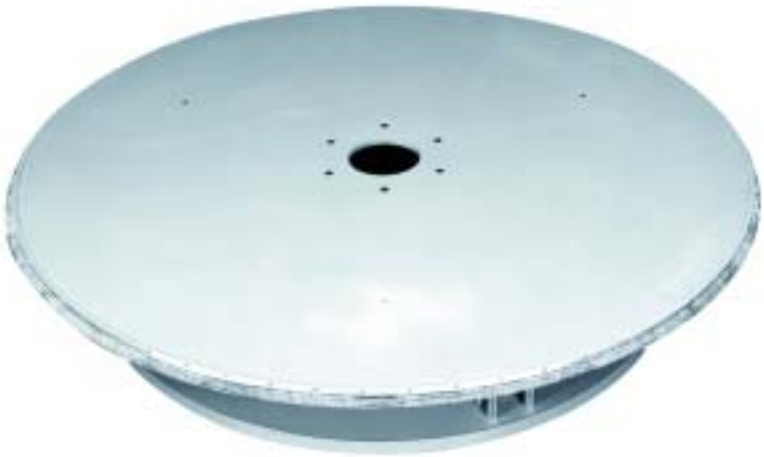
Model 2081

Turntable Series

2081-2.0, 2081-2.5, 2081-3.0,
2081-4.0, 2081-5.0, 2081-6.0

MANUAL



ETS·LINDGREN™
An ESCO Technologies Company

 REV D – PN 399212

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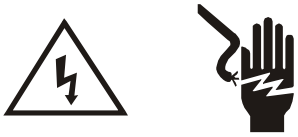
NOTICE: This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation.

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 2081 is an electric powered turntable platform system designed to be used with the Model 2090 Positioning Controller for EMI compliance testing. Two meter and larger tables utilize a pinion and gear drive with a gear reducer and electric motor. The conductive metal top is outfitted with a continuous ground brush to electrically couple the turntable to the ground plane. The drive motor and gearing are located beneath the platform. The sectional turntable top provides easy access in the event that service is required. A shielded enclosure contains the electronics for the system. Signal I/O from the turntable to the Model 2090 controller is via fiber optic cable.

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

To prevent over-travel of the turntable in either direction of movement, mechanical limits can be set using dial knobs on the outside of the encoder enclosure located in the center of the main pivot bearing. The knobs can be accessed by removing the center section of the turntable. Soft limits can be set within the mechanical limits, using the Model 2090 Positioning Controller.

Ground brushes attached directly to the top of the table are in continual contact with the floor flange supplied with the ground ring option. The brushes point downward from the top of the table.

To extend the life of the ground brush, a one-piece stainless steel liner is attached to the inside edge of the stationary floor flange.

STANDARD CONFIGURATION

- Three-phase electric motor unit (standard)
- Heavy duty two-speed drive system (standard)
- Conductive sectional top
- Convenient rotational limit adjust switches
- Limit override feature
- Ten meter fiber-optic control cables (standard)
- Overall height 400 mm (15.75 in)
- Sectional top for easy service access
- Full supporting leveling screws

OPTIONS

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.

Hand Control Unit: 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.

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.

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.

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).

Variable Speed Drive: An optional variable speed drive package is available with the Model 2081 Turntable. Speed adjustment is electronically controlled by the Model 2090 via the front panel or through the GPIB interface.

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EUT Power Outlets: Receptacles are usually mounted on the base of the turntable at its center axis point. These receptacles can be custom mounted, flush with the tabletop on some turntables. Consult the factory for more details.

Mounted LISNs: LISNs can be mounted to the underside of some turntables. This option is only practical on larger turntables with sufficient clearance.

PRECAUTIONS

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

Ensure correct voltage setting is selected on the Motor Base unit (when applicable).

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 or specified by ETS-Lindgren.

The access plate(s) above the pinion gear should remain firmly attached with the screws provided at all times. When the plate is removed for servicing, the electrical breaker located on the electrical control enclosure should be in the OFF position.

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 15cm (6in) 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.

INSTALLATION

The installation of turntables 2 meters and larger will be performed by a factory installation specialist or by individuals who have been authorized by ETS-Lindgren to do such work. Proper installation of the turntable directly affects performance. The following installation information is provided to familiarize the user of the turntable with the installation process.

1. Uncrate all parts. **NOTE:** Do not discard any packing material until unit is fully assembled. Check all parts for any shipping damage. Ensure a clear area is available to assemble the turntable unit safely.
2. After removing three ½-13 flat head screws from the center of the turntable, install three eye-bolts (provided) for lifting the turntable center drive section.
3. Attach lifting chains or slings though the eye-bolts.

CAUTION Lifting and placement of turntable center drive unit into a pit should only be performed by qualified personnel.

4. Safely lift the turntable into the pit using a forklift or other appropriate lifting device, place the turntable bottom or bearing support section into position.
5. Remove the drive pinion so the turntable may be rotated manually.
6. If the turntable is to be installed into a pit or floor cut-out, center and level the assembly. The drawings at the back of this manual illustrate the placement of floor plates and leveling screws that will take place in order to anchor and level the turntable. Your installation specialist may have to make slight adjustments to accommodate the conditions at your site. After installing the floor plates and leveling screws the installer will level the entire turntable by adjusting all the leveling screws.

CAUTION Ensure power is OFF and secured before proceeding further.

7. After the turntable is level the installation specialist will tighten all lock-nuts accompanying the leveling screws to lock the height of the turntable into place.
8. Anchor the turntable through the anchor holes with the appropriate bolts (provided).
9. With the electrical breaker still in the OFF position, re-install the drive pinion.

CAUTION Electrical connection should only be performed by a qualified electrician and in compliance with all applicable regulatory agencies.

10. Connect the fiber optic control cable and install the power connection. The “Electrical Installation” section provides guidelines for the installation of the electrical connection.
11. Return the breaker in the center of the turntable to the ON position.

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

12. Rotate the turntable using the controller to verify proper operation.
13. Set the travel limits, if desired, by following the instructions in the section titled “Setting Travel Limits”.
14. Install the ground ring flange provided around the turntable with flat head screws (not provided). Install the stainless steel wear strip and apply conductive grease according to the “Ground Ring Installation” section.
15. With the key provided, adjust the speed of the turntable while it is running on the CW or CCW direction until the desired speed is obtained.
16. Install the top sections of the turntable to complete the assembly.

GROUND RING INSTALLATION

The ground ring assembly includes a floor flange which interfaces with the brush ring located on the perimeter of the turntable. The floor flange provides constant electrical contact with the user's ground plane and is usually installed with the turntable.

Mounting methods vary according to user specifications. Clearance holes are provided along the outside perimeter of the ground ring as a means of attaching the ring to a customer supplied ground plane. These mounting holes are provided at evenly spaced intervals.

1. When attaching the ground ring, first center and level the turntable assembly into the turntable pit. The cutout diameter in the floor needs to be per the Dimensional Drawing for the table.
2. Install the floor flange around the turntable. A gap of 5/16" to 7/16" should be maintained around the turntable. Trim flange to length by match drilling with floor and installing ¼-20 flathead screws.
3. Install wear strip on inside of floor flange by aligning with top of turntable flange.
4. Make sure that pre-drilled mounting holes in wear strip are aligned to 2.54cm (1.00") from bottom of flange.
5. Trim wear strip to size after ensuring that the full circumference of the flange is covered by the strip.
6. Using pre-drilled holes on wear strip as a template, drill holes through the flange.
7. Secure wear strip to floor flange using 6-32 x 3/8" hex head stainless steel thread cutting screws (furnished with turntable).
8. Apply conductive grease (furnished with turntable) on wear strip along the brush contact area (approximately 1" to 2" from the top of the strip).

ELECTRICAL INSTALLATION

CAUTION It is important that this procedure be performed by a qualified electrician prior to energizing the unit.

The Model 2081 is designed to operate using either 208-230 VAC three–phase 60 Hz or 400 VAC three phase 50 Hz power. The appropriate power requirements are determined when the order is placed. Other power ratings are available on a special order basis.

1. The branch circuit supplying power to the motor base should be protected from excess current according to local electrical codes. ETS-Lindgren has provided a three pole circuit breaker integral to the relay control enclosure. This circuit breaker also serves as a service switch and removes motor power from both the control enclosure assembly and the motor.

WARNING With the circuit breaker in the off position some parts with AC hazards still present a potentially lethal shock hazard.

2. Check that the conductor size is adequate for the motor load and the distance from the mains source. Improperly sized conductors will lead to a high voltage drop in the power conductors and cause reduced starting torque and premature motor failure.
3. The motor base assembly is provided with an unterminated flexible conduit with input power leads exposed. This 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.

2081 Electrical Wiring Color Code	**208-230 VAC 60 Hz 3 phase**	**380-410 VAC 50 Hz 3phase**
Line Conductors (3 each)	Brown	Brown
Neutral	N/A	Blue
Protective Earth	Green with yellow stripe	Green with yellow stripe

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-optic 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. 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. 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.

CAUTION The soft rotational limits in the Model 2090 controller must be set. 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 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 section titled “Connection the Model 2090 Positioning Controller” 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 in the “Turntable Encoder Calibration” section.

RECOMMENDED PARAMETERS FOR THE MODEL 2090 POSITIONING CONTROLLER

DEVICE 2		
Parameter	**Value**	**Description**
P1	0	Turntable
P2	2	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	3608	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

The display symbol 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 2081 Turntable Series is: 3608

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)

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.

SETTING CURRENT POSITION ON 2090

The total travel between the mechanical limits is typically set between 370 and 400 degrees at the factory. 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 until 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 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 “Setting Travel Limits” section.

Should it become necessary to reset the current position readout of the Model 2090 Controller. 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 “Setting Travel Limits” section.

CHANGING ROTATION SPEED

The ETS-Lindgren two-speed turntable is designed to shift speeds at a standstill or during rotation. To change rotational speed, simply depress the POLAR/SPEED button on the front panel of the Model 2090 Controller. (Refer to the controller manual for more information). Changing speed on the turntable is also available through the IEEE-488 GPIB interface.

The shift from high to low speed as well as from low to high speed should be a relatively smooth transition. A smooth pole changer is utilized in the motor control assembly which compensates for changes in torque when switching speeds. No adjustments are necessary.

The ETS-Lindgren optional variable speed drive provides smooth speed adjustment throughout the range of adjustment. A variable frequency drive provides continuous speed adjustment with high reliability. Adjustment of the turntable's speed is facilitated by the Model 2090 Controller and these operations are discussed in detail in the Model 2090 Controller manual.

SETTING TRAVEL LIMITS

The mechanical limits of the Model 2081 turntable have been changed from previous models for user convenience, ease of operation and safety. These limit adjustments are located outside the center section of the turntable adjacent to the gearbox. In some installations, it will be necessary to remove several of the top sections of the turntable to access the limit switch adjustments.

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 ravel limit settings will not cause damage to existing cables and equipment located underneath the turntable.

