Model 2080/2081

Turntable Series

MANUAL

1.2 m / 1.5 m

ETS·LINDGREN™
An ESCO Technologies Company

REV C – PN 399228

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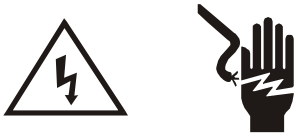
NOTICE: This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation.

SAFETY SYMBOL DEFINITIONS

REFER TO MANUAL When product is marked with this symbol refer to instruction manual for additional information.



HIGH VOLTAGE Indicates presence of hazardous voltage. Unsafe practice could result in severe personal injury or death.

PROTECTIVE EARTH GROUND (SAFETY GROUND)
Indicates protective earth terminal. You should provide uninterruptible safety earth ground from the main power source to the product input wiring terminals, power cord, or supplied power cord set.

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.

GENERAL SAFETY CONSIDERATIONS

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 the instrument, or disconnection of the protective earth terminal could result in personal injury.

BEFORE SERVICING: CONTACT ETS-LINDGREN - servicing (or modifying) the unit by yourself may void your warranty. If you attempt to service the unit by yourself, disconnect all electrical power before starting. There are voltages at many points in the instrument which 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 instrument is disconnected from its power source.*

ONLY QUALIFIED PERSONNEL should operate (or service) this equipment.

STAY CLEAR of moving components during operation of equipment.

INTRODUCTION

The ETS-Lindgren Model 2080/2081 Turntable Series is a family of electric powered turntable platform systems designed to be used with the Model 2090 Positioning Controller for EMI compliance testing. The primary difference between the Model 2080 and 2081 is the turntable top surface. The Model 2080 series turntables are equipped with a rugged textured ABS surface laminated to a PVC plate. Both materials are non-conductive and waterproof. The Model 2081 series turntables have a conductive table top with a continuous ground brush to electrically couple the turntable to the ground plane.

The turntable tops are a one piece design that will support EUT's weighing up to 450kg (1000 lb) distributed load. The outside support for the turntable includes casters which aid in the support of a cantilevered load on the outside of the turntable. They are powered by a single phase electric motor, driving a chain and sprocket assembly. The 1.2 and 1.5 meter diameter table tops may be removed to provide easy access in the event that service is required.

The turntable electronics are located in the shielded motor base enclosure with a fiber optic I/O (input/output) cable that interfaces with the Model 2090 controller. The low profile drive motor and gearing are located beneath the tabletop.

To prevent over-travel of the turntable in either direction of movement, mechanical limits should be set using the conveniently located knobs on the motor base enclosure. Soft rotational limits can be set within the mechanical limits, using the Model 2090 Positioning Controller.

The 2081 ground brushes are attached directly to the top of the table and are in continuous contact with the floor-flange supplied. Conductive grease enhances contact between the ground brush and floor flange.

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The Model 2080 and 2081 are designed for indoor/outdoor applications, provided adequate drainage is available for outdoor installations. Drainage considerations are covered in the installation section of this manual. While the units are indoor/outdoor capable, they may not be suitable for outdoor conditions with extreme temperatures or high humidity.

STANDARD CONFIGURATION

Model 2080 1.2 and 1.5 meter Turntables

- Turntable Assembly
- 10 meters Fiber Optic Cable
- Two Year Warranty

Model 2181 1.2 and 1.5 meter Turntables

- Turntable Assembly
- Ground Brush and Floor Flange
- 10 meters Fiber Optic Cable
- Two Year Warranty

OPTIONS

2080 2081 **Model 2090 Positioning Controller:** This controller provides control for two separate devices (towers and turntables) in any combination, plus the control of four auxiliary devices via a fiber optic interface. The unit includes a GPIB connection and is compatible with most popular EMI measurement software.

2080 2081 **Shield Room Feed-through:** This option allows the customer to take the fiber optic control cable from the control room to the shield room while maintaining shielding attenuation. The unit is made of brass for conductivity and provides attenuation of greater that 100 dB at 10 GHz. A single 22.25 mm (.875 inch) hole is required to mount this option.

2080 2081 **Additional Fiber Optic Cable:** Various lengths of fiber optic cable are available by customer order. The standard length provided is 10 m (32.8 ft).

2081 **Hand Control Unit (HCU):** This sturdy, hand-held controller will allow the user to manually operate the table remotely and independently from the Model 2090 Positioning Controller. This controller attaches conveniently to the electrical enclosure located on the base of the turntable. Functions include: Clockwise (CW), Counterclockwise (CCW) and Hand/Main Control selection.

