is X-inches (mm). The shaft collars on the Arm Support rod may need to be loosened to move the Arm Holder. This placement will ensure that the caster’s distance travelled is correct.
Arm Subassembly

Loosely secure the Plate Gusset and the Gusset Spacer to a gusset Spacer Mount Short and a Gusset Spacer Mount Long using two [2] 5/16-18 by 1.375-inch (34.93 mm) per mount. Note that these gusset spacer mounts have been chamfered on the ends to properly fit within the channel of the 8020 Bar. Repeat this until you have 2 gusset assemblies. Slide one gusset assembly on each side of the 3-Inch (50.8 mm) 8020 Square Bar—the short gusset spacer mount on top and the long mount on the bottom—through the slots on the bar. The 8020 Square Bars should be oriented such that the single hole on the side is facing up. Screw a 1-inch (25.4 mm) eye bolt into this hole. Attach the Cam Strap s-hook to this eye bolt. The other end will be connected later. Next, align the Arm Attachment such that the 6 holes on the sides align with the last 3 holes on each of the Plate Gussets and secure with ¼-20 by 7/8-inch (22.23 mm) socket head screws. Once in place, tighten all the 5/16-18 by 1.75-inch (44.45 mm) and ¼-20 by 7/8-inch (22.23 mm) socket head screws. A Plastic 2 Plane Cross Level should be placed anywhere on the top of the 8020 square bar such that it is square with the arm.

To attach the Arm Subassembly to the Arm Support Subassembly, four [4] 5/8-11 by 2.5-inch (63.5 mm) socket head screws go through the slots of the Arm Attachment to screw into the open holes in the Arm Holder.

Now, the other end of the cam strap can be hooked onto the eye bolt on the top frame. Tighten the cam strap so that the arm is angle up slightly. If there is extra strap, wrap it around the rec bar until you reach the desired length. This strap holds the arm up so that test casters can be added or removed, or maintenance can be done on the arm. In addition, this strap will be there to catch the arm, prohibiting it from damaging the rest of the machine, in case of caster failure. Leave enough strap so that the arm can lay level and still have some leeway.

Next, a 5/8-11 by 4-inch (101.6 mm) socket head screw will sit in the Weight Block and a 5/8-11 hex nut will be used to tightly secure the screw to the Weight Block to create a post for the weights. A Rubber
Square will sit below and above the weights on the Weight Block. Approximately 30-pounds (13.61 kg) of plate weights will be added to each arm at the end of the build. To secure, another 5/8-11 hex nut will be used.


The figure below shows the arm assembly at this stage of the build.

To attach the complete Arm Assembly to the frame, line up the arm support clamps such that the protrusions on the clamp straddle a side of the Base Leg angle iron. Before securing, be sure that the clamp sits up against the angle iron, as shown in the figure below. Note that the arm will swing on the arm support rod. Once in place, tighten the Flange Hex Head Screw as much as possible. Vibrations from testing may cause this clamp to move slightly. Periodically check to confirm that the arm is still level.

Now, slide the Arm Clamp Assembly onto the end of the 8020 Bar. Before tightly securing the clamp on the bar, insert the test caster bearings into the Caster Adapter and complete the build of the test caster assembly. With the caster assembly built, tightly secure the Caster Adapter to the hub side plate using two [2] 3/8-16 by 2.5-inch (63.5 mm) socket head screws in the top two [2] holes. The bottom two [2] holes will be loosely secured with two [2] 3/8-16 by 7-inch (177.8 mm) socket head screws and two [2] 3/8-16 hex nuts. These 7-inch (177.8 mm) socket head screws will go through both side plates before the hex nut is secured. The clamp can be adjusted on the bar such that the center of the caster wheel you are testing is
centered with the center shaft of the turntable, as shown in Figure 31. Once correctly placed, secure the location of the clamp by tightening the four [4] 3/8-16 nuts.

Repeat this entire process until 4 arms are built. Each of these arms will take a different side of the caster test machine.

![Diagram of test caster placement on turntable](image)

**Figure 31.** Test Caster placement on the turntable

**Finalizing the Build**

**Adding the Limit Switches**

Start by securing the Compact Limit Switch to the Limit Switch Clamp using two [2] M5 by 25-mm (.9843 inch) socket head screws on the side closest to the actuator. Repeat this until there is one [1] for each arm.

These Limit Switch Assemblies can be placed anywhere on the top frame rec bars. They are used to stop the turntable motion if the actuator is pulled by an arm. In this model, one Limit Switch Assembly slides onto the Rec Bar Gear Reducer in the back and connects to the arm on the back side. Another is located on the Rec Bar Top Frame 1-2 and connects to the right-side arm. The third, is on the Rec Bar Bearing Mount 2 and connects to the front side arm. The fourth is on the Rec Bar Gear Reducer in the front and connects to the left side arm. Laterally, the limit switch assemblies are placed such that they are lined up with the eye bolt on each respective arm. Once in place, a ¼-20 by 3-inch (76.2 mm) socket head screw is used to secure the Limit Switch Assembly. A 3/16-Inch (4.76 Mm) Diameter Shock-Absorbing Rope is tied from the limit switch actuator to the
eyebolt on the respective arm. Leave a little slack in the rope to ensure that a full bounce of the test caster can occur.

**Adding the Polycarbonate Protectors**

Polycarbonate Protectors are used on all sides of the test machine to protect the surroundings from any potential test caster failures. To hold the protector sheets up, three types of polycarbonate holders are used.

The first holder is the PC Holder (Sides). These are attached to the frame through the last remaining open hole of the Base Legs. This hole is of a smaller diameter and is about halfway up the leg. A 10-24 by 1-inch (25.4 mm) button head screw, No. 10 washer, and 10-24 locknut is used to secure the holder to the frame. Two [2] PC Holders (Sides) will attach to each side, one [1] on both Base Legs. Orient them such that the fork protrusions are facing each other forming a channel slot for the protective shield.

The second type of holder is the PC Holder (Square tubing). These holders will slide onto the table support rec bars and secure using a 10-24 by 3-inch (76.2 mm) socket head screw and a 10-24 hex nut. Two [2] will be used on each table support rec bar. These can be placed anywhere along the rec bar to support the protective shield. In this model, the holders are placed 10-inches (254 mm) from the Base Legs.

The final type of holder is the PC Holder (Angled iron). These holders are used on the Table Support Side pieces of the base table. This holder consists of two [2] pieces which are secured with two [2] 6-32 by 1.25-inch (31.75 mm) button head screws and 6-32 hex nuts. Again, these holders can be placed anywhere on the angle iron to support the shield. In this model, the holders are placed 10-inches (254 mm) from the Base Legs.

Once, all the PC Holders are on the machine, slide the Plexiglass Protector into the channel formed by the holders. These are there in case of any caster failure that could cause harm to the surroundings. The figure below is what the final assembly should look like.
Figure 36. Complete Caster Test Assembly
**Electrical**

**Notes:**

The manual for all the components used in this list of instructions are included in the appendix.

A 220V AC power supply is assumed to be accessible for the factory being set up, but if this is not true then a separate power supply must be obtained as it is required for operation of the equipment.

Organization of the wires within the control box is up to the user and can be done in any way they find the most effective.

Various types of wire can be used for the connections between different components of the control box. The associated manuals for each component should be consulted when ordering these wires.

All components mentioned in this section are included in the Bill of Materials.

Figure B.1 in Appendix B shows the complete wiring diagram for the caster tester and can be used to properly wire the components. This is just one option of wiring the caster test. Other wiring methods will work.

**Tools Required**

- Wire cutters
- Screwdrivers
- Drill
- Soldering Iron (if necessary for wire connections)

**Mounting the Components**

An external single phase 110V and 220V AC power source are fed through an enclosure mounted to a nearby wall that most of the electrical components used in this test setup. These components include a power supply, a logic controller, a VFD motor controller, an LCD display, some operation buttons, and circuit breakers. A din rail has been mounted on the inside of the enclosure for easy installation and access to the electrical components. The following sections outline the installation process for each individual component.

**Mounting the Logic Controller**

The power supply and the controller will be mounted on a din rail for ease of access. The DIN rail should be cut such that it fits the entire length of the enclosure and then mounted using the accompanying fasteners. Once the DIN rail is attached, the programmable logic controller can be mounted onto the DIN rail using the installation instructions included within the manual for the controller. An image of the logic controller mounted to the din rail is shown in the figure below.
Mounting the Power Supply

The power supply will be mounted to the DIN rail in a similar fashion to that of the logic controller. The figure below shows the proper location of the mounted power supply with the logic controller.
In this setup, a 2-amp circuit breaker is mounted on the DIN rail within the enclosure. The circuit breaker is wired such that it should be located nearby to the power supply. This is installed to prevent failure of the controller in the case of a power surge.

Mounting the Motor Controller

The purpose of the motor controller is to regulate the actions of the motor by using the commands from the logic controller. Once the logic controller has been successfully installed, you can now add in the motor controller. It will be mounted to the DIN rail on the back panel of the enclosure. A DIN rail kit will need to be installed onto the VFD before it can be attached to the DIN rail. Follow the DIN rail mounting diagram and instructions in the manual for outlined steps on how to mount the motor controller.

![Figure 39. Installing the DIN Rail Kit onto the VFD](image)

![Figure 40. Installing the VFD to the DIN Rail](image)

Mounting the LCD Display

The LCD display used in this setup was built for this specific logic controller. The display is mounted to the cover panel of the enclosure through a hole in the enclosure cover drilled to the appropriate size. These dimensions can be found in the user manual, in addition to instructions outlining the mounting process.

Mounting the Push Buttons

Various push buttons will be used to operate the turntable. These buttons will perform the basic functions of stopping and starting the test cycles. Additional functions controlled by the buttons include: reversing...
the direction of motion, a forward motion, pausing the test, and slowing the speed of rotation to a jog. The jog button slows the motor to around 10% of the normal speed.

All the buttons are mounted to the outside panel of the enclosure with the LCD display by drilling appropriately sized holes in the cover panel. In addition to these buttons, a panel mounted circuit breaker is, also, mounted to the cover panel. An image of the cover panel is shown in Figure 33. The associated colors for each button are up to the designer to decide, however it is recommended to use the setup shown in the following figure.

![Image of the Cover Panel](image)

**Figure 41.** Image of the Cover Panel

### Wiring the Components

A 110V and 220V power source will supply the caster test machine with power. Within an enclosure mounted to a nearby wall, a 24V DC power supply will convert the 110V AC power source to a 24V DC power supply. This will provide the power for all the electrical components in the test setup. The power source will then connect to the logic controller, the LCD display, the limit switches, and the proximity switch. The following sections outline the wiring for each individual component.
Wiring the Power Supply

The power supply will input a single phase 110V AC power and output 24V DC power. An image of the wiring terminals for this step is shown in Figure 33. The three-wired input from the 110V AC power source connects into the three ports of the DC power supply with the positive wire passing through the circuit breaker first. The power supply has four [4] output terminals: two [2] positive and two [2] negative. These outputs are used to power all the electrical components in this test setup. Follow Figure B.1 in Appendix B to make the proper connections with the other components.

