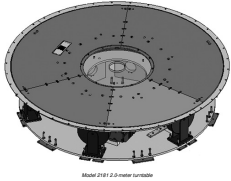


Model 2181
Electric-Powered Turntable
2-Meter, 3-Meter,
4-Meter, 5-Meter
User Manual



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A	Initial Release	February, 2007
B	Added 2-meter turntable, updated 3-meter turntable specifications	September, 2007
C	Updated 3-meter turntable drawing, added 4-meter turntable drawings/updated specifications	November, 2007
D	Added 2-meter turntable information and drawings, re-branding	June, 2009

ii |


Table of Contents

Notes, Cautions, and Warnings	v
1.0 Introduction	7
Model 2181 Standard Configuration.....	7
Turntable Assembly.....	7
Shield Room Field-Through.....	8
Model 2090 Series Mail-Device Positioning Controller.....	8
Model 2181 Optional Items.....	8
Infrared Remote Controller.....	8
Stop Ring.....	9
EUT Power Outlets.....	9
Mounted Line Impedance Stabilization Network.....	9
Additional Fiber Optic Cables.....	10
ETS Lindgren Product Information Bulletin.....	10
2.0 Maintenance	11
Recommended Maintenance Schedule.....	11
6-Month Service.....	11
12-Month Service.....	12
Replacement and Optional Parts.....	12
Service Procedures.....	12
3.0 Specifications	13
Electrical Specifications.....	13
Mechanical Specifications.....	13
4.0 Turntable Installation Considerations	15
Before You Begin—Precautions.....	15
Power and Signal Lines.....	16
Conduit.....	16
Electrical Considerations.....	16
Access.....	16
Outdoor Installations.....	16
Drainage.....	16
Cold Climate Conditioning.....	16
5.0 Electrical Installation	17
Model 2181 Electrical Installation.....	17
Connecting the Model 2090 Controller.....	18
6.0 Assembly and Installation	19
Assembly Instructions.....	19
Floor Flange Installation in a Paved Floor.....	20
Floor Flange Installation in a Concrete PB.....	23
R1 Repeater Installation.....	23
Installation Assembly Components.....	23
Required Tools for Installation.....	23
Installation Steps.....	24
7.0 Operation	25
Editing Positioning Controller Configuration Parameters.....	25
Setting Travel Limits.....	26
Turntable Encoder Calibration.....	26
Turntable Calibration Examples.....	29
Changing Rotation Speed.....	29
Variable Speed Settings.....	29
Speed Selection.....	30
OPB Commands.....	30
Appendix A: Warranty	33
Appendix B: EC Declaration of Conformity	35

i | iii

iv |

Notes, Cautions, and Warnings

	Note: Denotes helpful information intended to provide tips for better use of the product.
CAUTION	Caution: Denotes a hazard. Failure to follow instructions could result in minor personal injury and/or property damage. Included text gives proper procedures.
WARNING	Warning: Denotes a hazard. Failure to follow instructions could result in SEVERE personal injury and/or property damage. Included text gives proper procedures.

 See the ETS Lindgren Product Information Bulletin for safety, regulatory, and other product marking information.

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vi |

1.0 Introduction

The ETS Lindgren Model 2181 Turntable is an electric-powered turntable platform system designed for use with the Model 2090 Series Multi-Device Positioning Controller for 201 compliance testing. The Model 2181 is designed for indoor or outdoor use, and is available in 2-meter, 3-meter, 4-meter, and 5-meter sizes.

The top of the turntable is conductive with a continuous ground brush to electrically couple to the ground plane. The ground brushes are attached directly to the chamber floor by the floor flange, and are in continuous contact with the turntable top. The brushes point downward from the floor flange.

All models utilize a pinion and gear drive with a gear reducer and electric motor located beneath the platform. 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). Support for the turntable includes casters that aid in the support of cantilevered loads on the outside of the turntable.

The turntable top is sectional to provide easy access if service is required. On standard models, a 15-cm hole is provided in the center of the turntable to accommodate customer supplied cabling to and from the EUT.

To prevent over travel of the turntable in either direction of movement, hard limits are provided in the form of pins that activate 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.

Model 2181 Standard Configuration

TURNTABLE ASSEMBLY

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

- 3-phase electric motor unit
- Heavy-duty variable speed drive system
- Conductive sectional top for easy service access
- Convenient rotational limit adjust switches

Introduction | 7

- Limit override feature
- Ground ring assembly with ground brush and floor flange
- 10-meter fiber optic control cables

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 8.

SHIELD ROOM FEED-THROUGH

The 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 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.

Model 2181 Optional Items

INFRARED REMOTE CONTROLLER

The Model 2181 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).

8 | Introduction



The IR remote communicates with an infrared receiver in the Model 2181 motor base through an IR repeater installed in the foot near the turntable. See IR Repeater Installation on page 23 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.

ETS Lindgren Product Information Bulletin

See the ETS Lindgren Product Information Bulletin included with your shipment for the following:

- Warranty information
- Safety, regulatory, and other product marking information
- Steps to receive your shipment
- Steps to return a component for service
- ETS Lindgren calibration service
- ETS Lindgren contact information

2.0 Maintenance

WARNING Before performing any maintenance, follow the safety information in the ETS Lindgren Product Information Bulletin included with your shipment.



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

BEFORE SERVICING, CONTACT ETS LINDGREN

(415) 937-8400. 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. Capacitors inside this instrument may still be charged even when the instrument is disconnected from the power source.

Recommended Maintenance Schedule

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

CAUTION

Do not perform maintenance while the turntable is operating.

6-Month Service

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 degree 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

Following are the part numbers for ordering replacement or optional parts for the Model 2181 Turntable. For additional information on available replacement and optional parts, see Model 2181 Standard Configuration on page 7.

Part Description	Part Number
Turntable assembly	For a list of all turntable parts, see the drawings located in the back pocket of this manual.
Model 2000 Series Multi-Device Positioning Controller	2000
IR Remote Controller	707030
NEMA connectors for slip ring	103441
Schuko connectors for slip ring	103551

Service Procedures

For the steps to return a system or system component to ETS Lindgren for service, see the Product Information Bulletin included with your shipment.

3.0 Specifications

Electrical Specifications	
Drive Speed:	Variable
Nominal AC Voltage:	200–230 VAC
Input Frequency:	50/60 Hz
Current Rating:	15 amp service
Current Draw:	< 15 amp
IPM:	0.5 – 2.0
Phase:	Single (1)

Mechanical Specifications				
Dimension:	2.2m 6.56 ft	2.2m 6.56 ft	4.2m 13.12 ft	5.2m 16.40 ft
Number Height:				
Minimum:	44.78 cm 17.63 in	46.75 cm 18.37 in	47.75 cm 18.78 in	49.75 cm 19.59 in
Maximum:	46.88 cm 18.45 in	48.88 cm 19.24 in	49.88 cm 19.64 in	51.88 cm 20.43 in
Required Pin Diameter:	202.51 cm x 0.64 cm 79.73 in x 0.025 in	202.6 cm x 0.64 cm 79.76 in x 0.025 in	202.7 cm x 0.64 cm 79.79 in x 0.025 in	202.8 cm x 0.64 cm 79.82 in x 0.025 in
Top Construction:	Sectional aluminum	Sectional aluminum	Sectional aluminum	Sectional aluminum
Deckboard:	1000 kg 2200 lb	1000 kg 2200 lb	1000 kg 2200 lb	1000 kg 2200 lb
Load Rating:	1000 lb	1000 lb	1000 lb	1000 lb

Distributed Load Rating applies when:

- Load is evenly distributed on top;
- No point loads under 0.19 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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4.0 Turntable Installation Considerations

WARNING Before assembling, installing, or connecting any components, follow the safety information in the ETS L12000 Product Information Bulletin included with your shipment.