2081 for electrical and signal connections **Slip Ring:** This option allows continuous rotation of the turntable through the use of the latest technology in mercury slip-rings. The slip ring option is typically supplied with Schuko or NEMA connectors. Specify part #103441 for NEMA connectors, and part #103351 for Schuko connectors. The amperage rating for the standard electrical assembly is 20 amps. Consult the factory for all custom requirements on slip-rings.

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PRECAUTIONS

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

Ensure that the correct voltage setting is selected on the Motor Base unit.

The fiber optic cable must be looped through the “P” clip installed on the front panel of the motor base. Failure to do so will increase the chance of the cable being accidentally pulled, thus breaking the fiber optic connectors.

Do not attempt to service unless qualified to do so. As with any electrical equipment, ensure 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.

Stay clear of all moving components on this equipment.

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

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

Regularly inspect the equipment for loose fasteners and wear. Conduct scheduled maintenance in accordance with the factory recommendations provided.

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

TURNTABLE INSTALLATION CONSIDERATIONS

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

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. Be sure to consider the size of the cable bundle when selecting conduit diameter.

Electrical Considerations

A qualified and licensed electrical contractor should be used to 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 underneath 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 7.5cm (3in) must be installed to provide proper drainage during rain storms, etc.

Cold Climate Conditioning

Oil used in the gear assemblies will congeal at 2^{o} C (28^{o} F). Turntables operated in these temperatures should include a heat source and/or dehumidifier.

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TURNTABLE INSTALLATION INSTRUCTIONS

GLOSSARY

Anchor Plate – Anchors the turntable to the floor and provides an interface for leveling screws.

Leveling Screws – (½-13x5" square head screws with ½-13 flangenuts) work in concert to level the turntable assembly. The screws are shipped inserted into the turntable base.

Anchor Plate Screws – (#14x1" #3 square socket flat head screws) These screws will connect the anchor plates to the floor. If the turntable is being installed in a concrete pit please contact the factory for additional supplies.

Floor Flange – Mounts to the ground plane around the turntable perimeter. The floor flange works in conjunction with the wear strip and ground brushes to electrically couple the turntable to the ground plane. (not applicable to the Model 2080)

Stainless Steel Wear Strip- Serves as a wear point to prolong the life of both the ground brush and floor flange. This piece is attached to the floor flange during the installation process.

GUIDELINES

Proper installation of the turntable directly affects performance. While the Model 2080 and 2081 turntables are shipped fully assembled, there are additional parts for installing the turntable. The installation process includes placing and centering the turntable at the installation location, inserting the floor anchor plates and leveling screws, leveling the turntable, installing the floor flange and wear strip if applicable.

Uncrate all parts. Check all parts for any shipping damage. Ensure a clear area is available to install the turntable safely.
NOTE: Do not discard any packing material until the unit is fully installed and verified.

CAUTION Ensure power is OFF and secured before proceeding further. The voltage select switch on the motor base unit must be set to the proper mains voltage before power is applied to the unit.

The 1.2 and 1.5 meter models allow for the selection of either 115 or 230 VAC single phase, 50 or 60 Hz. This selection should be made during the initial installation and prior to applying mains power. There is a separate electrical installation section following the turntable installation instructions that will guide you through this process.

Verify that the fiber optic cable is long enough to reach from the turntable to the control room or station. Avoid pulling on the fiber optic cable or damaging the connectors.

When working around the turntable avoid stepping on the fiber optic connectors located at the motor base. The fiber optic cable should not be attached to the motor base during the physical installation process.

TOOLS REQUIRED

- 3/16” allen wrench
- 5/16” allen wrench
- 3/8” allen wrenches, qty 3
- 6 m.m. allen wrench
- 3/8” ratchet wrench
- 12” crescent wrench
- 15 m.m. 12 point socket for ½” square head screws
- 7/16” open/box end wrench
- ½” open/box end wrench
- ¾” open/box end wrench
- .120 drill bit for 6-32 self tapping screws
- “A” & “B” drill for ¼-20 self tapping flat head screws
- 27/64” drill bit for ½”-13 tap
- 3/8” hand drill
- ½”–13 tap
- #2 phillips screw bit
- #3 phillips screw bit
- Measuring tape
- Pry bar
- Level
- Square
- Hacksaw
- Black sharpie marker
- File
- WD 40
- ¾” pipe clamp ends
- ¾” pipe (length depends on table size 6 ft. will cover most tables)
- 1- ½” C-clamps, qty 8
- Cutting Oil
- Syringe for applying conductive grease
- Grease Gun
- Vacuum Cleaner

Concrete Pit Installations

- ½”“ hammer drill
- ½” x 12” masonry bit
- 3/16” x 6” masonry bit
- ¼” x 1-3/4” Tapcon Screws or equivalent

INSTALLATION

During the installation process please refer to the drawings at the back of this manual.