![Image of wiring terminals]

<table>
<thead>
<tr>
<th>AC Input Connectors</th>
<th>DC Output Connectors (DC 24V/1.6 A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAC-1 AC hot</td>
<td>DC-1 +</td>
</tr>
<tr>
<td>PAC-2 AC neutral</td>
<td>DC-2 +</td>
</tr>
<tr>
<td>PAC-3 Safety ground</td>
<td>DC-3 -</td>
</tr>
<tr>
<td>DC-4 -</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 42.** 24V DC Power Supply input and output terminals

Wiring the Logic Controller

The logic controller will receive its power through the 24V DC power supply. This will then connect to all other electrical components. This is so that the logic controller can communicate with the VFD motor controller to administer the proper operations to the motor. Table 1 outlines the input and output connections of the Micro800 Logic Controller used for the caster test. Further instructions for using the logic controller are included in the manual. More information for operation and maintenance of the logic controller can be found online in Rockwell Automation’s literature.
Below is an image of the serial port pin definitions. This is where the LCD display connects to the logic controller. Given that the LCD display uses a RS232 serial port, the logic controller will follow the RS232 example for wiring. Follow the user manual for further details. In addition, Figure B.1 in Appendix B shows the connection between the LCD display and the logic controller.

### Table 1. Micro800 20 I/O Enet/IP Controller (RTB) Fixed Terminal Block Connections

<table>
<thead>
<tr>
<th>Input Terminals</th>
<th>Connection</th>
<th>Output Terminals</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-00</td>
<td>Common Input from Limit Switches</td>
<td>O-00</td>
<td>FWD on VFD</td>
</tr>
<tr>
<td>I-01</td>
<td>Proximity Switch Input</td>
<td>O-01</td>
<td>REV on VFD</td>
</tr>
<tr>
<td>I-02</td>
<td>--</td>
<td>O-02</td>
<td>SP1 on VFD</td>
</tr>
<tr>
<td>I-03</td>
<td>--</td>
<td>O-03</td>
<td>--</td>
</tr>
<tr>
<td>I-04</td>
<td>Start Button</td>
<td>O-04</td>
<td>--</td>
</tr>
<tr>
<td>I-05</td>
<td>Pause Button</td>
<td>O-05</td>
<td>--</td>
</tr>
<tr>
<td>I-06</td>
<td>Stop/Reset Button</td>
<td>O-06</td>
<td>--</td>
</tr>
<tr>
<td>I-07</td>
<td>Jog Button</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-08</td>
<td>Forward Button</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-09</td>
<td>Reverse Button</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-10</td>
<td>--</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-11</td>
<td>--</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Below is an image of the serial port pin definitions. This is where the LCD display connects to the logic controller. Given that the LCD display uses a RS232 serial port, the logic controller will follow the RS232 example for wiring. Follow the user manual for further details. In addition, Figure B.1 in Appendix B shows the connection between the LCD display and the logic controller.

### RS232/RS485 Serial Port Pin Definition

<table>
<thead>
<tr>
<th>Pin</th>
<th>Definition</th>
<th>RS485 Example</th>
<th>RS232 Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RS485+</td>
<td>RS485+</td>
<td>(not used)</td>
</tr>
<tr>
<td>2</td>
<td>RS485-</td>
<td>RS485-</td>
<td>(not used)</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
<td>GND</td>
<td>GND</td>
</tr>
<tr>
<td>4</td>
<td>RS232 input (receiver)</td>
<td>(not used)</td>
<td>RxD</td>
</tr>
<tr>
<td>5</td>
<td>RS232 output (driver)</td>
<td>(not used)</td>
<td>TxD</td>
</tr>
<tr>
<td>6</td>
<td>GND</td>
<td>GND</td>
<td>GND</td>
</tr>
</tbody>
</table>

**Figure 43. Logic Controller Serial Port Pin Definitions**

A picture of the fully wired logic controller is shown in Figure 35. In the photo all input wires from the buttons and switches are yellow and all the input wires from the LCD display are purple.
Wiring the Motor Controller

The motor controller will run off a separate power supply of 220V AC power that first goes through a circuit breaker. Check the manual for more detailed instructions on mounting the VFD. The input and output connections for the motor controller are shown in Figure 37.
Wiring the LCD Display

The LCD screen connects to the 24V DC power supply through the power input terminals. Follow the instructions in the manual to properly wire the display to the power supply and logic controller. The wiring instructions for the connection of the LCD display to the controller are shown in the figure below.
Wiring the Push Buttons

Each push button has two [2] terminals; a positive and a negative. The negative terminal is wired to a terminal block connected to a negative output from the 24V DC power supply. Each positive terminal is then wired directly to the logic controller.

The panel mounted circuit breaker receives its power from the external 220V AC power source. This circuit breaker is a 2-pole breaker, therefore, the positive and negative of the power source go through the positive and negative poles of the breaker. The breaker outputs to power the VFD motor controller.

Figure B.1 in Appendix B shows a more detailed diagram of the wiring of the push buttons and panel mounted circuit breaker.

Wiring the Limit switches

Each limit switch is powered by the 24V DC power supply through a terminal block. All the positive connections to the limit switches branch off from a single connection to the terminal block within the enclosure. Similarly, all the outputs from each limit switch come together to make one [1] single connection to the logic controller. For further information, consult Figure B.1 in Appendix B.

Wiring the Proximity Switch

The proximity switch contains three wires within the black insulation of the cord. One wire connects to the positive terminal block powered by the 24V DC power supply. Another connects to the negative
terminal block, also, powered by the 24V DC power supply. The third and final wire connects is the output of the proximity switch and connects to the I-01 terminal of the logic controller. Refer to Appendix B for further information.

Wiring the Motor

The motor has only three external connections. Inside the junction box of the motor are connections outlined in the figure below. Follow the low voltage set up for the connections within the junction box.

For further details, refer to the user manual for the IronHorse motor. Line 1, 2, and 3 are the three wires that form external connections from the motor to the VFD motor controller. Follow the schematic in Figure B.1 and B.2 in Appendix B to make the proper connections.
Appendix

A. Links to Component Manuals

Micro820 20-Point Programmable Logic Controller:  
http://literature.rockwellautomation.com/idc/groups/literature/documents/um/2080-um005_en-e.pdf

Micro800 Programmable Controller External AC Power Supply:  

Micro800 Remote LCD:  

Variable Frequency 1ph/3ph to 3ph AC Motor Control  

IronHorse Premium Efficiency 3-Phase AC Induction Motor  
https://cdn.automationdirect.com/static/manuals/ironhorsemotor/ironhorsemotor.html

B. Wiring Diagrams

Figure B.1 shows the schematic of the complete caster test machine. This is just one way of completing the wiring of the system. There are other successful ways to wire the system.

