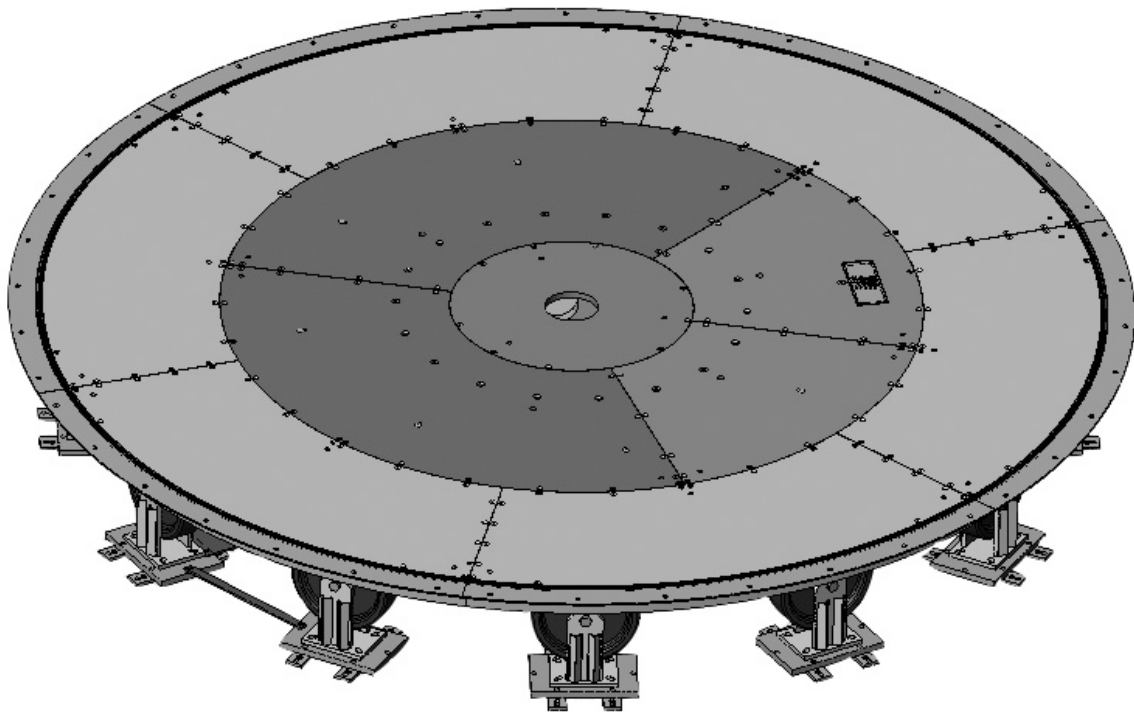


Model 2181

Electric Powered Turntable

3-Meter and 4-Meter

User Manual



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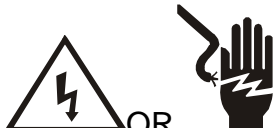



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Appendix B: EC Declaration of Conformity43



Safety Symbol Definitions

This product and related documentation must be reviewed for familiarization with safety markings and instructions prior to operation of the product.


Safety Symbol	Definition
	REFER TO MANUAL —When the product is marked with this symbol refer to the instruction manual for additional information. If the instruction manual has been misplaced, go to www.ets-lindgren.com for downloadable files or contact ETS-Lindgren customer service.
	HIGH VOLTAGE —Indicates the presence of hazardous voltage. Unsafe practice could result in several personal injury or death.
	PROTECTIVE EARTH GROUND (SAFETY GROUND) —Indicates protective earth terminal. Uninterruptible safety earth ground from the main power source to the product input wiring terminals, power cord or supplied power cord set shall be provided.
	CAUTION —Denotes a hazard. Failure to follow instructions could result in minor personal injury and/or property damage. Text that follows the symbol will provide proper procedures.
	WARNING —Denotes a hazard. Failure to follow instruction could result in severe personal injury and/or property damage. Text that follows the symbol will provide proper procedures.

General Safety Considerations

Safety Symbol	Definition
	Read this manual completely and refer to drawings at the end of the manual before beginning the installation. This equipment should be installed and operated only by qualified personnel.
	QUALIFIED PERSONNEL ONLY <ul style="list-style-type: none"> The electrical installation of this product should be accomplished by an individual who is authorized to so do by the appropriate local authority. The installation should be in compliance with local electrical safety codes. Only qualified personnel should operate or service this equipment.
	BEFORE POWER IS APPLIED TO THIS INSTRUMENT, GROUND IT PROPERLY through the protective conductor of the AC power cable to a power source provided with protective earth contact. Any interruption of the protective (grounding) conductor, inside or outside of the instrument, or disconnection of the protective earth terminal could result in personal injury.
	BEFORE SERVICING: CONTACT ETS-LINDGREN (+1.512.531.6400) —Servicing or modifying the unit without ETS-Lindgren authorization may void your warranty. If an attempt to service the unit must be made, disconnect all electrical power prior to beginning. Voltages exist at many points within the instrument that could, if contacted, cause personal injury. Only trained service personnel should perform adjustments and/or service procedures upon this instrument. <i>Capacitors inside this instrument may still be charged even when the instrument is disconnected from the power source.</i>
	<ul style="list-style-type: none"> Do not make any modifications to this unit without consulting the factory directly. Only use replacement parts and fasteners ordered directly from the factory.
	STAY CLEAR of moving components during operation of equipment.

Safety Symbol	Definition
	<p>Do not, at any time, place hands or feet in the vicinity of the drive pinion on the turntable.</p>
	<p>Regularly inspect all equipment and conduct scheduled maintenance in accordance with the factory recommendations provided.</p>

Waste Electrical and Electronic Equipment (WEEE) Directive

	<p>(European Union) At end of useful life, this product should be deposited at an appropriate waste disposal facility for recycling and disposal. Do not dispose of with household waste.</p>
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1.0 Introduction

The ETS-Lindgren Model 2181 is an electric-powered turntable platform system designed for use with the Model 2090 Series Multi-Device Positioning Controller for EMI compliance testing. The Model 2181 turntable is available in 3-meter and 4-meter sizes, both designed for indoor or outdoor use.

The Model 2181 turntable utilizes a pinion and gear drive with a gear reducer and electric motor located beneath the platform. The conductive metal top of the turntable is outfitted with a continuous ground brush to electrically couple it to the ground plane. The sectional turntable top provides easy access in the event that service is required. A shielded enclosure contains the electronics for the system. Signal I/O from the turntable to the Model 2090 controller uses fiber optic cable.

The ground brushes are attached directly to the turntable and are in continuous contact with the wear strip mounted on the floor flange. The brushes point outward from the turntable.

The bearing on which the turntable rotates has the drive teeth cut directly on the outside and will easily support most Equipment Under Test (EUT). Casters located beneath the table surface provide support for a cantilevered load. Leveling screws are located at each caster, between the casters, and in the center section of the assembly for ease in matching height on an uneven ground plane.

To prevent over-travel of the turntable in either direction of movement, hard limits are provided in the form of pins that actuate switches located below the tabletop. These pins allow limits to be set and allow as much as two full rotations. Rotation speed can be varied from the front panel of the Model 2090 controller or through the IEEE-488 interface bus.

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2.0 Receiving Your Order

Unpacking and Acceptance

Step 1. Upon delivery of your order, inspect the shipping container(s) for evidence of damage. Record any damage on the delivery receipt before signing it. In case of concealed damage or loss, retain the packing materials for inspection by the carrier.

Step 2. Remove the product from its shipping container(s). Save the container(s) and any protective packing materials for future use.

Step 3. Check all materials against the packing list to verify that the equipment you received matches what was ordered. If you find any discrepancies, note them and call ETS-Lindgren Customer Service for further instructions.

Make sure you are satisfied with the contents and condition of your order prior to placing the product into service.

Service Procedures

To return a system or system component for service:

Step 1. Contact ETS-Lindgren Customer Service to obtain a Service Request Order (SRO).

Step 2. Briefly describe the problem in writing. Give details regarding the observed symptom(s) or error codes, and whether the problem is constant or intermittent in nature. Please include the date(s), the service representative you spoke with, and the nature of the conversation. Include the serial number of the item being returned.

Step 3. Package the system or component carefully. If possible, use the original packing materials to return a system or system component to ETS-Lindgren at the following address:

ETS-Lindgren
Attn: Service Department
1301 Arrow Point Drive
Cedar Park, TX, USA 78613
Phone: +1.512.531.6400
Customer Service: +1.512.531.6498
www.ets-lindgren.com

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3.0 Maintenance

Recommended Maintenance Schedule

Regular maintenance will prolong the effective operation and reliability of your turntable. Follow the recommended schedule for 6- and 12-month service.

CAUTION

Do not perform maintenance while the turntable is operating.

6-MONTH SERVICE

- Lubricate the casters with good quality bearing grease.
- Check the gearbox for fluid leakage. A collection of slight film is normal, but puddles of fluid are not normal. The gearbox is lubricated and sealed at the factory. Under normal conditions, the gearbox should not require servicing during its life.

12-MONTH SERVICE

- Lubricate the main bearing race with a grease gun containing good quality bearing grease. The grease fittings are located inside the race, 90 degrees apart, beneath the top. Three discharges from the grease gun in each fitting are adequate.
- Lubricate the gear teeth with good quality grease.

Replacement and Optional Parts

Use the following tables to order replacement or optional parts for the Model 2181 turntable.

Replacement Part	Part Number
Turntable assembly	For a list of all turntable parts, see the drawings located in the back pocket of this manual.
Model 2090 Series Multi-Device Positioning Controller	2090

Table 1: Replacement Parts List

Optional Part	Part Number
IR Remote Controller	707030
NEMA connectors for slip ring	103441
Schuko connectors for slip ring	103351

Table 2: Optional Parts List

4.0 Model 2181 Turntable Configuration

Standard Configuration

TURNTABLE ASSEMBLY

Featuring continuous or non-continuous operation, the turntable assembly includes:

- Three-phase electric motor unit
- Heavy-duty variable speed drive system
- Conductive sectional top
- Convenient rotational limit adjust switches
- Limit override feature
- Ground ring assembly with ground brush and floor flange
- Ten-meter fiber optic control cables
- Overall height 40.0 cm (15.75 in)
- Sectional top for easy service access
- Full-supporting leveling screws

Additionally, the turntable is infrared compatible, and can be used with an optional ETS-Lindgren Infrared Remote Controller (IR remote). For more information on using an IR remote, see *Infrared Remote Controller* on page 16.

SHIELD ROOM FEED-THROUGH

Routes the fiber optic control cable from the control room to the shield room, maintaining satisfactory shielding attenuation. The unit is made of brass for conductivity and provides attenuation of greater than 100 dB at 10 GHz. A single 22.25-mm (.875-in) hole is required for mounting.

Model 2090 Series Multi-Device Positioning Controller



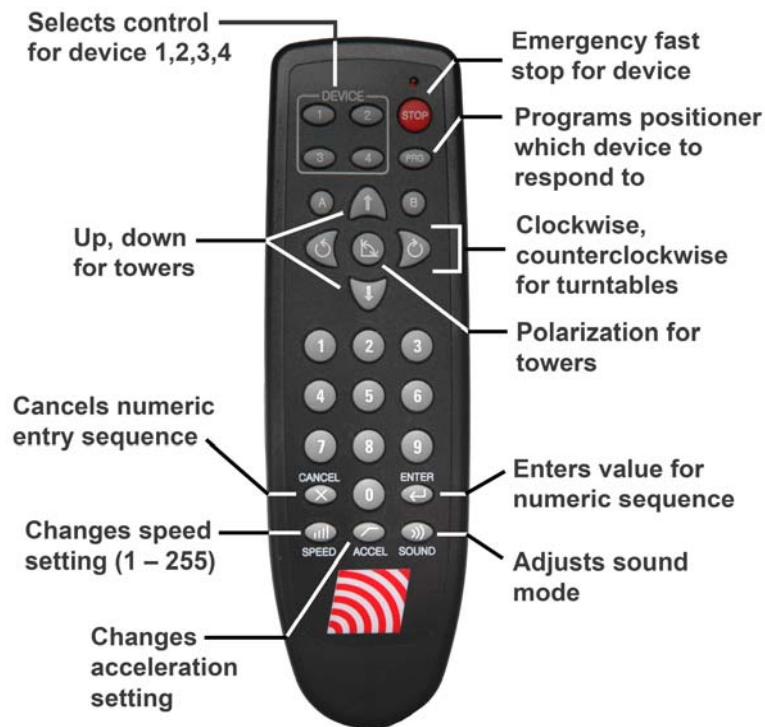
The Model 2090 controller is a separate component required for Model 2181 turntable operation.