1. If the turntable is to be installed in a pit, check the pit depth and inside diameter and compare measurements to the site drawings. Inside pit dimensions are typically as follows:

   Model 2080
   1.21 meter = 49.65”
   1.51 meter = 61.46”

   Model 2081
   1.23 meter = 50.44”
   1.53 meter = 62.25”

   If the turntable is a non-standard size then multiply meter size x 39.38” and add 2” for the finished pit inner diameter. These dimensions are +/- ¼”.

2. The location where the turntable will be installed should be as level as possible, and perpendicular to the room, before proceeding with the installation. It may be necessary to place shims on the floor to level it out before installing the anchor plates. The more level the installation surface is before installation, the faster the leveling process should go during installation.

   IMPORTANT When installing a turntable in a chamber with a raised floor, additional support under the floor will be necessary around the edge of the turntable.

3. Remove the top of the turntable by removing all necessary screws.

4. Lower the base of the turntable into the pit and position the motor base with the fiber optic connectors pointing in the direction that the fiber optic cable will be installed. This will reduce the chance of the cable being kinked or bent.

5. Center the turntable in the pit by measuring from the bearing to the I.D. of the raised floor. Measure in at least 8 places and equally divide the difference. Once you have found the center, and moved the turntable base into position, using a marker,

mark around the perimeter of the turntable base. These marks may be used for reference if the assembly is moved during placement of the floor shims or anchor plates. When positioning the turntable base, make as many anchor holes miss the floor joint strips as possible if the table is being installed on a panel floor in a chamber.

6. The hardware kit contains 12 floor plates. At the back of this manual there are drawings for each size of both the 2080 and 2081 that illustrate the floor plate placement. Using a pry bar carefully lift the table and place plates under the anchor holes on the turntable base.

7. Thread one ½-13 flange nut onto each ½-13x5" square head screw, with the flange facing towards to the tip of the screw. Insert the square head screws into the receptacle holes and anchor plates around the perimeter of the turntable base. Threading the screws into the anchor plates will align and secure them in place.

8. Attach each anchor plate to the floor using two #14x1" #3 square socket flat head screws. One screw will be inserted into each visible hole at the corner of each anchor plate. Drill 1/8" pilot holes for these screws and vacuum up shavings so that you have good contact with the floor. Continue mounting the rest of the plates.

9. With all anchor plates secured to the floor, remove only the ½-13x5" square head screws installed in step 7. These will typically be the center screw in sets of 3. Drill 27/64" pilot holes approximately ¾" deep into the paneled floor. Be careful not to go through the bottom skin of the panel. Vacuum out shavings and dust. Tap holes ½"-13 about ½" deep then install the square head screws back into the turntable base, anchor plate, and floor. Do not drive the screws too far. Screws should not penetrate the outer layer of shielding, as this will affect the shielding attenuation.

10. After the anchor plates have been secured to the floor it is time to level the table to the raised floor. Back off all the ½-13 flange nuts so they are against the square head of each screw.

CAUTION: Before leveling make sure ½-13 flange nuts are backed off all the way to avoid pulling plates off the floor.

11. While the ½-13x5 square head screws are all identical, they serve two purposes. The screws installed in step 9 anchor the assembly through the anchor plates and into the floor. The screws you are about to manipulate will level the assembly with the raised floor or ground plane. Please refer to the drawings at the back of this manual to determine which screws serve each purpose. The screws which anchor the unit have an A by their receptacle hole on the plan view of the turntable. Using a leveling instrument, (torpedo laser level or some other device), the leveling screws should be turned, to raise the table until it is between 1/8" and 3/16" above the raised floor, this is just a rough finish height. It is easier to lower one leveling screw in each group and then lower the second after the floor flange has been mounted. Once you have one screw in each group leveling the assembly and the turntable is level, lock down the flange nut to hold the table in place while the turntable floor flange is being mounted.

2081 RAISED PANEL FLOOR FLANGE INSTALLATION

For this step you will need:

- pipe clamp
- three 3/8” allen wrenches
- hand drill
- 5/32” drill bit
- #3 phillips drive bit
- a small square
- marker
- ¼”x 1-3/4” phillips flat head
- TAPCON screws
- hacksaw

1.2 and 1.5 meter turntables with the floor flange option have two floor flange pieces. All of the flanges are cut oversize for bending purposes and the only one that will need to be cut is the last flange installed.