Figure B.2 shows the schematic of the connections made in the junction box of the motor. Refer to the user manual of each component for further details.
Figure B. 1. Complete Caster Test Schematic
Figure B. 2. Motor wiring Diagram for Junction Box
Bill of Materials
<table>
<thead>
<tr>
<th>Hardware</th>
<th>Qty. Needed</th>
<th>Source</th>
<th>Pkg. Size</th>
<th>Pkgs. to Order</th>
<th>Cost per Unit</th>
<th>Total Cost</th>
<th>Parts for which Hardware is used</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25in Flat Washer</td>
<td>13</td>
<td>Fastenal</td>
<td>71013</td>
<td>1</td>
<td>$ 0.05</td>
<td>$ 0.69</td>
<td>Bearing Housing Mount connection to frame</td>
<td>Plain</td>
</tr>
<tr>
<td>0.3125in Flat Washer</td>
<td>16</td>
<td>McMaster Carr</td>
<td>92141A030</td>
<td>100</td>
<td>$ 5.10</td>
<td>$ 5.10</td>
<td>Roller Caster connection</td>
<td></td>
</tr>
<tr>
<td>0.5in Flat Washer</td>
<td>70</td>
<td>Fastenal</td>
<td>33861</td>
<td>1</td>
<td>$ 0.47</td>
<td>$ 33.15</td>
<td>Cross bracelet connection to frame, frame connections, Top of shaft bearing connections.</td>
<td>Yellow Zinc</td>
</tr>
<tr>
<td>1.5in Shaft Flange</td>
<td>2</td>
<td>McMaster Carr</td>
<td>9692T39</td>
<td>1</td>
<td>$ 132.67</td>
<td>$ 265.34</td>
<td>Turntable</td>
<td></td>
</tr>
<tr>
<td>1/2-13 Hex Nut</td>
<td>4</td>
<td>McMaster Carr</td>
<td>94895A823</td>
<td>50</td>
<td>$ 7.59</td>
<td>$ 7.59</td>
<td>Frame connections</td>
<td>Yellow Zinc-Chromate</td>
</tr>
<tr>
<td>1/2-13 Locknut</td>
<td>88</td>
<td>Fastenal</td>
<td>37187</td>
<td>1</td>
<td>$ 0.58</td>
<td>$ 51.03</td>
<td>Frame connections</td>
<td>Yellow Zinc</td>
</tr>
<tr>
<td>1/2-13 x 1.75 HHS</td>
<td>44</td>
<td>Fastenal</td>
<td>15210</td>
<td>1</td>
<td>$ 1.11</td>
<td>$ 48.84</td>
<td>Frame connections, gear reducer side mount 2, top of shaft bearing</td>
<td>Yellow Zinc</td>
</tr>
<tr>
<td>1/2-13 x 2 HHS</td>
<td>8</td>
<td>Fastenal</td>
<td>15211</td>
<td>1</td>
<td>$ 1.16</td>
<td>$ 9.28</td>
<td>Cross bracelet connection to frame</td>
<td>Yellow Zinc</td>
</tr>
<tr>
<td>1/2-13 x 3 HHS</td>
<td>30</td>
<td>Fastenal</td>
<td>15215</td>
<td>1</td>
<td>$ 1.54</td>
<td>$ 46.20</td>
<td>Cross brace connection to frame, gear reducer mount to frame, frame connections</td>
<td>Yellow Zinc</td>
</tr>
<tr>
<td>1/2-13 x 3.25 HHS</td>
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<td>McMaster Carr</td>
<td>91257A725</td>
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<td>$ 13.78</td>
<td>$ 13.78</td>
<td>Frame connections</td>
<td>Yellow Zinc-Chromate</td>
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<tr>
<td>1/2-13 x 3.5 HHS</td>
<td>2</td>
<td>McMaster Carr</td>
<td>92620A726</td>
<td>1</td>
<td>$ 3.93</td>
<td>$ 7.86</td>
<td>Proximity Switch connection</td>
<td>Yellow Zinc-Chromate</td>
</tr>
<tr>
<td>1/2-13 x 5 HHS</td>
<td>4</td>
<td>Fastenal</td>
<td>15223</td>
<td>1</td>
<td>$ 3.48</td>
<td>$ 13.92</td>
<td>Frame connections</td>
<td>Yellow Zinc</td>
</tr>
<tr>
<td>1/2-13 x 7 HHS</td>
<td>2</td>
<td>Fastenal</td>
<td>15227</td>
<td>1</td>
<td>$ 5.24</td>
<td>$ 10.48</td>
<td>Frame connections</td>
<td>Yellow Zinc</td>
</tr>
<tr>
<td>1/4-20 Hex Nut</td>
<td>7</td>
<td>McMaster Carr</td>
<td>90499A029</td>
<td>100</td>
<td>$ 2.90</td>
<td>$ 2.90</td>
<td>Turntable flange connections</td>
<td>Plain</td>
</tr>
<tr>
<td>1/4-20 x 0.75 FHS</td>
<td>4</td>
<td>McMaster Carr</td>
<td>90585A540</td>
<td>10</td>
<td>$ 4.24</td>
<td>$ 4.24</td>
<td>Slat</td>
<td>Plain</td>
</tr>
<tr>
<td>1/4-20 x 0.75 SHS</td>
<td>2</td>
<td>Fastenal</td>
<td>73461</td>
<td>1</td>
<td>$ 0.31</td>
<td>$ 0.61</td>
<td>Slat</td>
<td>Plain</td>
</tr>
<tr>
<td>1/4-20 x 0.875 SHS</td>
<td>24</td>
<td>McMaster Carr</td>
<td>92196A541</td>
<td>50</td>
<td>$ 10.53</td>
<td>$ 10.53</td>
<td>Gusset to arm attachment</td>
<td>Plain</td>
</tr>
<tr>
<td>1/4-20 x 1 SHS</td>
<td>1</td>
<td>Fastenal</td>
<td>73462</td>
<td>1</td>
<td>$ 0.26</td>
<td>$ 0.26</td>
<td>Limit switch clamps</td>
<td>Plain</td>
</tr>
<tr>
<td>Part Description</td>
<td>Supplier</td>
<td>Part Number</td>
<td>Quantity</td>
<td>Unit</td>
<td>Price</td>
<td>Total</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-----------</td>
<td>-------------</td>
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<td>-------</td>
<td>-------</td>
<td>---------------------------</td>
<td></td>
</tr>
<tr>
<td>1/4-20 x 1.75 SHS</td>
<td>Fastenal</td>
<td>73465</td>
<td>1</td>
<td>16</td>
<td>$0.41</td>
<td>$6.50</td>
<td>arm support clamp</td>
<td></td>
</tr>
<tr>
<td>1/4-20 x 2 HHS</td>
<td>McMaster Carr</td>
<td>92196A550</td>
<td>25</td>
<td>1</td>
<td>$10.71</td>
<td>$10.71</td>
<td>turntable flange connections</td>
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</tr>
<tr>
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<td>92196A801</td>
<td>25</td>
<td>1</td>
<td>$11.17</td>
<td>$11.17</td>
<td>turntable flange connections</td>
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<tr>
<td>1/4-20 x 3 SHS</td>
<td>McMaster Carr</td>
<td>92196A554</td>
<td>10</td>
<td>1</td>
<td>$5.60</td>
<td>$5.60</td>
<td>Limit switch clamps</td>
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<tr>
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<td>91251A440</td>
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<td>$11.67</td>
<td>$11.67</td>
<td>tapered bearing shield</td>
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</tr>
<tr>
<td>10-24 Hex Nut</td>
<td>McMaster Carr</td>
<td>90480A011</td>
<td>1</td>
<td>16</td>
<td>$0.07</td>
<td>$1.05</td>
<td>PC Holder (square tubing)</td>
<td></td>
</tr>
<tr>
<td>10-24 x 1 BHS</td>
<td>McMaster Carr</td>
<td>97763A342</td>
<td>50</td>
<td>1</td>
<td>$8.69</td>
<td>$8.69</td>
<td>PC Holder (sides)</td>
<td></td>
</tr>
<tr>
<td>10-24 x 1.25 BHS</td>
<td>McMaster Carr</td>
<td>97763A339</td>
<td>50</td>
<td>1</td>
<td>$10.10</td>
<td>$10.10</td>
<td>Bearing Housing Mount to frame</td>
<td></td>
</tr>
<tr>
<td>10-24 x 3 SHS</td>
<td>Fastenal</td>
<td>0171107</td>
<td>1</td>
<td>4</td>
<td>$2.14</td>
<td>$8.56</td>
<td>PC Holder (square tubing)</td>
<td></td>
</tr>
<tr>
<td>10-32 x 0.875 FHS</td>
<td>McMaster Carr</td>
<td>91253A009</td>
<td>50</td>
<td>1</td>
<td>$10.27</td>
<td>$10.27</td>
<td>Arm Clamp side plates</td>
<td></td>
</tr>
<tr>
<td>1in Eye Bolt</td>
<td>McMaster Carr</td>
<td>3014T471</td>
<td>1</td>
<td>8</td>
<td>$3.81</td>
<td>$30.48</td>
<td>Arm, Top frame</td>
<td></td>
</tr>
<tr>
<td>1in Shaft Collar</td>
<td>McMaster Carr</td>
<td>6157K18</td>
<td>1</td>
<td>8</td>
<td>$4.02</td>
<td>$32.16</td>
<td>Arm Support Rod</td>
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</tr>
<tr>
<td>3/8-16 Flange Locknut</td>
<td>McMaster Carr</td>
<td>93776A461</td>
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<td>1</td>
<td>$6.67</td>
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<td>Turntable Pie Pieces</td>
<td></td>
</tr>
<tr>
<td>3/8-16 Hex Nut</td>
<td>McMaster Carr</td>
<td>90499A031</td>
<td>100</td>
<td>1</td>
<td>$6.34</td>
<td>$6.34</td>
<td>Arm Clamp</td>
<td></td>
</tr>
<tr>
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<td>McMaster Carr</td>
<td>97646A230</td>
<td>5</td>
<td>4</td>
<td>$9.24</td>
<td>$36.96</td>
<td>Turntable Pie Pieces</td>
<td></td>
</tr>
<tr>
<td>3/8-16 x 2.5 SHS</td>
<td>McMaster Carr</td>
<td>91251A634</td>
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<td>1</td>
<td>$5.93</td>
<td>$5.93</td>
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<td></td>
</tr>
<tr>
<td>3/8-16 x 5 SHS</td>
<td>McMaster Carr</td>
<td>91251A644</td>
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<td>2</td>
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<td>$3.89</td>
<td>$31.12</td>
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<td>40-6596</td>
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<td>16</td>
<td>$3.90</td>
<td>$62.40</td>
<td>Clamp Bearing</td>
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</tr>
<tr>
<td>5/16-18 Locknut</td>
<td>Fastenal</td>
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<td>20</td>
<td>$0.25</td>
<td>$4.92</td>
<td>Motor Mount</td>
<td></td>
</tr>
<tr>
<td>5/16-18 x 0.875 HHS</td>
<td>McMaster Carr</td>
<td>91251A582</td>
<td>50</td>
<td>1</td>
<td>$10.00</td>
<td>$10.00</td>
<td>Motor Mount</td>
<td></td>
</tr>
<tr>
<td>5/16-18 x 1 SHS</td>
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<td>91251A583</td>
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<td>1</td>
<td>$10.56</td>
<td>$10.56</td>
<td>Roller Caster connection</td>
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</tr>
<tr>
<td>5/16-18 x 1.375 SHS</td>
<td>McMaster Carr</td>
<td>91251A620</td>
<td>25</td>
<td>2</td>
<td>$14.47</td>
<td>$28.94</td>
<td>Arm Gusset</td>
<td></td>
</tr>
</tbody>
</table>

---

| 5/16-18 x 2.5 SHS                       | McMaster Carr | 91251A634 | 10       | 1    | $5.93  | $5.93  | Arm Clamp                  |
| 3/8-16 x 5 SHS                         | McMaster Carr | 91251A644 | 5        | 2    | $5.29  | $10.58 | Arm Clamp                  |
| 3/8-16 x 7 SHS                         | McMaster Carr | 91251A116 | 1        | 8    | $3.89  | $31.12 | Arm Clamp                  |
| 40 Series Single-Keyed High-Cycle Linear Bearing Pad | McMaster Carr | 40-6596 | 1        | 16   | $3.90  | $62.40 | Clamp Bearing             |
| 5/16-18 Locknut                        | Fastenal  | 37185       | 1        | 20   | $0.25  | $4.92  | Motor Mount                |
| 5/16-18 x 0.875 HHS                    | McMaster Carr | 91251A582 | 50       | 1    | $10.00 | $10.00 | Motor Mount                |
| 5/16-18 x 1 SHS                        | McMaster Carr | 91251A583 | 50       | 1    | $10.56 | $10.56 | Roller Caster connection   |
| 5/16-18 x 1.375 SHS                    | McMaster Carr | 91251A620 | 25       | 2    | $14.47 | $28.94 | Arm Gusset                 |
### Materials

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<tr>
<th>Materials</th>
<th>Quantity Needed</th>
<th>Source</th>
<th>Size to Order</th>
<th>Qty. to Order</th>
<th>Unit Cost</th>
<th>Total Cost</th>
<th>Parts for which material is used</th>
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<td>Alro</td>
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<td>Shock-Absorbing Rope—Not for Lifting—3/16&quot; Diameter</td>
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<td>Oil-Resistant Vibration-Damping Pad, Black, 6&quot;x6&quot;x1/2&quot;, 280 PSI Capacity</td>
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**Metals Depot Total**: $2,520.31  
**Alro Total**: $794.90  
**McMaster Carr Total**: $695.53
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<td>2080-PS120-240VAC</td>
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<td>FM50-DIN-201</td>
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<td>11-3425-2</td>
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<td>$76.38</td>
<td>$76.38</td>
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<td>McMaster Carr</td>
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<td>McMaster Carr</td>
<td>5967K88</td>
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<td>Quantity</td>
<td>Unit</td>
<td>Supplier</td>
<td>Quantity</td>
<td>Unit Price</td>
<td>Total Cost</td>
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<tr>
<td>1&quot;x10' Cam Strap with S-Hook and Keeper</td>
<td>4</td>
<td></td>
<td>US Cargo Control</td>
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<td>$5.79</td>
<td>$23.16</td>
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<td>US Cargo Control</td>
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<td>McMaster Carr Total</td>
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<td><strong>Total</strong></td>
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<td><strong>$7,924.94</strong></td>
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</tbody>
</table>
Part Drawings
Base Frame Drawings
**Base Legs (L_Front & R_Back)**

**UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]**

**MATERIAL:** Material <not specified>  
**FINISH:** Plain

**TOLERANCES:**  
+0.100  
-0.100

**SCALE:** 1:8  
**SIZE:** A  
**DATE:** 4/13/2018  
**REV:** 2  
**WEIGHT (LBS):** 27.56  
**DO NOT SCALE DRAWING**

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Quantity: 2

2"x2"x3/8" A36 Steel Angle

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

TITLE:
Base Legs Angled Iron (Right)

MATERIAL:
ASTM A36 Steel

FINISH:
Powder Coated

TOLERANCES:
+ 0.100 - 0.100

SCALE:
1:12

DATE:
2/15/2018

REV:
2

WEIGHT (LBS):
20.63

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Quantity: 2

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Base Legs Angled Iron (Left)</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Base Legs Mounting Support</td>
<td>1</td>
</tr>
</tbody>
</table>

**Title:** Base Legs (R_Front & L_Back)

**Material:** <not specified>

**Finish:** Plain

**Tolerances:**
- + 0.100
- - 0.100

**Scale:** 1:8

**Weight (lbs):** 27.56

---

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Quantity: 2
2"x2"x3/8" A36 Steel Angle

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

BASE LEGS ANGLED IRON (LEFT)

MATERIAL: ASTM A36 Steel
FINISH: Powder Coated

TOLERANCES: + 0.100 - 0.100

SCALE: 1:12
SIZE: A
DATE: 2/15/2018
WEIGHT (LBS): 20.63

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Quantity: 4
1/2" A36 Steel Plate

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: ASTM A36 Steel
FINISH: Plain

TOLERANCES: + 0.100 - 0.100

SCALE: 1:4
SIZE: A
DATE: 2/15/2018
WEIGHT (LBS): 6.93

DO NOT SCALE DRAWING

SHEET 1 OF 1
Note: Mill 50 thou on one face of cross brace with 3 inches from the ends and 4 in equally around center hole to allow flat contact with other parts.
Note: Mill 50 thou on one face of cross brace with 3 inches from the ends and 4in equally around center hole to allow falt contact with other parts.
Quantity: 8
3/8"x5" 6061 Aluminum Flat Bar