The Model 2090 Series Multi-Device Positioning Controller provides control for two separate devices, such as ETS-Lindgren towers and turntables, plus the control of four auxiliary devices. The Model 2090 controller includes a GPIB bus and is compatible with most popular software, and electronically controls speed adjustment through the GPIB interface or front panel.

Optional Items

INFRARED REMOTE CONTROLLER

The Model 2181 turntable is infrared compatible, and can be used with a universal remote control programmed to a specific protocol, such as the ETS-Lindgren Infrared Remote Controller (IR remote).



The IR remote communicates with an infrared receiver in the Model 2181 motor base through an IR repeater installed in the floor near the turntable. See *IR Repeater Installation* on page 27 for instructions on installing an IR repeater.

SLIP RING

Allows continuous rotation of the turntable through the latest technology in mercury slip rings, and either Schuko or NEMA connectors can be ordered with the slip ring. The current rating for the standard electrical assembly is 20 amperes. Contact ETS-Lindgren for custom requirements on slip rings.

EUT POWER OUTLETS

Receptacles are usually mounted on the base of the turntable at the center axis point. These receptacles can be custom mounted, flush with the tabletop on some turntables. Contact ETS-Lindgren for information.

MOUNTED LINE IMPEDANCE STABILIZATION NETWORK

A Line Impedance Stabilization Network (LISN) can be mounted to the underside of some turntables. This option is only practical on larger turntables with sufficient clearance.

ADDITIONAL FIBER OPTIC CABLES

Additional lengths of fiber optic cable may be ordered.

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5.0 Specifications

Electrical Specifications

Drive Speeds:	Variable
Nominal AC Voltage:	200–230 VAC
Input Frequency:	50/60 Hz
Current Rating:	15 amp service
Current Draw:	< 10 amps
RPM:	.5 – 2.0
Phase:	Single (1)

Mechanical Specifications

Diameter:	3.0 m 9.84 ft	4.0 m 13.12 ft
Nominal Height:	40.0 cm 15.75 in	40.0 cm 15.75 in
Required Pit Diameter:	306.3 cm ± 1.0 cm 120.6 in ± .40 in	406.4 cm ± 1.0 cm 160.0 in ± .40 in
Top Construction	Sectional Aluminum	Sectional Aluminum
Distributed Load Rating:	4000 kg 8818 lb	6000 kg 13227 lb



Distributed Load Rating applies when:

- Load is evenly distributed on top;
- No point loads under .19 sq m (2.0 sq ft) should exceed 100 kg (220 lb);
- And not over 28.5 kg (62.8 lb) should be applied to a 45-degree segment at the table outer edge.

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6.0 Turntable Installation Considerations



Prior to assembly, installation, and operation, read *Safety Symbol Definitions* on page v and *General Safety Considerations* on page vi.

Pre-planning is essential for a successful installation. Discuss your requirements with your sales representative and request dimensional drawings prior to site construction.

Before You Begin—Precautions



Read this manual completely before starting installation. This equipment should be installed and operated only by qualified personnel.

The electrical installation of this product should be accomplished by an individual who is authorized to so do by the appropriate local authority. The installation should be in compliance with local electrical safety codes.

Do not attempt to service unless qualified to do so. As with any electrical equipment, make sure unit electrical power has been disconnected and secured when performing scheduled maintenance or adjustments.



Do not make any modifications to this unit without consulting the factory directly.

Regularly inspect all equipment and conduct scheduled maintenance in accordance with the factory recommendations provided.

Only use replacement parts and fasteners ordered directly from the factory.



Stay clear of all moving components on this equipment.

Do not operate turntable while someone is physically on the turntable top.

Do not, at any time, place hands or feet in the vicinity of the drive pinion on the turntable.

Power and Signal Lines

CONDUIT

Power and signal line paths should be planned in advance. Conduit should be in place before pouring concrete or installing the ground plane. Consider the size of the cable bundle when selecting conduit diameter.

ELECTRICAL CONSIDERATIONS

A qualified and licensed electrical contractor should install power lines, and the installation should comply with all applicable regulatory agencies. A dedicated circuit should be used, with the shortest distance possible between the power source and the turntable.

ACCESS

An access area beneath the turntable is advisable for large diameter installations. A service switch should be installed to deactivate the turntable during service.

Outdoor Installations

DRAINAGE

A centerline drain of at least 15 cm (6 in) must be installed to provide proper drainage during rainstorms and other moisture-collecting situations.

COLD CLIMATE CONDITIONING

The oil used in the gear assemblies will congeal at 2 degrees C (28 degrees F). Turntables operated in these temperatures should include a heat source or dehumidifier, or both.

7.0 Assembly and Installation Instructions

Proper installation of the turntable directly affects performance. The installation of turntables two meters and larger will be performed by factory installation specialists or individuals authorized by ETS-Lindgren to perform such work. The following installation information is included only to provide an informational overview of the installation process.



Prior to assembly and installation, review the drawings located in the back pocket of this manual.

1. Uncrate all parts and check for shipping damage. Create a clear area to safely assemble the turntable unit. Do not discard any packing material until unit is fully assembled.
2. Remove the ½-13 flat head screws from the center of the turntable.
3. Install the eye-bolts (included) into the appropriate holes located on the center top sections, and then attach lifting chains or slings (not included) through the eye-bolts.

CAUTION

Only qualified personnel should use a forklift or other lifting machinery.

4. Using a forklift or other appropriate lifting machinery, remove the turntable top.
5. Remove the eye-bolts from the turntable top, and install them in the appropriate holes located on the bearing support.
6. Using a forklift or other appropriate lifting machinery, place the turntable bottom bearing support section into position. Remove the eye-bolts from the bearing support.
7. Remove the drive pinion to allow manual rotation of the turntable.
8. To install the turntable into a pit or floor cut-out, first center and level the turntable assembly. The drawings located in the back pocket of this manual illustrate the placement of floor plates and leveling screws required to anchor and level the turntable. Your installation specialist may make slight adjustments to accommodate your particular site.



Make sure the diameter of the cutout in the floor matches the dimensions specified in the assembly drawings located in the back pocket of this manual.

9. Install the floor plates and leveling screws, and then adjust all of the leveling screws to level the entire turntable.

CAUTION

Turn off the electrical breaker located on the drive box assembly. Make sure power is off and secured before proceeding.

10. After the turntable is leveled, lock the height of the turntable into place by tightening the lock-nuts that accompanied the leveling screws.
11. Anchor the turntable through the anchor holes with the included bolts.
12. Confirm the electrical breaker is off, and then re-install the drive pinion.

CAUTION

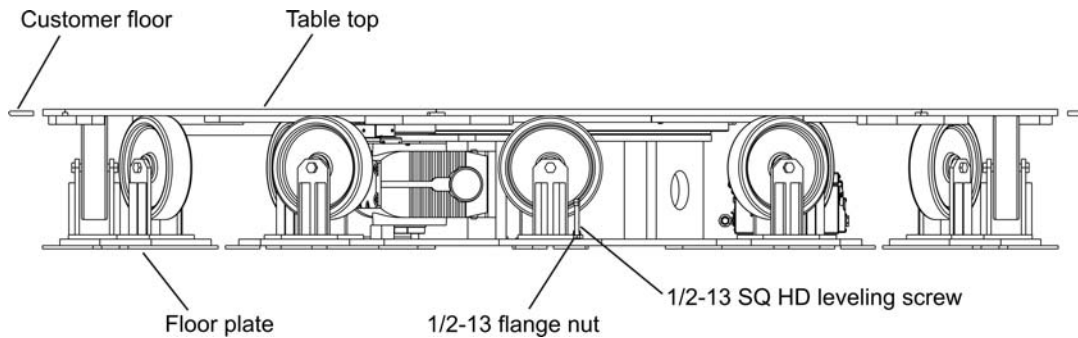
Electrical connection is subject to local electrical codes, and should only be performed by a qualified electrician.

13. Connect the fiber optic control cable and install the power connection according to local electrical code. See *Electrical Installation* on page 29 for electrical installation guidelines.

CAUTION

Keep all body parts away from the drive pinion when the turntable is energized.

14. Turn on the electrical breaker located on the drive box assembly.
15. To verify proper operation, rotate the turntable using the controller.
16. To set travel limits, see *Setting Travel Limits* on page 32.
17. Follow the instructions in the next section, *Floor Flange Installation*, to install the ground ring assembly.
18. With the turntable running in the clockwise (CW) or counterclockwise (CCW) direction, use the included key to adjust the speed of the turntable to the desired speed.
19. Using the ½-13 flat head screws removed in step 2, re-install the turntable top onto the drive section.



Floor Flange Installation



Prior to installing the floor flanges, review the drawings located in the back pocket of this manual.

The ground ring assembly includes a set up floor flanges that interface with the brush ring located on the perimeter of the turntable. The floor flanges provide constant electrical contact with the ground plane, and are usually installed with the turntable.

Mounting methods vary according to user specifications. Clearance holes are provided at evenly spaced intervals along the outside perimeter of the floor flanges to attach to a customer supplied ground plane.

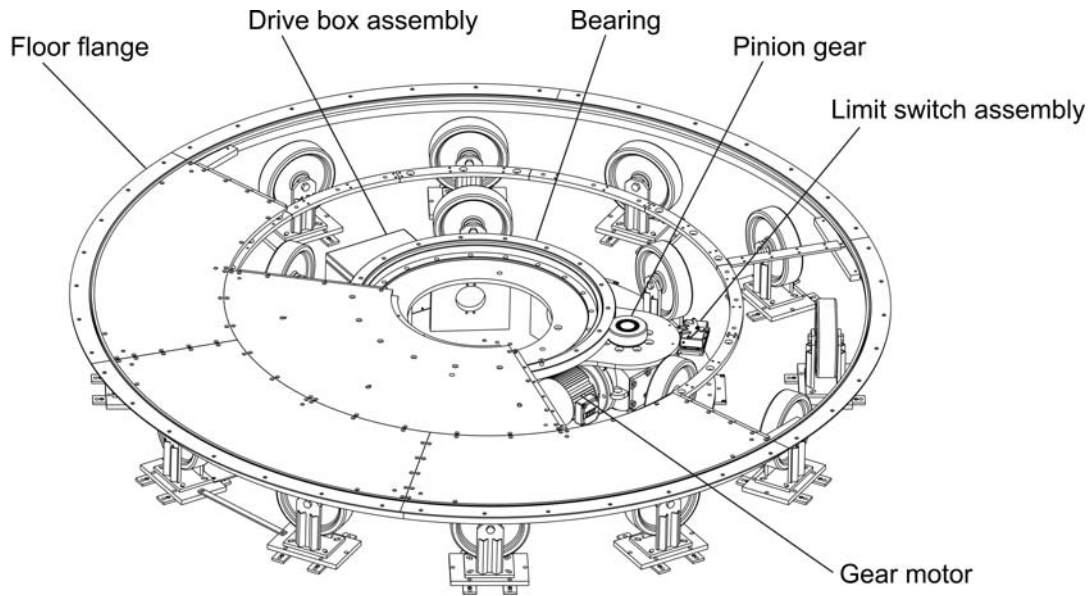
Installing the ground ring assembly requires these tools:

- Three ¼-in spacers
- Hand drill
- 5/32-in drill bit
- #3 Phillips drive bit
- Small square
- #14 x 1 wood/metal screws

The turntables each have six floor flange pieces. All flanges are pre-cut at the factory for a drop-in fit.



