Model 2065

LoPro Turntable

Electric-powered 1.2m Turntable

MANUAL

ETS·LINDGREN™

An ESCO Technologies Company

REV F – PN 399230

Note: Model 2065 on cover shown with optional shaft kit.

E-MAIL & INTERNET
Support@ets-lindgren.com
http://www.ets-lindgren.com

USA
1301 Arrow Point Dr., Cedar Park, TX 78613
P.O. Box 80589, Austin, TX 78708-0589
Tel 512.531.6400 Fax 512.531.6500

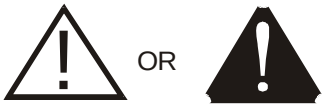
FINLAND
Euroshield OY
Mekaanikontie 1
27510, Eura, Finland
Tel 358.2.838.3300
Fax 358.2.865.1233

SINGAPORE
Lindgren RF Enclosures Asia-Pacific
87 Beach Road
#06-02 Chye Sing Building
Singapore 189695
Tel 65.536.7078 Fax 65.536.7093

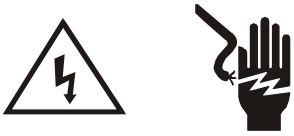
Table of Contents

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 Model 2065 is an electric-powered turntable platform system designed to be used with the Model 2090 Positioning Controller for EMI compliance testing. The Model 2065 Turntable is a low-profile design which is constructed of PVC plate with a textured ABS top and other non-metallic components. The 1.2 meter diameter turntable is provided as an easily assembled system which can be disassembled for service or to be moved. The mechanical assembly, motor drive unit, and shaft kit (optional), comprise the three basic subassemblies of the turntable.

The mechanical assembly is shipped assembled with the top, base, gear box, support bearings and drive belt included. The bearings on which the table rotates are integral to the top and bottom of the turntable. Three independent bearing races provide support for the inner and outer portions of the turntable top. These bearings are of a completely non-metallic construction. There are four keepers located on the outside of the turntable top. These keepers prohibit the bearings from shifting out of position during shipment. When the user has the table set in place and is ready to begin testing, these should be removed.

The motor drive, encoder and limit switch assemblies are located in a shielded enclosure with state of the art I/O provided via a fiber optic interface. The motor drive is coupled to the drive shaft with a flexible hose coupling. The other end of the shaft connects to the turntable gear box with a keyed coupling that clamps between the two shafts. The shaft assembly transmits torque from the motor drive to the gear box at the table. The drive belt, which runs around the underside of the turntable at its perimeter, is driven by a pulley in the gear box.

To limit over-travel of the turntable in either direction of movement, fixed mechanical limits are installed in the motor base enclosure. The primary means of limiting the turntable's rotation are the soft (electrical) limits which are set on the front panel of the Model 2090 Positioning Controller. These soft limits should be set

within the mechanical limits. The mechanical limits are secondary and a safety stop to limit the turntable's total rotation.

Overshoot of the turntable's rotation is limited by an electric brake which is directly attached to the drive motor. The Model 2090 Positioning Controller compensates for any remaining overshoot by applying an overshoot compensation routine which is accomplished automatically without any user input.

MODEL 2065 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 Motor Base Unit of the Model 2065 Low Profile Turntable. Functions include: Clockwise (CW), Counterclockwise (CCW) and Hand/Main Control selection.

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 than 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 custom order. The standard length provided is 10 m (32.8 ft).

Shaft Kit (Optional): This option allows the user to position the electric drive motor farther away from the turntable. The extension shaft separates the turntable and the drive motor by as much as 5 m (16.4ft). Following the detailed instructions in this manual, it may be cut to a custom length. This option must be specified at the time the order is placed.

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.

Do not attempt to service unless qualified to do so. As with any electrical equipment, ensure that electrical power to the unit 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 operate this equipment with the protective covers removed.

Do not, at any time, place hands or feet in the vicinity of the drive gears 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 appropriate scheduled maintenance in accordance with factory recommendations.

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

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.

The keepers on the outside edge of the turntable should be in place when the turntable is to be moved or relocated. This will prevent damage to the bearings on which the turntable top rotates.