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.
-  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 piston 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 installer 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 (36 degrees F). Turntables operated in these temperatures should include a heat source or oil warmer, or both.

WARNING Before assembling, installing, or connecting any components, follow the safety information in the ETS L3D-Logan Product Information Bulletin included with your shipment.

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

Model 2181 Electrical Installation

The Model 2181 Turntable is configured to operate using 200-250 VAC, single phase, 50/60 Hz service. It is recommended to operate at its 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 main source. Inadequately 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:

- Black: AC High
- Blue: AC neutral
- Green/Yellow: Protective earth/safety ground

Connect the fiber optic cable and install the power connection according to local electrical code. See the Model 2090 Series Multi-Device Positioning 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 sheath 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. First, mark the spot where you will need to remove the sheath. Use a sharp utility 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, and 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 the 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 sheath.

Connecting the Model 2090 Controller

Any combination of primary devices (tower, turntable, reverberation paddles, MAFS, and so on) can be connected to the two device input ports located on the rear panel of the Model 2090 Series Multi-Device Positioning Controller. For easy set up of ETSAC 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 N1 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 N1 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 fiber and connectors are easily broken if flexed 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 counter-clockwise, 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.

6.0 Assembly and Installation

WARNING Before assembling, installing, or connecting any components, follow the safety information in the ETS L3D-Logan Product Information Bulletin included with your shipment.

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

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-Logan to perform such work. The following installation information is included only to provide an informational overview of the installation process.

 Do not discard any packing material until the turntable is fully installed and operational.

Assembly Instructions

1. Unrattle 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 bolts that attach the top onto the turntable drive assembly. Make note of the placement of each top section as it is removed. See the assembly drawings in the back of the manual.

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

3. Using a forklift or other appropriate lifting machinery, place the turntable bottom or bearing support section into position. If the turntable is to be installed in a pit, center and level the assembly.

CAUTION Make sure power is off and secured before proceeding.

4. The drawings in the back pocket of this manual show the placement of floor plates and leveling screws to anchor and level the turntable. Anchor the turntable through the attachment holes using the concrete expansion bolts provided. After installing the floor plates and leveling screws, level the entire turntable by adjusting all the leveling screws between and under the casters, and in the center section of the turntable.

5. Tighten all lock nuts accompanying the leveling screws to lock the height of the turntable into place.

6. Connect the fiber optic control cable and install the power connection according to local electrical code. The standard power configuration is 200 VAC 50/60 Hz.

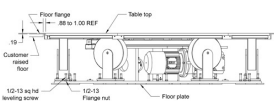
CAUTION Electrical connection is subject to local electrical codes, and should only be performed by a qualified electrician.

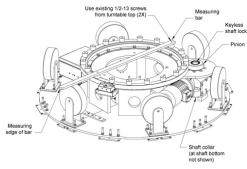
CAUTION Keep all body parts away from the drive pinion when the turntable is energized.

7. Follow the instructions in the next section, Floor Flange Installation in a Paralel Floor, to install the ground ring assembly.
8. Reinstall the top section removed in step 3 of these instructions.

Floor Flange Installation in a Paralel Floor

 A 2-meter Model 2181 Turntable is depicted in the following illustrations.





When the turntable is positioned as close as possible to the center, attach the measuring bar to the brass spacers mounted onto the bearing. Appropriate hole-mount locations correspond to the size of the turntable. Rotate the bearing and make sure approximately 1/8-in to 1/4-in spacing exists between the edge of the outer measuring bar and the diameter of hole cut into the pit. Adjust as required.

The ground ring assembly includes a floor flange with a mounted brush ring that interfaces with the contact ring mounted beneath the turntable top. The floor flange provides constant electrical contact with the ground plane.

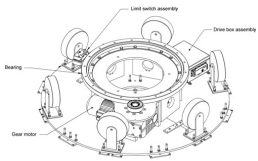
Mounting methods vary according to user specifications. Clearance holes are provided at evenly spaced intervals along the outside perimeter of the floor flange to attach to a customer supplied ground plane. These instructions describe installation for a parallel floor. For concrete pit mounting instructions see Floor Flange Installation in Concrete Pit on page 23.

Installing the ground ring assembly requires these tools:

- 1/4-in spacers (3)
- Hand drill
- 5/32-in drill bit
- #3 Phillips drive bit
- Small square
- #14 x 1 wood/metal screws

The turntables have a quantity of floor flange pieces depending on the size of the turntable. All flanges are pre-cut at the factory for a 9/16-in fit.

A 2-meter Model 2181 is depicted in the following. The turntable top is shown as a partial cut-away to provide a view of internal components.



1. Lay the floor flange into the opening of the raised floor and push outward to the diameter of the opening.
2. Attach the turntable top onto the center bearing with the hardware provided.
3. Using a pipe clamp and 1/4-in Allen wrenches or 1/4-in pin, place a spacer between the turntable and floor flange starting in three places in the center or on the flange.
4. Once tension is placed on all three wrenches, drill a 5/32-in hole through the counter sunk holes in the floor flange. Drill completely through the panel and place screws into the holes.
5. Continue working around the floor flange, completing two or three holes at a time.

Make sure that a 1/4-in gap between the turntable top and the mounted brush ring be held as close as possible so that the grounding brushes seat properly. Also, make sure the flange ends are flush with each other.

6. Continue mounting until all screws are installed. Some screws may fall between the floor panel joints. Try to position the flanges, making sure as few screws fit their points as possible, and making sure that the fast or fast hole in the flange is not too close to one of these joints. Trim the top floor joint strips to fit up against the flange.

Floor Flange Installation in a Concrete Pit

Installing in a concrete pit is the same as a parallel floor, with the exception of the mounting hardware. Instead of the #14 x 1-in square socket flat head screws, use 1/4 x 1-3/4-in Phillips flat head concrete anchors.

These tools are required for the next stage of installation:

- 1/2-in hammer drill
- 3/16 x 3 1/2-in hammer drill bit, at minimum
- Vacuum to clean inside the drilled holes for maximum thread engagement

When drilling holes, be aware of buried conduit and pit drainpipes. Drill 3/16-in holes, see inches minimum diam.

IR Repeater Installation

INSTALLATION ASSEMBLY COMPONENTS

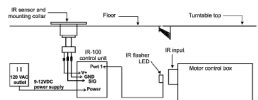
- Infrared sensor
- Mounting collar
- IR-100 control unit
- IR flasher LED
- 9-12VDC power supply
- Connection cable
- Flathead mounting screws

REQUIRED TOOLS FOR INSTALLATION

- Electric drill
- 1-in hole saw to create a
- 1/16-in 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-in 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-in 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.

WARNING Before placing into operation, follow the safety information in the ETS-Lindgrin Product Information Bulletin included with your shipment.

If you are unfamiliar with the operation of the controller, see the Model 2000 Series Multi-Device Controller Manual. A manual is included with each positioning controller shipment and is also available for download from [www.ets-lindgrin.com](#).

With the assembly of the turntable complete, the Model 2000 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 2000 controller manual for information on connecting the fiber optic cable.

Use the Model 2000 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 28.

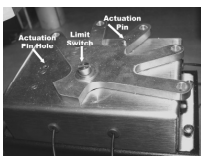
Editing Positioning Controller Configuration Parameters

Key	Function
PARAM	To edit a configuration parameter: • Press PARAM key to display the current parameter. • Press PARAM key repeatedly to scroll through the parameter list, displaying each parameter. To scroll up or down the parameter list while viewing a parameter: • Press the left arrow key to scroll through a long parameter list using the PARAM key.
STEP (INC/DEC)	To scroll up or down the parameter list while viewing a parameter: • Press the left arrow key to scroll 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 motor 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 the key. (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 +45 degrees.