Using a pipe clamp and 3/8” allen wrenches or 3/8” pin, place a spacer between the TT and flange starting in three places in the center or on the flange. Once there is tension on all three wrenches, drill a 5/32” hole through the counter-sunk holes in the floor flange. Drill completely through the panel and place screws into the holes. Continue working around the flange doing 2 or 3 holes at a time. Some screws may fall between the floor panel joints. Try to position the flanges ensuring as few screws hit these points as possible making sure that the first or last hole in the flange are not too close to one of these joints.

NOTE: It is very important that this 3/8” gap between TT and floor flange be held as close as possible so that the grounding brushes seat properly. Also make sure that the flange ends are flush with each other.

Typically the last flange will be too long. Turn the flange upside down, butt one end to the other and evenly mark off with the other end and trim to fit. Do not cut too much off. It is preferable to not

have more than 1/16" gap between the butt joint when finished. Continue mounting as stated above until all screws have been installed. Also the top floor joint strips will need to be trimmed to fit up against the flange.

2081 INSTALLATION OF STAINLESS STEEL WEAR STRIP

Tools and Hardware Needed:

- eight small 1-1/2” C-clamps
- 6-32x 3/8” thread rolling screws
- hand drill
- 0.120 dia. drill bits
- a #2 phillips bit
- cutting oil

It is very important that the floor around the TT pit is level all the way around. If it is not, it will make the installation of the wear strip very difficult. Start the strip 1/8" below the surface of the flange at the end with the hole closest to the end of the strip. Also start with the first 2 holes in the strip between the casters. Place a clamp about 2” on each side of the hole on the strip in 4 places. Transfer drill .120 dia. holes into the aluminum floor flange and screw in the 6-32 x 3/8” thread rolling screws.

NOTE: Some of the pre-drilled holes in the strip will be in the path of a caster. For these holes, casters will need to be removed by taking out the center axle of the caster. Be careful not to lose any washers or allow the washers to fall out.

NOTE: Be careful not to bend the stainless steel strip, this will make it difficult to install properly. Do not let the stainless steel strip come up above the top of floor flange since it may bend when something heavy is rolled over it. It will be beneficial to be slightly below the surface of the flange.

Continue installation around the TT with the strip. When you get to the end, you will need to cut the strip to length. Let the strip overlap the fixed end. Using your square, mark a line even with the

fixed end. The gap of the 2 joints should be less than 1/16". Deburr the cut. You will need to drill the last hole about the same distance as the other end.

Greasing Casters & Bearings: Using a synthetic grease, grease all casters. Mobil 1 synthetic is recommended, do not use a lithium grease.

NOTE: Some casters may not have grease fittings. These will be sealed bearings and will not require grease.

Final Leveling of Table: Lower all ½-13 leveling screws. Once you have the table with the floor flange and wear strip mounted, install all remaining screws to the spacer plate and tighten. Once this is done, place shim plates in the center of the TT and level screws in the center of TT. Plug in the fiber optic cable and secure with tie wraps to a leveling screw.

Setting Mechanical Limits: Make sure that the mechanical limits have been set for proper amount of travel. It is standard to set the limits where the table has about 45 degrees of over-travel in each direction. Adjust as needed by turning the proper knob for the direction of travel.

Application Of Conductive Grease: Attach the turntable top. Using the TT controller, position the table to the 0 degrees position. Make a straight line from the table to the flange to verify the encoder count and positioning of table. Then start the table in scan mode. Using a syringe, squeeze the contents of one tube of GC Electronics conductive grease into the barrel. While table is rotating slowly apply grease to the grounding brushes. Apply one tube per meter size of the diameter of the table. Run table for approximately 1 hour to validate proper operation and allow sufficient lubrication of moving parts.

2081 ROLLED STEEL FLANGE MOUNTING IN CONCRETE PIT

Mounting to concrete is the same with the exception of the mounting hardware. You should have ½-13 wedge type concrete anchors. Instead of the #14 x 1" square socket flat head screws, you will use 1/4 x 1-3/4 Phillips flat head TAPCON screws.

You will need a ½" hammer drill with a ½" x 12" hammer drill bit and a 3/16 x 6" hammer drill bit. Instead of the 1/4 x 1-3/4" tapcons, you will need ¼-20 x 1" phillips flat head thread rolling screws for mounting the flange to the rolled steel flange. The drill hole size for ¼-20 x 1" thread rolling screws is 0.238 - 0.242 (B or C drill). You will also want a small vacuum to clean up concrete dust so that it does not get into the screw threads making them hard to screw in.

NOTE: When drilling holes, watch out for buried conduit and pit drain pipes. Also drill ½" hole as deep as you can. Drill 3/16" holes about 3 to 4 inches deep.