INSTALLATION

The Model 2065 turntable is shipped partially assembled. It is anticipated that assembly will take no longer than 1 hour. Ensure that a clear area is available to unpack, assemble and install the turntable. Prior to starting assembly, open the shipping container and check all parts for any shipping damage. **NOTE:** Do not discard any packing material until the turntable is fully installed and operational.

WHAT IS INCLUDED IN SHIPMENT

Attention: Completely check all packing material for parts before discarding.

You should have received the following items:

Item	Part Number	Quantity
2065 Turntable Assembly		1 ea.
Motor Base Assembly	105772	1 ea.
Tie Bracket	105728	1 ea.
Standoff	890508	2 ea.
½-13 x ¾ " Hex Bolt	910551	2 ea.
¼ x 1 – ¼" Hex Bolt	910449	2 ea.
Hose Clamp	890684	2 ea.
Hose Coupling	860204	.25 ft
Fiber-optic Cable	705344-10	1 ea.
Manual	399230	1 ea.
Shaft Kit (optional)	106555	1 ea.

TOOLS REQUIRED

Level
Adjustable Wrench
Phillips and flat head screwdrivers
Shims – if the floor surface is not level

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 2065 Low Profile 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. 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. 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 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.

ASSEMBLY INSTRUCTIONS

CAUTION Ensure power is OFF and secured before proceeding further.

1) Position the turntable mechanical assembly on the floor. The turntable mechanical assembly has a 44 inch (112 cm) wide base plate that needs to rest on a flat surface. To insure proper alignment of the drive shaft, the bottom surface of all three sub assemblies: the TT mechanical assembly, the drive shaft assembly and the motor drive will need to be installed at the same level with each other. It may be necessary to place shims under the base if the floor is not flat. The table base plate has four holes for fastening the unit to the floor using 5/16" diameter screws but will stay in place due to its own weight.

2) After the turntable is in position, remove the plastic gear box cover plate by loosening the 4 plastic bolts used to hold it in place.

If the optional shaft kit was purchased please continue to the Optional Shaft Kit Installation Instructions and disregard the remainder of the instructions in this section.

3) Install the aluminum shaft adapter to the black shaft out of the turntable gearbox. A ¼" phenolic (brown plastic) pin is used to key it to the black shaft. A spacer piece fits inside the shaft adapter, between the adapter and the pin to help secure the pin in place. Two setscrews (size 8-32) lock the adapter in place on the shaft.

4) The gray hose coupling with two hose clamps around it is now slipped on to the shaft adapter.

5) The motor drive is held to the turntable base by an aluminum bracket. The bracket attaches to the ¾" base plate of the turntable using two ½-13 x ¾" bolts. There are two standoffs that attach the bracket to the motor base at the correct distance.

6) Position the motor drive so that its shaft slips into the hose coupling. The bracket installed in step 5 should now be in place. Secure the bracket to the motorbase using the ¼ x 1-1/4" hex head cap screws provided. Both hose clamps should be tightened to secure the gray hose coupling around the shafts.

7) The gearbox cover can now be placed on the gearbox and the 4 bolts that hold it in place inserted and tightened.

OPTIONAL SHAFT KIT INSTALLATION INSTRUCTIONS

The Optional Shaft Kit allows the motor base to be positioned up to 5 meters (16.4 ft) away from the turntable. If the optional shaft kit was not purchased as part of this installation please continue to the "OPERATION" section.

The optional drive shaft assembly consists of an inner shaft mounted in an outer housing that is supported in the center and at each end by plastic floor supports. The instructions that follow provide guidance through the assembly process for the shaft as well as instructions for cutting the shaft components if a shorter distance between the motorbase and turntable is required.

WHAT IS INCLUDED IN SHIPMENT

Item	**Quantity**
Shaft Sections	2 ea.
Shaft Coupler	1 ea.
¼-20 Self Tapping Screws	4 ea.
End Floor Supports –these have a single clamp for a single item	2 ea.
Mid Floor Support – this has a double clamp for two items	1 ea.
Shaft Housings, 4.5 inches DIA	2 ea.
White Bushings – one will go at each end of the shaft housing assembly and one will go in the center between the two shaft housing components.	3 ea.