1. Remove all pins around the turntable and the ETS-Lindgrin 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 set 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 35 and 45 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 2000 controller permits easy configuration in this type of operation from the limit panel through the IEEE-488 interface bus. For more information, see the Model 2000 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, parameter C must be set to 3600. 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 3600, the encoder has too many counts per meter and the controller cannot correct for it. In this case, contact ETS-Lindgrin 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 scavenging between limits, it is not uncommon to have a small discrepancy between the absolute position of the tape 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.

TURNABLE 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 gasket cover. The turntable is stopped when the tape travels exactly 360 degrees around. The display on the controller now reads 355.3 degrees, which is recorded.
- The table is rotated CCW back to zero. The parameter button is set on the C setting. The C digit display 3430. A new C setting is now calculated:
New C = (356.3 / 360) x 3430 = 3395 (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 is equipped with a variable speed drive. Firmware revision 3.11 or higher must be installed in the Model 2000 controller for proper operation of the Model 2181. The revision level is displayed on the front panel display during startup of the Model 2000 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 2000 Series Multi-Device Controller Manual for information on setting the parameters.

Variable Speed Settings

The Model 2000 controller parameters 1.1 - 1.4 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 5/255 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 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 (E500) 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/Potential 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.

CPB Commands

The following CPB commands have been added or modified:

- Sic:** Select speed
 - n = 1-4 for a variable speed turntable
- S7:** 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 100
- 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, SS1?

Appendix A: Warranty

See the Product Information Bulletin included with your shipment for the complete ETS-Lindgren warranty for your ETS-Lindgren Model 2181 Turntable.

Duration of Warranties from Model 2181

All product warranties, except the warranty of fit, and all remedies for warranty failures are limited to two years.

Product Warranted	Duration of Warranty Period
ETS-Lindgren Model 2181 Turntable	2 Years

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Appendix B: EC Declaration of Conformity

The EC Declaration of Conformity is the result of what ETS-Lindgren, L.P. declares that the equipment listed on this document complies with the EMC Directive (89/368/EEC) and Low Voltage Directive (90/269/EEC), including applicable amending directives.

Factory	Headquarters
ETS-Lindgren, L.P. 1201 Avenue Post Office Cedar Park, TX, USA 78613	ETS-Lindgren, L.P. 1201 Avenue Post Office Cedar Park, TX, USA 78613

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

- Model 2181 Electric-Powered Turntable with 3088 style motor base

APPLICABLE REQUIREMENTS

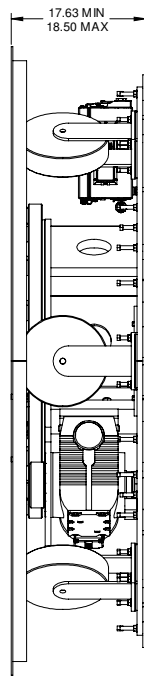
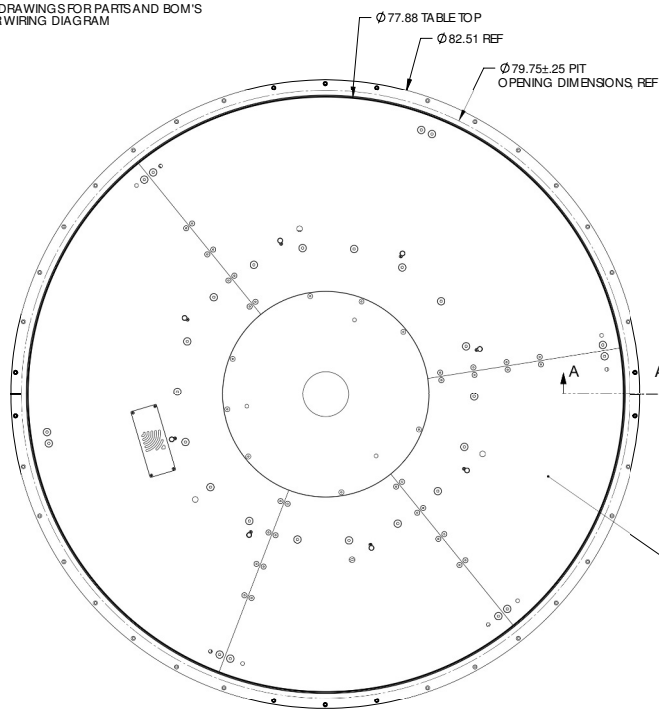
Standard	Category
EN 50311	Group 1, Class B
EN 61000-4-2:1992	Level 2 (3 kV/m)
EN 61000-4-3:1997	Level 2 (3 kV/m)
EN 61000-4-4	Level 2 (10 kV/m)
EN 50304-1:1996	Level 2 (3 kV/m)
EN 61000-6-1:1995	Level 2 (3 kV/m)
EN 61000-6-2:1995	Level 2 (3 kV/m)
EN 61010-1:1994	2 kV
EN 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use

AUTHORIZED SIGNATORIES

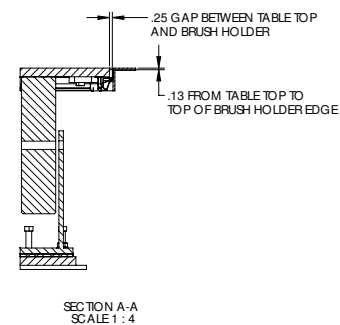
 Bryan Saylor, General Manager
 James C. Piarock, Vice President, Engineering

The authorizing signature on the EC Declaration of Conformity document authorizes ETS-Lindgren, L.P. to affix the CE mark to the referenced product. CE being placed on these products will be deemed acceptable. Other marks or inscriptions placed on these products will not be affixed to these products. ETS-Lindgren, L.P. has ensured that appropriate documentation and other evidence is prepared for inspection and evidence purposes for a period of no less than 10 years.

- REFER TO SUB ASSY DRAWINGS FOR PARTS AND BOM'S
- SEE P/N 398797 FOR WIRING DIAGRAM



REVISIONS				
ECN	REV	DESCRIPTION	DATE	APPROVED
1	INITIAL BUILD			

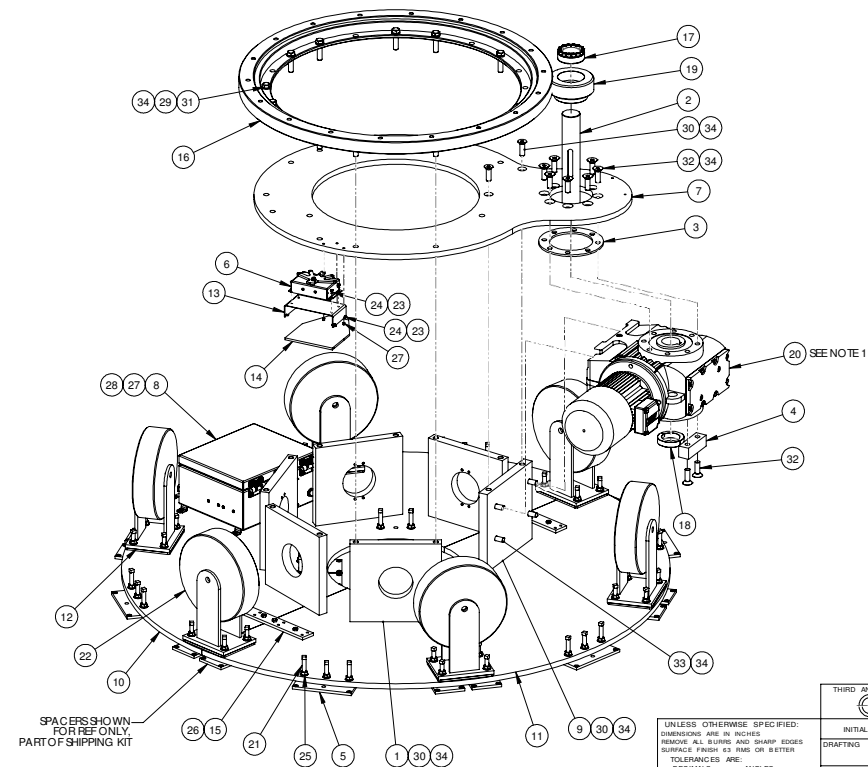


ITEM#	QTY	PART#	DESCRIPTION
3	1	112197	KIT, SHIPPING, 2181 - 2.0 TURNTABLE
2	1	112196	SUB- ASSY, TOP, TURNTABLE, 2181 - 2.0
1	1	112195	TURNTABLE, 2181 - 2.0