You may decide not to use any mechanical limits if you want the turntable to rotate continuously. To do this, the coupling between the encoder and threaded shaft must be disengaged. To gain access, remove the knobs and cover to the encoder. Disengage one side of the coupling by loosening the set screws that link it to the shaft. Then slide the coupling ¼ inch on the shaft to disengage the teeth and retighten the shaft set screws.

CAUTION The limits should 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.

Once limits have been set, return the turntable to its original position by replacing the top center section removed previously.

ALTIVAR MOTOR BASE CONFIGURATION

The following settings are the defaults for the Altivar motor base set by ETS-Lindgren:

Altivar Setting	208/230 VAC 60 Hz	400 VAC 50 Hz
bFr	60	50
ACC	0.1	0.1
dEC	0.1	0.1
LSP	0	0
HSP	75	75
UnS	230	400
FrS	60	60
tFr	90	90

Should you need to change the configuration on the Altivar motor base supplied with your turntable the Altivar manual is available at www.SquareD.com.

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.

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RECOMMENDED MAINTENANCE

CAUTION Do not perform maintenance while turntable is operating.

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

EVERY SIX MONTHS

Adjust the encoder chain. The chain should have no more than 20 mm (1/8”) looseness when flexed to a point halfway between the two sprockets. Adjust the chain by loosening the two screws holding the encoder assembly. Move the encoder in or out to the desired tension.

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

Grease the casters. Use a good quality bearing grease to lubricate the casters.

Check the gearbox for fluid leakage. A slight film that collects is normal. You should not have puddles of fluid. The gearbox is lubricated and sealed at the factory. Under normal conditions, it should not require servicing during its life.

Apply conductive grease on the ground brush along the wear strip contact area (approximately 1 to 2” from the top of the strip).

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 TWELVE 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.

Grease the gear teeth with a good quality grease.

SPECIFICATIONS

ELECTRICAL

Model	Drive Speeds	RPM	Voltage	Line Frequency	AMP	Phase
2081-2.0 Series	Dual	.5/2.0	208-230	60	8	3
	Dual	.5/2.0	380	50	5	3
	Variable	.5/2.0	208-230	60	18	3
	Variable	.5/2.0	380	50	7	3
2081-3.0 Series	Dual	.5/2.0	208-230	60	8	3
	Dual	.5/2.0	380	50	5	3
	Variable	.5/2.0	208-230	60	18	3
	Variable	.5/2.0	380	50	7	3
	Variable	.5/2.0	208-230	50/60	15	Single
2081-4.0 Series	Dual	.5/2.0	208-230	60	8	3
	Dual	.5/2.0	380	50	5	3
	Variable	.5/2.0	208-230	60	18	3
	Variable	.5/2.0	380	50	7	3
	Variable	.5/2.0	208-230	50/60	15	Single
2081-5.0 Series	Dual	.5/2.0	208-230	60	13	3
	Dual	.5/2.0	380	50	8	3
	Variable	.5/2.0	208-230	60	20	3
	Variable	.5/2.0	380	50	14	3
2081-6.0 Series	Dual	.5/2.0	208-230	60	13	3
	Dual	.5/2.0	380	50	8	3
	Variable	.5/2.0	208-230	60	20	3
	Variable	.5/2.0	380	50	14	3

PHYSICAL

Model	Diameter	Nominal Height	Distributed Load Rating*	Top Construction
2081-2.0 Series	2.0 m	40.0 cm	1,500 kg	Sectional
	6.56 ft	15.75 in	3,300 lb	Aluminum
2081-3.0 Series	3.0 m	40.0 cm	4,000 kg	Sectional
	9.84 ft	15.75 in	8,800 lb	Aluminum
2081-4.0 Series	4.0 m	40.0 cm	6,000 kg	Sectional
	13.12 ft	15.75 in	13,200 lb	Aluminum
2081-5.0 Series	5.0 m	40.0 cm	6,800 kg	Sectional
	16.40 ft	15.75 in	15,000 lb	Aluminum
2081-6.0 Series	6.0 m	40.0 cm	9,000 kg	Sectional
	19.69 ft	15.75 in	20,000 lb	Aluminum

*Distributed Load Rating is based on load being evenly distributed to each section. No point loads under .37 sq. m (4 sq. ft) should exceed 500kg (1100 lb); and not over 500 kg should be applied to a 45 degree segment outboard of the casters.

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.

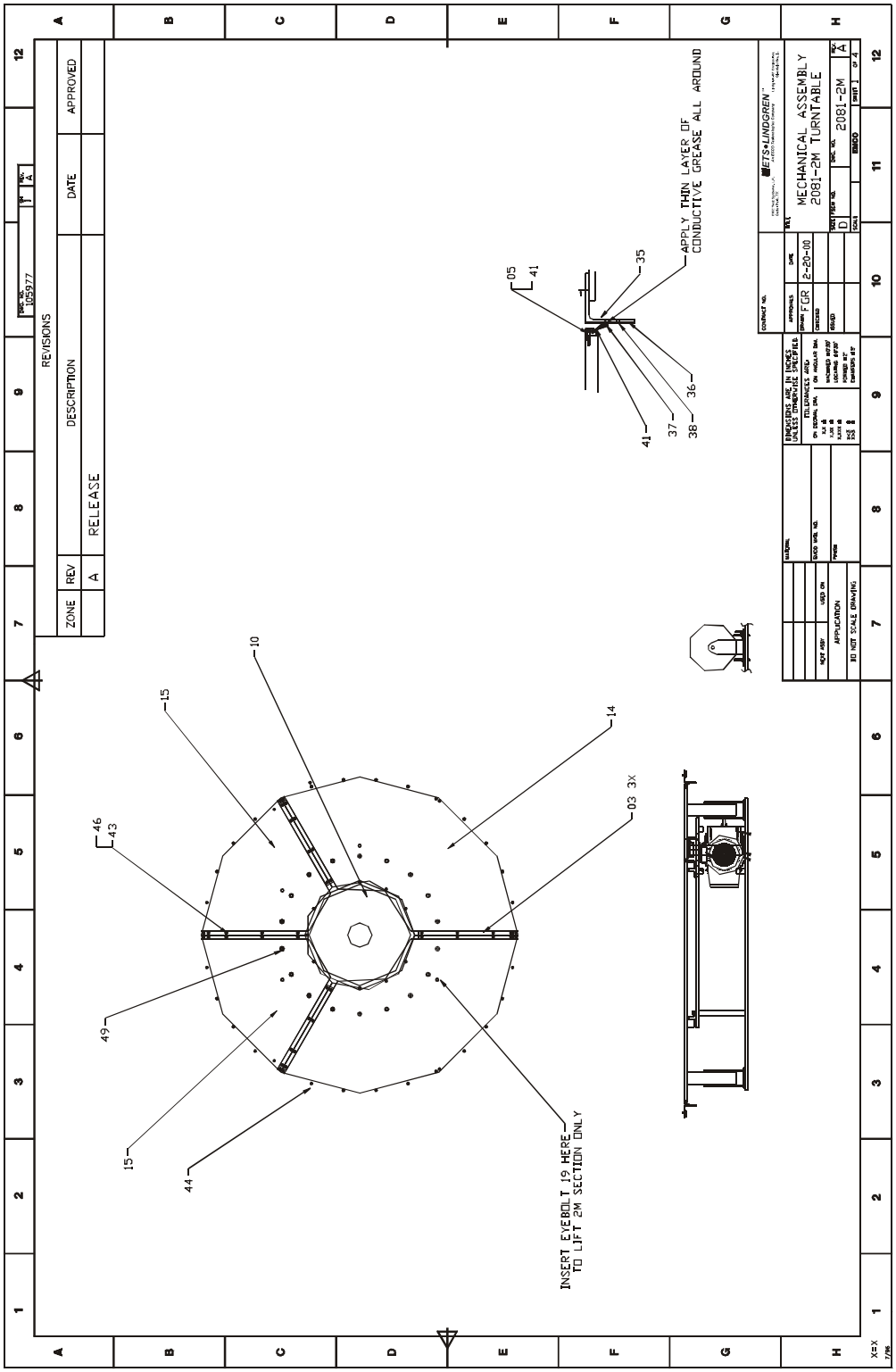
This warranty does not apply to:

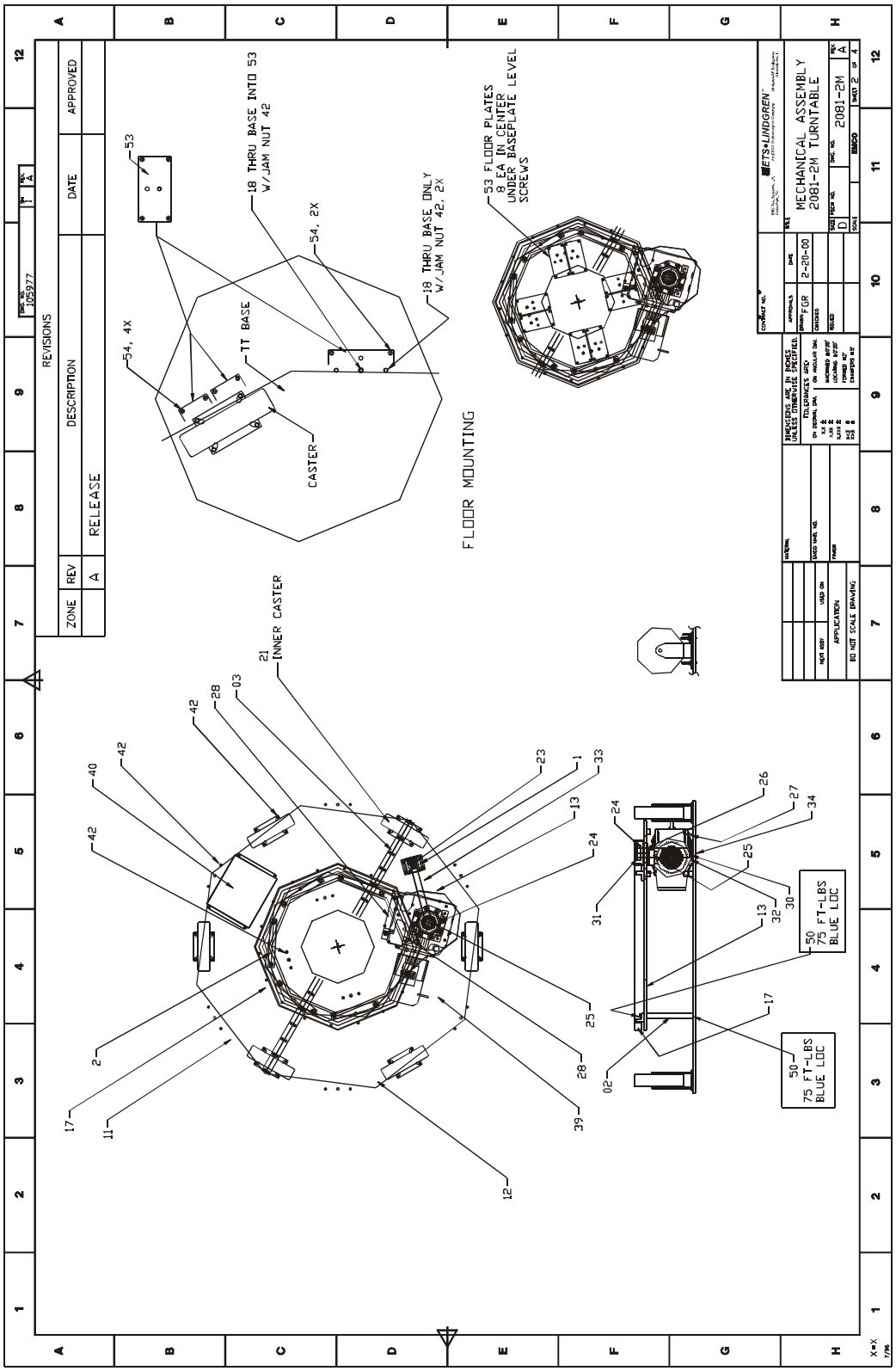
- Normal wear and tear of materials
- Consumable items such as fuses, batteries, etc.
- Products that have been improperly installed, maintained or used
- Products which have been operated outside the specifications
- Products which have been modified without authorization
- Calibration of products,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