TOOLS REQUIRED

In addition to the tools required for basic installation:
Tape Measure
Drill
Assorted Bits including 7/32
Hand or Reciprocating Saw
Marker
File and or Sandpaper

DETERMINING THE LENGTH OF THE SHAFT

In order to install the shaft kit the customer needs to determine the dimensions DIM1 as shown on Drawing 4 in the back of the manual. This is the distance from the center of the turntable top to the end of the drive shaft floor support.

If DIM1 needs to be shorter than the standard 5 m (16ft 5 inches), then the drive shaft assembly needs to be cut to the proper lengths before attaching it to the turntable. Refer to the section "CUTTING THE DRIVE SHAFT ASSEMBLY" for instructions on cutting the shaft if a shorter length is required. Follow these instructions before continuing. No cutting is required if the standard length above is acceptable for installation.

The shaft must be the correct length before proceeding.

DRIVE SHAFT ASSEMBLY

To assemble the two sections of the drive shaft (A and B as shown in Drawing 8) using the coupling provided. Insert the 6.0 cm (2.37 in) diameter plain ends of the shaft sections into the coupling all the way to the step. Match drill the shaft sections through four pre-drilled holes in the coupling and install the four ¼-20 self tapping screws provided.

SHAFT HOUSING INSTALLATION

Next assemble one of the two PVC outer shaft housings into one of the two end floor supports. The floor supports are split into a top and bottom half that clamp together. Loosen the top ½-13 hex nuts to separate these two split pieces. Insert one white bushing followed by the end of one housing into the floor support. Then tighten the two top nuts to clamp the floors support around the housing and bushing.

Install the housing assembly onto the base plate of the turntable mechanical assembly using two ½-13 x 1.5 inch hex bolts that will be inserted through the tie plate. Be sure the housing is square with the turntable base to insure proper shaft alignment.

If DIM1 is 3035mm (9ft 11.5 inches) or less then the mid floor support is not needed go on to the "Drive Shaft Installation" section.

If DIM1 is more than 3035mm (9ft 11.5 inches) then the mid floor support is required.

If required, assemble the middle floor support with a white bushing onto the end of the shaft housing. Be sure the housing is square with the turntable base to insure proper drive-shaft alignment after final assembly.

DRIVE SHAFT INSTALLATION

The drive shaft has two "reduced ends". Be sure the 2.69 cm (1.06 in) diameter end with the groove goes toward the turntable. The knurled 2.54 cm (1.0 in) diameter end will point toward the motor drive.

NOTE: The coupling on the drive shaft will not fit through the white bushing if a middle support is used. The coupling should be on the motor drive side of the middle support when the drive shaft is installed into the housing.

1. Insert the turntable end of the drive shaft through the housing assembly and into the clamp coupling on the gearbox. A ¼ inch diameter x 1 inch dowel pin is furnished to key the shaft to the coupling and prevent slipping.
2. Loosen the three 3/8-16 hex head screws on the gearbox coupling before insertion. Place the ¼ inch diameter x 1 inch long dowel pin into the groove of the drive shaft and line the shaft and pin up with the groove in the coupling. With everything aligned, push the shaft and pin into the coupling. Leave about a ¼ inch gap between the 6.01 cm (2.37 in) diameter shaft shoulder and the end of the coupling. Then slowly tighten down the three screws on the coupling.
3. If the mid floor support was not required because DIM 1 was less than 3035mm (9ft 11.5 inches then delete the second shaft housing, skip step 4, and go on to step 5.

Otherwise continue with the next step.

4. If the second shaft housing is required then slip it around the shaft, into the middle floor support and clamp it in place. Only the one bushing that was installed earlier is needed in this support. There should be one more bushing that will be used in the next step.
5. Install the remaining bushing and floor support onto the motor drive end of the shaft housing. Guide the 2.54 cm (1 in) diameter end of the shaft to get it through the white bushing. The end of the shaft should be sticking out of the bushing approximately 5.08 cm (2.0 in). Be sure the housing extends out square with the base of the table to insure proper alignment.

CONNECTING THE SHAFT TO THE MOTOR DRIVE

Install the hose coupling onto the steel shaft of the motor drive unit with the two hose clamps provided resting loosely around the hose. Position the motor drive on the floor and slide the unit into place with the hose coupling connecting both shafts. Bolt the aluminum

tie bracket in place and installe one hose clamp onto the steel drive shaft and one onto the plastic shaft.