A 3-meter Model 2181 turntable is depicted in the following. The turntable top is shown as a partial cut-away to provide a view of internal components.



1. When attaching the ground ring, first center and level the turntable assembly into the turntable pit.
2. Install the floor flanges around the turntable. A gap of 5/16 inch (0.79 cm) to 7/16 inch (1.11 cm) should be maintained around the turntable. Match drill with the floor and install ¼-20 inch flat head screws.
3. Install a wear strip on the inside of the floor flange by aligning it with the top of the flange, and aligning the pre-drilled mounting holes in the strip to 1.00 inch (2.54 cm) from the bottom of the flange.
4. Make sure that the wear strip covers the full circumference of the flange, and then trim the wear strip to size.
5. Using the pre-drilled holes on the wear strip as a template, drill holes through the floor flange.
6. Secure the wear strip to the floor flange with 6-32 x 3/8-in thread cutting screws (provided).
7. Apply conductive grease (provided) on the wear strip along the brush contact area, approximately one inch to two inches from the top of the strip.

IR Repeater Installation

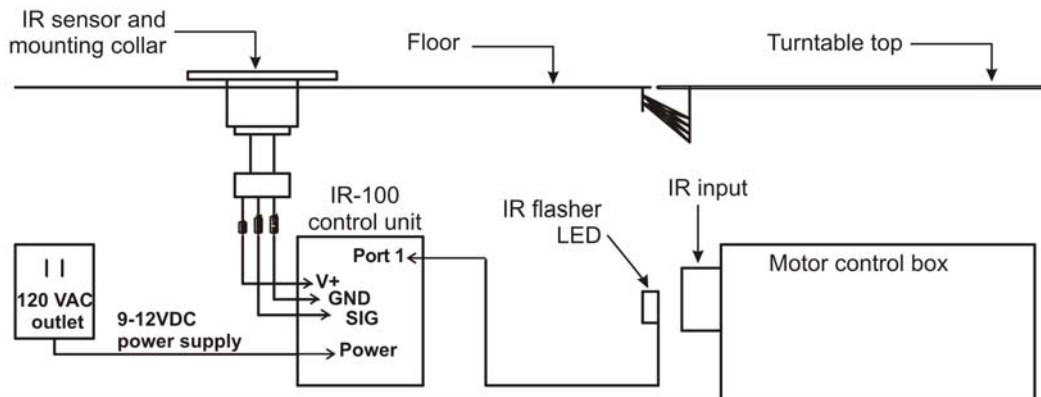
INSTALLATION ASSEMBLY COMPONENTS

- Infrared sensor
- Mounting collar
- IR-100 control unit
- IR flasher LED
- 9-12VDC power supply
- Connection cable
- Flathead mounting screws

REQUIRED TOOLS FOR INSTALLATION

- Electric drill
- 1-inch hole saw to create a
- 1/16-inch drill bit
- Small flat blade screwdriver
- Phillips #2 bit driver
- Adhesive tape

INSTALLATION STEPS



1. Choose a location for the IR infrared sensor that is away from traffic.
2. Using a 1-inch hole saw, cut an opening in the floor for the IR sensor.
3. Connect the **V+**, **GND**, and **SIG** wires to the IR sensor as shown in the diagram, and feed the cable through the hole.

4. Use the 1/16-inch drill bit and four flathead mounting screws to mount the IR sensor collar.
5. Connect the **V+**, **GND**, and **SIG** wires from the IR sensor to the IR-100 control unit as shown in the diagram.
6. Using adhesive tape, attach the IR flasher LED directly over the IR input on the motor control box.
7. Connect the IR flasher to port 1 on the IR-100 control unit.
8. Plug the 9-12VDC power supply into the power connector on the IR-100 control unit, and then plug the power supply into a 120 VAC outlet.

8.0 Electrical Installation

CAUTION

Electrical installation must be performed by a qualified electrician, and in accordance with local and national electrical standards.

The Model 2181 turntable is configured to operate using 200-230 VAC, single phase, 50/60 Hz service. It is recommended to operate at this voltage level to reduce the surge currents necessary to power an electric motor.

1. The branch circuit supplying power to the motor base should be protected from excess current according to local electrical codes. An integral circuit breaker is mounted inside the main bearing on one of the bearing support blocks. The circuit breaker is specifically designed for the inductive load presented by the electric motor.
2. Make sure the conductor size is adequate for the motor load and the distance from the mains source. Improperly sized conductors will lead to a high voltage drop in the power conductors and cause reduced starting torque and premature motor failure.
3. The motor base assembly is provided with a non-terminated flexible conduit with input power leads exposed. The flexible conduit is to be terminated into a junction box fitted on or near the motor base. Terminate the power leads of the motor base assembly according to local electrical code requirements. Following is the conductor color code:

Brown: AC high

Blue: AC neutral

Green/Yellow: Protective earth/safety ground

Connect the fiber optic control cable and install the power connection according to local electrical code. See the *Model 2090 Series Multi-Device Controller Manual* for information on connecting the fiber optic cable. After the fiber optic cable is installed, secure it with a wire tie to one of the leveling screws.

To feed the fiber optic connectors through the waveguide in a chamber, it may be necessary to remove part of the protective sheath. This removal allows the connectors to fit through the hole without excessively bending the fiber optic cable. Find and mark the spot where you will need to remove the sheath. Use a sharp knife to carefully cut around the outside of the sheath at each end of the defined area. Cut very lightly to avoid cutting into the fiber optic cables, then bend the sheath back and forth to expose the fiber optic cables.

Next, make a cut down the length of sheath area, being careful not to cut into fiber optic cable. Inside the sheath are two pieces of white string. Find the string and use it to split the sheath open. Insert the fiber optic cable into the waveguide.

Connecting the Model 2090 Controller

Any combination of primary devices (towers, turntables, reverberation paddles, MAPS, and so on) can be connected to the two device interface ports located on the rear panel of the Model 2090 Series Multi-Device Positioning Controller. For easy set up of an EMC facility, it is recommended that the turntable be connected to the **Device 2** port. The default settings for the controller are for a tower connected to the **Device 1** port and a turntable connected to the **Device 2** port.

Primary device connection is accomplished with a dual fiber optic cable included with the device. This cable terminates into two ST connectors that are identical at both ends. The cable is symmetrical, so either end can be connected to the controller. A fiber optic cable connected to the IN port of a device should be connected to the primary OUT port of the motor base at the other end. Similarly, a fiber optic cable connected to the OUT port of the device should be connected to the primary IN port of the motor base at the other end. Older motor base designs have only one fiber optic connector pair, but the newer motor base interface provides a secondary interface reserved for future expansion.



Fiber optic cabling for each device should not hang unsupported from the rear panel of the controller. The fibers and connectors are easily broken if twisted or bent. Keep the fiber optic cables as straight as possible from the connector to the protective sheath.

Using the Model 2090 controller or optional Infrared Remote Controller (IR remote), rotate the motor base shaft to verify proper operation. Run the motor base down to the lower limit counterclockwise, and then back it off from the lower limit a small amount. The previous step will help when it is time to set the rotation limits for the turntable.

CAUTION

The soft rotational limits in the Model 2090 controller must be set. Make sure the travel limit settings will not cause damage to user installed cables and equipment mounted on the table.

9.0 Operation

If you are unfamiliar with the operation of the controller, see the *Model 2090 Series Multi-Device Controller Manual*. A manual is included with each positioning controller shipment and is also available for download from www.ets-lindgren.com.

With the assembly of the turntable complete, the Model 2090 Series Multi-Device Positioning Controller must be connected to the unit and power applied to both the motor base and controller in order to continue. See the Model 2090 controller manual for information on connecting the fiber optic cable.

Use the Model 2090 controller to check the clockwise (CW) and counterclockwise (CCW) rotation in both directions by a few degrees. The position in degrees increases (+) in the CW direction and decreases (-) in CCW direction.

The turntable is calibrated in the factory to read out 360 degrees (plus or minus 1 degree) for one complete revolution. If the turntable is not within this range, the unit can be re-calibrated using the instructions in *Turntable Encoder Calibration* on page 34.

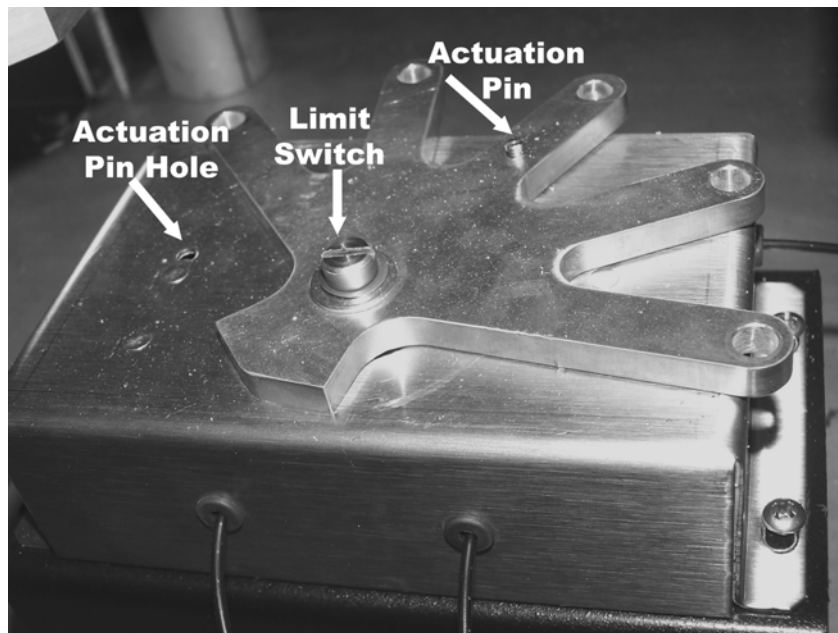
Editing Positioning Controller Configuration Parameters

Key	Function
PARAM	To edit a configuration parameter: <ul style="list-style-type: none">• Press PARAM key to display the current parameter.• Press PARAM key repeatedly to scroll through the parameter list, displaying each parameter.
STEP (INC/DEC)	To scroll up or down the parameter list while viewing a parameter. Reduces the effort necessary to scan through a long parameter list using the PARAM key.
LIMIT/POSITION	Press any of the LIMIT/POSITION selection keys to return the display to that selection. Press any of the remaining motion keys to return the display to the current position and execute that motion. Press the PARAM key again to return to the last displayed parameter in the list, allowing easy transition between parameter adjustment and device operation.

Key	Function
INCRM, DECRM, or ENTER	Once the desired limit, position, or parameter is visible in the display window, press INCRM, DECRM, or ENTER to toggle into edit mode. The lowest adjustable digit will flash on and off.
LOCAL	Press the LOCAL key for that device to switch the flashing digit to the next higher digit. In this way, it is possible to rapidly adjust any digit of a multi-digit parameter or limit.

Setting Travel Limits

The Model 2181 turntable is fitted with mechanically actuated, or hard limit, switches. These switches are adjustable to allow for limited travel beyond zero and 360 degrees. Actuation pins are placed in the turntable top to engage the limit switch mechanism. The limit switch mechanism is designed so that the amount of travel is dictated by the pin position in the turntable top.



Turntable Limit Switch

The default configuration allows for travel between -45 degrees and +405 degrees.

1. Remove all pins around the turntable and the ETS-Lindgren logo access panel.
2. Move the turntable so that the access compartment is directly above the limit switch.

3. Set the mechanism to the CCW armed position and insert actuation pins in the holes on either side of the mechanism 45 degrees away.
4. Set the current position displayed by the controller to 000.0 degrees.
5. Test the lower limit by holding down the DEC key, which allows the turntable to travel past the soft limit. The turntable should engage the lower hard limit between -35 and -55 degrees. You can also test the upper limit by holding down the INC key until the upper limit is engaged between 395 and 415 degrees.



If non-continuous operation is desired, properly set the soft limits in the controller.