2081 WELDED CHAMBER WITH STEEL PIT & STEEL RAISED FLOOR

When mounting to a steel pit and steel raised floor you will not need ¼" anchor/shim plates. You will need a ½-13 tap, 27/64" drill for tap, ½-13 x 5" square head set screw and flange nuts. Drill 27/64" diameter. holes in locations shown in the illustrations at the back of this manual. (Model 2081-6x). Tap each hole as you drill it and then screw in ½-13 x 5" set screw so that the table does not move as you go around each location. Proceed with leveling instructions in step 11 of the "Installation" section of this manual.

FINAL HEIGHT ADJUSTMENT

Once the table has been pre leveled, floor flanges mounted, and the wear strips mounted, you are now ready to finish leveling. Rotate table to where the joint of the table top is directly over the center of the caster. Making sure not to get caster out of level from side to side, slowly raise caster until table top is about 1/32" above the highest spot on the floor flange. Once this has been done, tighten down all screws on that caster assembly. Rotate top to the next caster and continue with the remaining casters.

FIBER OPTIC SPLICE FOR WAVEGUIDE FEED

Find the spot in which you will need to remove sheath and mark. A very sharp knife is needed to make the splice. Being very careful, cut around the outside of the sheath at each end of the area needing to be cut, cut very lightly so as to not cut into the fiber cables. You should then be able to bend the sheath back and forth until you can see the fiber cables.

Next you will need to make a cut down the length of sheath area, being careful not to cut into fiber cable. You should now see two pieces of white string inside the sheath. Find the string and use it to split the sheath open. Now insert into the waveguide.

On the outside wall of the motor control enclosure, locate the voltage select switch marked 115 and 230 and switch to the appropriate setting. This switch provides a means for selecting the AC input voltage for the DC power supply and the AC drive motor located in the enclosure.

Determine the mains voltage to be applied to the motor base. The branch circuit supplying power to the motor base should be protected from excess current according to local electrical codes.

Check that the conductor size is adequate for the motor load and the distance from the mains source. Improperly sized conductors

will lead to high voltage drop in the power conductors and cause reduced starting torque and premature motor failure.

Connect the fiber optic control cable and install the power connection according to the “Electrical Installation” section.

The fiber optic cable must be looped through the “P” clip installed on the front panel. Failure to do so will increase the chance of cable being accidentally pulled, thus breaking the fiber optic connectors.

CAUTION Prior to energizing the unit, a qualified and licensed electrical contractor should be used to 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.

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

Rotate the turntable using the controller to verify proper operation. If necessary, remove the top section

Set the travel limits. The mechanical travel limits of the turntable have been changed from previous models for user convenience, ease of operation and safety. These limit adjustments are not located on the side of the motor base enclosure.

CAUTION The limits must be set whether or not the soft limits present in the controller are used. Failure to do so may cause damage to occur due to overrun of the table in either direction.

To increase the amount of travel in either direction, turn the knob in the direction indicated by the positive (+) sign. To decrease the amount of travel in either direction you must turn the knob in the minus (-) direction as indicated.

WARNING Ensure the current travel limit settings will not cause damage to existing cables and equipment located underneath the turntable.

Once limits have been set, return the turntable to its original position and replace the top section.

ELECTRICAL INSTALLATION

CAUTION It is important that this electrical installation procedure be performed by a qualified electrician, in accordance with local and national electrical standards prior to energizing the unit.

CAUTION Ensure power is off and secured before proceeding further. The voltage select switch on the Motor Base Unit must be set to the proper mains voltage before power is applied to the unit.

The Motor Base Unit of the Model 2080/2081 Turntable allows for the selection of either 115 or 230 VAC mains input voltage. This selection should be made during installation and prior to connecting the Motor Base Unit to the power mains.

On the front of the enclosure for the Motor Base Unit, locate the voltage select switch which is marked for 115 and 230. Switch to the appropriate position which corresponds to the mains voltage to be applied. This switch provides a means of selecting the voltage to be applied to the drive motor, electric brake and internal power supply.

Determine the mains voltage to be applied to the Motor Base Unit. The branch circuit supplying power to the motor base should be protected from excess current according to local electrical codes. Check that the conductor size is adequate for the motor load with respect to 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. This condition could lead to premature motor failure.

CAUTION Keep all body parts away from the drive gears and drive belt when the turntable is energized. Do not operate the turntable with the protective guards removed.

CONNECTING THE MODEL 2090 POSITIONING CONTROLLER

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

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

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

Using the Model 2090 Position Controller (or hand controller), rotate the motor base shaft to verify proper operation. Find the travel (mechanical) limit adjustment knobs on the side of the motor base enclosure. To increase the amount of travel in either direction, turn the knob in the direction indicated by the positive (+) sign. To decrease the amount of travel in either direction, turn the knob in direction indicated by the minus (-) sign.