Cross Brace Spacer

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: 6061 Alloy
FINISH: Plain

TOLERANCES: + 0.100 - 0.100

SCALE: 3:2
SIZE: A
DATE: 2/15/2018
REVISION: 2

DO NOT SCALE DRAWING
WEIGHT (LBS): 0.07

SHEET 1 OF 1
Quantity: 2
2"x2"x3/8" A36 Steel Angle

Table Support Center

Title:

unless otherwise specified: dimensions are in inches [mm]

Material:
ASTM A36 Steel

Finish:
Plain

Tolerances:
+ 0.100 - 0.100

Scale:
1:12

Size:
A

Date:
2/19/2018

Rev:
2

Do not scale drawing

Weight (lbs): 15.64

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Quantity: 4
2"x2"x3/8" wall A36 Steel Angle

Table Support Short

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: ASTM A36 Steel
FINISH: Plain

TOLERANCES: + 0.100 - 0.100

SCALE: 1:4
SIZE: A
DATE: 2/19/2018
REV: 2

WEIGHT (LBS): 5.94

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Quantity: 4
2"x2"x3/8" wall A36 Steel Angle

Table Support Sides

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: ASTM A36 Steel
FINISH: Plain

TOLERANCES: + 0.100 - 0.100

SCALE: 1:12
SIZE: A
DATE: 2/19/2018
WEIGHT (LBS): 14.11

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Quantity: 16
2"x2"x3/8" A36 Steel Angle

Note: Mill 50 thou on outside connecting faces
Quantity: 1

2" x 2" x 1/4" wall A500 Square Steel Tube

Rec Bar_Table Support

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: A500 Steel

FINISH: Slightly Grainy, Dry

TOLERANCES: + 0.100 - 0.100

SCALE: 1:12

SIZE: A

DATE: 2/19/2018

WEIGHT (LBS): 20.29

DO NOT SCALE DRAWING

REV: 2

SHEET 1 OF 1

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Quantity: 1

2" x 2" x 1/4" wall A500 Square Steel Tube

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: A500 Steel
FINISH: Slightly Grainy, Dry

TOLERANCES: + 0.100 - 0.100

SCALE: 1:12
SIZE: A
DATE: 2/19/2018

DO NOT SCALE DRAWING

WEIGHT (LBS): 20.29

SHEET 1 OF 1

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Quantity: 4
ABS Plastic

PC Holder (AngledIron)

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: ABS
FINISH: FINISH:

TOLERANCES:
+ 0.100
- 0.100

SCALE: 1:2
SIZE: A
DATE: 2/19/2018
REV: 2

WEIGHT (LBS): 0.08

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DO NOT SCALE DRAWING
SHEET 1 OF 1
Quantity: 4

ABS Plastic

PC Holder (RecBar)

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: ABS

FINISH: ABS

TOLERANCES: + 0.100 - 0.100

SCALE: 1:2

SIZE: A

DATE: 2/19/2018

WEIGHT (LBS): 0.11

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SHEET 1 OF 1
Quantity: 8
ABS Plastic

PC Holder (Side)

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: ABS
FINISH: Plain

TOLERANCES: + 0.100 - 0.100

SCALE: 1:1
SIZE: A
DATE: 2/19/2018
REV: 2
WEIGHT (LBS): 0.05

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Quantity: 4
1/4" Clear Polycarbonate Sheet

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: ABS PC
FINISH: Smooth

TOLERANCES: + 0.100 - 0.100

SCALE: 1:12
SIZE: A
DATE: 2/19/2018
WEIGHT (LBS): 4.75

DO NOT SCALE DRAWING

TOLERANCES: + 0.100 - 0.100

SCALE: 1:12
SIZE: A
DATE: 2/19/2018
WEIGHT (LBS): 4.75

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Quantity: 1

2" x 2" x 1/4" wall A500 Square Steel Tube

2X Ø .5625[14.29] THRU ALL

.5625[14.29] x .7500[19.05]

1.0000 [25.40]

3.0000 [76.20]

20.5000 [520.70]

24.5000 [622.30]

42.0000 [1066.80]

45.0000 [1143]

.2500 [6.35]

2.0000 [50.80]

2.0000 [50.80]

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: A500 Steel
FINISH: Slightly Grainy, Dry

TOLERANCES: + 0.100 - 0.100

SCALE: 1:12
SIZE: A
DATE: 2/19/2018
REV: 2

WEIGHT (LBS): 20.29

DO NOT SCALE DRAWING

TITLE: Rec Bar_Bearing Mount

SCALE: 1:12
SIZE: A
DATE: 2/19/2018
REV: 2

WEIGHT (LBS): 20.29

DO NOT SCALE DRAWING

TITLE: Rec Bar_Bearing Mount

SCALE: 1:12
SIZE: A
DATE: 2/19/2018
REV: 2

WEIGHT (LBS): 20.29

DO NOT SCALE DRAWING
Quantity: 1

2" x 2" x 1/4" wall A500 Square Steel Tube

2X Ø .5625 [14.29] THRU ALL

Dimensions:
- .5625 [14.29] x .7500 [19.05]

Material:
- A500 Steel

Finish:
- Slightly Grainy, Dry

Tolerances:
- +0.100
- -0.100

Scale: 1:12

Weight (LBS): 20.29

Title: Rec Bar_Bearing Mount 2

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Quantity: 1
2" x 2" x 1/4" wall A500 Square Steel Tube

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: A500 Steel
FINISH: Slightly Grainy, Dry

TOLERANCES: + 0.100 - 0.100

SCALE: 1:12
SIZE: A
DATE: 2/19/2018
REV: 2

WEIGHT (LBS): 20.29

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Quantity: 1
2" x 2" x 1/4" wall A500 Square Steel Tube

Material: A500 Steel
Finish: Slightly Grainy, Dry

Scale: 1:12
Date: 2/19/2018
Rev.: 2

Dimensions are in inches [mm]

Tolerances: +0.100 -0.100

Weight (LBS): 20.29

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Quantity: 2
2"x2"x1/4" A500 Square Steel Tube

Rec Bar_Top Frame 1-2

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: A500 Steel
FINISH: Slightly Grainy, Dry

TOLERANCES: + 0.100 - 0.100

SCALE: 1:12  SIZE: A  DATE: 2/19/2018  REV: 2

WEIGHT (LBS): 20.29  SHEET 1 OF 1
Quantity: 1
2" x 2" x 1/4" wall A500 Square Steel Tube

Rec Bar_Top Frame 3

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: A500 Steel
FINISH: Slightly Grainy, Dry

TOLERANCES: + 0.100 - 0.100

SCALE: 1:12
SIZE: A
DATE: 4/16/2018
REVIEW: 2

DO NOT SCALE DRAWING
WEIGHT (LBS): 20.29

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4/16/2018 2
Rec Bar_Top Frame 4

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: A500 Steel
FINISH: Slightly Grainy, Dry

TOLERANCES: + 0.100 - 0.100

SCALE: 1:12
SIZE: A
DATE: 4/16/2018
REV: 2

DO NOT SCALE DRAWING
WEIGHT (LBS): 20.29

TITLE: Rec Bar_Top Frame 4

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<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>QTY.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>1/4-20 x 3 SHS</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Limit Switch Clamp</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Compact Limit Switch</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>M5 x 25mm SHS</td>
<td>2</td>
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</table>

**Limit Switch SubAssembly**

**UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]**

**MATERIAL:** Material <not specified>

**FINISH:** Plain

**TOLERANCES:**

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<th>SIZE:</th>
<th>DATE:</th>
<th>REV:</th>
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DO NOT SCALE DRAWING

**WEIGHT (LBS):** 0.27

SHEET 1 OF 1
Quantity: 1

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<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>QTY.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>1/4-20 x 3 SHS</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Limit Switch Clamp</td>
<td>1</td>
</tr>
</tbody>
</table>

Limit Switch Clamp SubAssembly

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Material <not specified>
FINISH: Plain

TOLERANCES:

SCALE: 1:1
SIZE: A
DATE: 2/20/2018
DO NOT SCALE DRAWING
WEIGHT (LBS): 0.14

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**Limit Switch Clamp**

**UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]**

**MATERIAL:** 6061 Alloy  
**FINISH:** Plain

**TOLERANCES:** + 0.100 - 0.100

**SCALE:** 1:1  
**SIZE:** A  
**DATE:** 4/16/2018  
**REV:** 2

**DO NOT SCALE DRAWING**  
**WEIGHT (LBS):** 0.09  
**SHEET 1 OF 1**

---

**Quantity:** 4  
**1/2" 6061 Aluminum Plate**

**M5 Thread Size**  
**1/4-20 Thread Size**  
One hole only

---

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---
Quantity: 1

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<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>QTY.</th>
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<td>1</td>
<td>Limit Switch Clamp 2</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>1/4-20 x 1 SHS</td>
<td>1</td>
</tr>
</tbody>
</table>

Title: Limit Switch Clamp 2 SubAssembly

_UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]_

_MATERIAL: Material <not specified>_
_FINISH: Plain_

_TOLERANCES:_

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<th>SIZE:</th>
<th>DATE:</th>
<th>REV:</th>
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</thead>
<tbody>
<tr>
<td>1:1</td>
<td>A</td>
<td>2/19/2018</td>
<td>2</td>
</tr>
</tbody>
</table>

_DO NOT SCALE DRAWING_  WEIGHT (LBS): 0.13  SHEET 1 OF 1
Quantity: 1
1/2" 6061 Aluminum Plate