To set the CCW rotational limit for the turntable:

1. Press the DOWN/CCW key under LIMIT. The indicator above the key will illuminate.
2. Set the limit by pressing the INCRM and DECRM keys under LIMIT until the desired limit is shown on the display.
3. Press the ENTER key.

To set the CW rotational limit for the turntable:

1. Press the UP/CW key under LIMIT. The indicator above the key will illuminate.
2. Set the limit by pressing the INCRM and DECRM keys under LIMIT until the desired limit is shown on the display.
3. Press the ENTER key.

WARNING

Make sure the current travel limit settings will not cause damage to existing cables and equipment located beneath the turntable.

If continuous operation is desired, the Model 2090 controller permits easy configuration to this type of operation from the front panel or through the IEEE-488 interface bus. For more information, see the *Model 2090 Series Multi-Device Controller Manual*. The limit pins should also be removed from the turntable top to allow for continuous operation.

Turntable Encoder Calibration

Parameter **C**, the encoder calibration parameter, calibrates the encoder counts to the rotation of the turntable. For the Model 2181 turntable, parameter **C** must be set to 3660. This setting is used to convert the encoder count values returned from a motor base into the corresponding centimeter or degree position reading. For turntables, this represents the number of encoder counts per revolution.

If the given value does not work correctly, the encoder calibration value can be determined using the following procedure:

1. Set the encoder calibration value to 3600.
2. Make sure the turntable is positioned to allow more than a full revolution of travel in the CW direction. Use the STEP keys to run the turntable CW a few degrees to remove any play in the turntable.
3. Using masking tape, mark the current location of the turntable against the ground ring, and set the current position reading to 000.0.
4. Using the STEP keys, rotate the turntable CW until it is again aligned with the mark on the ground ring. For best results, the last motion should always be in the CW direction to account for any play in the gearing between the motor and encoder.
5. Record the reading of the display, ignoring the decimal point. For example, **360.0** would be **3600**. This is the encoder calibration value.



If the value is below 3600, the resolution of the encoder is low and the controller will not provide 0.1-degree resolution, even though the display shows that digit. If the value is past 9999, the encoder has too many counts per meter and the controller cannot correct for it. In this case, contact ETS-Lindgren for assistance.

6. Enter the encoder calibration value and reset the limits and position information.
7. Test the turntable by moving it a complete revolution and comparing the alignment marks. It may be necessary to adjust the encoder calibration value up or down slightly depending on the result.



When scanning between limits, it is not uncommon to have a small discrepancy between the absolute position of the table and the display on the controller. This is because reversing the direction of rotation reverses any gear play between the encoder and the table top, allowing that play to be visible in the positioning accuracy.

TURNTABLE CALIBRATION EXAMPLE

- The turntable is set at the 0 degree position. A piece of tape is placed on the edge of the turntable to line up with the edge of the gearbox cover. The turntable is stopped when the tape travels exactly 360 degrees around. The display on the controller now reads 356.3 degrees, which is recorded.
- The table is rotated CCW back to zero. The parameter button is set on the **C** setting. The **C** digits display 3430. A new **C** setting is now calculated:

$$\text{New } \mathbf{C} = (356.3 / 360) \times 3430 = 3395 \text{ (rounded)}$$

- Decrement the **C** parameter to 3395 and press ENTER. Press the current position button to get back to operation mode.
- The table is rotated from 0 to 360 and the mark is now within one degree of being one full turntable revolution. Calibration is complete.

Changing Rotation Speed

The Model 2181 turntable is equipped with a variable speed drive. Firmware revision 3.11 or higher must be installed in the Model 2090 controller for proper operation of the Model 2181. The revision level is displayed on the front panel display during startup of the Model 2090 controller. If the controller does not have this revision or a later revision installed, contact ETS-Lindgren for an upgrade.

To select one of the four speeds, use the POLAR/SPEED button to toggle through the speed options. It is necessary to set the controller parameters to configure the controller to properly control the motor base. See the *Model 2090 Series Multi-Device Controller Manual* for information on setting the parameters.

Variable Speed Settings

The Model 2090 controller parameters **S1-S8** control the variable speed settings for the turntable. These parameters are the continuous variable speed settings for each of the four speed selections described in the next section, *Speed Selection*. Each of these parameters can be set to any value from 1 to 255, with the resulting turntable speed being roughly an S/255 fraction of the maximum speed. For any variable speed drive, there is a minimum speed at which the motor will operate. For the Model 2181 turntable this minimum speed setting is between 30 and 75, and should correspond to a value of 0.5 RPM or less. Below this setting, the motor will not be able to cause rotation, but will be active until a **Motor Not Moving** error (E002) occurs.

WARNING

Do not operate the turntable in a stalled condition. Doing so may cause damage to the drive unit and will void your warranty. Always make sure that the minimum speed setting specified in the S1-S8 parameters is above the minimum value at which your turntable will rotate under normal load.

Speed Selection

For the variable speed turntable, the Polarization/Flotation button provides the ability to cycle between eight preset speeds. For each press of the button, the turntable will change to the next speed setting. The polarization LEDs will light to indicate the speed selection as shown in the following:

Speed 1: Both off

Speed 2: Top on, bottom off

Speed 3: Top off, bottom on

Speed 4: Both on

Speed 5: Both off

Speed 6: Top on, bottom off

Speed 7: Top off, bottom on

Speed 8: Both on

Each speed setting has an individual overshoot compensation value to provide overshoot correction.

GPIB Commands

The following GPIB commands have been added or modified:

Sn: Select speed

- $n = 1-4$ for a variable speed turntable

S?: Query speed selection

- Returns 1-4 for a variable speed turntable

SSn: Set speed value

- $n = 1-4$
- Command is valid only for a variable speed turntable
- Valid speed values are 1-255
- Command Usage: *SSn <Speed>*
- Example: Output 708, SS1 196

SSn?: Query speed value

- $n = 1-4$
- Command is valid only for a variable speed turntable
- Returns a speed value 1-255
- Command Usage: *SSn?*
- Example: Output 708, SS2?

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Appendix A: Warranty Policy for Standard EMCO Brand Products

SCOPE AND DURATION OF WARRANTIES

Seller warrants to Buyer that the Standard EMCO Brand Products Excluding 5211 & 5220 be (1) free from defects in material, manufacturing workmanship, and title, and (2) conform to the Seller's applicable product descriptions and specifications, if any, contained in or attached to Seller's quotation. If no product descriptions or specifications are contained in or attached to the quotation, Seller's applicable product descriptions and specifications in effect on the date of shipment shall apply. The criteria for all testing shall be Seller's applicable product specifications utilizing factory-specified calibration and test procedures and instruments.

All product warranties, except the warranty of title, and all remedies for warranty failures are limited in time as shown in the table below.

Product Warranted	Duration of Warranty Period
Standard EMCO Brand Products Excluding 5211 & 5220	2 Years

Any product or part furnished to Buyer during the warranty period to correct a warranty failure shall be warranted to the extent of the unexpired term of the warranty applicable to the repaired or replaced product.

The warranty period shall commence on the date the product is delivered to Buyer; however, if Seller assembles the product, or provides technical direction of such assembly, the warranty period for such product shall commence on the date the assembly of the product is complete. Notwithstanding the foregoing, in the event that the assembly is delayed for a total of thirty (30) days or more from the date of delivery for any reason or reasons for which Seller is not responsible, the warranty period for such product may, at Seller's options, commence on the thirtieth (30th) day from the date such product is delivered to Buyer. Buyer shall promptly inspect all products upon delivery. No claims for shortages will be allowed unless shortages are reported to Seller in writing within ten (10) days after delivery. No other claims against Seller will be allowed unless asserted in writing within thirty (30) days after delivery (or assembly if the products are to be assembled by Seller) or, in the case of alleged breach of warranty, within the applicable warranty period.

WARRANTY EXCLUSIONS

Except as set forth in any applicable patent indemnity, the foregoing warranties are exclusive and in lieu of all other warranties, whether written, oral, express, implied, or statutory. EXCEPT AS EXPRESSLY STATED ABOVE, SELLER MAKES NO WARRANTY, EXPRESS OR IMPLIED, BY STATUTE OR OTHERWISE, WHETHER OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE OR USE OR OTHERWISE ON THE PRODUCTS, OR ON ANY PARTS OR LABOR FURNISHED DURING THE SALE, DELIVERY OR SERVICING OF THE PRODUCTS. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF.

Warranty coverage does not include any defect or performance deficiency (including failure to conform to product descriptions or specifications) which results, in whole or in

part, from (1) negligent storage or handling of the product by Buyer, its employees, agents, or contractors, (2) failure of Buyer to prepare the site or provide an operating environmental condition in compliance with any applicable instructions or recommendations of Seller, (3) absence of any product, component, or accessory recommended by Seller but omitted at Buyer's direction, (4) any design, specification, or instruction furnished by Buyer, its employees, agents or contractors, (5) any alteration of the product by persons other than Seller, (6) combining Seller's product with any product furnished by others, (7) combining incompatible products of Seller, (8) interference with the radio frequency fields due to conditions or causes outside the product as furnished by Seller, (9) improper or extraordinary use of the product, or failure to comply with any applicable instructions or recommendations of Seller, or (10) acts of God, acts of civil or military authority, fires, floods, strikes or other labor disturbances, war, riot, or any other causes beyond the reasonable control of Seller. This warranty does not cover (1) contact fingers or replacements unless loss is caused by a defect in material or manufacturing workmanship within the scope of this warranty (2) items designed to be consumable and (3) removal and reconstruction of walls, partitions, ceilings and other facility costs arising from repair or replacement of the product or parts thereof by Seller under the warranty. Seller does not warranty products of others which are not included in Seller's published price lists for shielding products and systems supplies and accessories.

BUYER'S REMEDIES

If Seller determines that any product fails to meet any warranty during the applicable warranty period, Seller shall correct any such failure by either, at its option, repairing, adjusting, or replacing without charge to Buyer any defective or nonconforming product, or part or parts of the product. Seller shall have the option to furnish either new or exchange replacement parts or assemblies.

Warranty service during the applicable warranty period will be performed without charge to Buyer within the contiguous 48 United States during Seller's normal business hours. After the warranty period, service will be performed at Seller's prevailing service rates. Subject to the availability of personnel, after-hours service is available upon request at an additional charge. For service outside the contiguous 48 United States, travel and per diem expenses, when required, shall be the responsibility of the Buyer, or End User, whichever is applicable.

The remedies set forth herein are conditioned upon Buyer promptly notifying Seller within the applicable warranty period of any defect or nonconformance and making the product available for correction.

The preceding paragraphs set forth Buyer's exclusive remedies and Seller's sole liability for claims based on failure of the products to meet any warranty, whether the claim is in contract, warranty, tort (including negligence and strict liability) or otherwise, and however instituted, and, upon the expiration of the applicable warranty period, all such liability shall terminate. IN NO EVENT SHALL SELLER BE LIABLE TO BUYER FOR ANY SPECIAL INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND ARISING OUT OF, OR AS A RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, ASSEMBLING, USE OR LOSS OF USE OF THE PRODUCTS OR ANY PART THEREOF, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT DESPITE ANY NEGLIGENCE ON BEHALF OF THE SELLER. IN NO EVENT SHALL SELLER'S LIABILITIES UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE OF THE PRODUCT IN RESPECT OF WHICH DAMAGES ARE CLAIMED. This agreement shall be construed in

accordance with laws of the State of Illinois. In the event that any provision hereof shall violate any applicable statute, ordinance, or rule of law, such provision shall be ineffective to the extent of such violation without invalidating any other provision hereof.

Any controversy or claim arising out of or relating to the sale, delivery, nondelivery, servicing, assembling, use or loss of use of the products or any part thereof or for any charges or expenses in connection therewith shall be settled in Austin, Texas by arbitration in accordance with the Rules of the American Arbitration Association, and judgment upon the award rendered by the Arbitrator may be entered in either the Federal District Court for the Western District of Texas or the State District Court in Austin, Texas, all of the parties hereto consenting to personal jurisdiction of the venue of such court and hereby waive the right to demand a jury trial under any of these actions.