Run the motorbase down to the lower limit CCW and then back it off from the lower limit just a bit. This step will help after the

turntable is attached to the motorbase and it is time to set the rotation limits for the turntable. Disconnect the power for the Model 2090 and the motor base before proceeding with the assembly of the turntable. Disconnect the fiber optic cables from the units so they will not be damaged during installation.

CAUTION The limits must be set whether or not the soft limits in the 2090 controller are used. Failure to do so may cause damage due to overrun of the table. Ensure the travel limit settings will not cause damage to user installed cables and equipment mounted on the table.

OPERATION

Please refer to the Model 2090 Positioning Controller manual if you are unfamiliar with the operation of the unit. A 2090 manual is included with each 2090 shipment and is also available for download from our website.

With the assembly complete the Model 2090 controller will need to be connected to the unit and power applied to both the motor base and controller in order to continue. Refer to the electrical installation section if you have questions about how to connect the fiber optic cables.

Using the Model 2090 Positioning Controller check the CW and 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 at the factory to read out 360 degrees (+ or - 1 degree) for one complete revolution. If the table is not within this accuracy, the unit can be re-calibrated per the instructions below.

RECOMMENDED PARAMETERS FOR THE MODEL 2090 POSITIONING CONTROLLER

DEVICE 2		
Parameter	**Value**	**Description**
P1	0	Turntable
P2	0	Standard Turntable
P3	000	Infinite Scan Count
P5	1	Non-continuous rotation
P8	2.5	2.5 Second reverse delay
P9	9	Primary GPIB address 9
b1	000	User options disabled
c	3600	3600 encoder counts per meter
S0	-1	Step speed = run speed
S1	31	Speed 1 ~12.5% of max speed
S2	63	Speed 2 ~25% of max speed
S3	95	Speed 3 ~37.5% of max speed
S4	127	Speed 4 ~50% of max speed
S5	159	Speed 5 ~62.5% of max speed
S6	191	Speed 6 ~75% of max speed
S7	223	Speed 7 ~87.5% of max speed
S8	255	Speed 8 = max speed
Oc	On	Overshoot compensation enabled

EDITING MODEL 2090 POSITIONING CONTROLLER CONFIGURATION PARAMETERS

To edit a configuration parameter, press the PARAM key to display the current parameter. Pressing the PARAM key repeatedly will scroll down through the parameter list, showing each parameter in turn. While viewing a parameter, the STEP keys (INC/DEC) may be used to scroll up or down the parameter list. This reduces the effort necessary to scan through a long parameter list using the PARAM key. Pressing any of the LIMIT/POSITION selection keys will return the display to that

selection. Pressing any of the remaining motion keys will return the display to the current position and execute that motion. Pressing the PARAM key again will return to the last displayed parameter in the list, allowing easy transition between parameter adjustment and device operation.

Once the desired limit, position or parameter is visible in the display window, pressing INCRM, DECRM, or ENTER will toggle into edit mode. The lowest adjustable digit will flash on and off. Pressing the LOCAL key for that device will 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.

TURNTABLE ENCODER CALIBRATION

C Refers to the encoder calibration parameter. 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. The setting for the Model 2080/2081 Turntable Series is: 3600

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

1. Set the encoder calibration value to 3600.
2. Insure that the turntable is positioned to allow more than a full revolution of travel in the clockwise direction and use the STEP keys to run the turntable clockwise a few degrees to remove any play in the table.
3. Mark the current location of the turntable against the ground ring (masking tape works well), and set the current position reading to 000.0.
4. Using the STEP keys, rotate the turntable clockwise until it is again aligned with the mark on the ground ring. For best results, the last motion should always be in the clockwise direction to insure that any play in the gearing between the motor and encoder is accounted for.

5. Record the reading of the display, ignoring the decimal point (i.e. 360.0 would be 3600). This is the encoder calibration value. *NOTE: If the value is below 3600, the resolution of the encoder is low and thus the 2090 will not provide 0.1 degree resolution, even though the display shows that digit. If the value has gone past 9999, the encoder has too many counts per meter and the 2090 can not correct for it. In this case, contact ETS-Lindgren for assistance.*
6. Enter this value for 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. *NOTE: 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 2090. 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.*

TT CALIBRATION EXAMPLE

The table is set at the 0 degree position. A piece of tape is placed on the edge of the TT to line up with the edge of the gearbox cover. The table is stopped when the tape travels exactly 360 degrees around. The display on the 2090 now reads 356.3 degrees which is recorded.