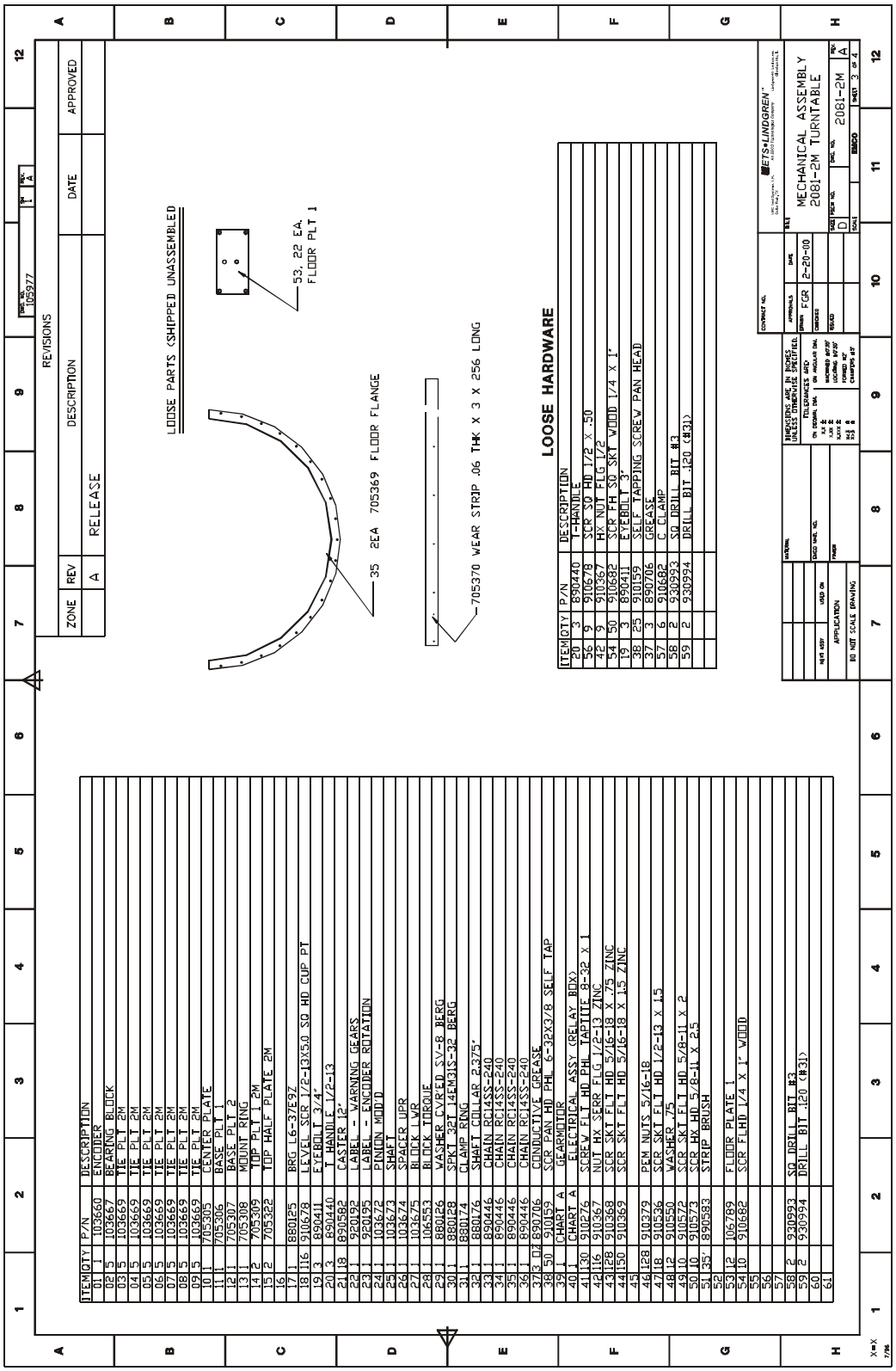
THIS WARRANTY IS EXCLUSIVE. NO OTHER WARRANTY, WRITTEN OR ORAL, IS EXPRESSED OR IMPLIED, INCLUDING BUT NOT LMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE REMEDIES PROVIDED BY THIS WARRANTY ARE THE BUYER'S SOLE AND EXCLUSIVE REMEDIES. IN NO EVENT IS THE 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.