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Appendix B: EC Declaration of Conformity

The EC Declaration of Conformity is the method by which ETS-Lindgren, L.P. declares that the equipment listed on this document complies with the EMC Directive (EEC/89/336) and Low Voltage Directive (EEC/73/23), including applicable amending directives.

Factory

ETS-Lindgren, L.P.
1301 Arrow Point Drive
Cedar Park, TX, USA 78613

Issued by

ETS-Lindgren, L.P.
1301 Arrow Point Drive
Cedar Park, TX, USA 78613

The products listed below are eligible to bear the CE mark:

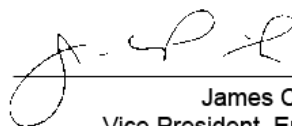
– Model 2181 Electric Powered Turntable, 3-Meter and 4-Meter with 2088 style motor base

APPLICABLE REQUIREMENTS

<u>Standard</u>	<u>Criteria</u>
EN 55011	Group 1, Class B
EN 61000-4-2:1995	Level 2/3 (4/8 kV)
EN 61000-4-3:1997	Level 2 (3 V/m)
EN 61000-4-4	Level 2 (1/0.5 kV)
ENV 50204:1996	Level 2 (3 V/m)
EN 61000-4-5:1995	Level 3 (2/1 kV)
EN 61000-4-11:1994	2 kV
EN 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use

AUTHORIZED SIGNATORIES

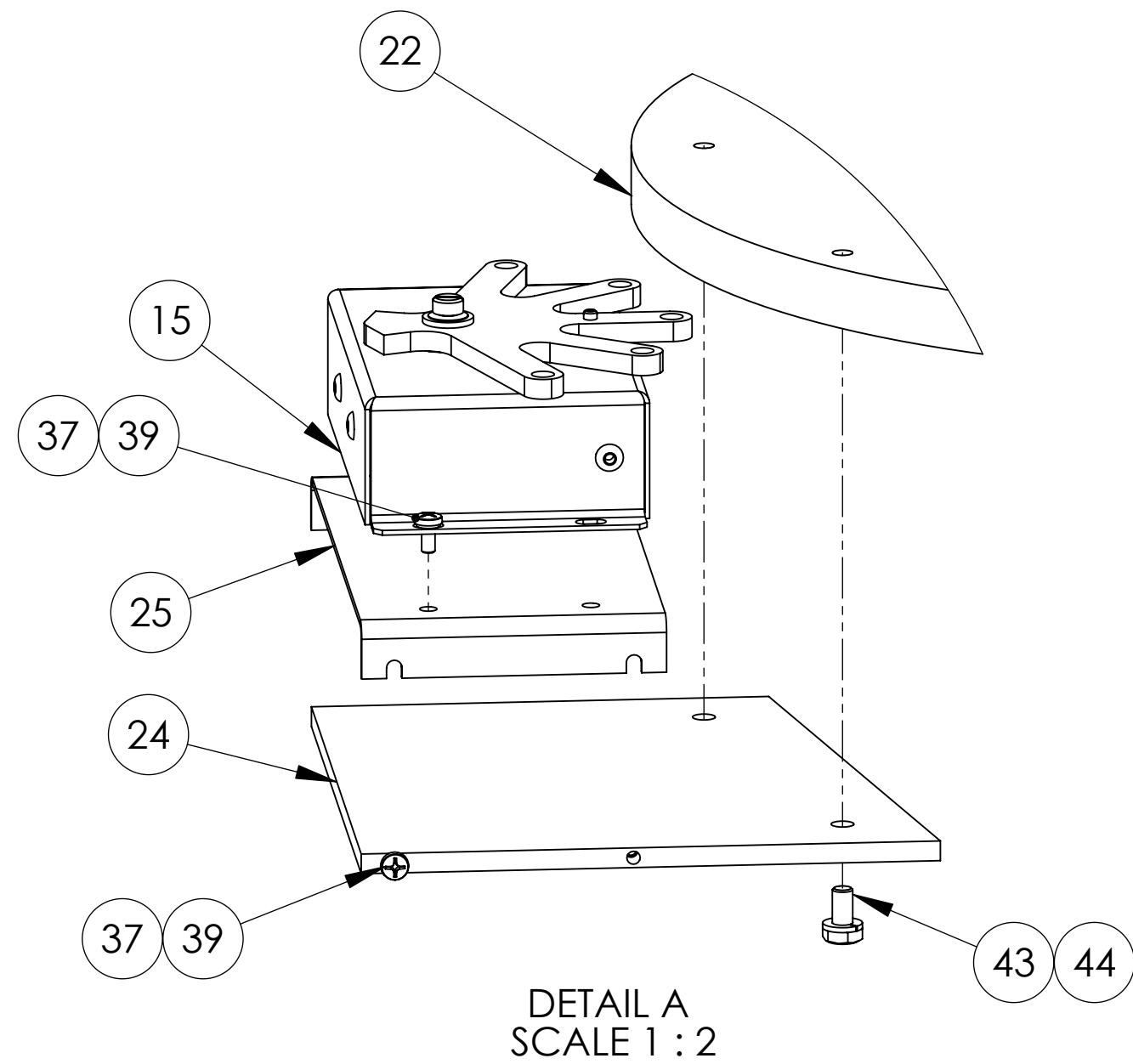
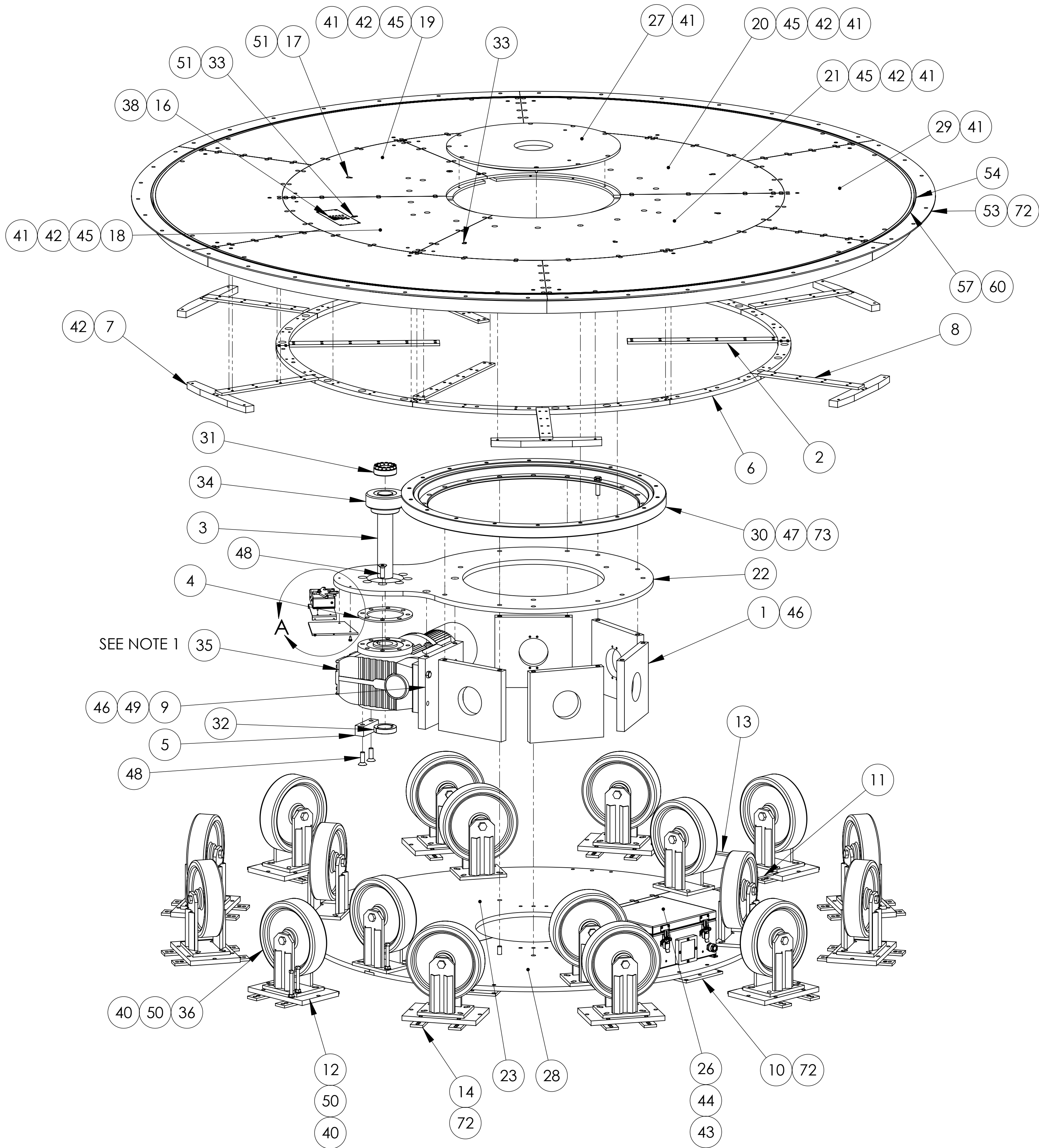

Bryan Sayler,
General Manager


James C. Psencik,
Vice President, Engineering


Charles Garrison,
Quality Assurance

The authorizing signatures on the EC Declaration of Conformity document authorizes ETS-Lindgren, L.P. to affix the CE mark to the indicated product. CE marks placed on these products will be distinct and visible. Other marks or inscriptions liable to be confused with the CE mark will not be affixed to these products. ETS-Lindgren, L.P. has ensured that appropriate documentation shall remain available on premises for inspection and validation purposes for a period of no less than 10 years.