Note: All holes are 1/4-20 and 0.201 is the drill size for the holes
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<th>PART NUMBER</th>
<th>QTY.</th>
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<tbody>
<tr>
<td>1</td>
<td>LFront&amp;Rback Base Legs</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>RFront&amp;Lback Base Legs</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Rec Bar_Table Support</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Rec Bar_Table Support 2</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Rec Bar_Top Frame 4</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Rec Bar_Top Frame 3</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Rec Bar_Top Frame 1-2</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Table Support Center_Default</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Table Support Center_2</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Table Support Sides</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>Table Support Short_Right</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Table Support Short_Left</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Table Support Short_L2</td>
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</tr>
<tr>
<td>14</td>
<td>Table Support Short_R2</td>
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<tr>
<td>15</td>
<td>1in Eye Bolt</td>
<td>4</td>
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<tr>
<td>16</td>
<td>Cross Brace_F&amp;B</td>
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</tr>
<tr>
<td>17</td>
<td>Cross Brace_R&amp;L</td>
<td>4</td>
</tr>
<tr>
<td>18</td>
<td>Cross Brace Spacer</td>
<td>8</td>
</tr>
<tr>
<td>19</td>
<td>1/2-13 x 3 HHS</td>
<td>20</td>
</tr>
<tr>
<td>20</td>
<td>1/2-13 x 1.75 HHS</td>
<td>36</td>
</tr>
<tr>
<td>21</td>
<td>1/2-13 Locknut</td>
<td>64</td>
</tr>
<tr>
<td>22</td>
<td>1/2-13 x 2 HHS</td>
<td>8</td>
</tr>
<tr>
<td>23</td>
<td>0.5in Washer</td>
<td>40</td>
</tr>
<tr>
<td>24</td>
<td>No.10 Washer</td>
<td>8</td>
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<tr>
<td>25</td>
<td>6-32 Hex Nut</td>
<td>8</td>
</tr>
<tr>
<td>26</td>
<td>6-32 x 1.25 BHS</td>
<td>8</td>
</tr>
<tr>
<td>27</td>
<td>10-24 Hex Nut</td>
<td>12</td>
</tr>
<tr>
<td>28</td>
<td>10-24 x 3 SHS</td>
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</tr>
<tr>
<td>29</td>
<td>5/16-18 Locknut</td>
<td>16</td>
</tr>
<tr>
<td>30</td>
<td>5/16-18 x 1 SHS</td>
<td>16</td>
</tr>
<tr>
<td>31</td>
<td>0.3125in Flat Washer</td>
<td>16</td>
</tr>
<tr>
<td>32</td>
<td>L Connector</td>
<td>16</td>
</tr>
<tr>
<td>33</td>
<td>PC Holder (Sides)</td>
<td>8</td>
</tr>
<tr>
<td>34</td>
<td>PC Holder (SquareTubing)</td>
<td>4</td>
</tr>
<tr>
<td>35</td>
<td>PC Holder (AngledIron)</td>
<td>4</td>
</tr>
<tr>
<td>36</td>
<td>Turntable Caster</td>
<td>4</td>
</tr>
<tr>
<td>37</td>
<td>10-24 x 1 BHS</td>
<td>8</td>
</tr>
</tbody>
</table>
Turntable Drawings
<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Base Plate</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>1.5in Shaft Flange</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Centre Shaft</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Center Shaft Key</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Angled Slat Pie Piece SubAssembly</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Slat Plate New</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>3/8-16 x 2 Flange HHS</td>
<td>16</td>
</tr>
<tr>
<td>8</td>
<td>3/8-16 Flange Hex Nut</td>
<td>16</td>
</tr>
<tr>
<td>9</td>
<td>1/4-20 Hex Nut</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>0.25in Washer</td>
<td>18</td>
</tr>
<tr>
<td>11</td>
<td>0.25in Washer</td>
<td>18</td>
</tr>
<tr>
<td>12</td>
<td>Quick Release Clamp</td>
<td>8</td>
</tr>
<tr>
<td>13</td>
<td>1/4-20 x 2 SHS</td>
<td>3</td>
</tr>
</tbody>
</table>

**Title:** Exploded Turntable Assembly

**Material:** Material <not specified>

**Finish:** Plain

**Tolerances:**

**Scale:** 1:8

**Size:** A

**Date:** 2/19/2018

**Revision:** 2

**Weight (LBS):** 175.27

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Quantity: 1
1-1/2" 440C Stainless Steel Rod

Centre Shaft

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Stainless Steel (ferritic)
FINISH: Plain

TOLERANCES: + 0.025 - 0.025

SCALE: 1:8
SIZE: A
DATE: 2/19/2018
REV: 2

DO NOT SCALE DRAWING
WEIGHT (LBS): 14.71

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Quantity: 1
3/8" x 1/2" Grade 18-8 Stainless Steel Machine Key Stock

Center Shaft Key

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Stainless Steel (ferritic)
FINISH: Plain

TOLERANCES: + 0.025 - 0.025

SCALE: 1:1
SIZE: A
DATE: 2/20/2018
REV: 2

WEIGHT (LBS): 0.18

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Quantity: 4
Heavy Duty Rigid Plate Caster 4" Polyurethane Wheel 600 Lb. Capacity

Roller Caster 2

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Material <not specified>
FINISH: Plain

TOLERANCES: Manufacturer Spec

SCALE: 1:4
SIZE: A
DATE: 2/19/2018
REV: 2

WEIGHT (LBS): 0.82

Copyright 2017, University of Pittsburgh. Made available under Creative Commons Attribution-ShareAlike 4.0 License (International): (https://creativecommons.org/licenses/by-sa/4.0/)
Quantity: 6
1/2" 6061 Aluminum Plate

All holes are 1/4-20 thread size

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: 6061-T6 (SS) FINISH: Plain

TOLERANCES: + 0.025 - 0.025

SCALE: 1:8 SIZE: A DATE: 4/16/2018 REV: 2

WEIGHT (LBS): 7.49

DO NOT SCALE DRAWING

Copyright 2017, University of Pittsburgh. Made available under Creative Commons Attribution-ShareAlike 4.0 License (International): (https://creativecommons.org/licenses/by-sa/4.0/)
Row 1 has 27 holes each 2 deg apart
Rows 2-4 have 28 holes each 2 deg apart
Each row is offset by 1/2 deg and 3/8" apart

Quantity: 2
1/2" 6061 Aluminum Plate

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]
MATERIAL: 6061-T6 (SS) FINISH: Plain
TOLERANCES: + 0.025 - 0.025

SCALE: 1:8 SIZE: A DATE: 2/19/2018 REV: 2
DO NOT SCALE DRAWING WEIGHT (LBS): 7.33 SHEET 1 OF 1
Row 1 has 27 holes each 2 deg apart
Rows 2-4 have 28 holes each 2 deg apart
Each row is offset by 1/2 deg and 3/8" apart
ALL HOLES ARE THREADED FOR 1/4-20 THREAD SIZE
Quantity: 2

1/2" x 1" 6061 Aluminum Flat Bar

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: 6061-T6 (SS)
FINISH: Plain

TOLERANCES: + 0.025 - 0.025

SCALE: 1:4
SIZE: A
DATE: 2/19/2018
REV: 2

DO NOT SCALE DRAWING
WEIGHT (LBS): 0.68

Sheet 1 of 1

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Quantity: 2

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Slat Plate V4</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Slat V2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>1/2-20 x 0.75 SHS</td>
<td>2</td>
</tr>
</tbody>
</table>
Title: Tapered Bearing Shield

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

Material: ABS

Finish: Plain

Tolerances: Manufacturer Specs

Scale: 1:2

Size: A

Date: 2/19/2018

Rev: 2

Weight (lbs): 0.11
Quantity: 1
1" x 4" 6061 Aluminum Flat Bar

Bearing Housing

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: 6061 Alloy
FINISH: Plain

TOLERANCES: + 0.025 - 0.025

SCALE: 1:2
SIZE: A
DATE: 4/16/2018
REV: 2

DO NOT SCALE DRAWING
WEIGHT (LBS): 0.45
SHEET 1 OF 1
Quantity: 1
303 Stainless Steel Grease Fitting, 30 Degree Elbow, 1/8 PTF Male

1/8 PTF Pipe Thread Size, 27 Threads Per Inch

Bearing Housing Grease Fitting

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Stainless Steel (ferritic)
FINISH: Plain
TOLERANCES: Manufacturer Spec

DO NOT SCALE DRAWING
WEIGHT (LBS): 0.02

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Quantity: 1
3/8" x 5" 6061 Aluminum Flat Bar

Bearing Housing Mount

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: 6061 Alloy
FINISH: Plain

TOLERANCES: + 0.025 - 0.025

SCALE: 1:2
SIZE: A
DATE: 2/22/2018
REV: 2

WEIGHT (LBS): 0.89

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Quantity: 1
3/8" Square Zinc-Plated Steel Machine Key Stock

Center Shaft to Love Joy Key

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Plain Carbon Steel
FINISH: Plain

TOLERANCES: + 0.025 - 0.025

SCALE: 2:1
SIZE: A
DATE: 2/20/2018
WEIGHT (LBS): 0.07

REV: 2

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### Turntable Assembly

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Base Plate</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>1.5in Shaft Flange</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Centre Shaft</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Center Shaft Key</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Angled Slat Pie Piece</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>SubAssembly</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Slat Plate New</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>3/8-16 x 2 Flange HHS</td>
<td>16</td>
</tr>
<tr>
<td>8</td>
<td>3/8-16 Flange Hex Nut</td>
<td>16</td>
</tr>
<tr>
<td>9</td>
<td>1/4-20 Hex Nut</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>0.25in Washer</td>
<td>18</td>
</tr>
<tr>
<td>11</td>
<td>1/4-20 x 2 HHS</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>Quick Release Clamp</td>
<td>8</td>
</tr>
<tr>
<td>13</td>
<td>1/4-20 x 2 SHS</td>
<td>3</td>
</tr>
</tbody>
</table>

**TOLERANCES:**

- Material <not specified>
- Finish: Plain
- Dimensions are in inches [mm]
- DO NOT SCALE DRAWING

**WEIGHT (LBS):** 175.27

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Quantity: 1

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Top of Shaft Bearing</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Top of Shaft Bearing Mount (Side 2)</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Top of Shaft Bearing Mount (Default)</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>1/2-13 Locknut</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>0.5in Washer</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td>1/2-13 x 1.75 HHS</td>
<td>4</td>
</tr>
</tbody>
</table>

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: <not specified>
FINISH: Plain

SCALE: 1:2
DATE: 2/19/2018
REV: 2

WEIGHT (LBS): 9.92

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Quantity: 1
Flange-Mounted Ball Bearing for 1-1/2" Shaft

Top of Shaft Bearing

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Gray Cast Iron
FINISH: Plain

TOLERANCES: Manufacturer Spec

SCALE: 1:2
SIZE: A
DATE: 2/19/2018
REV: 2

WEIGHT (LBS): 6.176

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Quantity: 2
1/4" x 2" Hot-Rolled A36 Steel Flat Stock

Top of Shaft Bearing Mount

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: ASTM A36 Steel
FINISH: Plain

TOLERANCES: + 0.025 - 0.025

SCALE: 1:2 SIZE: A DATE: 2/19/2018 REV: 2

WEIGHT (LBS): 1.44

DO NOT SCALE DRAWING

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Quantity: 2
1/4" x 2" 6061 Aluminum Flat Bar

Top of Shaft Bearing Mount Spacer

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: 6061 Alloy
FINISH: Plain

TOLERANCES: + 0.025 - 0.025

SCALE: 2:3 SIZE: A DATE: 2/19/2018 REV: 2
DO NOT SCALE DRAWING WEIGHT (LBS): 0.28 SHEET 1 OF 1

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Quantity: 1
16 GA. Hot-Rolled Steel Sheet

Proximity Switch Mount

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Plain Carbon Steel
FINISH: Plain

TOLERANCES: + 0.025 - 0.025

SCALE: 1:2
SIZE: A
DATE: 2/19/2018
REV: 2

WEIGHT (LBS): 0.40

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Quantity: 1
16 GA, Hot-Rolled Steel Sheet

Title: Proximity Switch Mount Flat

Material: Plain Carbon Steel
Finish: Plain

Tolerances: + 0.025 - 0.025

Scale: 1:2
Size: A
Date: 2/19/2018
Rev: 2

Weight (lbs): 0.40

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Motor-Gear Reducer Drawings
Quantity: 1
IronHorse Premium Efficiency AC Induction Motor
1-1/2hp, 3-phase, 208-230/460 VAC, 1800 rpm

3/8-16 Tapped Hole

3/16" X 3/32" Keyway

Do NOT SCALE DRAWING

SCALE: 1:4
SIZE: A
DATE: 2/19/2018
REV: 2

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]
MATERIAL: Varies
FINISH: Plain
TOLERANCES: Manufacturer Specs

WEIGHT (LBS): 43.00

Copyright 2017, University of Pittsburgh. Made available under Creative Commons Attribution-ShareAlike 4.0 License (International): (https://creativecommons.org/licenses/by-sa/4.0/).
Quantity: 1
40:1 RA Gear Reducer 3.35 HP Left Output

5/16" x 5/32" Keyway

3/16" x 3/32" Keyway

DIAMETERS ARE IN INCHES [mm]