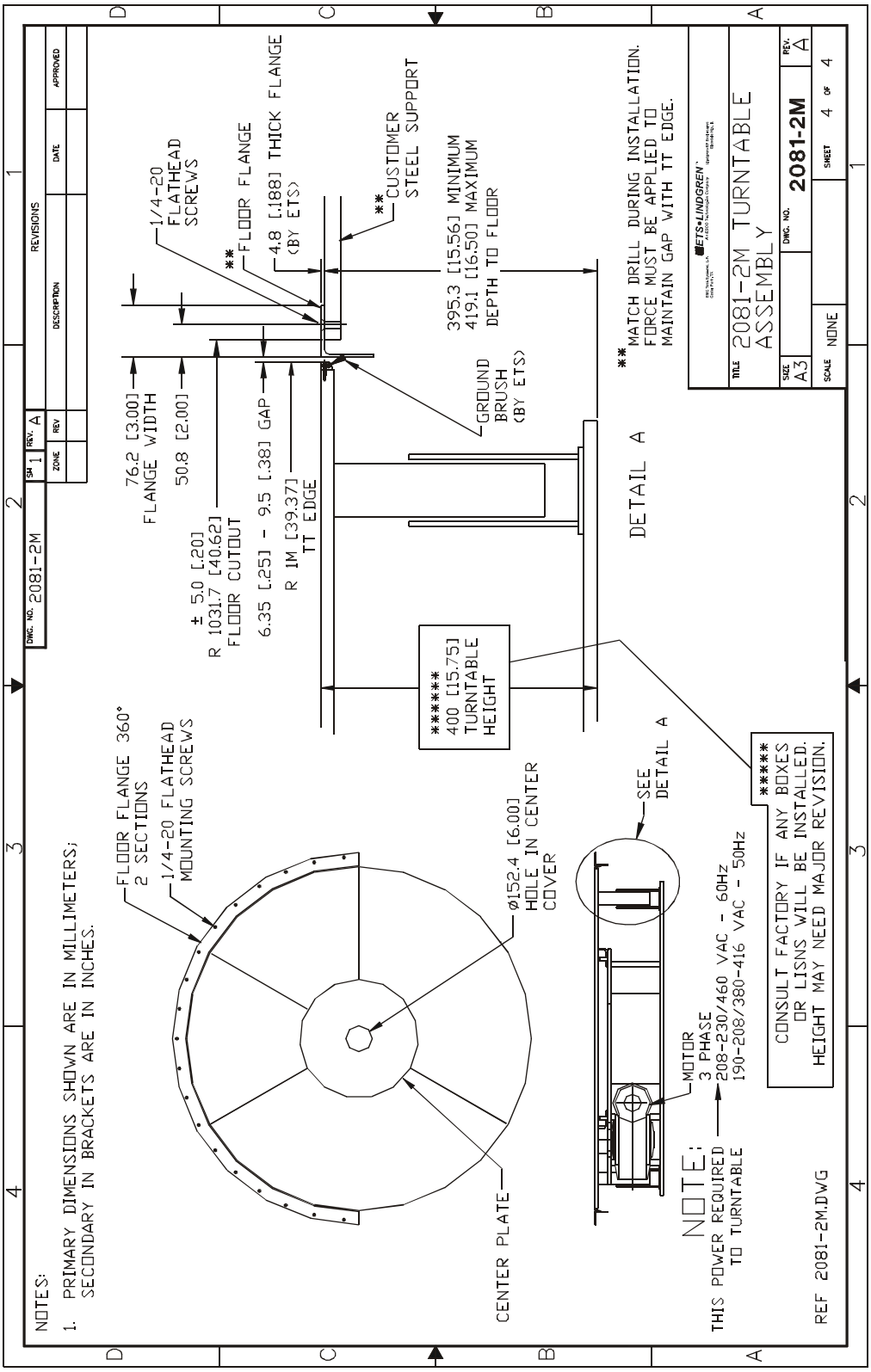
ILLUSTRATIONS

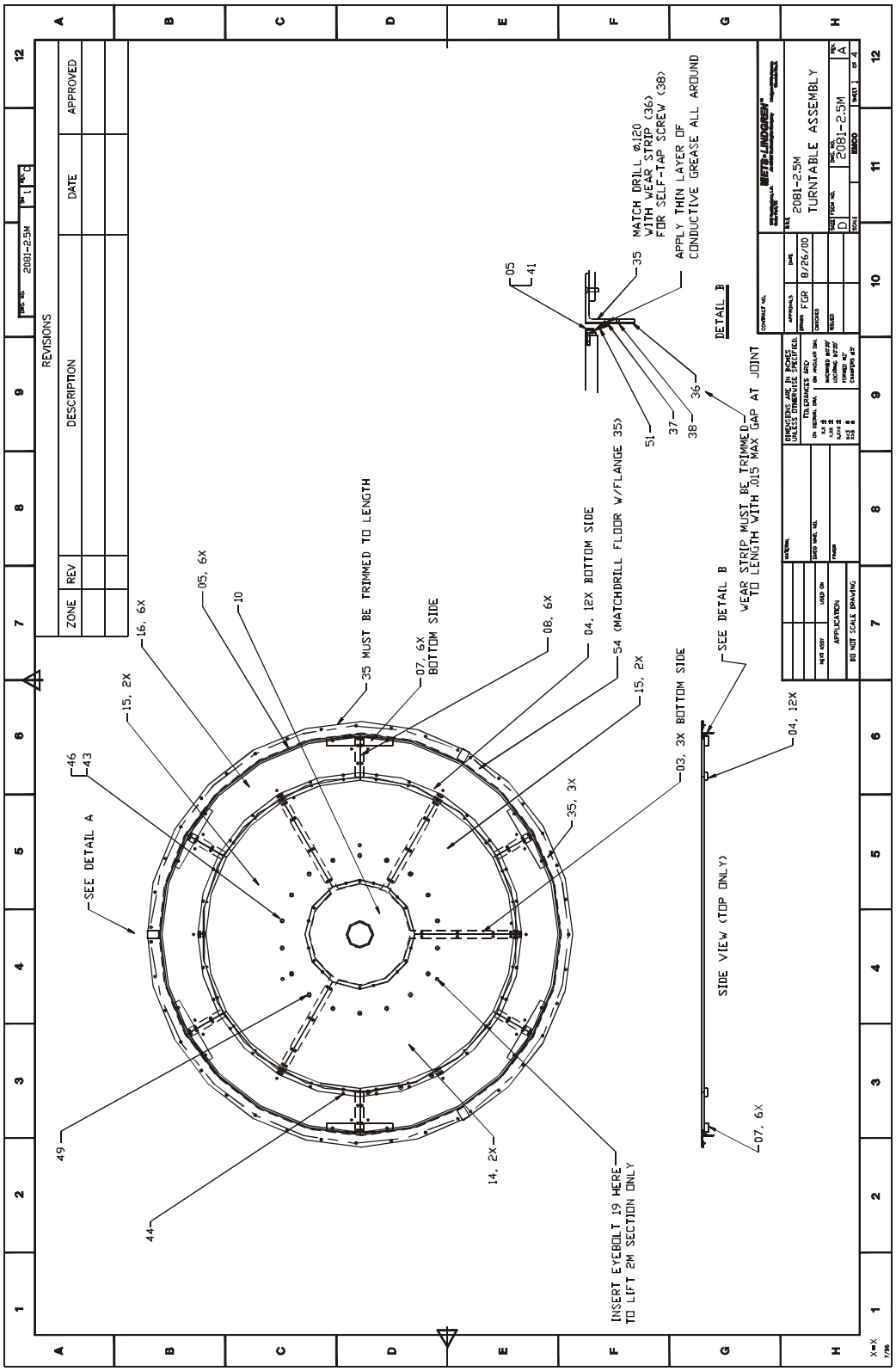


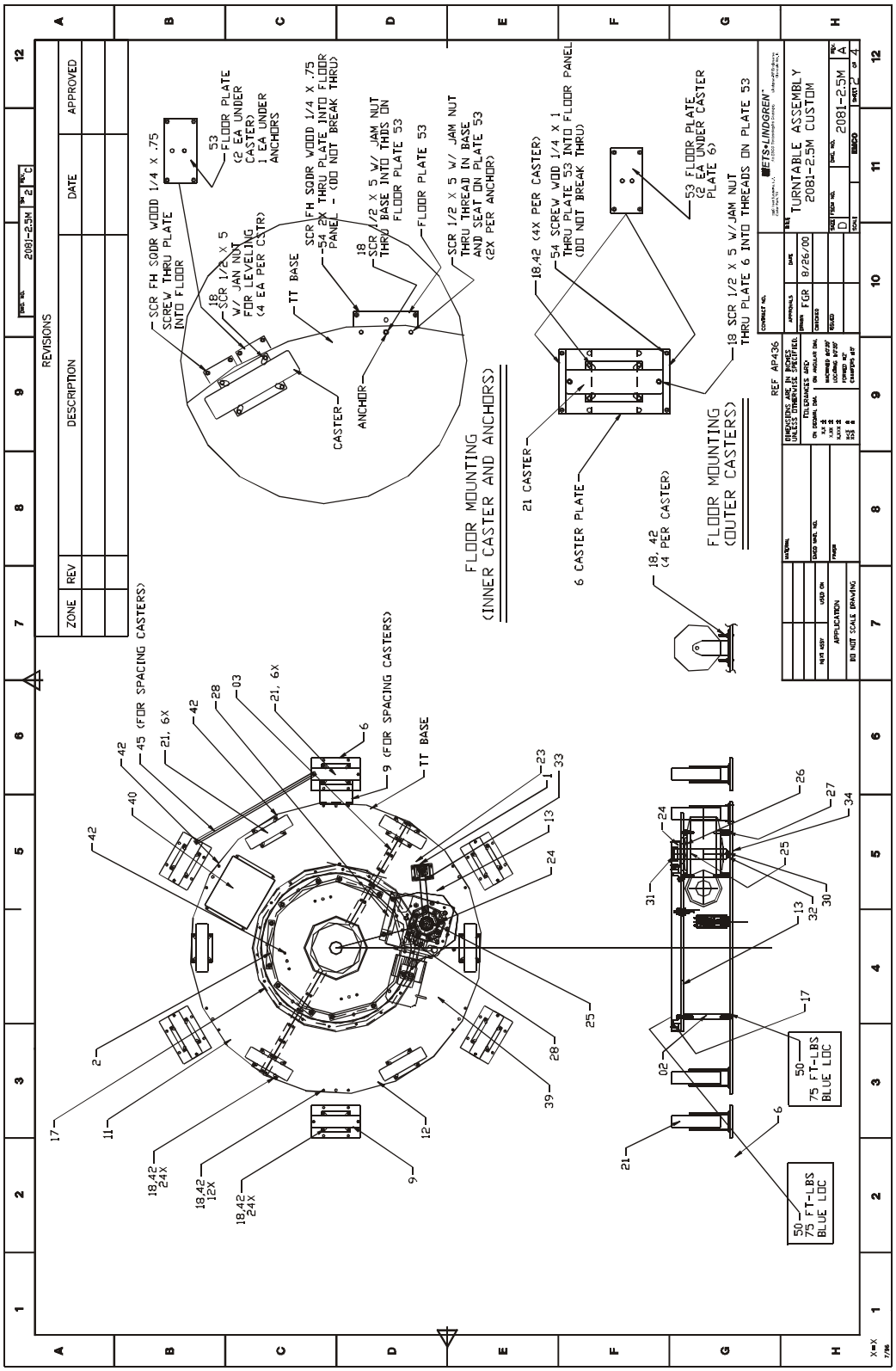


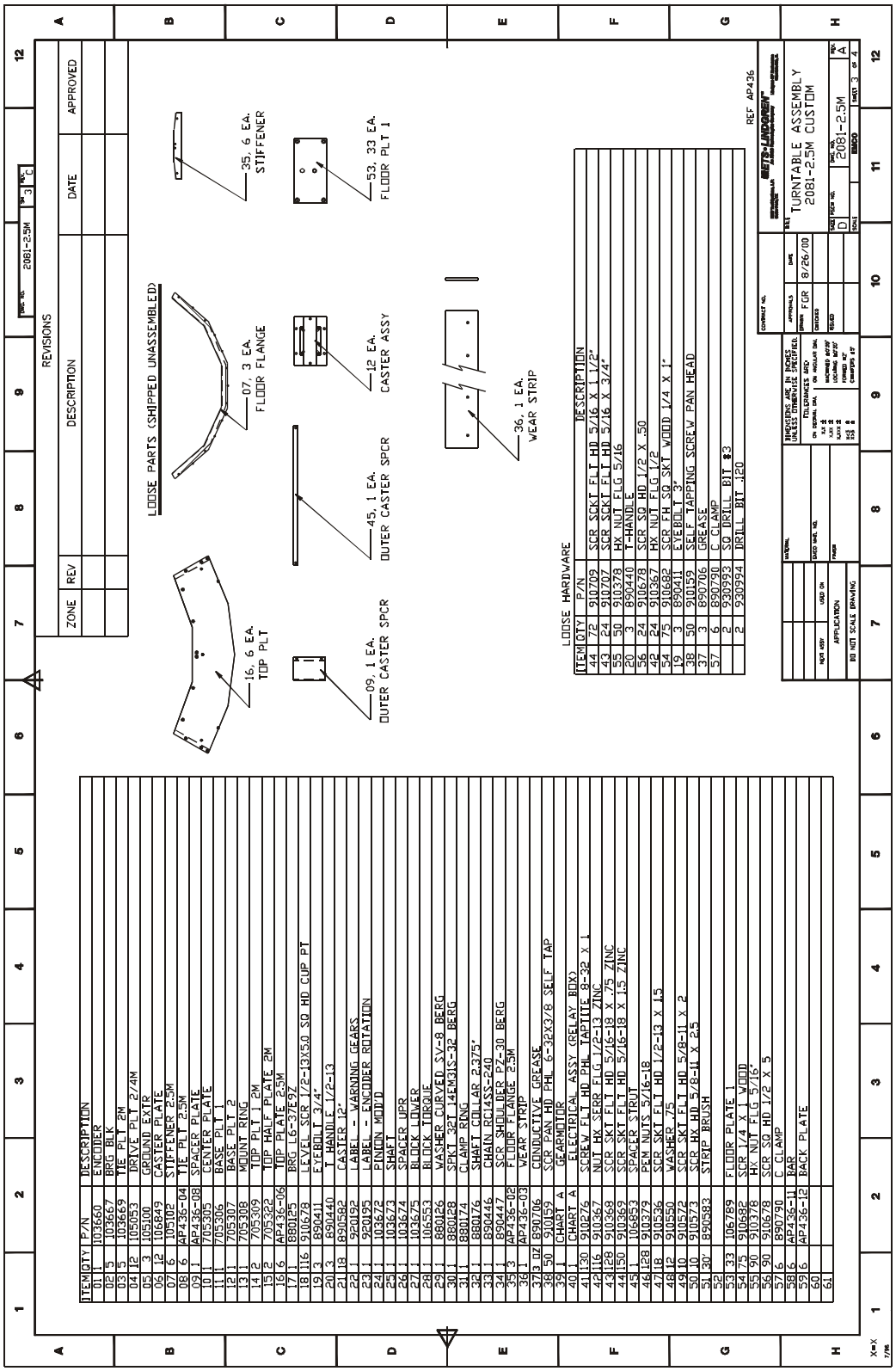


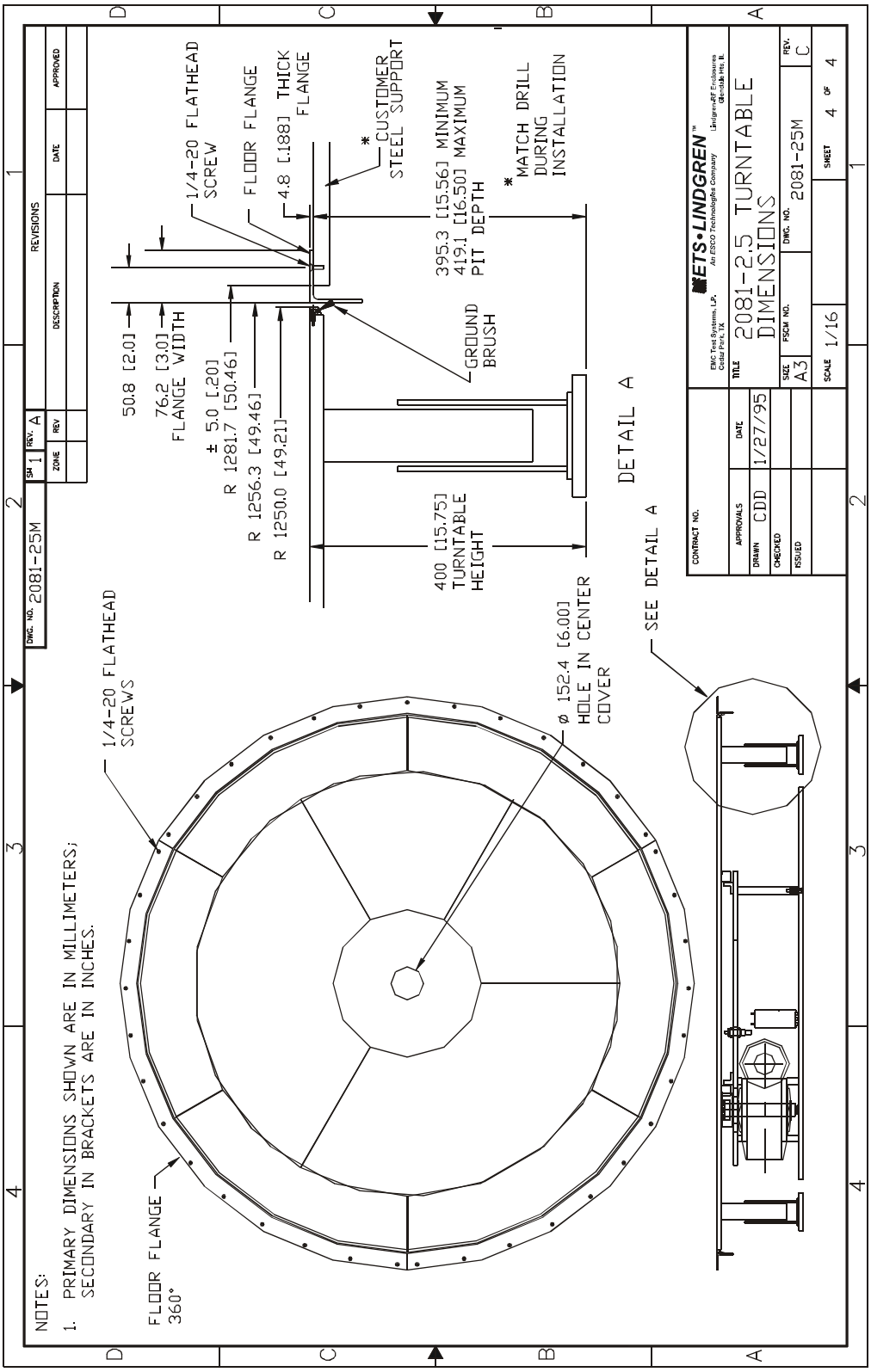
ITEM	QTY	P/N	DESCRIPTION
01	1	103660	ENCODER
02	5	103667	BEARING BLOCK
03	5	103669	TIE PLT 2M
04	5	103669	TIE PLT 2M
05	5	103669	TIE PLT 2M
06	5	103669	TIE PLT 2M
07	5	103669	TIE PLT 2M
08	5	103669	TIE PLT 2M
09	5	103669	TIE PLT 2M
10	1	705305	CENTER PLATE
11	1	705306	BASE PLT 1
12	1	705307	BASE PLT 2
13	1	705308	MOUNT RING
14	2	705309	TOP PLT 1 2M
15	2	705322	TOP HALF PLATE 2M
16			
17	1	880125	BRG L6-37E9Z
18	116	910678	LEVEL SCR 1/2-13X5.0 SQ HD CUP PT
19	3	890411	EYEBOLT 3/4"
20	3	890440	T HANDLE 1/2-13
21	18	890582	CASTER 12"
22	1	920192	LABEL - WARNING GEARS
23	1	920195	LABEL - ENCODER ROTATION
24	1	103672	PINION MOD D
25	1	103673	SHAFT
26	1	103674	SPACER UPR
27	1	103675	BLOCK LWR
28	1	106553	BLOCK TORQUE