1. BREATHER PLUG ON GEARBOX TO BE RELOCATED TO TOP OF GEARBOX

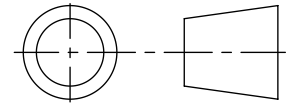


78	2	930993	ROBERTSON POWER BIT #3 1 15/16" LONG(NS)	33	2	880316	PIN,CLEVIS,SS,1/2"O.D. X 1.5" LONG
77	18	890259	SHIELDING STRIP 24" 97-555 INSTR SPEC(NS)	32	1	880176	COLLAR SHAFT 2.375"
76	50	890192	CONDUIT FLEX 1/2" RF SHIELDED(NS)	31	1	880174	SHAFT LOCK,KEYLESS,2 3/8 DIA
75	1	890191	CONN 90DEG CONDUIT FLX(NS)	30	1	880125	BEARING,42.20 O.D.,122T
74	50	675289	CORD,10-3 SJTO(NS)	29	6	705321	TOP SECTION,2081-3M
73	10	910539	WASHER,5/8,LOCK,STL,ZN,SPLIT	28	1	705307	TT BASE PLATE 2
72	150	910682	SCREWS,WOOD/METAL,FLAT SOCKET 1" X 14	27	1	705305	CENTER PLATE ALUMINUM 2081
71	1	107039	KIT,SHIELD ROOM,TOWERS AND TURNABLES(NS)	26	1	111401	DRIVE,TURNABLE,2181
70	1	399289	MANUAL, 2181 TURNTABLE SERIES,3M & 4M(NS)	25	1	111376	COVER,LIMIT SWITCH ASSY
69	1	675294	CABLE,ENCODER,8 METER SHIELDED(NS)	24	1	111375	MOUNT,COVER,LIMIT SWITCH ASSY
68	85	890983	SLEEVING,SLIT-CONVOLUTED,PE,1/4" ID(NS)	23	1	111374	BASE PLATE 1,2181 TT
67	4	708041	FIBER OPTIC CABLE LIMIT SWITCH 6.5M(NS)	22	1	111373	MOUNT,BEARING/GEARMOTOR,2181 TT
66	6	890790	C CLAMP 5133A11 MCMMASTER(NS)	21	1	111372	TOP PLATE,MID CENTER 3,2181 TT
65	1	920228	LABEL,EQUIPMENT CHECKED (CAL)(NS)	20	1	111371	TOP PLATE,MID CENTER 4,2181 TT
64	1	920122	LABEL,SAFETY,TURNTABLE(NS)	19	1	111370	TOP PLATE,MID CENTER 2,2181 TT
63	1	920192	LABEL,WARNING,GEAR BELOW TURNTABLE(NS)	18	1	111369	TOP PLATE,MID CENTER 1,2181 TT
62	130	910276	SCREW ROLL FORM FLAT HEAD PHL 8-32 X 1	17	6	110059	PLUG,HOLE,TABLE TOP
61	1	890589	T-HANDLE HEX 3/16" 71-360-930 TRAVERS(NS)	16	1	108925	COVER,ACCESS
60	35	890583	STRIP BRUSH STRAIGHT #5 BRASS CH/.005B	15	1	108758	ASSY,MECHANICAL LIMIT SWITCH,MOTORBASE
59	3	890440	CLAMPING PIN T-HANDLE CL-4-CP(NS)	14	24	106973	OUTER FLOOR PLATE, 2081
58	3	890411	EYEBOLT 3/4-10X2 6000LBS 3014T53 MCMMASTER(NS)	13	1	106850	CASTER SPACER STRUT 17.6"
57	6	105130	GROUND RING 2081-3M	12	12	106849	CASTER PLATE RECT 2081-3M
56	50	910159	SELF TAPPING SCREW PA HEAD ZN 6-32X3/8	11	1	106848	CASTER SPACER PLATE 14.1 LG 2081-3M
55	3	890706	GREASE CONDUCTIVE 19-820 796-9821 ALLIED(NS)	10	22	106789	FLOOR PLATE SPACER 2081
54	1	705387	WEAR STRIP SS 3.0M TT	9	1	106553A	BLOCK,TORQUE,2081
53	6	705386	FLOOR FLANGE ALUM 3.0M TT	8	6	105133	TIE PLATE,2081/3M
52	1	705344-10	FIBER OPTIC CABLE 2090 10 METERS(32.8FT)(NS)	7	6	105132	STIFFENER TOP 2081-3M
51	8	910930	SCREW,10-32 X 3/8,PHIL,FLAT,SS	6	12	105053	PLATE,DRIVE,2M/4M
50	116	910678	SCREW LEVELING 1/2-13 X 5.0 SQHD CUP	5	1	103675	BLOCK,G-BOX LOWER,2081
49	4	910660	BOLT,M12 X 30,HEX,SS	4	1	103674	SPACER,UPPER,2081
48	10	910659	SCREW,M16 X 2.00 X 50mm,FLAT,SOCKET,BLK	3	1	103673	SHAFT,DRIVE,2081
47	10	910573	BOLT,5/8-11 X 2-1/2,HEX,GR5,ZN	2	6	103669	TIE PLATE,2081-2M
46	12	910572	SCREW,5/8-11 X 2,SH,FLAT,ZN	1	5	103667	BEARING BLOCK,2081
ITEM#	QTY	PART#	DESCRIPTION	ITEM#	QTY	PART#	DESCRIPTION

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES.
REMOVE ALL BURRS AND SHARP EDGES
SURFACE FINISH 63 RMS OR BETTER
TOLERANCES ARE:
DECIMALS ANGLES
X.XX ± .015 ± .5
X.XXX ± .005

FINISH NONE

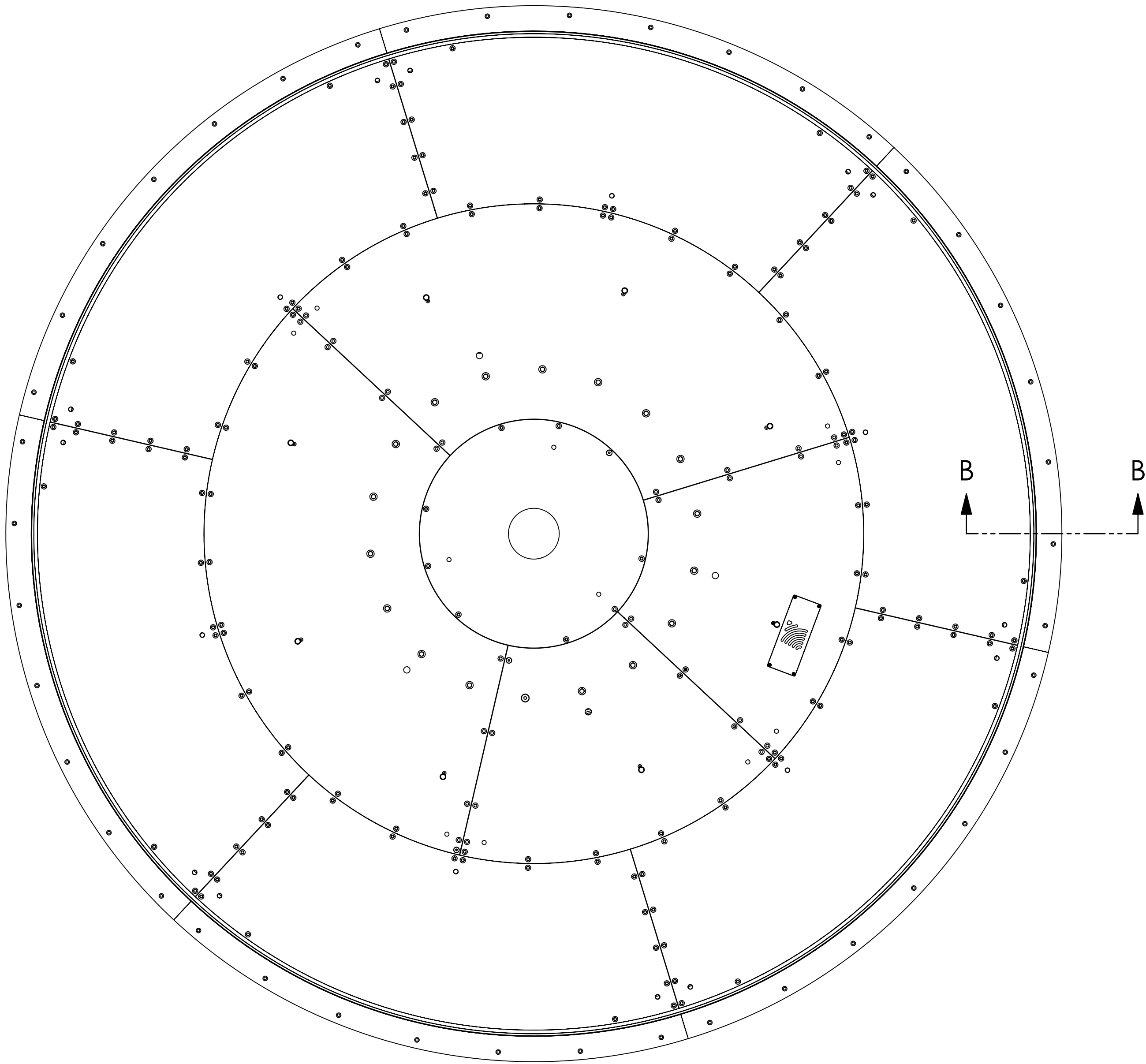
THIRD ANGLE PROJECTION



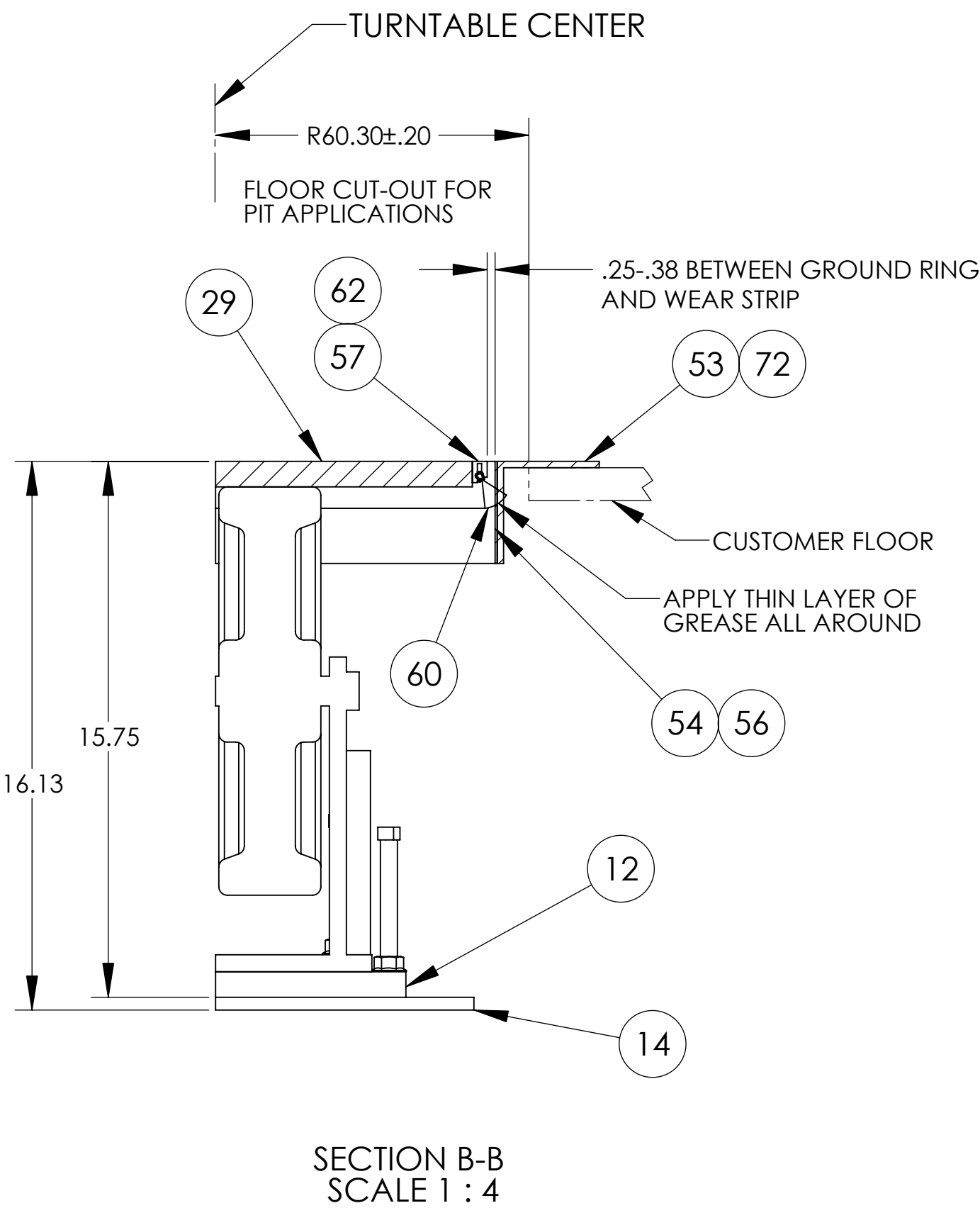
INITIAL	DATE
DRAFTING	
ENGINEERING	12/1/06
JSW	

TITLE				REV.			
TURNTABLE,3M,HD,ELECTRIC , METAL TOP 220V				7			
PROPRIETARY INFORMATION		SIZE	SCALE	DWG. NO.			
ANY DUPLICATION OF THIS DOCUMENT, WHOLE OR IN PART, WITHOUT EXPRESS WRITTEN PERMISSION OF ETS•LINDGREN IS PROHIBITED.		D	1:12	2181-3.0			
		DO NOT SCALE DRAWING		SHEET	1	OF	2