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Plain

TOLERANCES: Manufacturer Specs

DO NOT SCALE DRAWING

WEIGHT (LBS): 82.00

SHEET 1 OF 1
Quantity: 1
3/8\" Square Zinc Plated Steel Machine Key Stock

Đimensions: 1.0000 [25.40]

Material: Plain Carbon Steel
Finish: Zinc Plated

Scale: 4:1
Size: A
Date: 2/20/2018
Rev: 2

Weight (lbs): 0.01

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Quantity: 1
3/8" Square Zinc-Plated Steel Machine Key Stock

Gear Reducer Output Key

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Plain Carbon Steel
FINISH: Plain

TOLERANCES: + 0.025 - 0.025

SCALE: 1:1
SIZE: A
DATE: 2/20/2018
REV: 2

WEIGHT (LBS): 0.07

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Quantity: 2

Weld 3 Sides 2 Pieces

2.3750 [60.33]

Title: Gear Reducer Side Mount SubAssembly

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

Material <not specified> Finish: Plain

Tolerances:

Scale: 1:4 Size: A Date: 3/12/2018 Rev: 2

Do not scale drawing

Weight (LBS): 2.77

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Quantity: 2
1/4" A36 Steel Plate

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]
MATERIAL: ASTM A36 Steel
FINISH: Plain

TOLERANCES: + 0.025 - 0.025

SCALE: 1:4
SIZE: A
DATE: 2/19/2018
REV: 2

WEIGHT (LBS): 5.33

DO NOT SCALE DRAWING

Title: Gear Reducer Side Mount

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Quantity: 2
2"x2"x3/8" A36 Steel Angle Iron

2X Ø .4219 [10.72] THRU ALL
1/2-13 UNC THRU ALL
√ Ø .5500 [13.97] X 90°, NEAR SIDE

Gear Reducer Side Mount 2

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: ASTM A36 Steel
FINISH: Plain

TOLERANCES: + 0.100 - 0.100

SCALE: 1:2
SIZE: A
DATE: 2/19/2018
REV: 2

WEIGHT (LBS): 2.09

DO NOT SCALE DRAWING
Quantity: 1
3/8" Square Zinc-Plated Steel Machine Key Stock

TOLERANCES: + 0.025 - 0.025

MATERIAL: Plain Carbon Steel
FINISH: Zinc Plated

SCALE: 2:1
SIZE: A
DATE: 2/20/2018
REV: 2

WEIGHT (LBS): 0.01

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Quantity: 2
1/4" x 2" Hot Rolled A36 Steel Flat Stock

Motor Mount to Frame

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: ASTM A36 Steel
FINISH: Plain

TOLERANCES: + 0.025 - 0.025

SCALE: 1:2
SIZE: A
DATE: 2/19/2018

WEIGHT (LBS): 1.90
Quantity: 1

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gear reducer 325 series</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Love Joy for GR Input</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Love Joy for Motor</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Love Joy Spider Motor to GR</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>3 phase motor MTR-1P5-3BD18</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Love Joy to Motor Key</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Motor Mount to Frame</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Gear Reducer Input Key</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>1/2-13 Hex Nut</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>7/16-14 x 0.75 HHS</td>
<td>8</td>
</tr>
<tr>
<td>11</td>
<td>5/16-18 Locknut</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>5/16-18 x 0.875 HHS</td>
<td>4</td>
</tr>
<tr>
<td>13</td>
<td>Gear Reducer Side Mount SubAssembly</td>
<td>2</td>
</tr>
</tbody>
</table>

Motor-Gear Reducer Assembly

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Material <not specified>
FINISH: Plain

TOLERANCES:

SCALE: 1:4
SIZE: A
DATE: 4/16/2018
REV: 2

WEIGHT (LBS): 136.57

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Arm Drawings
## Exploded 8020 Arm Support SubAssembly

### Quantity: 4

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Arm Support Rod</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Arm Support Clamp</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Arm Support Clamp Round Piece</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>3/8-16 x 2 Flange HHS</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>1/4-20 x 1.75 SHS</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>1in Shaft Collar</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Arm Flange Bushing</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Arm Holder</td>
<td>1</td>
</tr>
</tbody>
</table>

**Material**: Not specified

**Finish**: Plain

**Dimensions are in inches [mm]**

**Tolerances**: 2/27/2018

**Weight (LBS)**: 14.58

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Quantity: 4
1" Dia High-Strength 4140 Alloy Steel Rod

ϕ 1.0000
[25.40]

42.0000
[1066.80]

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: 4140 Alloy Steel
FINISH: Plain

TOLERANCES: + 0.100 - 0.100

SCALE: 1:8
SIZE: A
DATE: 2/16/2018
REV: 2

DO NOT SCALE DRAWING
WEIGHT (LBS): 9.36

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Quantity: 8

2" Thick 6061 Aluminum Plate

Arm Support Clamp

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: 6061 Alloy
FINISH: Plain

TOLERANCES: + 0.050 - 0.050

SCALE: 1:2
SIZE: A
DATE: 3/1/2018
REV: 2

DO NOT SCALE DRAWING
WEIGHT (LBS): 0.83

Copyright 2017, University of Pittsburgh. Made available under Creative Commons Attribution-ShareAlike 4.0 License (International): (https://creativecommons.org/licenses/by-sa/4.0/)
Quantity: 8
1"x4" 6061 Aluminum Flat Bar

Arm Support Clamp Round Piece

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: 6061 Alloy
FINISH: Plain

TOLERANCES: + 0.050 - 0.050

SCALE: 2:1
SIZE: A
DATE: 4/4/2018
REV: 2

DO NOT SCALE DRAWING
WEIGHT (LBS): 0.05

SHEET 1 OF 1
Quantity: 4
2"x4" 6061 Aluminum Bar

Set to Bushing

5/8-11 Thread Size

Arm Holder

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: 6061 Alloy
FINISH: Plain

TOLERANCES: + 0.050 - 0.050

SCALE: 1:2
SIZE: A
DATE: 4/13/2018
REVISION: 2

WEIGHT (LBS): 2.73

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Quantity: 8
Oil-Embedded Flanged Sleeve Bearings with PTFE

Arm Flange Bushing

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: SAE 841 Bronze
FINISH: Plain

TOLERANCES: Manufacturer Spec

SCALE: 1:1
SIZE: A
DATE: 2/16/2018
REV: 2

WEIGHT (LBS): 0.159

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**Quantity: 4**

<table>
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<tr>
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<th>PART NUMBER</th>
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<tbody>
<tr>
<td>1</td>
<td>Arm Support Rod</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Arm Support Clamp</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Arm Support Clamp Round Piece</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>3/8-16 x 2 Flange HHS</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>1/4-20 x 1.75 SHS</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>1in Shaft Collar</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Arm Flange Bushing</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Arm Holder</td>
<td>1</td>
</tr>
</tbody>
</table>

**TITLE:**
8020 Arm Support SubAssembly

**UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]**

**MATERIAL:** <not specified>

**FINISH:** Plain

**TOLERANCES:**

**SCALE:** 1:6

**SIZE:** A

**DATE:** 2/27/2018

**REV:** 2

**WEIGHT (LBS):** 14.58

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**Quantity: 4**

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NUMBER</th>
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<tbody>
<tr>
<td>1</td>
<td>Arm Attachment</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Gusset Spacer</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Plate Gusset</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>1in Eye Bolt</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>3in Square 8020 Bar</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Gusset Spacer Mount Short</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Gusset Spacer Mount Long</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>8020 Arm Clamp SubAssembly</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>5/16-18 x 1.375 SHS</td>
<td>8</td>
</tr>
<tr>
<td>10</td>
<td>1/4-20 x 0.875 SHS</td>
<td>6</td>
</tr>
</tbody>
</table>
Quantity: 4
3in Square Aluminum Bar, T-Slotted Profile

3in Square 8020 Bar

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: 6105-T5 Aluminum
FINISH: Anodize #204-R1

TOLERANCES: + 0.100 - 0.100

SCALE: 1:8
SIZE: A
DATE: 2/16/2018

WEIGHT (LBS): 8.85

SHEET 1 OF 1
Quantity: 4
1/2" Thick 6061 Aluminum Plate

Arm Attachment

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: 6061 Alloy
FINISH: Plain

TOLERANCES: + 0.050 - 0.050

SCALE: 1:4
SIZE: A
DATE: 2/16/2018
REV: 2

WEIGHT (LBS): 2.07

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Quantity: 8
1/8" x 3/4" Hot Rolled Steel Flat Stock

Grind down corners to fit the 3-in 8020 Square Bar Slots

2X Ø .2570 [6.53] THRU 5/16-18 UNC THRU

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: ASTM A36 Steel
FINISH: Plain

TOLERANCES: + 0.050 - 0.050

SCALE: 2:3 SIZE: A DATE: 3/15/2018
DO NOT SCALE DRAWING WEIGHT (LBS): 0.16
Quantity: 8
1/8" x 3/4" Hot Rolled Steel Flat Stock

Grind down corners to fit the 3-in 8020 Square Bar Slots

1:1
WEIGHT (LBS): 0.11
DO NOT SCALE DRAWING
SHEET 1 OF 1

2X Ø .2570 [6.53] THRU 5/16-18 UNC THRU

1.2500 [31.75]
3.2500 [82.55]
4.2500 [107.95]

.3750 [9.53]
.7500 [19.05]

.0750 [1.91]
Quantity: 8
7/8" 6061 Aluminum Plate

Gusset Spacer

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: 6061 Alloy
FINISH: Plain
TOLERANCES: + 0.050 - 0.050
SCALE: 1:2
SIZE: A
DATE: 2/16/2018
REV: 2
WEIGHT (LBS): 1.38

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Quantity: 8
1/4" A36 Steel Plate

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: AISI 1020 Steel, Cold Rolled
FINISH: Plain

TOLERANCES: + 0.050 - 0.050

SCALE: 1:2
SIZE: A
DATE: 2/16/2018
REV: 2

WEIGHT (LBS): 1.67

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# Quantity: 4

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<tr>
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<tbody>
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<td>Arm Attachment</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Gusset Spacer</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Plate Gusset</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>1in Eye Bolt</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>3in Square 8020 Bar</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Gusset Spacer Mount Short</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Gusset Spacer Mount Long</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>8020 Arm Clamp SubAssembly</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>5/16-18 x 1.375 SHS</td>
<td>8</td>
</tr>
<tr>
<td>10</td>
<td>1/4-20 x 0.875 SHS</td>
<td>6</td>
</tr>
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**Dimensions: Inches (mm)**

**Material: not specified**

**Finish:** Plain

**Tolerances:**

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<td>A</td>
<td>2/27/2018</td>
<td>2</td>
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</table>

**Weight (lbs):** 57.44

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Exploded 8020 Arm Clamp SubAssembly

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Material <not specified>  
FINISH: Plain

TOLERANCES:

TITLE:

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A

Quantity: 4
Quantity: 4
2" 6061 Aluminum Square Bar

Variates with caster's bearing size

Blocks are cut to form blanks. The center hole is then drilled out to custom fit a caster's bearings.