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THIRD ANGLE PROJECTION		TITLE	SIZE	SCALE	DWG. NO.	REV.
INITIAL	DATE	TURNTABLE, 2M, HD, ELECTRIC, METAL TOP	D	1:6	2181 - 2.0	1
DRAFTING						
ENGINEERING	7/ 24/ 07					
FINISH	NONE	PROPRIETARY INFORMATION	DO NOT SCALE DRAWING	SHEET 1 OF 1		

- BREATHER PLUG ON GEARBOX TO BE RELOCATED TO TOP OF GEARBOX



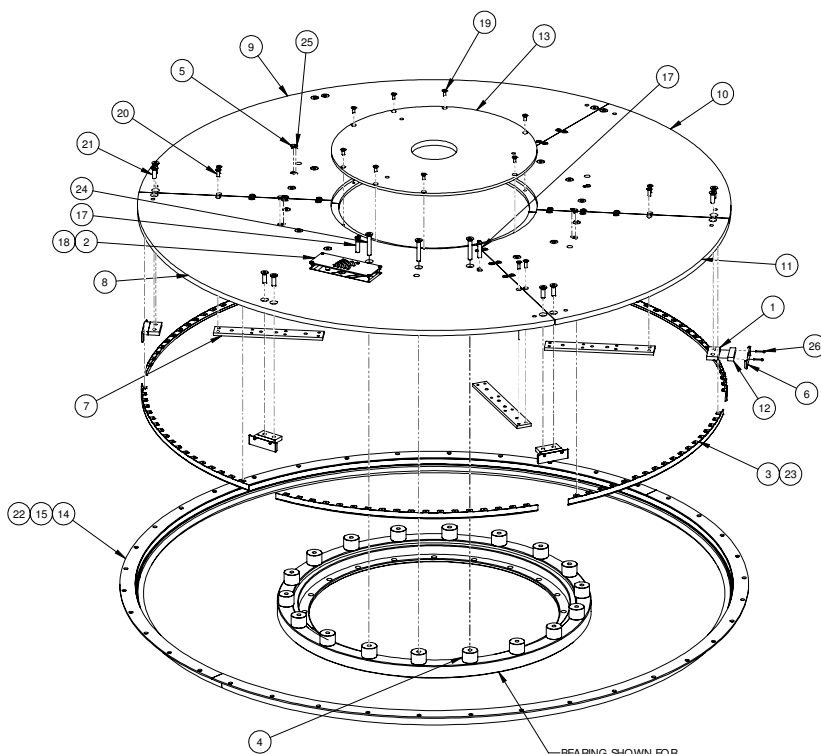
REVISIONS				
ECN	REV	DESCRIPTION	DATE	APPROVED
1	INITIAL BUILD			

ITEM#	QTY	PART#	DESCRIPTION
43	1	920192	LABEL WARNING GEARS BELOW TURNTABLE (N/S)
42	1	920122	LABEL SAFETY TURNTABLE (N/S)
41	1	398797	WIRING DIAGRAM 2187/2181 (N/S)
40	24	890983	SLEEVING SLIT CONVOLUTION PE 1/4" ID (N/S)
39	4	790841	FIBER OPTIC CABLE LIMIT SWITCH 6.5M (N/S)
38	1	675294	CABLE END ORB METER SHIELDED (N/S)
37	1	920228	LABEL EQUIPMENT CHECKED (CAL) (N/S)
36	1	880191	CONN 90DEG CONDUIT FLX (N/S)
35	25	890192	CONDUIT FLX 1/2" RF SHIELDED (N/S)
34	01	920081	LOCTITE THREAD LOCKING #242 31 50M (N/S)
33	4	930999	BOLT M16 X 60 HEX 2N
32	10	910559	SCREW M16 X 2.00 X 50mm PLAT SOCKETBLK
31	10	910573	BOLTS 8-11 X 2-1/2 HEX G15 2N
30	14	910572	SCREW 5/8-11 X 2.34 PLAT SIL 2N
29	10	910539	WASHER 5/8 LOCK SIL 2N SPLIT
28	4	910436	WASHER 1/4 LOCK SS SPLIT
27	7	910436	BOLT 1/4-20 X 1/2 HEX SS
26	8	910405	BOLT 3/8-16 X 1 HEX G15 2N
25	48	910367	NUT 1/2-13 HEX SEPARATED FLANGE 2N
24	8	910244	SCREW 8-32 X 3/8 PHIL BIND SS
23	8	910228	WASHER 8/16 LOCK SS SPLIT
22	6	881125	CASER 12" WHEEL RHD 14.50" HGDHT
21	48	890238	SCREW LEVELING 1/2-13 X 3/32 HD CU
20	1	880323	GEARBOX SEW EURO DRIVE 1801 220V
19	1	880322	PNION 18T 30P
18	1	880176	COLLAR SHAFT 2" 375"
17	1	880174	SHAFT LOCK KEYLESS 3/8 DIA
16	1	880125	BEARING LG-37BZ RD TK
15	2	112204	TEFLON BASE PLATE 2181 TURNTABLE
14	1	112203	BASE PLATE LIMIT SWITCH 2181 TURNTABLE
13	1	112202	MOUNT LIMIT SWITCH 2181 TURNTABLE
12	6	112201	SPACER CASER 2181 TURNTABLE
11	1	112200	BASE PLATE GEARBOX 2181 TURNTABLE
10	1	112199	BASE PLATE DRIVE BOX 2181 TURNTABLE
9	1	112188	SUPPORT BEARING GEARBOX
8	1	111461	DRIVE TURNTABLE 2181
7	1	111373	MOUNT BEARING GEAR MOTOR 2181 TT
6	1	108758	ASBY MECH HANICAL LIMIT SWITCH MDR REASE
5	6	106789	FLOOR PLATE SPACER 2081
4	1	103675	BLOCK G-BOX LOWER 2081
3	1	103674	SPACER UPPER 2081
2	1	103673	SHAFT DRIVE 2081
1	5	103667	BEARING BLOCK 2081

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THIRD ANGLE PROJECTION		TITLE	SIZE	SCALE	DWG. NO.	REV.
INITIAL	DATE	TURNTABLE, 2181 - 2.0	D	1:6	112195	1
DRAFTING						
ENGINEERING	7/ 24/ 07					
FINISH	NONE	PROPRIETARY INFORMATION	DO NOT SCALE DRAWING	SHEET 1 OF 1		