The table is rotated CCW back to 0. The parameter button is set on the “C” setting. The “C” digits display 3430. A new “C” setting is now calculated:

New “C” = (356.3 divided into 360) times 3430 = 3395 (rounded off)

The decrement the C parameter to 3395 and “**ENTER**” is pressed. Then the “current position” button is pressed 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 TT revolution. Calibration is complete.

CONTINUOUS ROTATION / DISENGAGING MECHANICAL LIMIT SWITCHES

The motor drive unit contains a mechanical limit switch mechanism that is coupled to the encoder shaft inside the drive unit. For continuous rotation it is necessary to disengage the coupling per instructions below. This will then prevent the mechanical limits from being engaged. The soft (electrical) limits that are set on the 2090 remain functional and can still be used to limit TT travel.

CAUTION All power must be turned off and locked out before opening the drive unit.

CAUTION Exercise care when using the continuous rotation feature so as not to damage user installed cables and equipment mounted on the table.

A hex wrench and crescent wrench are required to disengage the shaft coupling.

The capacitor above the coupling will need to be moved out of the way by removing the mounting nut on the outside of the box. It can then be shifted to the side.

There are two setscrews on the coupling of the 0.63 cm (0.25 in) DIA shaft that drives the limit switch actuator inside the box. Loosen these setscrews and push the coupling back on the shaft to disengage it from the encoder shaft then tighten the setscrews back. With the teeth disengaged the switches are now disabled.

The CW and CCW limit buttons on the 2090 will continue to function at their settings.

SETTING CURRENT POSITION ON 2090

The total travel between the mechanical limits is between 370 and 400 degrees. This is fixed by the engagement mechanism inside the drive unit and is non-adjustable. Set the 0 degree position on the 2090 so that the 2090 moves the table between the mechanical limits without engaging them in normal operation.

EXAMPLE (CW - clockwise, CCW - counterclockwise)
The table is rotated CCW until it stops at the mechanical limit. The table current position is then set at 0. Then it is rotated CW till it stops at the CW mechanical limit switch. The controller now reads 385 degrees which is the full travel between mechanical limits. The current position on the 2090 is then reset to 360 about 10-15 degrees from the CW mechanical limit. This will keep it from hitting both mechanical limits when rotating from 0 to 360 during operation by the 2090.

CAUTION: ON RESETTING CURRENT POSITION ON 2090

The stopped position of the TT platform at 0 degrees may drift overtime depending on usage. The 0 degree position of the 2090 controller is fixed with respect to the mechanical limits described in the “SETTING CURRENT POSITION ON 2090” section if they are not disabled per the instructions in the “CONTINUOUS ROTATION / DISENGAGING MECHANICAL LIMIT SWITCHES” section.

The platform can be rotated periodically back to a desired position and the 2090 current position can be reset to 0 only if the mechanical limits are disabled. The CW and CCW limits on the 2090 will continue to function with the mechanical limits disabled. If the mechanical limits remain in operation, the 360 travel on the 2090 will no longer be between mechanical limits and normal operation will be interrupted if they are not disabled per the instructions in the “CONTINUOUS ROTATION / DISENGAGING MECHANICAL LIMIT SWITCHES” section.

HAND CONTROL UNIT

To connect the Hand Control Unit (HCU), remove the connector cap on the motor base. Plug the cable receptacle from the hand control unit into the electrical enclosure and screw connectors completely together. The HCU is now ready to operate. Be sure to coordinate use of the unit with the operator of the Model 2090 Positioning Controller.

To allow the HCU to operate, push the control switch from MAIN to HAND. When the HCU is selected, the Model 2090 Positioning Controller is overridden until control is returned from the HCU. If the Model 2090 Positioning Controller is left on while the HCU is used, all changes in position are recorded by the Model 2090 Device Positioner.

CAUTION Do not plug the hand control unit into the motor base while that device is operational. Coordinate with the operator of the Model 2090 Positioning Controller before plugging in, using, or unplugging. Do not push the CD and CCW buttons at the same time. Be sure that the motor is completely stopped before reversing direction with the unit.

When you are ready to change to automated testing, toggle the control switch from HAND to MAIN.

MAINTENANCE

Regular maintenance will prolong the serviceability of your turntable. Follow this recommended schedule.

CAUTION Do not perform maintenance while turntable is operating.

CAUTION: When removing the Model 2081 top use caution. The edges are greasy from the conductive grease and the copper ground brush is very sharp. Use rags or gloves when handling the edges to prevent cuts and abrasions.

EVERY SIX MONTHS

Lubricate the drive chain. Use a good quality grease to lubricate the chain.

Check all mechanical parts for wear.