The floor supports and motor drive unit can now be fastened to the floor using 5/16 inch diameter screws through the mounting holes in the bottom base of the shaft supports and motor drive.

Reinstall the gearbox cover using four 3/8-16 x 1 inch hex screws. Be careful not to over-tighten these plastic bolts.

If desired cables can be run along a slot under the base of the turntable up through the opening at the center of the table. The slot is 1 cm (.40 in) deep and 2.54 cm (1 in) wide. It should accept a cable as large as 3/8 inch diameter.

CUTTING THE DRIVE SHAFT ASSEMBLY

The inner drive shaft is shipped separate from the turntable and consists of the following:

Drive shaft section (A) is 2.37 inches diameter by 82 inches long with a grooved 1.06 inch diameter end for the turntable side.

Drive shaft section (B) is 2.37 inches in diameter by 72 inches long with a knurled 1.0 inch diameter end for the motor drive side.

A shaft coupling with ¼-20 self-tapping screws for joining the above two shaft sections.

Follow the steps below to cut the shaft to the desired length. The material is PVC and can be cut with a hand saw or reciprocating saw with a 6 inch long blade.

1. Determine the distance DIM1 from the center of the turntable to the mounting holes in the floor support next to the motor drive unit. This DIM1 dimension will be critical in figuring the length of the drive shaft and shaft housing.
2. Determine the total length that the drive shaft needs to be after both sections (A) and (B) are connected with the coupling.
3. Subtract 978mm (38.5in) from DIM1 in step 1 to get the total overall length of the shaft.
4. Now subtract 6.3 mm (.25 inch) more to get the total combined cut length of sections (A) and (B). Note that the coupling will add 6.3mm (.25 inch) to the shaft length after the two sections are assembled.
5. Divide the total cut length in step 4 in half. Cut shaft (B) longer than (A) as follows:
    a. Add 3 inches to this half length and mark shaft A to this length measuring from the 1.0 inch diameter end.
    b. Subtract 3 inches from this half length and mark shaft B to this length measuring from the 1.06 inch diameter end.

This will make the coupling offset 3 inches from the center after it is assembled.

NOTE: Be sure to measure and mark each section from the small end (NOT THE PLAIN END). The length of section A (on the turntable side) should be at least 150mm (6 inches) longer than the other section B (on the motor side).

6. Place the shaft sections side by side to double check the length from small end to small end. Offset the cut marks 6.35mm (.25 inch) for the coupling. If the length is okay then cut the shaft pieces to length at the marks.
7. De-burr the cut ends before installing them in the coupling.
8. Install the plain end of each shaft into the coupling all the way to the step. The total overall length should be close to the length calculated in step 3.

CUTTING THE SHAFT HOUSING

9. The shaft housing(s) need to be cut next:
    a. If DIM1 in step1 was 3035mm (9ft 11.5inches) or less then the middle floor support IS NOT required – only one housing will be used. Continue to step 10.
    b. If DIM1 is more than 3035 mm (9ft 11.5inches) then the middle floor support will be required – two housings will be used. Continue to step 11.
10. Determine the total length of the shaft housing. Only one housing will be used. Subtract 4.75 inches from the overall length of the assembled shaft in step 3. Then cut one of the two housings to this length +/– 1/16 inch. Discard the other unused housing and mid floor support. Skip to step 12.
11. Determine the total combined length of the two shaft housings. Both housings will be used along with the middle floor support. Subtract 5.75 inches from the overall length of the assembled shaft to get the combined length of the housings. Cut each housing to one half this length +/- 1/16 inch. After

cutting the first housing determine the length that the second needs to be to get the total combined length.

12. The shaft housing pieces should now be ready to assemble per the “DRIVE SHAFT ASSEMBLY” section.

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.

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. Using this parameter, a variety of standard, retrofit, and custom devices can be used. The setting for the Model 2065 LoPro Turntable is:

3786 for models with a black turntable top
3665 for models with a gray turntable top

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.