REVISIONS				
ECN	REV	DESCRIPTION	DATE	APPROVED
	1	INITIAL BUILD		



BEARING SHOWN FOR REFERENCE ONLY

UNLESS OTHERWISE SPECIFIED:
 DIMENSIONS ARE IN INCHES
 REMOVE ALL BURRS AND SHARP EDGES
 SURFACE FINISH 63 RMS OR BETTER
 TOLERANCES ARE:
 DECIMALS ANGLES
 X.XXX ± .015 ± .5
 X.XXX ± .005 ± .5
 FINISH NONE

THIRD ANGLE PROJECTION	
INITIAL	DATE
ENGINEERING	7/ 24/ 07
RB G	

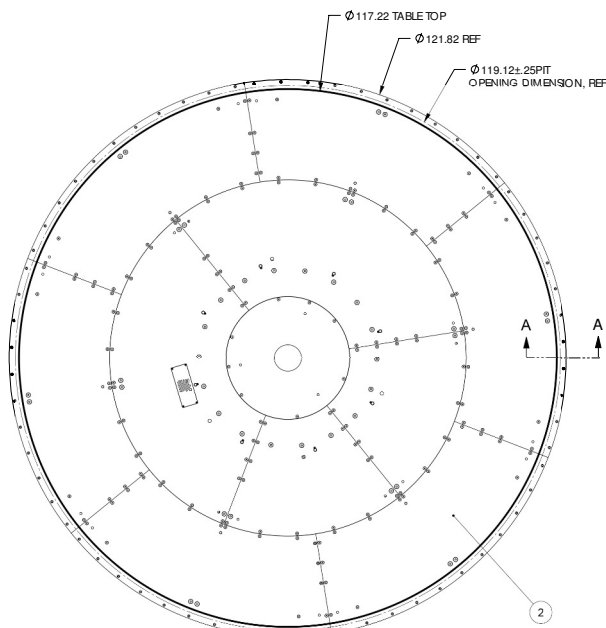
27	1	920250	LABELS LINDGREN 3.75 X 1.75 WHT BKGRD (N/S)
26	12	911001	SCREW .8-32 X 1/8 PHIL FLAT SS
25	8	910930	SCREW 1/8-32 X 3/8 PHIL FLAT SS
24	18	910920	SCREW 1/8-32 X 3/8 SH FLAT SS
23	108	910714	SCREW .6-32 X 1/4 PHIL BIND TAPITIE
22	80	910652	SCREW PH PHIL ZN TAPITIE .6-32 X 3/8
21	12	910538	SCREW 1/2-13 X 1 1/2 SH FLAT ZN
20	32	910373	SCREW .5/16-18 X 1 SH FLAT SS
19	8	910368	SCREW .5/16-18 X 3/4 FLAT SH ZN
18	4	910241	SCREW .8-32 X 3/8 PHIL FLAT SS
17	2	880352	PIN CUSHION 1/2" O.D. X 2 1/2" LONG
15	6	760275	ASSY BRUSH HOLDER 4 TT CONTACT BRUSH
14	2	705421	FLOOR FLANGE TURNABLE 2.03mm AL
13	1	112215	COVER CONTACT 2181 TURNABLES
12	6	112209	SPACER CONTACT FLAT BRUSH
11	1	112208	TOP SEC TON 4 TURNABLE 2181-2.0
10	1	112207	TOP SEC TON 3 TURNABLE 2181-2.0
9	1	112206	TOP SEC TON 2 TURNABLE 2181-2.0
8	1	112205	TOP SEC TON 1 TURNABLE 2181-2.0
7	4	112204	TRIE PLATE BASE PLATE 2181 TURNABLE
6	8	112025	CONTACT FLAT BRUSH TURNABLE
5	6	110059	PLUG HOLE TABLE TOP
4	18	109960	SPACER 2" O.D. X .51 ID X 1.50
3	6	108333	CONTACT SHIP BRUSH TURNABLE
2	1	108225	COVER CONTACT
1	6	105813	TAB TOP 2087

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 An ESDU Technologies Company

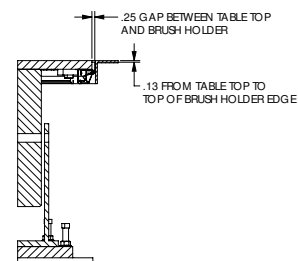
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1. REFER TO SUB ASSY DRAWINGS FOR PARTS AND BOM'S
2. SEE P/N 388797 FOR WIRING DIAGRAM

REVISIONS				
ECN	REV	DESCRIPTION	DATE	APPROVED
	1	INITIAL BUILD		



17.63 MIN
18.50 MAX



SECTION A-A
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.XXX ± .015 ± .5
 X.XXX ± .005 ± .5
 FINISH NONE

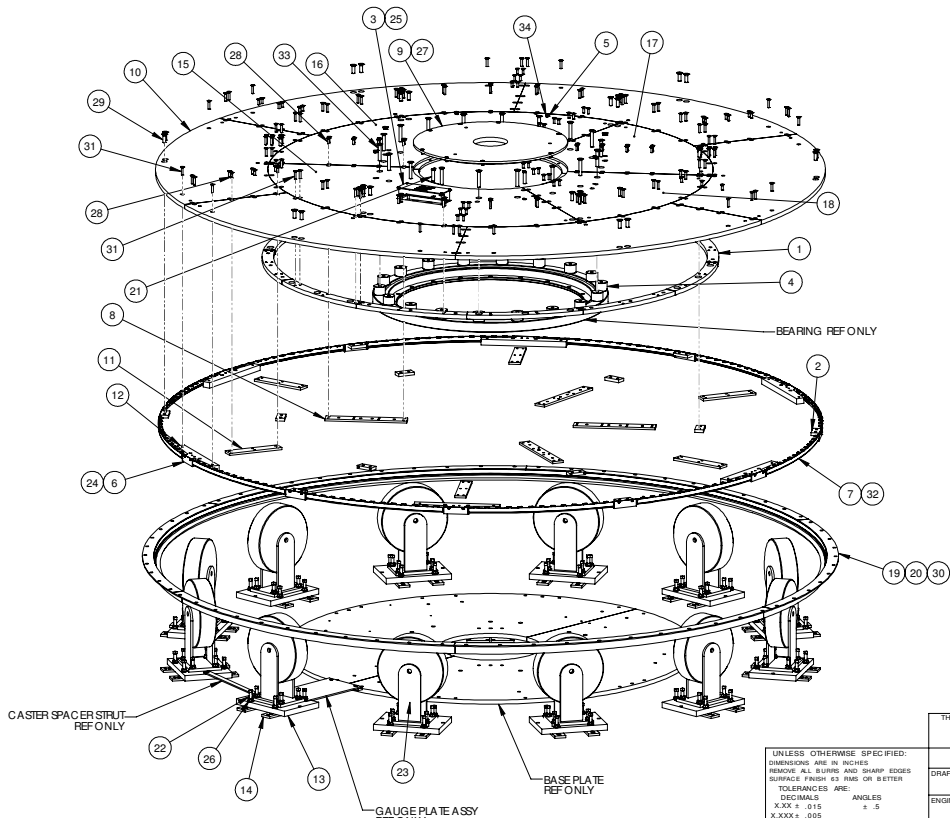
THIRD ANGLE PROJECTION	
INITIAL	DATE
ENGINEERING	9/ 11/ 07
RB G	

3	1	112338	KIT, SHIPPING, 2181 - 3.0 TURNTABLE
2	1	112337	SUB - ASSY, TOP, TURNTABLE, 2181 - 3.0
1	1	112195	TURNTABLE, 2181 - 2.0

ITEM#	QTY	PART#	DESCRIPTION
TITLE: TURNTABLE, 3M, HD, ELECTRIC, METAL TOP 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 REV: 1 DO NOT SCALE DRAWING SHEET 1 OF 1			