29	1	880126	WASHER CVRED SV-8 BERG
30	1	880128	SPKT 32T 14EM31S-32 BERG
31	1	880174	CLAMP RING
32	1	880176	SHAFT COLLAR 2.375"
33	1	890446	CHAIN RC14SS-240
34	1	890446	CHAIN RC14SS-240
35	1	890446	CHAIN RC14SS-240
36	1	890446	CHAIN RC14SS-240
37	3	890706	CONDUCTIVE GREASE
38	50	910159	SCR PAN HD PHL 6-32X3/8 SELF TAP
39	1	CHART A	GEARMOTOR
40	1	CHART A	ELECTRICAL ASSY (RELAY BOX)
41	130	910276	SCREW FLT HD PHL TAPTITE 8-32 X 1
42	116	910367	NUT HX SERR FLG 1/2-13 ZINC
43	128	910368	SCR SKT FLT HD 5/16-18 X .75 ZINC
44	150	910369	SCR SKT FLT HD 5/16-18 X 1.5 ZINC
45			
46	128	910379	PEM NUTS 5/16-18
47	18	910536	SCR SKT FLT HD 1/2-13 X 1.5
48	12	910550	WASHER .75
49	10	910572	SCR SKT FLT HD 5/8-11 X 2
50	10	910573	SCR HX HD 5/8-11 X 2.5
51	35	890583	STRIP BRUSH
52			
53	12	106789	FLOOR PLATE 1
54	10	910682	SCR FLHD 1/4 X 1" WOOD
55			
56			
57			
58	2	930993	SQ DRILL BIT #3
59	2	930994	DRILL BIT .120 (#31)
60			
61			