Adapter for Casters

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: 6061 Alloy
FINISH: Plain

TOLERANCES: + 0.050 - 0.050

SCALE: 2:3 SIZE: A DATE: 2/16/2018

WEIGHT (LBS): 1.31

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Quantity: 16
8020 Single-Keyed High-Cycle Linear Bearing Pad

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: UHMW PE
FINISH: Smooth
TOLERANCES: Manufacturer Spec

SCALE: 1:1
SIZE: A
DATE: 2/16/2018
REV: 2
WEIGHT (LBS): 0.03

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Quantity: 8
1/2" 6061 Aluminum Plate

5X φ .2660 [6.76] THRU ALL
√ φ .5070 [12.88] X 100°

Φ .4000 [10.16] THRU

Clamp Side Plate (Default)

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: 6061 Alloy
FINISH: Plain

TOLERANCES: + 0.050 - 0.050

SCALE: 1:2
SIZE: A
DATE: 2/28/2018
REV: 2

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Quantity: 8
1/2" 6061 Aluminum Plate

5X Ø .2660 [6.76] THRU ALL
2X Ø .3125 [7.94] THRU ALL
3/8-16 UNC THRU ALL

DO NOT SCALE DRAWING

SCALE: 1:2
SIZE: A
DATE: 2/28/2018
REV: 2

WEIGHT (LBS): 0.88

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]
MATERIAL: 6061 Alloy
FINISH: Plain
TOLERANCES: + 0.050 - 0.050

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Quantity: 4
1" x 4" 6061 Aluminum Flat Bar

2X φ .6562 [16.67] THRU ALL
□ φ 1.0000 [25.40] \(\sqrt[3]{.6250 [15.88]}\)

 Clamp Weight Block

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: 6061 Alloy
FINISH: Plain

TOLERANCES: \(+ 0.050\) \(- 0.050\)

SCALE: 1:2
SIZE: A
DATE: 2/16/2018
REVISION: 2

WEIGHT (LBS): 1.21

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Quantity: 8  
Vibration-Damping Pad for Heavy Machinery

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: NBR  
FINISH: Textured

TOLERANCES: + 0.050 - 0.050

SCALE: 1:2  
SIZE: A  
DATE: 2/16/2018  
REV: 2

WEIGHT (LBS): 0.08

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## Quantity: 4

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<tr>
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<td>2</td>
<td>Clamp Side Plate</td>
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<tr>
<td>3</td>
<td>Clamp Bearing</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Adapter for Casters</td>
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</tr>
<tr>
<td>5</td>
<td>Rubber Square</td>
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<tr>
<td>6</td>
<td>Weight</td>
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<tr>
<td>7</td>
<td>Whirlwind RR Caster</td>
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</tr>
<tr>
<td>8</td>
<td>5/8-11 x 4 SHS</td>
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<tr>
<td>9</td>
<td>3/8-16 x 5 SHS</td>
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<tr>
<td>10</td>
<td>10-32 x 0.875 FHS</td>
<td>8</td>
</tr>
<tr>
<td>11</td>
<td>3/8-16 x 7 SHS</td>
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</tr>
<tr>
<td>12</td>
<td>3/8-16 x 2.5 SHS</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>5/8-11 Hex Nut</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>3/8-16 Hex Nut</td>
<td>4</td>
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### 8020 Arm Clamp SubAssembly

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

**MATERIAL:** <not specified>

**FINISH:** Plain

**TOLERANCES:**

**SCALE:**

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DO NOT SCALE DRAWING

**WEIGHT (LBS):** 39.35

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Hardware Drawing
Quantity: 88
1/2-13 Grade 8 Yellow Zinc NE Steel Nylon Insert Locknut

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Plain Carbon Steel
FINISH: Yellow Zinc

TOLERANCES: Manufacturer Specs

SCALE: 2:1
SIZE: A
DATE: 2/16/2018
WEIGHT (LBS): 0.050

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Quantity: 52

1/2-13 x 1.75 Grade 8 Yellow Zinc Hex Head Screw

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Plain Carbon Steel
FINISH: Yellow Zinc

TOLERANCES: Manufacturer Specs

SCALE: 1:1
SIZE: A
DATE: 2/16/2018
WEIGHT (LBS): 0.13

DO NOT SCALE DRAWING

SHEET 1 OF 1
Quantity: 8
1/2-13 x 2 Grade 8 Yellow Zinc Hex Head Screw

0.5-13 x 2 HHS

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Plain Carbon Steel
FINISH: Yellow Zinc

TOLERANCES: Manufacturer Specs

SCALE: 1:1
SIZE: A
DATE: 2/16/2018
REV: 2

WEIGHT (LBS): 0.14

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Quantity: 30

1/2-13 x 3 Grade 8 Yellow Zinc Hex Head Screw

Material: Plain Carbon Steel
Finish: Yellow Zinc

Title: 0.5-13 x 3 HHS

Dimensions are in inches [mm].

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

Scale: 1:1  
Size: A  
Date: 2/16/2018  
Rev: 2

Tolerances: Manufacturer Specs

Weight (LBS): 0.18

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Quantity: 4
1/2-13 x 3.25 Zinc Yellow-Chromate Plated Grade 8 Steel Hex Head Screw

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

TOLERANCES: Manufacturer Specs

0.5-13 x 3.25 HHS

MATERIAL: Plain Carbon Steel
FINISH: Zinc Yellow Chromate

SCALE: 1:1
SIZE: A
DATE: 2/16/2018
REV: 2

WEIGHT (LBS): 0.21
DO NOT SCALE DRAWING
Quantity: 2
1/2-13 x 3.5" Zinc Yellow-Chromate Plated Grade 8 Steel Heax Head Screw

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Plain Carbon Steel
FINISH: Zinc Yellow-Chromate

TOLERANCES: Manufacturer Spec

SCALE: 1:1
SIZE: A
DATE: 2/23/2018
REVISION: 2
WEIGHT (LBS): 0.20

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Quantity: 4
1/2-13 x 5 Zinc Yellow-Chromate Plated Grade 8 Steel Hex Head Screw
Quantity: 2
1/2-13 x 7 Zinc Yellow-Chromate Plated Grade 8 Steel Hex Head Screw

0.5-13 x 7 HHS

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL:
Plain Carbon Steel

FINISH:
Zinc Yellow Chromate

TOLERANCES: Manufacturer Specs

SCALE: 1:2
SIZE: A
DATE: 2/16/2018
DO NOT SCALE DRAWING
WEIGHT (LBS): 0.42

SHEET 1 OF 1
Quantity: 70

1/2" Flat Washer

Plain Carbon Steel
Yellow Zinc

TOLERANCES: Manufacturer Specs

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Plain Carbon Steel
FINISH: Yellow Zinc

TOLERANCES: Manufacturer Specs

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Quantity: 7
1/4-20 High-Strength Steel Hex Nut

Plain Carbon Steel
Plain

TOLERANCES: Manufacturer Specs

SCALE: 4:1  SIZE: A  DATE: 2/16/2018  WEIGHT (LBS): 0.008

DO NOT SCALE DRAWING
Quantity: 4
1/4-20 x 0.75" 316 Stainless Steel Hex Drive Flat Head Screw

0.25-20 x 0.75 FHS

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: AISI Type 316L stainless steel
FINISH: Plain

TOLERANCES: Manufacturer Spec

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Quantity: 4
1/4-20 x 3/4 Grade 18-8 Stainless Steel Socket Head Screw

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Stainless Steel (ferritic)
FINISH: Plain

TOLERANCES: Manufacturer Specs

SCALE: 2:1
SIZE: A
DATE: 2/19/2018
REV: 2

WEIGHT (LBS): 0.01

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Quantity: 24
1/4-20 x 7/8 Grade 18-8 Stainless Steel Socket Head Screw

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL:
AISI 304

FINISH:
Plain

TOLERANCES: Manufacturer Specs

SCALE: 2:1
SIZE: A
DATE: 2/16/2018
WEIGHT (LBS): 0.02
REV: 2

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Quantity: 1
1/4-20 x 1 Grade 18-8 Stainless Steel Socket Head Screw

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: AISI 304
FINISH: Plain

TOLERANCES: Manufacturer Specs

SCALE: 2:1
SIZE: A
DATE: 2/16/2018
WEIGHT (LBS): 0.02

DO NOT SCALE DRAWING

SHEET 1 OF 1
Quantity: 16
1/4-20 x 1.75in Grade 18-8 Stainless Steel Socket Head Screw

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

TOLERANCES: Manufacturer Specs

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<th>REV</th>
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DO NOT SCALE DRAWING

WEIGHT (LBS): 0.03

SHEET 1 OF 1
Quantity: 3
1/4-20 x 2in Grade 18-8 Stainless Steel Hex Head Screw
Quantity: 3
1/4-20 Grade 18-8 Stainless Steel Socket Head Screw

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: AISI 304
FINISH: Plain

TOLERANCES: Manufacturer Specs

SCALE: 2:1
SIZE: A
DATE: 2/16/2018
REV: 2

WEIGHT (LBS): 0.03

DO NOT SCALE DRAWING
Quantity: 5

1/4-20 x 3in Grade 18-8 Stainless Steel Socket Head Screw

TITLE: 0.25-20 x 3 SHS

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: AISI 304
FINISH: Plain

TOLERANCES: Manufacturer Specs
Quantity: 2
1/4-28 x 3/4 Black Oxide Alloy Steel Socket Head Screw

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Alloy Steel
FINISH: Black Oxide

TOLERANCES: Manufacturer Specs

SCALE: 3:1
SIZE: A
DATE: 2/16/2018
REV: 2

WEIGHT (LBS): 0.01
Quantity: 13
1/4" Grade 18-8 Stainless Steel Flat Washer

TITLE: 0.25in Washer

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: AISI 304
FINISH: Plain

TOLERANCES: Manufacturer Specs

SCALE: 4:1  SIZE: A  DATE: 2/16/2018  REV: 2

DO NOT SCALE DRAWING  WEIGHT (LBS): 0.00  SHEET 1 OF 1
Quantity: 16
3/8-16 Grade 18-8 Stainless Steel Serrated Flange Locknut

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: AISI 304
FINISH: Plain

TOLERANCES: Manufacturer Specs

SCALE: 2:1
SIZE: A
DATE: 2/16/2018
REV: 2

DO NOT SCALE DRAWING
WEIGHT (LBS): 0.02

SHEET 1 OF 1
Quantity: 16
3/8-16 High-Strength Steel Hex Nut

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Plain Carbon Steel
FINISH: Plain

TOLERANCES: Manufacturer Specs

SCALE: 4:1 SIZE: A DATE: 2/19/2018 REV: 2

WEIGHT (LBS): 0.019

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Quantity: 16
3/8-16 x 2 Grade 18-8 Stainless Steel Serrated-Flange Hex Head Screw

0.375-16 x 2 Flange HHS

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: AISI 304
FINISH: Plain

TOLERANCES: Manufacturer Specs

SCALE: 3:2
SIZE: A
DATE: 2/19/2018
REVISION: 2

WEIGHT (LBS): 0.085

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Quantity: 8
3/8-16 x 2.5 Black-Oxide Alloy Steel Socket Head Screw

TITLE: 0.375-16 x 2.5 SHS

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Alloy Steel
FINISH: Black Oxide

TOLERANCES: Manufacturer Specs

SCALE: 3:2  SIZE: A  DATE: 2/16/2018  REV: 2

DO NOT SCALE DRAWING  WEIGHT (LBS): 0.09  SHEET 1 OF 1
Quantity: 8

3/8-16 x 5 Black-Oxide Alloy Steel Socket Head Screw
Quantity: 8
3/8-16 x 7 Black-Oxide Alloy Steel Socket Head Screw

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Alloy Steel
FINISH: Black Oxide

TOLERANCES: Manufacturer Specs

SCALE: 2:3
SIZE: A
DATE: 2/16/2018
REV: 2

WEIGHT (LBS): 0.23

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Quantity: 16
5/16" ID Grade 18-8 Stainless Steel Flat Washer