ETS • LINDGREN
 An ESDU Technologies Company

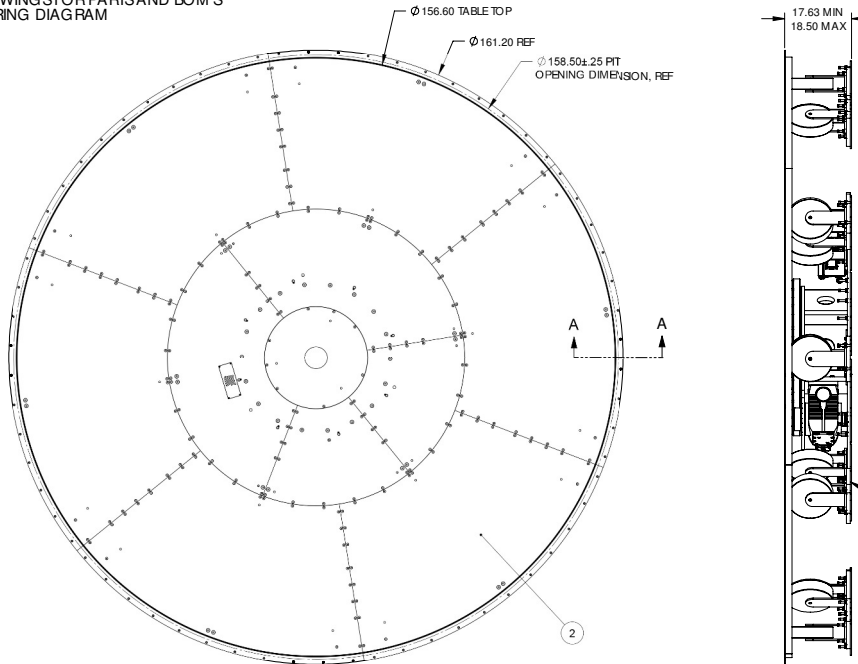
REVISIONS				
ECN	REV	DESCRIPTION	DATE	APPROVED
	1	INITIAL BUILD		



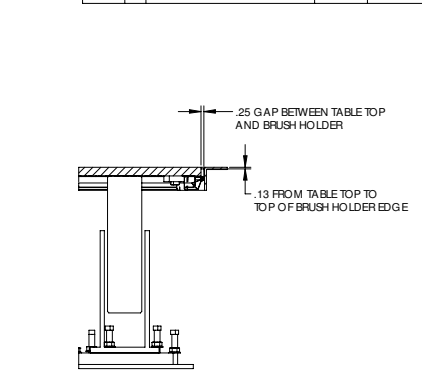
35	1	820050	LABEL LINDGREN 3.75 X 1.75 WHT BKG RD IN/S
34	8	910830	SCREW 10-32 X 3/8 PHL FLAT SS
33	18	910823	BOLT 1/2-13 X 3.5 SH FLAT SS
32	156	910714	SCREW 8-32 X 1/4 PHL BND TAPITE
31	96	910709	SCREW 5/16-18 X 1/2 SH FLAT SS
30	96	910652	SCREW RH PHL ZN TAPITE 8-32 X 3/8
29	24	910536	SCREW 1/2-13 X 1 1/2 SH FLAT ZN
28	68	910573	SCREW 5/16-18 X 1 SH FLAT SS
27	8	910388	SCREW 5/16-18 X 3/4 FLAT SH ZN
26	96	910387	NUT 1/2-13 HEX SERRAED FLANGE ZN
25	4	910241	SCREW 8-32 X 3/8 PHL FLAT SS
24	24	910173	SCREW 6-32 X 3/8 PHL FLAT SS
23	12	891125	CASIER 12" WHEEL RIG ID 15.50" HEG HT
22	96	890238	SCREW LEVELING 1/2-13 X 3/8 HD CU
21	2	880552	PHI CLEVELSS 1/20 D X 2 1/2" LONG
20	8	780275	ASSY BRUSH HOLDER 4 TTC CONTACT BRUSH
19	6	705434	FLOOR FLANGE TURN TABLE 3.0m AL
18	1	112350	TOP SECTION 4 TURN TABLE 2181-3.0
17	1	112349	TOP SECTION 3 TURN TABLE 2181-3.0
16	1	112348	TOP SECTION 2 TURN TABLE 2181-3.0
15	1	112347	TOP SECTION 1 TURN TABLE 2181-3.0
14	24	112343	FLOOR PLATE OUTER TURN TABLE 2181-3.0
13	12	112342	SPACE OUTER CASIER TURN TABLE 2181-3.0
12	6	112341	SPRIFER OUTER TURN TABLE 2181-3.0
11	6	112340	THE PLATE OUTER TURN TABLE 2181-3.0
10	6	112339	TOP COVER TURN TABLE 2181-3.0
9	1	112215	COVER CENTER TOP 2181 TURN TABLE
8	4	112204	THE PLATE BASE PLATE 2181 TURN TABLE
7	12	112134	CONTACT STRIP TURN TABLE
6	12	110405	CONTACT FLAT BRUSH TURN TABLE
5	6	110059	PLUG HOLE TABLE TOP
4	18	109980	SPACER 2" OD X 51 ID X 1.50
3	1	108025	COVER ACCESS
2	12	105813	TAB TOP 2087
1	12	105053	PLATE DRIVE 2081-2M/4M

ITEM#	QTY	PART#	DESCRIPTION
ETS LINDGREN An ESDCO Technologies Company			
SUB- ASSY, TOP, TURNTABLE, 2181 - 3.0			
PROPRIETARY INFORMATION		SIZE	SCALE
ANY DUPLICATION OF THIS DOCUMENT, WHOLE OR IN PART, WITHOUT EXPRESS WRITTEN PERMISSION OF ETS LINDGREN IS PROHIBITED.		D	1:8
DWG. NO.		112337	
REV.		1	
DO NOT SCALE DRAWING		SHEET 1 OF 1	

- REFER TO SUB ASSY DRAWINGS FOR PARTS AND BOM'S
- SEE P/N 398797 FOR WIRING DIAGRAM



REVISIONS				
ECN	REV	DESCRIPTION	DATE	APPROVED
	1	INITIAL BUILD		



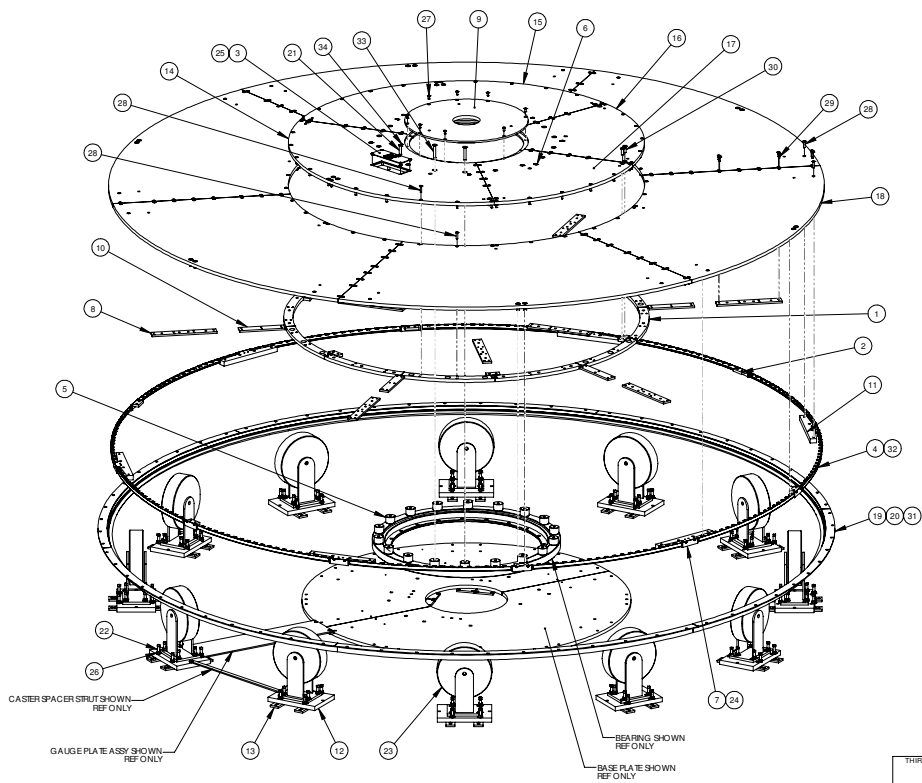
3	1	112451	KIT, SHIPPING, 2181- 4.0 TURNTABLE
2	1	112450	SUB- ASSY, TOP, TURNTABLE, 2181- 4.0
1	1	112195	TURNTABLE, 2181- 2.0