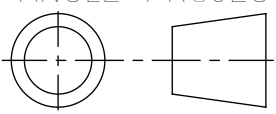

REVISIONS				
EC N	REV	DESCRIPTION	DATE	APPROVED
	7	INITIAL BUILD		—



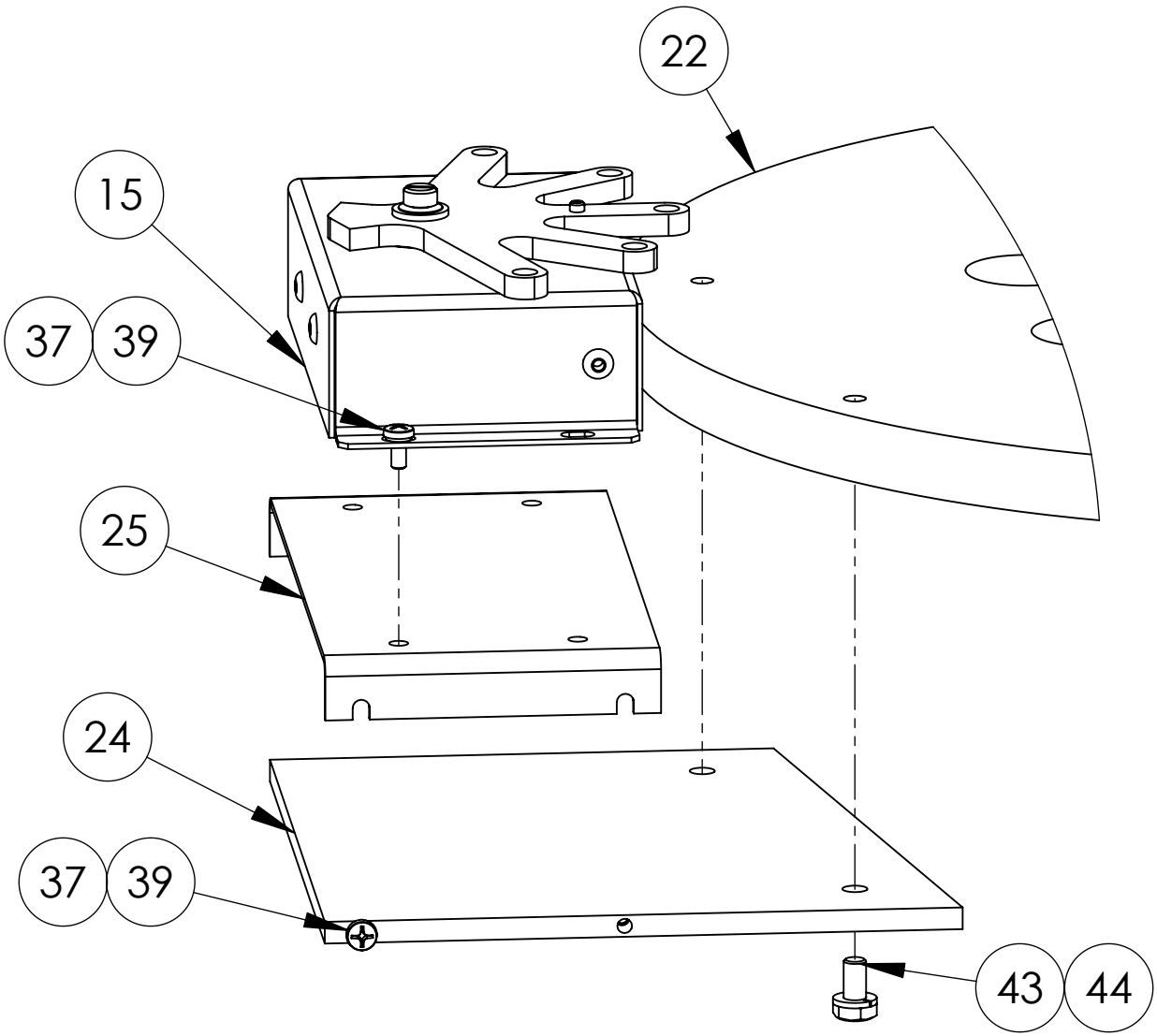
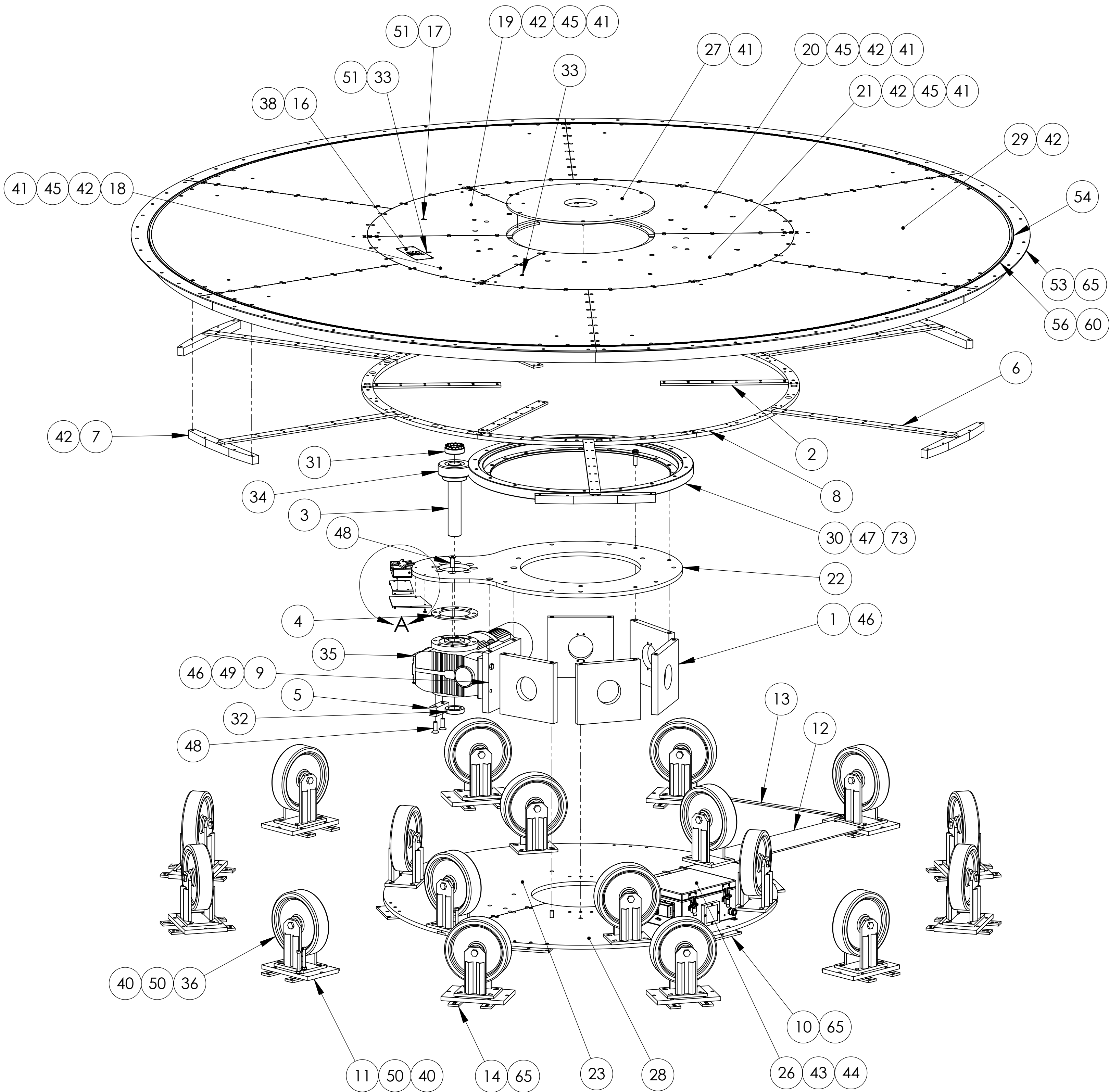
TOP VIEW OF TURNTABLE



SECTION B-B
SCALE 1 : 4

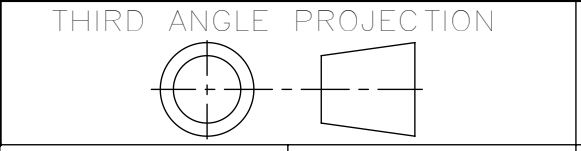
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES REMOVE ALL BURRS AND SHARP EDGES SURFACE FINISH 63 RMS OR BETTER TOLERANCES ARE: DECIMALS ANGLES X.XX ± .015 ± .5 X.XXX ± .005	THIRD ANGLE PROJECTION 		 An ESCO Technologies Company					
	INITIAL	DATE	TITLE TURNTABLE, 3M, HD, ELECTRIC , METAL TOP 220V					
	DRAFTING							
	ENGINEERING JSW	12/1/06	PROPRIETARY INFORMATION ANY DUPLICATION OF THIS DOCUMENT, WHOLE OR IN PART, WITHOUT EXPRESS WRITTEN PERMISSION OF ETS•LINDGREN IS PROHIBITED.			SIZE D	SCALE 1:10	DWG. NO. 2181-3.0
FINISH NONE					DO NOT SCALE DRAWING		SHEET 2 OF 2	

REVISIONS				
ECN	REV	DESCRIPTION	DATE	APPROVED
	4	INITIAL BUILD		-



DETAIL A
SCALE 1 : 2

77	18	890259	SHIELDING STRIP 24" 97-555 INSTR SPEC(NS)	43	6	910436	BOLT,1/4-20 X 1/2,HEX,SS
76	50	890192	CONDUIT FLEX 1/2" RF SHIELDED(NS)	42	200	910369	SCREW,5/16-18 X 1-1/2,SH,FLAT,STL,ZINC
75	1	890191	CONN 90DEG CONDUIT FLX(NS)	41	170	910368	SCREW,5/16-18 X 3/4,FLAT,SH,ZN
74	50	675289	CORD,10-3 SJTO(NS)	40	174	910367	NUT,1/2-13,HEX,SERRATED FLANGE,ZN
73	10	910539	WASHER,5/8,LOCK,STL,ZN,SPLIT	39	8	910244	SCREW,8-32 X 3/8,PHIL,BIND,SS
72	4	708041	FIBER OPTIC CABLE LIMIT SWITCH 6.5M(NS)	38	4	910241	SCREW,8-32 X 3/8,PHIL,FLAT,SS
71	85	890983	SLEEVING,SLIT-CONVOLUTED,PE,1/4" ID(NS)	37	8	910228	WASHER,#8,LOCK,SS,SPLIT
70	1	675294	CABLE,ENCODER,8 METER SHIELDED(NS)	36	18	890582	CASTER 12" WHEEL,RIGID,14.25" HEIGHT
69	115	910159	SELF TAPPING SCREW PAN HEAD ZN 6-32X3/8(NS)	35	1	880323	GEARBOX,SEW EURODRIVE,180:1,220V
68	1	399289	MANUAL,2181 TURNTABLE SERIES,3M & 4M	34	1	880322	PINION,16T,3DP
67	1	107039	KIT,SHIELD ROOM,TOWERS AND TURNTABLES(NS)	33	2	880316	PIN,CLEVIS,SS,1/2"O.D. X 1.5" LONG
66	2	930993	ROBERTSON POWER BIT #3 1 15/16" LONG(NS)	32	1	880176	COLLAR SHAFT 2.375"
65	170	910682	SCREWS,WOOD/METAL,FLAT SOCKET 1" X 14(NS)	31	1	880174	SHAFT LOCK,KEYLESS,2 3/8 DIA
64	6	890790	C CLAMP 5133A11 MMCARR(NS)	30	1	880125	BEARING,L6-37E9Z ROTEK
63	1	920122	LABEL,SAFETY,TURNTABLE(NS)	29	6	705313	TOP SECTION,2081-4M
62	1	920192	LABEL,WARNING,GEARS BELOW TURNTABLE(NS)	28	1	705307	TT BASE PLATE 2
61	190	910276	SCREW ROLL FORM FLAT HEAD PHL 8-32 X1(NS)	27	1	705305	CENTER PLATE ALUMINUM 2081
60	45	890583	STRIP BRUSH STRAIGHT #5 BRASS CH/.005B(NS)	26	1	111401	DRIVE,TURNTABLE,2181
59	3	890440	CLAMPING PIN T-HANDLE CL-4-CP(NS)	25	1	111376	COVER,LIMIT SWITCH ASSY
58	1	890589	T-HANDLE HEX 3/16" 71-360-930 TRAVERS(NS)	24	1	111375	MOUNT,COVER,LIMIT SWITCH ASSY
57	3	890411	EYEBOLT 3/4-X10X2 6000LBS 3014T53 MCMMASTER(NS)	23	1	111374	BASE PLATE 1,2181 TT
56	6	105015	GROUND RING 2081 4M9(NS)	22	1	111373	MOUNT,BEARING/GEARMOTOR,2181 TT
55	4	890706	GREASE CONDUCTIVE 19-820 796-9821 ALLIED(NS)	21	1	111372	TOP PLATE,MID CENTER 3,2181 TT
54	1	705389	WEAR STRIP SS 4.0M TT(NS)	20	1	111371	TOP PLATE,MID CENTER 4,2181 TT
53	6	705388	FLOOR FLANGE ALUM 4.0M TT(NS)	19	1	111370	TOP PLATE,MID CENTER 2,2181 TT
52	1	705344-10	FIBER OPTIC CABLE 2090 10 METERS(32.8FT)(NS)	18	1	111369	TOP PLATE,MID CENTER 1,2181 TT
51	8	910930	SCREW,10-32 X 3/8,PHIL,FLAT,SS	17	6	110059	PLUG,HOLE,TABLE TOP
50	174	910678	SCREW LEVELING 1/2-13 X 5.0 SQHD CUP	16	1	108925	COVER,ACCESS
49	4	910660	BOLT,M12 X 30,HEX,SS	15	1	108758	ASSY,MECHANICAL LIMIT SWITCH,MOTORBASE
48	10	910659	SCREW,M16 X 2.00 X 50mm,FLAT,SOCKET,BLK	14	24	106973	OUTER FLOOR PLATE,2081
47	10	910573	BOLT,5/8-11 X 2-1/2,HEX,GR5,ZN	13	1	106853	CASTER SPACER STRUT 2081-4M
46	12	910572	SCREW,5/8-11 X 2,SH,FLAT,ZN	12	1	106852	CASTER SPACER PLATE 2081-4M
45	18	910536	SCREW,1/2-13 X 1 1/2,SH,FLAT,ZN	11	12	106849	CASTER PLATE RECT 2081-3M
44	6	910456	WASHER,1/4,LOCK,SS,SPLIT	10	22	106789	FLOOR PLATE SPACER 2081
ITEM#	QTY	PART#	DESCRIPTION	ITEM#	QTY	PART#	DESCRIPTION



UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES.
REMOVE ALL BURRS AND SHARP EDGES
SURFACE FINISH 63 RMS OR BETTER

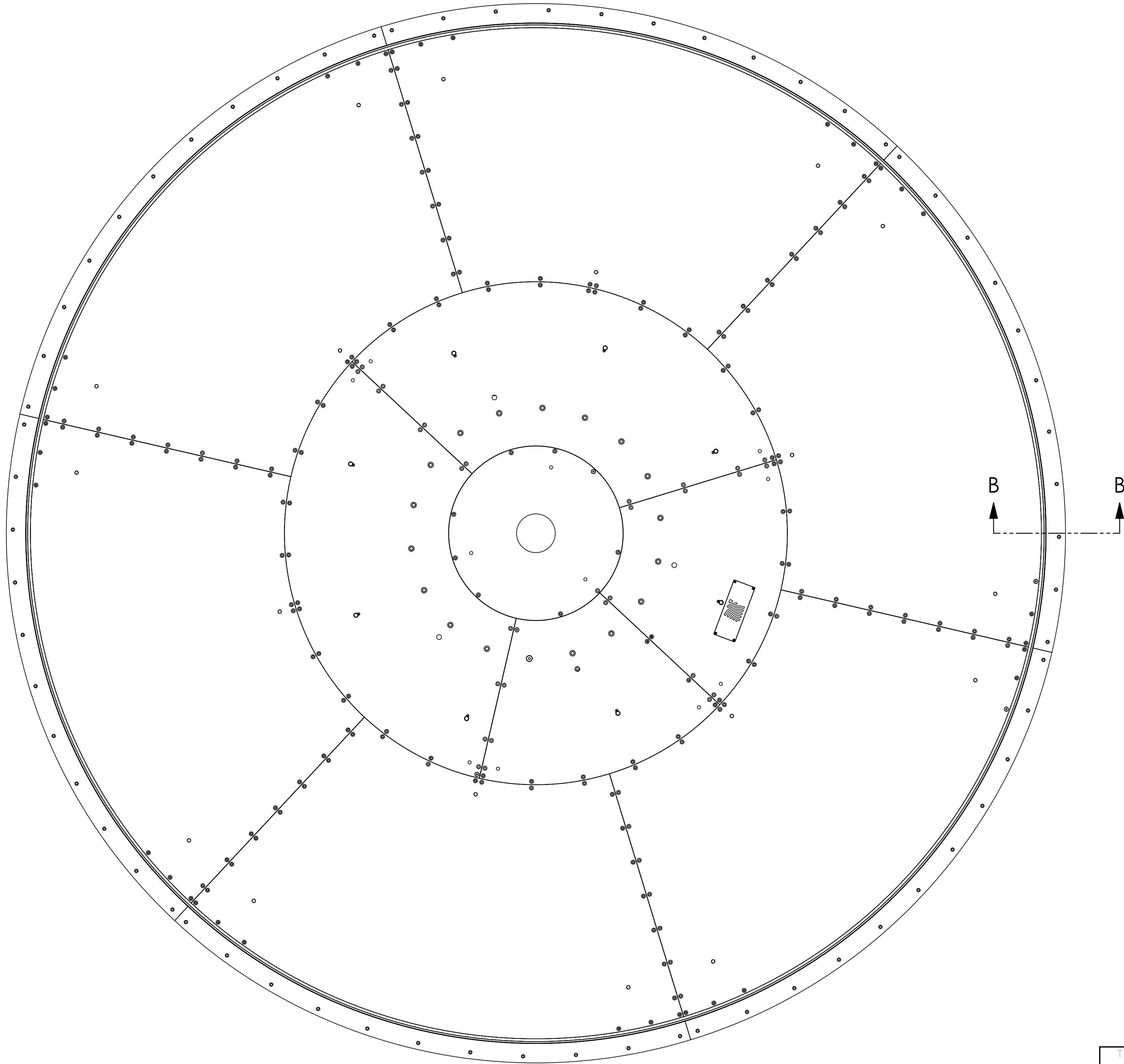
TOLERANCES ARE:
DECIMALS ANGLES
X.XX ± .015 ± .5
X.XXX ± .005

INITIAL	DATE
DRAFTING	
ENGINEERING JSW	12/1/06

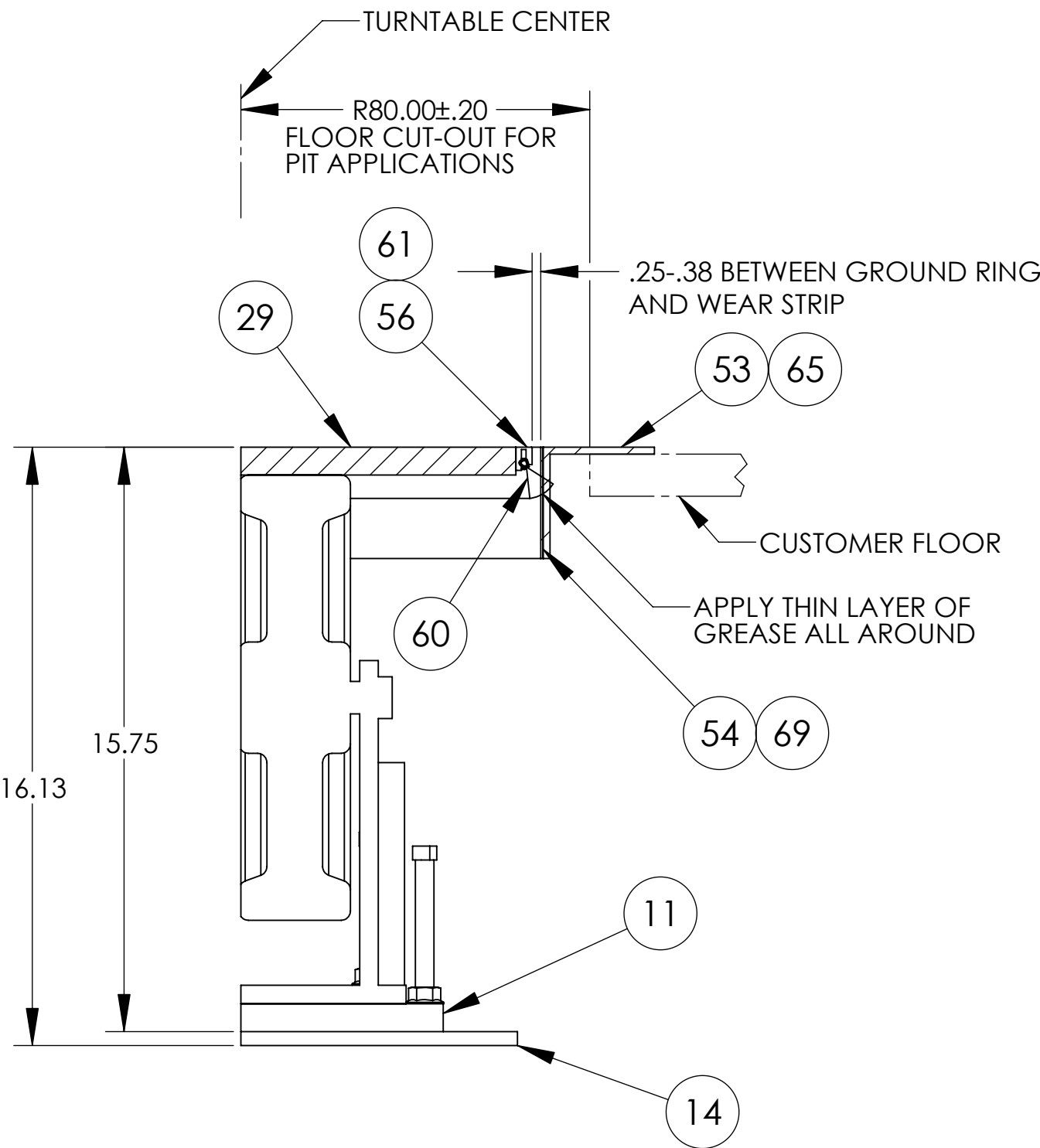
TITLE				
TURNTABLE,4M,HD,ELECTRIC , METAL TOP 220V				
PROPRIETARY INFORMATION ANY DUPLICATION OF THIS DOCUMENT, WHOLE OR IN PART, WITHOUT EXPRESS WRITTEN PERMISSION OF ETS•LINDGREN IS PROHIBITED.		SIZE D	SCALE 1:12	DWG. NO. 2181-4.0
		REV. 4		
DO NOT SCALE DRAWING			SHEET 1	OF 2

FINISH
NONE

REVISIONS				
EC N	REV	DESCRIPTION	DATE	APPROVED
	4	INITIAL BUILD		—



TOP VIEW OF TURNTABLE



SECTION B-B
SCALE 1 : 4

<div>UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES REMOVE ALL BURRS AND SHARP EDGES SURFACE FINISH 63 RMS OR BETTER TOLERANCES ARE: DECIMALS ANGLES X.XX ± .015 ± .5 X.XXX ± .005</div>	THIRD ANGLE PROJECTION		<div></div>				<div> An ESCO Technologies Company</div>			
	INITIAL	DATE	TITLE TURNTABLE,4M,HD,ELECTRIC METAL TOP 220V							
	DRAFTING									
	ENGINEERING JSW	12/1/06	PROPRIETARY INFORMATION ANY DUPLICATION OF THIS DOCUMENT, WHOLE OR IN PART, WITHOUT EXPRESS WRITTEN PERMISSION OF ETS•LINDGREN IS PROHIBITED.			SIZE D	SCALE 1:10	DWG. NO. 2181-4.0	REV. 4	
FINISH NONE						DO NOT SCALE DRAWING		SHEET 2 OF 2		