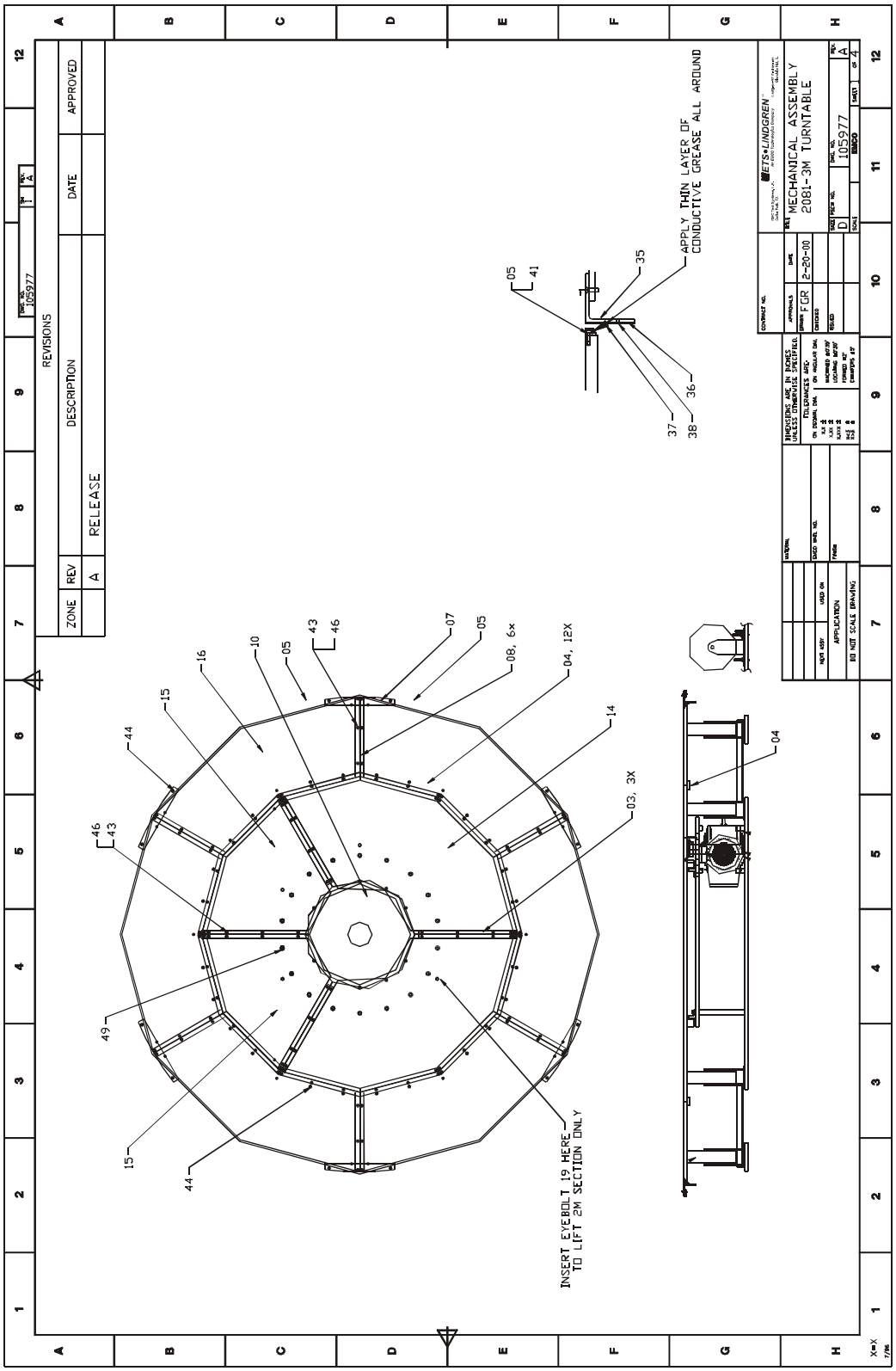


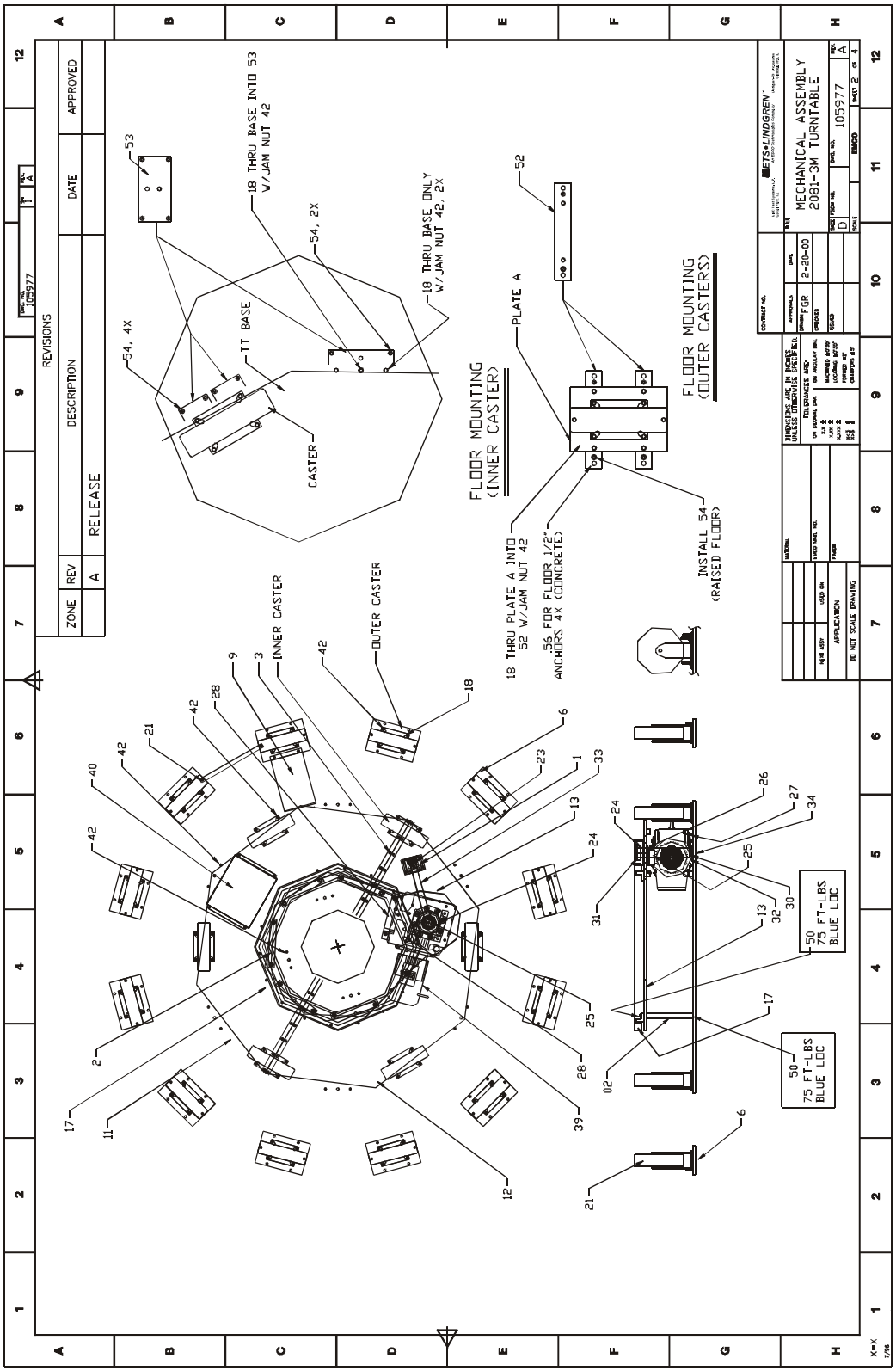


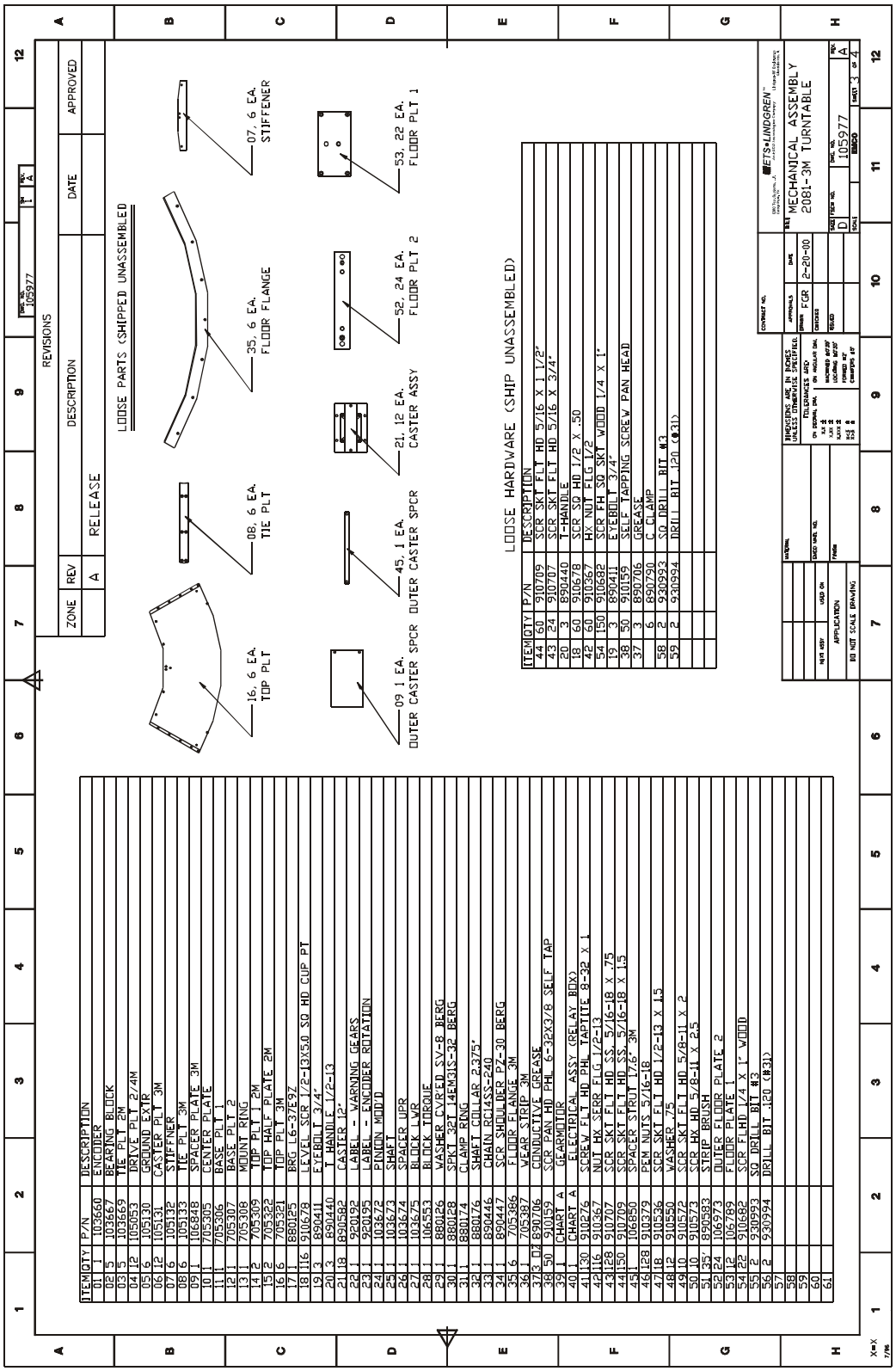




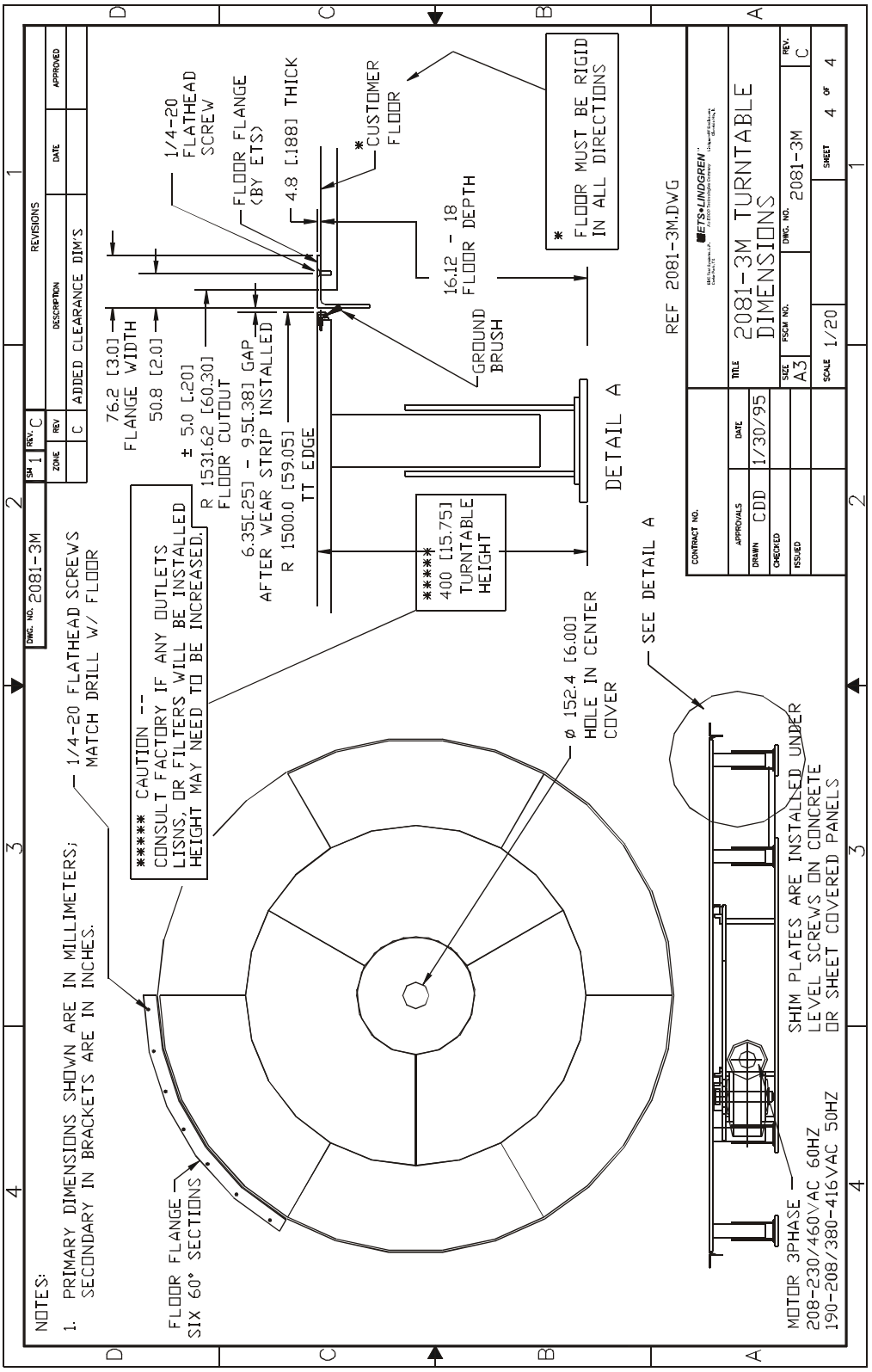


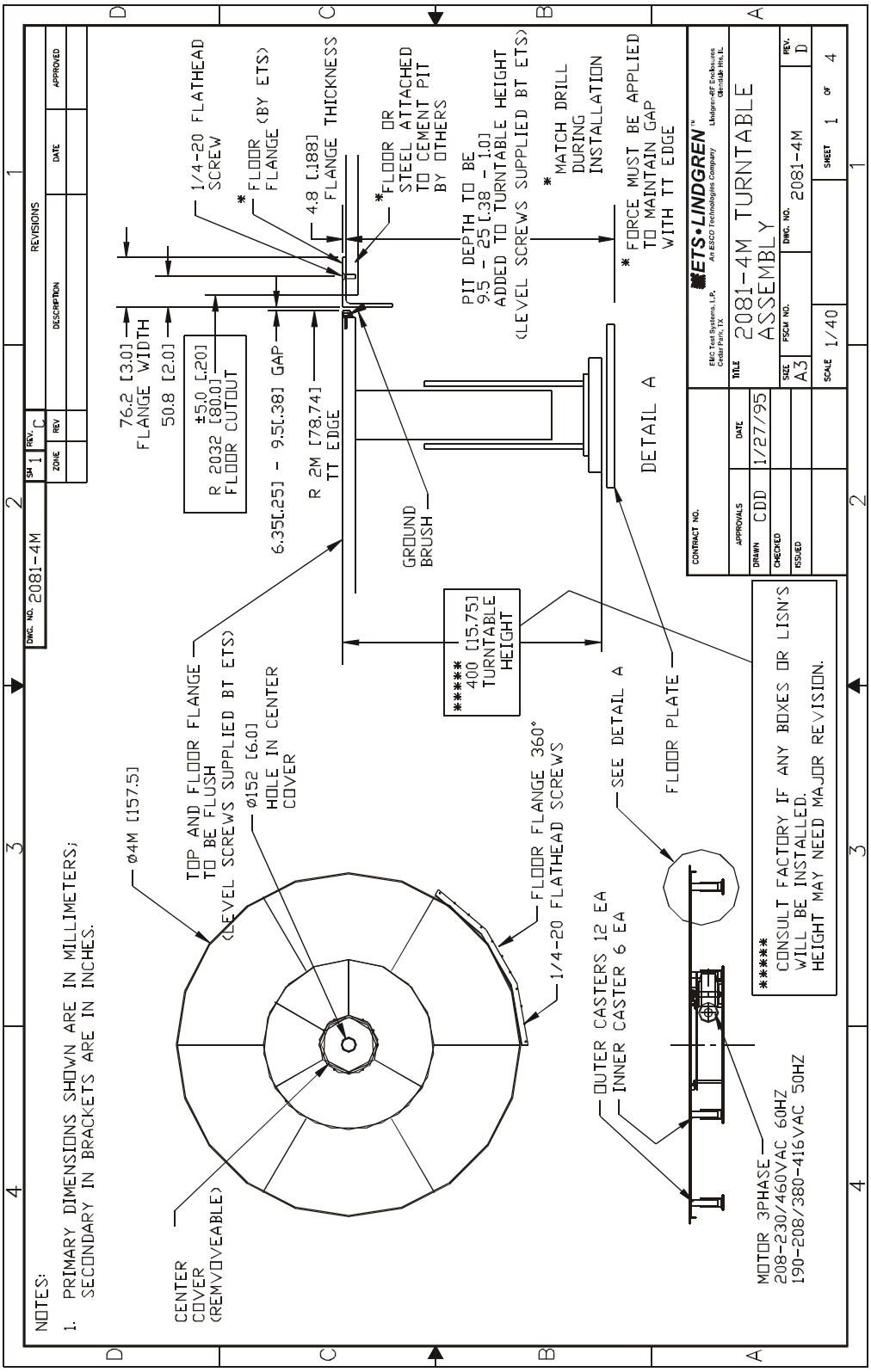


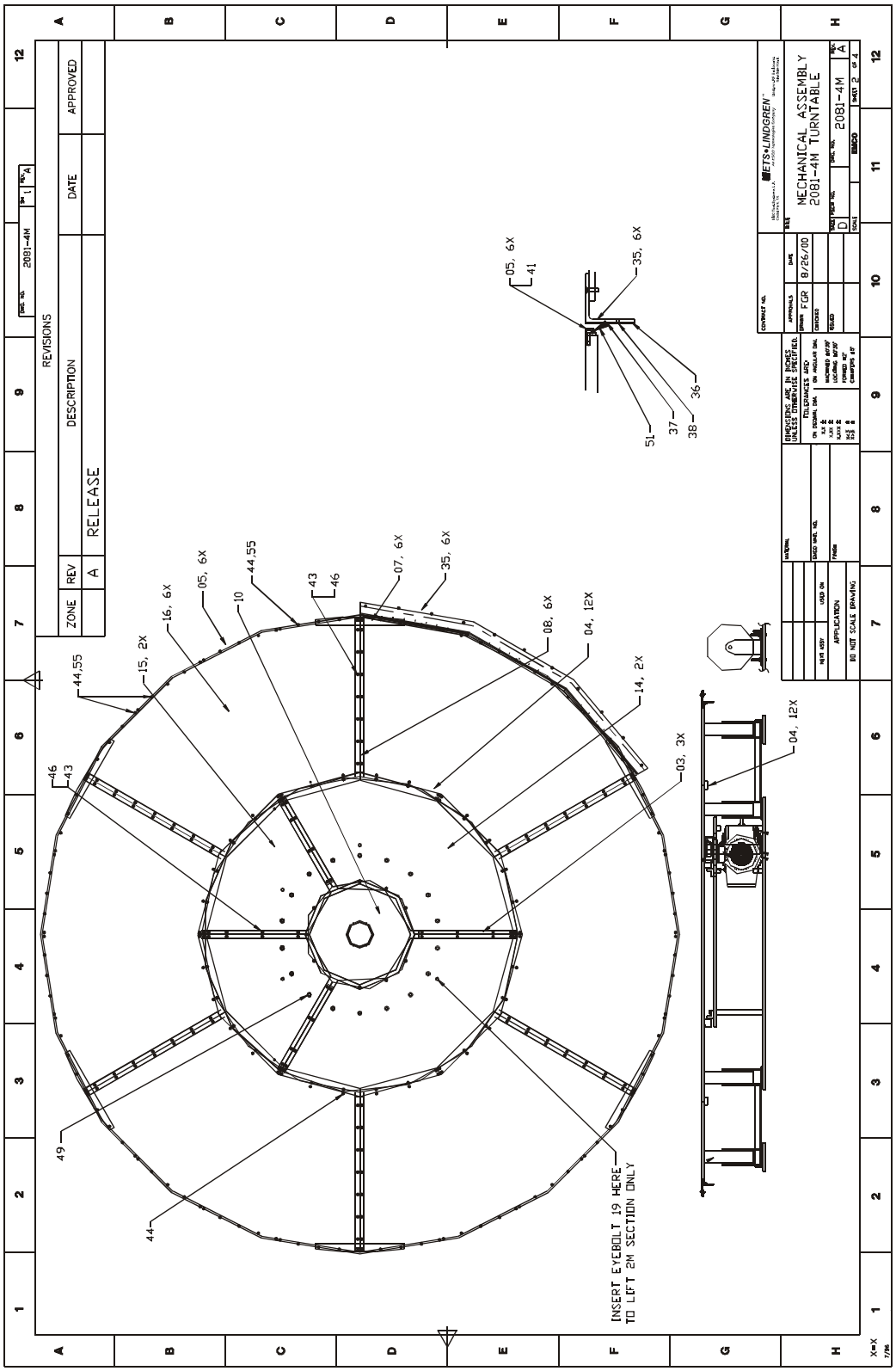


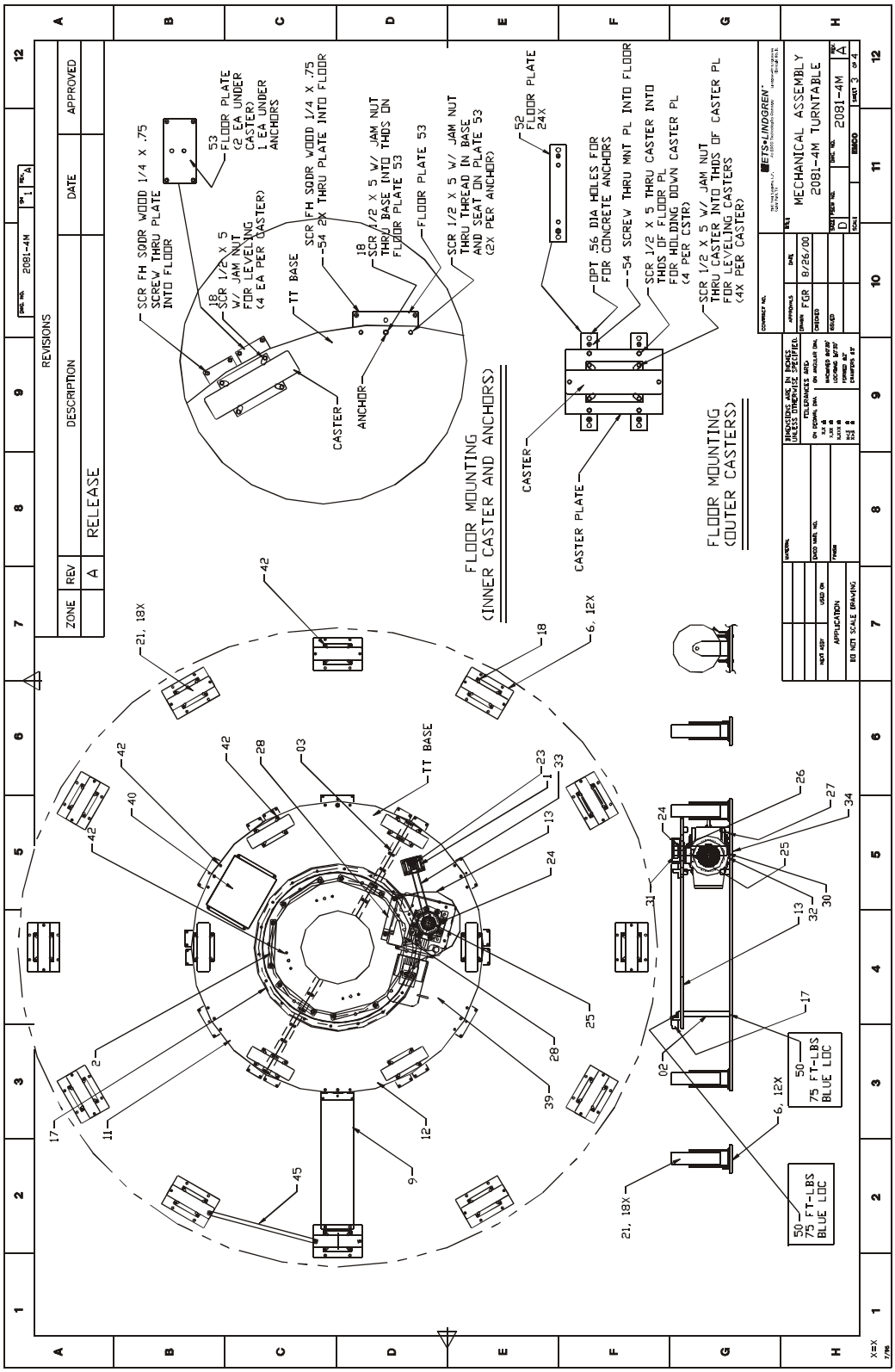


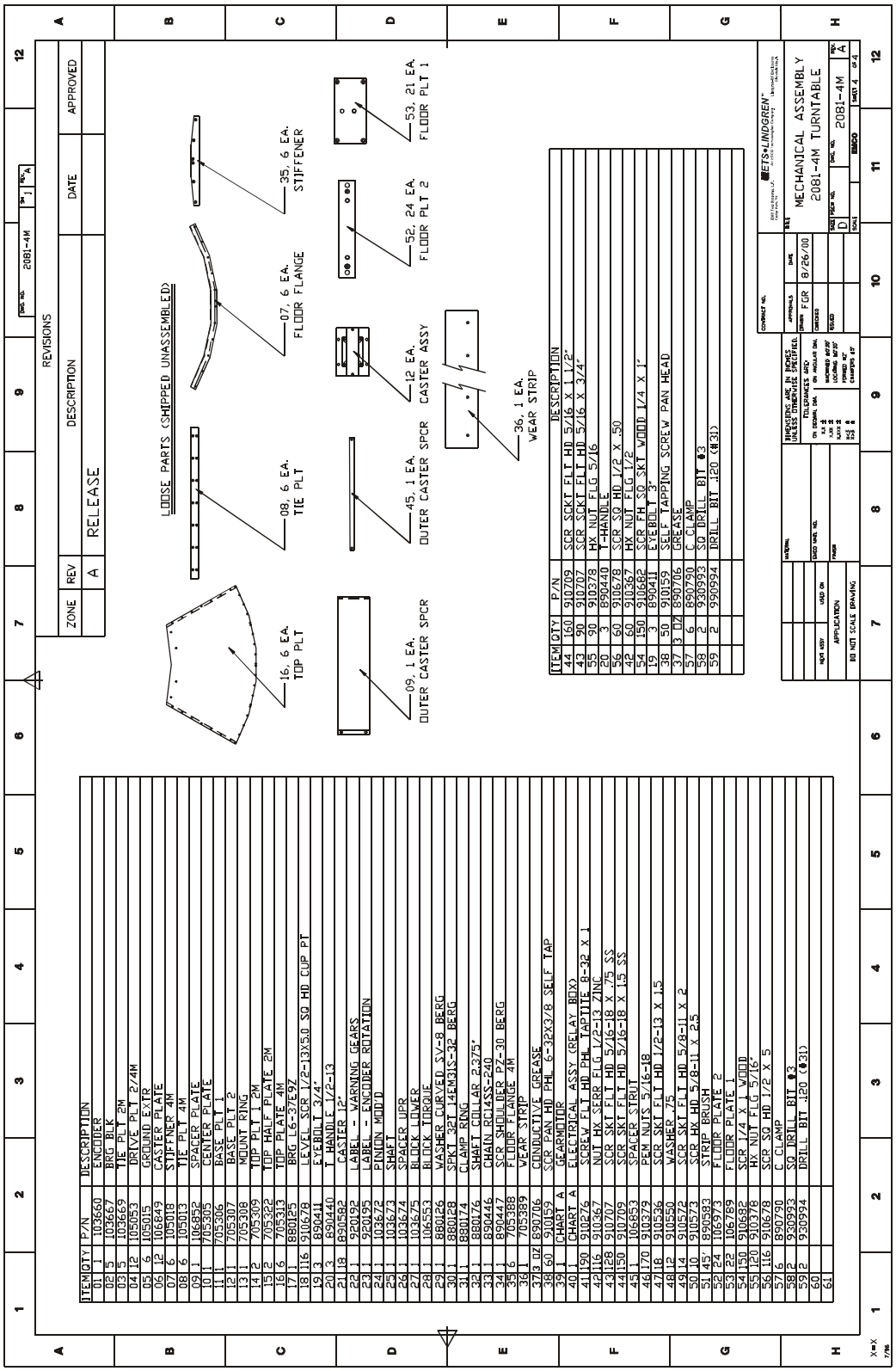
ITEM	QTY	P/N	DESCRIPTION
01	1	103660	ENCODER
02	5	103667	BEARING BLOCK
03	5	103669	TIE PLT 2M
04	12	105053	DRIVE PLT 2.4M
05	6	105130	GROUND EXTR
06	12	105131	CASTER PLT 3M
07	6	105132	STIFFNER
08	6	105133	TIE PLT 3M
09	1	106848	SPACER PLATE 3M
10	1	705305	CENTER PLATE
11	1	705306	BASE PLT 1
12	1	705307	BASE PLT 2
13	1	705308	MOUNT RING
14	2	705309	TOP PLT 1 2M
15	2	705322	TOP HALF PLATE 2M
16	6	705321	TOP PLT 3M
17	1	880125	BRG L6-37E9Z
18	116	910678	LEVEL SCR 1/2-13X5.0 SQ HD CUP PT
19	3	890411	EYEBOLT 3/4"
20	3	890440	T HANDLE 1/2-13
21	18	890582	CASTER 12"
22	1	920192	LABEL - WARNING GEARS
23	1	920195	LABEL - ENCODER ROTATION
24	1	103672	PINION MOD D
25	1	103673	SHAFT
26	1	103674	SPACER UPR
27	1	103675	BLOCK LWR
28	1	106553	BLOCK TORQUE
29	1	880126	WASHER CVRED SV-8 BERG
30	1	880128	SPKT 32T 14EM31S-32 BERG
31	1	880174	CLAMP RING
32	1	880176	SHAFT COLLAR 2.375"
33	1	890446	CHAIN RC14SS-240
34	1	890447	SCR SHOULDER P2-30 BERG
35	6	705386	FLOOR FLANGE 3M
36	1	705387	WEAR STRIP 3M
37	3	890706	CONDUCTIVE GREASE
38	50	910159	SCR PAN HD PHL 6-32X3/8 SELF TAP
39	1	CHART A	GEARMOTOR