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: AISI 304
FINISH: Plain

TOLERANCES: Manufacturer Specs

SCALE: 4:1
SIZE: A
DATE: 2/16/2018
REV: 2

WEIGHT (LBS): 0.01

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SHEET 1 OF 1
Quantity: 8
5/8-11 High-Strength Steel Hex Nut

Plain Carbon Steel

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Plain Carbon Steel
FINISH: Plain

TOLERANCES: Manufacturer Specs

SCALE: 2:1
SIZE: A
DATE: 2/19/2018
WEIGHT (lbs): 0.077

REV: 2

DO NOT SCALE DRAWING

SHEET 1 OF 1
Quantity: 16
5/8-11 x 2.5 Black-Oxide Alloy Steel Socket Head Screw

[Diagram of screw with dimensions]

TITLE: 0.625-11 x 2.5 SHS PT

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Alloy Steel
FINISH: Black Oxide

TOLERANCES: Manufacturer Specs

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Quantity: 4
5/8-11 x 4in Black-Oxide Alloy Steel Socket Head Screw

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Alloy Steel
FINISH: Black Oxide

TOLERANCES: + -

SCALE: 1:2
SIZE: A
DATE: 2/19/2018
WEIGHT (LBS): 0.38

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Quantity: 2
1.5" Flange-Mount Shaft Collar

Dimensions:
- Ø3.2500 [82.55] (Main Diameter)
- Ø3.7000 [93.98] (Shaft Diameter)
- R.7500 [19.05] (Radius)
- 3/8" x 5/32" Keyway
- 1/4" - 20 Tapped Hole

Materials:
- Stainless Steel (ferritic)

Finish:
- Plain

Tolerances:
- Manufacturer Spec

Scale:
- 2:1

Weight (lbs):
- 1.47

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UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

TITLE: 1.5in Shaft Flange

MATERIAL: Stainless Steel (ferritic)
FINISH: Plain
TOLERANCES: Manufacturer Spec

SCALE: 1:2
SIZE: A
DATE: 2/19/2018
REV: 2

DO NOT SCALE DRAWING
WEIGHT (LBS): 1.47

SHEET 1 OF 1
Quantity: 8
1" Steel Eye Bolt with Shoulder, 3/8-16 Thread

1in Eye Bolt

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]
MATERIAL: Plain Carbon Steel
FINISH: Plain

TOLERANCES: Manufacturer Specs

SCALE: 1:1
SIZE: A
DATE: 2/16/2018
REV: 2

WEIGHT (LBS): 0.17

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Quantity: 8
1" 2024 Aluminum Clamping Shaft Collar

1/4-20 x 5/8 Socket Head Screw

DO NOT SCALE DRAWING

1in Shaft Collar

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: 2024 Alloy
FINISH: Plain

TOLERANCES: Manufacturer Specs

SCALE: 1:1
SIZE: A
DATE: 2/16/2018
REVISION: 2

WEIGHT (LBS): 0.08

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Quantity: 4
5/16-18 Grade 8 Yellow Zinc Steel Nylon Insert Locknut

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Plain Carbon Steel
FINISH: Yellow Zinc

TOLERANCES: Manufacturer Specs

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Quantity: 4
5/16-18 x 7/8 Zinc Yellow-Chromate Plated Grade 8 Steel Hex Head Screw

<table>
<thead>
<tr>
<th>Scale</th>
<th>Size</th>
<th>Date</th>
<th>Rev</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:1</td>
<td>A</td>
<td>2/16/2018</td>
<td>2</td>
</tr>
</tbody>
</table>

DO NOT SCALE DRAWING

WEIGHT (LBS): 0.03

SHEET 1 OF 1
Quantity: 16
5/16-18 Black Oxide Alloy Steel Socket Head Screw

DIMENSIONS ARE IN INCHES [mm]

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Alloy Steel
FINISH: Black Oxide

TOLERANCES: Manufacturer Specs

SCALE: 2:1
SIZE: A
DATE: 2/19/2018
REV: 2

WEIGHT (LBS): 0.03
DO NOT SCALE DRAWING

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Quantity: 32
5/16-18 x 1.375 Black-Oxide Alloy Steel Socket Head Screw
Quantity: 8
6-32 Zinc Plated Low-Strength Steel Hex Nut

#6-32 Thread

.3125 [7.94]

.3608 [9.17]

.1094 [2.78]

6-32 Hex Nut

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Plain Carbon Steel
FINISH: Zinc

TOLERANCES: Manufacturer Specs

SCALE: 8:1
SIZE: A
DATE: 2/16/2018
REV: 2

DO NOT SCALE DRAWING
WEIGHT (LBS): 0.00
SHEET 1 OF 1
Quantity: 8
6-32 x 1.25 Black-Oxide Grade 18-8 Stainless Steel Button Head Screw

SCALE: 4:1  SIZE: A  DATE: 2/16/2018  REV: 2
DO NOT SCALE DRAWING
WEIGHT (LBS): 0.005
Quantity: 8
7/16-14 x 0.75in Zinc Yellow-Chromate Plated Grade 8 Steel Hex Head Screw
Quantity: 4
10-24 Zinc Plated Low-Strength Steel Hex Nut

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Plain Carbon Steel
FINISH: Zinc

TOLERANCES: Manufacturer Specs

SCALE: 6:1
SIZE: A
DATE: 2/19/2018
WEIGHT (LBS): 0.00

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Quantity: 8
10-24 x 1in 18-8 Stainless Steel Black Oxide Button Head Hex Drive Screws

Material: AISI 304
Finish: Black Oxide

Scale: 2:1
Date: 4/10/2018
Rev: 2

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

TOLERANCES: Manufacturer Specs

Weight (lbs): 0.008
Quantity: 4
10-24 x 1.5 18-8 Stainless Steel Black Oxide Button Head Hex Drive Screws

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]
MATERIAL: AISI 304
FINISH: Black Oxide

TOLERANCES: Manufacturer Specs

SCALE: 2:1
SIZE: A
DATE: 4/10/2018
REVIEW: 2
WEIGHT (LBS): 0.012

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Quantity: 4
10-24 x 3 Grade 18-8 Stainless Steel Socket Head Screw

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: AISI 304
FINISH: Plain

TOLERANCES: Manufacturer Specs

SCALE: 3:2
SIZE: A
DATE: 2/19/2018
REV: 2

WEIGHT (LBS): 0.03

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Quantity: 32
10-32 x 7/8 Black-Oxide Alloy Steel Flat Head Screw

Dimensions:
- \( \phi 0.4110 \) [10.44]
- \( 0.8750 \) [22.23]
- \( 0.8750 \) [22.23]
- \( 0.1270 \) [3.23]
- \( 0.1250 \) [3.18]
- \( 82.00^\circ \)

Title: 10-32 x 0.875 FHS

Material: Alloy Steel
Finish: Black Oxide

Tolerances: Manufacturer Specs

Scale: 4:1
Size: A
Date: 2/19/2018
Rev: 2

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Quantity: 4
Roller Lever Actuator Limit Switch

Compact Limit Switch

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Varies
FINISH: Plain

TOLERANCES: Manufacturer Specs

SCALE: 1:2
SIZE: A
DATE: 2/19/2018
REV: 2

WEIGHT (LBS): 0.11

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Quantity: 1
Flexible Shaft Coupling Iron Hub

3/16" x 3/32" Keyway

.4670 [11.86]

.8125 [20.64]

1/4"-20 x 5/16" Set Screw

R1.0547 [26.79]
R.4375 [11.11]

Love Joy for GR Input

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Ductile Iron
FINISH: Plain

TOLERANCES: Manufacturer Specs

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Quantity: 1
Flexible Shaft Coupling Iron Hub

5/16" x 5/32" Keyway
R1.8750 [47.63]
R.6875 [17.46]

.9400 [23.88]
1.7500 [44.45]

3/8"-16 x 1/2" Set Screw

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]
MATERIAL: Ductile Iron
FINISH: Plain
TOLERANCES: Manufacturer Specs

SCALE: 1:2
SIZE: A
DATE: 2/19/2018
WEIGHT (LBS): 4.851
REV: 2

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Quantity: 1
Flexible Shaft Coupling Iron Hub

3/16" x 3/32" Keyway

5/16"-18 x 3/8" Set Screw

R1.0547 [26.79]
R.3125 [7.94]

.4670 [11.86]
.8125 [20.64]

Scale: 1:1
Size: A
Date: 2/19/2018
Rev: 2

Weight (lbs): 0.741

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

Material: Ductile Iron
Finish: Plain

Tolerances: Manufacturer Specs

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Quantity: 1
Flexible Shaft Coupling Iron Hub

3/8" x 3/16" Keyway
R 7500 [19.05]
R 1.8750 [47.63]

.9400 [23.88]
1.7500 [44.45]

3/8"-16 x 1/2" Set Screw

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]
MATERIAL: Ductile Iron
FINISH: Plain
TOLERANCES: Manufacturer Specs

SCALE: 1:2
SIZE: A
DATE: 2/19/2018
WEIGHT (LBS): 4.718
REV: 2

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Quantity: 1
3600 rpm Hytrel Rubber Spider

Love Joy Spider for Shaft to GR

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Hytrel Rubber
FINISH: Plain

SCALE: 1:2
SIZE: A
DATE: 2/19/2018
REV: 2

WEIGHT (LBS): 0.177

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Quantity: 1
9000 rpm Buna-N Rubber Spider

Love Joy Spider Motor to GR

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: NBR
FINISH: Plain

TOLERANCES: Manufacturer Specs

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DO NOT SCALE DRAWING
WEIGHT (LBS): 0.031

SCALE: 1:1
SIZE: A
DATE: 2/19/2018
REV: 2

SHEET 1 OF 1
Quantity: 8
M5 x 25mm Black Oxide Alloy Steel Socket Head Screw

M5 x 25mm SHS

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Alloy Steel
FINISH: Black Oxide

TOLERANCES: Manufacturer Spec

SCALE: 2:1
SIZE: A
DATE: 2/20/2018
REV: 2

WEIGHT (LBS): 4.90

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Quantity: 8
No.10 316 Stainless Steel Flat Washer

No.10 Washer

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL:
AISI Type 316L stainless steel

FINISH:
Plain

TOLERANCES: Manufacturer Specs

SCALE: 6:1
SIZE: A
DATE: 2/19/2018
REV: 2
WEIGHT (LBS): 0.00

DO NOT SCALE DRAWING

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INTERNATIONAL SOCIETY OF WHEELCHAIR PROFESSIONALS

ISWP

USAID FROM THE AMERICAN PEOPLE

FROM THE AMERICAN PEOPLE
Quantity: 1
DC 12mm Dia. Proximity Switch

Proximity Switch

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

MATERIAL: Brass
FINISH: Nickel

TOLERANCES: Manufacturer Specs

SCALE: 2:1
SIZE: A
DATE: 4/13/2018
REV: 2

WEIGHT (LBS): 0.09694646
Quantity: 1
Zinc-Alloy Tapered-Roller Bearing for 1-1/4" Shaft Dia.

Thrust bearing

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]

<table>
<thead>
<tr>
<th>MATERIAL:</th>
<th>FINISH:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plain Carbon Steel</td>
<td>Plain</td>
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</tbody>
</table>

TOLERANCES: Manufacturer Spec

SCALE: 1:1  SIZE: A  DATE: 2/19/2018  REV: 2

DO NOT SCALE DRAWING  WEIGHT (LBS): 0.42

SHEET 1 OF 1