ITEM#	QTY	PART#	DESCRIPTION
ETS LINDGREN An ESDCO Technologies Company			
TURNTABLE, 4M, HD, ELECTRIC, METAL TOP			
PROPRIETARY INFORMATION		SIZE	SCALE
ANY DUPLICATION OF THIS DOCUMENT, WHOLE OR IN PART, WITHOUT EXPRESS WRITTEN PERMISSION OF ETS LINDGREN IS PROHIBITED.		D	1:12
DWG. NO.		2181- 4.0	
REV.		1	
DO NOT SCALE DRAWING		SHEET 1 OF 1	

THIRD ANGLE PROJECTION	
INITIAL	DATE
DRAFTING	
ENGINEERING	10/ 2/ 07
FINISH	NONE

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
REMOVE ALL BURRS AND SHARP EDGES
SURFACE FINISH #3 RMS OR BETTER
TOLERANCES ARE:
DECIMALS ANGLES
X.XXX ± .015 ± .5
X.XXX ± .005

REVISIONS				
ECN	REV	DESCRIPTION	DATE	APPROVED
1	INITIAL BUILD			



CASTER SPACER SPRUT SHOWN REF ONLY

GAUGE PLATE ASSY SHOWN REF ONLY

BEARING SHOWN REF ONLY

BASE PLATE SHOWN REF ONLY

THIRD ANGLE PROJECTION

INITIAL	DATE
DRAFTING	
ENGINEERING	9/29/07
RB G	

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 ± .5
 FINISH NONE

35	1	920250	LABELS LINDGREN 3.75 X 1.75 WHITE GFD (N/S)	
34	8	910930	SCREW 1/8-32 X 3/8 PHIL FLAT SS	
33	18	910923	BOLT 1/2-13 X 3 SH FLAT SS	
32	216	910714	SCREW 6-32 X 1/4 PHIL BND TAPITE	
31	150	910652	SCREW PH PHL 2IN TAPITE 6-32 X 3/8 (N/S)	
30	24	910536	SCREW 1/2-13 X 1 1/2 SH FLAT ZN	
29	116	910373	SCREW 5/16-18 X 1 SH FLAT SS	
28	96	910369	SCREW 5/16-18 X 1-1/2 SH FLAT SS ZINC	
27	8	910368	SCREW 5/16-18 X 3/4 FLAT SS ZN	
26	96	910367	NUT 1/2-13 HEX SEPPA TED FLANGE ZN	
25	4	910241	SCREW 8-32 X 3/8 PHIL FLAT SS	
24	24	910173	SCREW 6-32 X 3/8 PHIL FLAT SS	
23	12	891125	CASER 1" WHEEL RHD 15.50" HEIGHT	
22	96	890238	SCREW LEVELING 1/2-13 X 3 SD HD CU	
21	2	880352	PN CLVSS 1" P.O.D. X 2.0" LONG	
20	415	705278	ASSY BRUSH HOLDER 4" T/C CONTACT BRUSH	
19	6	705435	FLOOR FLANGE TURNTABLE 4.0m AL	
18	6	112452	TOP TURNTABLE 2181-4.0	
17	1	112380	TOP SECTION 4 TURNTABLE 2181-3.0	
16	1	112349	TOP SECTION 3 TURNTABLE 2181-3.0	
15	1	112348	TOP SECTION 2 TURNTABLE 2181-3.0	
14	1	112347	TOP SECTION 1 TURNTABLE 2181-3.0	
13	24	112343	FLUSH PLATE OUTER TURNTABLE 2181-3.0	
12	12	112342	SPACER OUTER CASER TURNTABLE 2181-3.0	
11	6	112341	RIFTFENER OUTER TURNTABLE 2181-3.0	
10	6	112340	TE PLATE OUTER TURNTABLE 2181-3.0	
9	1	112115	COVER CENTER POP 2181 TURNTABLES	
8	10	112204	TE PLATE BASE PLATE 2181 TURNTABLE	
7	12	110465	CONTACT FLAT BRUSH TURNTABLE	
6	6	110059	PLUG HOLE DRIBLE TOP	
5	18	109960	SPACER 2" OD X 5.1 ID X 1.50	
4	12	109333	CONTACT STRIP BRUSH TURNTABLE	
3	1	108925	COVER LACCESS	
2	12	105813	TABLE TOP 2087	
1	12	105053	PLATE DRIVE 2081 2M/4M	
ITEM#	112450	QTY	PA RT#	DESCRIPTION

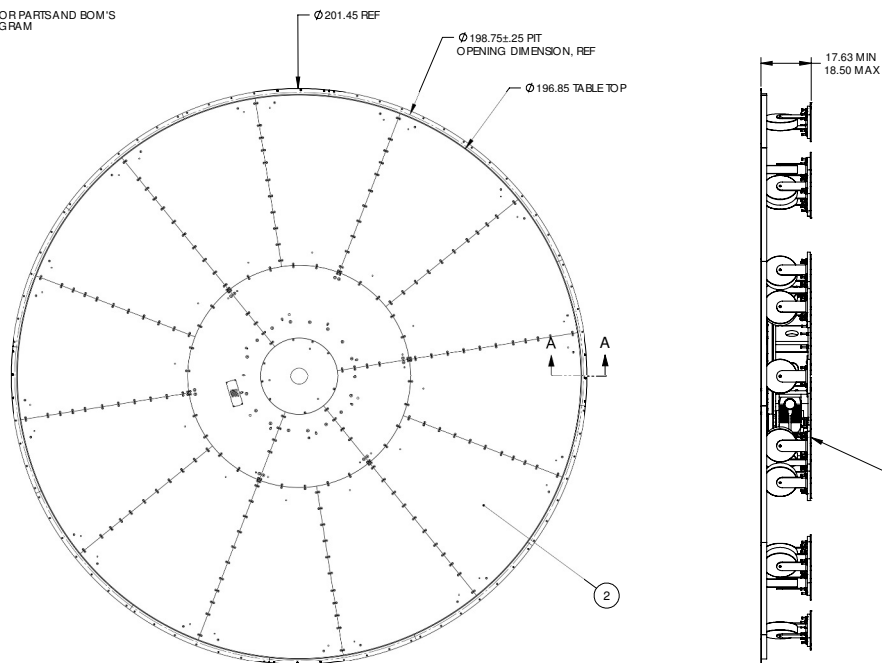
ETS•LINDGREN™
An ESDCO Technologies Company