40	1	CHART A	ELECTRICAL ASSY (RELAY BOX)
41	130	910276	SCREW FLT HD PHL TAPTITE 8-32 X 1
42	116	910367	NUT HX SERR FLG 1/2-13
43	128	910707	SCR SKT FLT HD SS 5/16-18 X .75
44	150	910709	SCR SKT FLT HD SS 5/16-18 X 1.5
45	1	106850	SPACER STRUT 17.6" 3M
46	128	910379	PEM NUTS 5/16-18
47	18	910536	SCR SKT FLT HD 1/2-13 X 1.5
48	12	910550	WASHER .75
49	10	910572	SCR SKT FLT HD 5/8-11 X 2
50	10	910573	SCR HX HD 5/8-11 X 2.5
51	35	890583	STRIP BRUSH
52	24	106973	OUTER FLOOR PLATE 2
53	12	106789	FLOOR PLATE 1
54	22	910682	SCR FLHD 1/4 X 1" WDDD
55	2	920993	SQ DRILL BIT #3
56	2	920994	DRILL BIT .120 (#31)
57			
58			
59			
60			
61			











ITEM	QTY	P/N	DESCRIPTION
01	1	103660	ENCODER
02	5	103667	BRG BLK
03	5	103669	TIE PLT 2M
04	12	105053	DRIVE PLT 2/4M
05	6	105015	GROUND EXTR
06	12	106849	CASTER PLATE
07	6	105018	STIFFNER 4M
08	6	105013	TIE PLT 4M
09	1	106852	SPACER PLATE
10	1	705305	CENTER PLATE
11	1	705306	BASE PLT 1
12	1	705307	BASE PLT 2
13	1	705308	MOUNT RING
14	2	705309	TOP PLT 1 2M
15	2	705322	TOP HALF PLATE 2M
16	6	705313	TOP PLATE 4M
17	1	880125	BRG L6-37692
18	16	910678	LEVEL SCR 1/2-13X5.0 SQ HD CUP PT
19	3	890441	EYEBOLT 3/4"
20	3	890440	T HANDLE 1/2-13
21	18	890582	CASTER 12"
22	1	920192	LABEL - WARNING GEARS
23	1	920195	LABEL - ENCODER ROTATION
24	1	103672	PINION MOD D
25	1	103673	SHAFT
26	1	103674	SPACER UPR
27	1	103675	BLOCK LOWER
28	1	106553	BLOCK TORQUE
29	1	880126	WASHER CURVED SV-8 BERG