Inspect the ground brush for wear. A well maintained ground brush should have a long serviceable life. Should it need to be replaced, replacement ground brushes for turntables are available in standard lengths that are straight and not trimmed. They are assembled at the factory into the predrilled aluminum extrusion that is attached around the edge of the turntable. During replacement the brush assembly is clamped in place using a pipe clamp in order to bend the brushes to conform to the edge of the turntable top. The replacement brushes have hole spacing that is machined exactly the same as the original.

EVERY 12 MONTHS

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

REV C – PN 399228

Grease the gear teeth. Apply good quality grease to the gear teeth.

SPECIFICATIONS

ELECTRICAL

Model	**2080**	**2081**
Nominal AC Voltage	115/230 VAC	115/230 VAC
Input Frequency	50/60 Hz	50/60 Hz
Current Rating	3.8 / 2.5 A	4.0 / 3.0 A
Phase	Single (1)	Single (1)
RPM	1.3	1.3

MECHANICAL

Diameter	1.2 m (48 in) or 1.5 m (59.24 in)
Height	26.67 cm (10.5 in)
Load Rating	455 kg (1000 lb) distributed

WARRANTY STATEMENT

ETS-Lindgren L.P., hereinafter referred to as the Seller, warrants that standard EMCO products are free from defect in materials and workmanship for a period of two (2) years from date of shipment. Standard EMCO Products include the following:

- Antennas, Loops, Horns
- GTEM cells, TEM cells, Helmholtz Coils
- LISNs, PLISNs, Rejection cavities & Networks
- Towers, Turntables, Tripods, & Controllers
- Field Probes, Current Probes, Injection Probes

If the Buyer notifies the Seller of a defect within the warranty period, the Seller will, at the Seller's option, either repair and/or replace those products that prove to be defective.

There will be no charge for warranty services performed at the location the Seller designates. The Buyer must, however, prepay inbound shipping costs and any duties or taxes. The Seller will pay outbound shipping cost for a carrier of the Seller's choice, exclusive of any duties or taxes. If the Seller determines that warranty service can only be performed at the Buyer's location, the Buyer will not be charged for the Seller's travel related costs.

This warranty does not apply to:

- Normal wear and tear of materials
- Consumable items such as fuses, batteries, etc.
- Products that have been improperly installed, maintained or used
- Products which have been operated outside the specifications
- Products which have been modified without authorization
- Calibration of products, unless necessitated by defects

THIS WARRANTY IS EXCLUSIVE. NO OTHER WARRANTY, WRITTEN OR ORAL, IS EXPRESSED OR IMPLIED, INCLUDING BUT NOT LMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE REMEDIES PROVIDED BY THIS WARRANTY ARE THE BUYER'S SOLE AND EXCLUSIVE REMEDIES. IN NO EVENT IS THE SELLER LIABLE FOR ANY DAMAGES WHATSOEVER, INCLUDING BUT NOT LIMITED TO, DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

Note: Please contact the Seller's sales department for a Return Materials Authorization (RMA) number before shipping equipment to us.

EUROPEAN COMMUNITY DECLARATION OF CONFORMITY

The EC Declaration of Conformity is the method by which EMC Test Systems, L.P. declares that the equipment listed on this document complies with the EMC and Low-voltage Directives.

Factory:
EMC Test Systems, L.P.
P.O. Box 80589
Austin, Texas USA
78708-0589

Issued by:
EMC Test Systems, L.P.
P.O. Box 80589
Austin, Texas USA
78708-0589

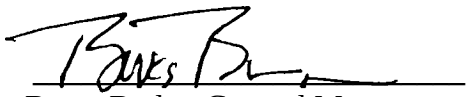
The products manufactured under the EMCO product name and listed below are eligible to bear the EC Mark:

Model 2080 series turntable

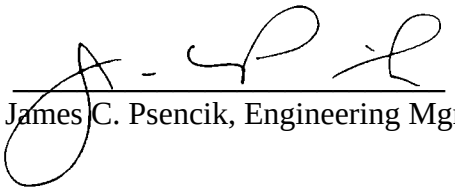
Applicable Requirements:

Standard	Criteria
EN55022	Class B
IEC 801-2	Level 2 4/8kV
IEC 801-3	Level 2 3V/m
IEC 801-4	Level 2 .5 I/O, 1kV AC

Authorized Signatories



Bruce Butler, General Manager



James C. Psencik, Engineering Mgr.

Charles Garrison, Quality Assurance

Date of Declaration: 23 February 96

The authorizing signature on the EC Declaration of Conformity document authorizes EMC Test Systems, 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. EMC Test Systems, 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.

ILLUSTRATIONS