TITLE: SUB- ASSY, TOP, TURNTABLE, 2181 - 4.0

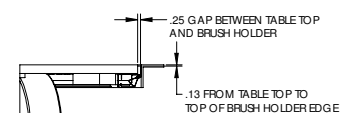
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SIZE	SCALE	DWG. NO.	REV.
D	1:10	112450	1
DO NOT SCALE DRAWING		SHEET	1 OF 1

- REFER TO SUB ASSY DRAWINGS FOR PARTS AND BOM'S
- SEE P/N 398797 FOR WIRING DIAGRAM



REVISIONS				
ECN	REV	DESCRIPTION	DATE	APPROVED
1	INITIAL BUILD			



SECTION A-A
SCALE 1:4

3	1	113180	KIT, SHIPPING 2181 - 5.0 TURNTABLE
2	1	113179	SUB- ASSY, TOP, TURNTABLE, 2181 - 5.0
1	1	112195	TURNTABLE, 2181 - 2.0
ITEM#	QTY	PART#	DESCRIPTION

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TITLE: TURNTABLE, 5M, HD, ELECTRIC, METAL TOP

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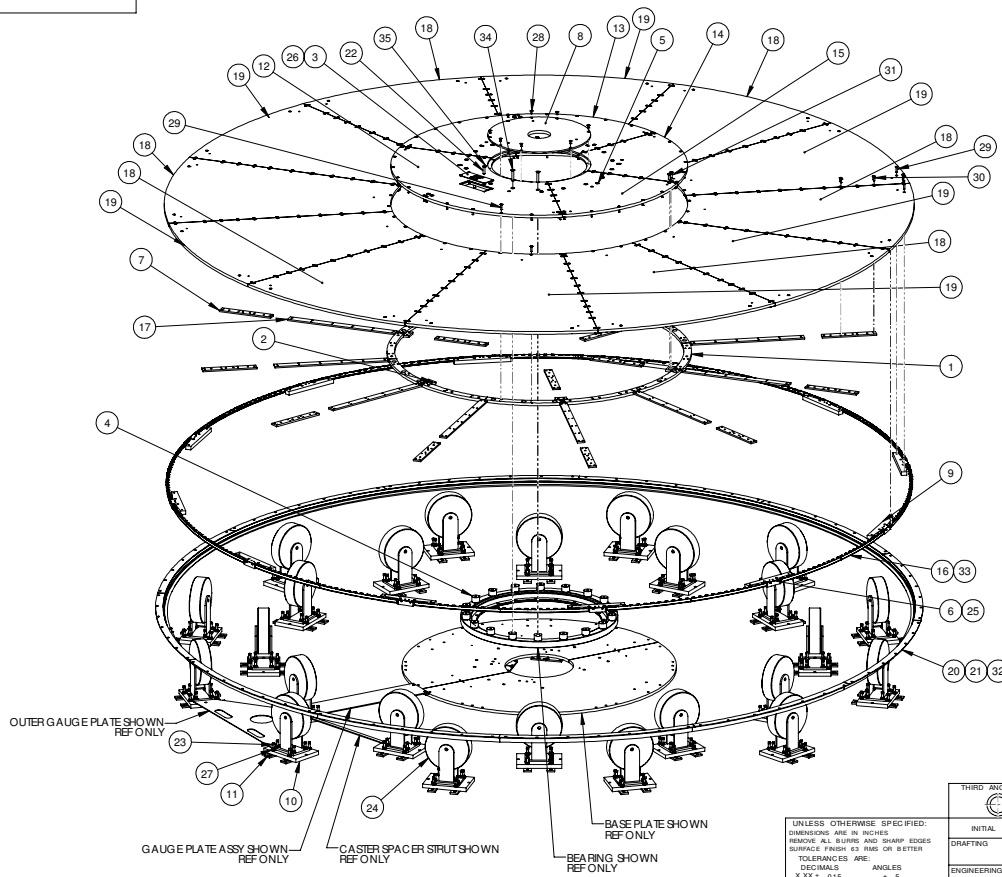
SIZE	SCALE	DWG. NO.	REV.
D	1:16	2181 - 5.0	1
DO NOT SCALE DRAWING		SHEET	1 OF 1

THIRD ANGLE PROJECTION

INITIAL	DATE
DRAFTING	
ENGINEERING	6/6/08
RB G	

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 ± .5
 FINISH NONE

REVISIONS				
ECN	REV	DESCRIPTION	DATE	APPROVED
1	INITIAL	BUILD		



36	1	920250	LABELS LINDGREN 3.75 X 1.75 WHT BKGRD (N/S)
35	8	910930	SCREW 10-32 X 3/8 PHIL PLAT SS
34	18	910923	BOLT 1/2-13 X 3/8 SH PLAT SS
33	288	910774	SCREW 6-32 X 1/4 PHIL BND 18 APFITE
32	160	910652	SCREW PH PLAT 2N TAPFITE 6-32 X 3/8 (N/S)
31	12	910536	SCREW 1/2-13 X 1 1/2 SH PLAT LN
30	272	910373	SCREW 5/16-18 X 1 SH PLAT SS
29	120	910368	SCREW 5/16-18 X 1 1/2 SH PLAT SS ZNC
28	8	910368	SCREW 5/16-18 X 3/4 SH PLAT LN
27	192	910367	NUT 1/2-13 HEX SEPRM TEE FLANGE LN
26	4	910241	SCREW 6-32 X 3/8 PHIL PLAT SS
25	24	910173	SCREW 6-32 X 3/8 PHIL PLAT SS
24	24	891125	CASER 12" WHEEL RGD 15.50" HEIGHT
23	192	890238	SCREW LEVELING 1/2-13 X 3/8 HD CU
22	2	890350	PN CLVLS 1/2" OD B X 2" P LONG
21	52	760275	ASSY BRUSH HOLDER 4 TT CONTACT BRUSH
20	12	705436	FLOOR FLANGE TURN TABLE 2181-5.0m AL
19	6	113172	TOP SEC NON 1 TURN TABLE 2181-5.0
18	6	113171	TOP SEC NON 1 TURN TABLE 2181-5.0
17	12	113170	TE PLATE TOP TURN TABLE 2181-5.0
16	24	113168	CONTACT STRIP BRUSH TURN TABLE
15	1	112359	TOP SEC NON 4 TURN TABLE 2181-3.0
14	1	112348	TOP SEC NON 3 TURN TABLE 2181-3.0
13	1	112348	TOP SEC NON 2 TURN TABLE 2181-3.0
12	1	112347	TOP SEC NON 1 TURN TABLE 2181-3.0
11	48	112343	FLOOR PLATE OUTER TURN TABLE 2181-3.0
10	24	112342	SPACER OUTER CASTER TURN TABLE 2181-3.0
9	12	112341	SPRING OUTER TURN TABLE 2181-3.0
8	1	112215	COVER CENTER TOP 2181 TURN TABLE
7	16	112204	TE PLATE BASE PLATE 2181 TURN TABLE
6	12	110405	CONTACT FLA BRUSH TURN TABLE
5	6	110359	PLUG HOLE TABLE TOP
4	18	109960	SPACER 2" OD X 51 ID X 1.50
3	1	108925	COVER ACCESS
2	6	105813	DIAL TOP 2087
1	12	105025	PLATE DRIVE 2081-2M/4M
ITEM#	SI CTV	PAR#	DESC RPTION



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 TOLERANCES ARE:
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 .XXX ± .015 ° .5
 .XXXX ± .005

FINISH NONE

INITIAL DATE

DRAFTING 6/11/08

ENGINEERING RB G

TITLE SUB - ASSY, TOP, TURNTABLE, 2181 - 5.0

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SIZE SCALE DWG. NO. REV.

D 1:12 113179 1

DO NOT SCALE DRAWING SHEET 1 OF 1