30	1	880128	SPKT 32T 14EM31S-32 BERG
31	1	880174	CLAMP RING
32	1	880176	SHAFT COLLAR 2.375"
33	1	890446	CHAIN RC14SS-240
34	1	890447	SCR SHOULDER PZ-30 BERG
35	6	705388	FLOOR FLANGE 4M
36	1	705389	WEAR STRIP
37	3 OZ	890706	CONDUCTIVE GREASE
38	60	90159	SCR PAN HD PHL 6-32X3/8 SELF TAP
39	1	CHART A	GEARMOTOR
40	1	CHART A	ELECTRICAL ASSY (RELAY BOX)
41	190	910276	SCREW FLT HD PHL TAPTITE 8-32 X 1
42	116	910367	NUT HX SERR FLG 1/2-13 ZINC
43	128	910707	SCR SKT FLT HD 5/16-18 X .75 SS
44	150	910709	SCR SKT FLT HD 5/16-18 X 1.5 SS
45	1	106853	SPACER STRUT
46	170	910379	PEM NUTS 5/16-18
47	18	910536	SCR SKT FLT HD 1/2-13 X 1.5
48	12	910550	WASHER .75
49	14	910572	SCR SKT FLT HD 5/8-11 X 2
50	10	910573	SCR HX HD 5/8-11 X 2.5
51	45'	890583	STRIP BRUSH
52	24	106973	FLOOR PLATE 2
53	22	106789	FLOOR PLATE 1
54	150	910682	SCR 1/4 X 1 WOOD
55	120	910378	HX NUT FLG 5/16"
56	116	910678	SCR SQ HD 1/2 X 5
57	6	890790	C CLAMP
58	2	930993	SQ DRILL BIT #3
59	2	930994	DRILL BIT .120 (#31)
60			
61			

ITEM	QTY	P/N	DESCRIPTION
44	160	910709	SCR SCKT FLT HD 5/16 X 1 1/2"
43	90	910707	SCR SCKT FLT HD 5/16 X 3/4"
55	90	910378	HX NUT FLG 5/16
20	3	890440	T-HANDLE
56	60	910678	SCR SQ HD 1/2 X 50
42	60	910367	HX NUT FLG 1/2
54	150	910682	SCR FH SQ SKT WOOD 1/4 X 1"
19	3	890411	EYEBOLT 3"
38	50	910159	SELF TAPPING SCREW PAN HEAD
37	3 OZ	890706	GREASE
57	6	890790	C CLAMP
58	2	930993	SQ DRILL BIT #3
59	2	990994	DRILL BIT .120 (#31)