CONTINUOUS ROTATION / DISENGAGING MECHANICAL LIMIT SWITHCES

(REFER TO DRAWING 11 in the back of the manual)
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 .63 cm (.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 untill 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.

CABLE PATH

There is a 1 cm (.40 in) high by 2.54 cm (1.0 in) wide slot on the bottom side of the TT base that can be used to run 3/8 inch maximum DIA cable from the side up through the center opening of the TT.

BELT TENSION

The drive belt is furnished fully tensioned on new units. After usage the belt may need to be tightened. (Refer to drawing 5 at the back of this manual.) To take up any slack in the belt, loosen the 6 bolts on the gearbox, move it outward and retighten.

HAND CONTROL UNIT

To connect the Hand Control Unit (HCU), remove the connector cap on the motor base. This connector is located adjacent to the fiber optic connectors on the side panel. Plug the cable connector from the HCU into the receptacle on the front panel of the Motor Base Unit and turn until tightened. The HCU is now ready to operate. Be sure to coordinate the use of the HCU with the operation of the Model 2090 Positioning Controller.

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

CAUTION Do not plug the Hand Control Unit into the motor base while the Motor Base Unit is operational. Coordinate with the operator of the Model 2090 Positioning Controller before plugging in, using or unplugging the Hand Control Unit. Do not push the CW and CCW buttons simultaneously. Be sure that the motor has come to a complete STOP before reversing direction.

When you are ready to return control back to the Model 2090 Positioning Controller, toggle the control switch from **HAND** to **MAIN**.

RECOMMENDED MAINTENANCE

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

CAUTION: Do not perform maintenance while the turntable is operating.

MONTHLY

Inspect the turntable assembly for loose fasteners, abnormal wear and oil leaks.

Verify the accuracy of the current position setting on the controller in relation to the turntable. The stopped position of the turntable platform at 0 degrees may drift over time depending un usage. See the sections “Setting Current Position on 2090” and “Caution: On Resetting Current Position on 2090” for more information about this procedure.

SEMI-ANNUALLY

Check all parts for wear.

The drive belt if furnished fully tensioned on new units. After usage the belt may need to be tightened. (Refer to drawing 5 in the back of the manual.) To take up any slack in the belt, loosen the 6 bolts on the gearbox, move it outward and retighten.

ANNUALLY

1. Grease the plastic miter gears. A silicone grease lubricant is recommended.
2. Clean the bearing races to remove any dust or dirt that may have accumulated. (see instructions below for this procedure)
3. Thoroughly inspect the unit for wear.

Cleaning the bearing races

To clean the bearing races the turntable top will need to be removed.

1. Remove the 8 bolts at the center ring in order to remove the center plate/flange that holds the turntable down.
2. If the keepers are in place holding the turntable top down at the four corners of the assembly remove the bolts that hold the 4 keepers in place and the keepers at the same time.
3. Gently lift the turntable top and place it to the side. The bearing races will now be exposed.
4. Remove the bearings and carefully place them into a container for safe storage so as not to loose any.
5. Use a clean, damp rag; moistened with water to clean the races. No lubrication is necessary in the tracks.
6. When you are through cleaning, replace the bearings in the tracks. Alternate the delrin and nylon bearings to improve wear characteristics. The delrin bearings are white while the nylon bearings have a tan tint to them. Gently replace the turntable surface to its original location. Insert the plate/flange in the center and the 8 bolts that hold it in place. If desired reinstall the four keepers at the edge of the turntable surface.

SPECIFICATIONS

ELECTRICAL

Nominal AC Voltage	115/230 VAC
Input Frequency	60/50 Hz
Current Rating	3.8/2.8 amps
RPM	1.2/1.0
Phase	Single
Motor Horsepower	1/6 HP

MECHANICAL

Turntable Diameter	1.22 m (48 in)
Nominal Turntable Height	50 mm (1.96 in)
Distributed Load Rating*	273 kg (600 lb.)

***Distributed Load Rating** applies when load is evenly distributed on top; no point loads under .19 sq. m (2 sq. ft) should exceed 100 kg (220 lb.); and not over 28.5 kg (63 lb.) should be applied to a 45 degree segment at the table's outer edge.

WARRANTY STATEMENT

EMC Test Systems, 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.

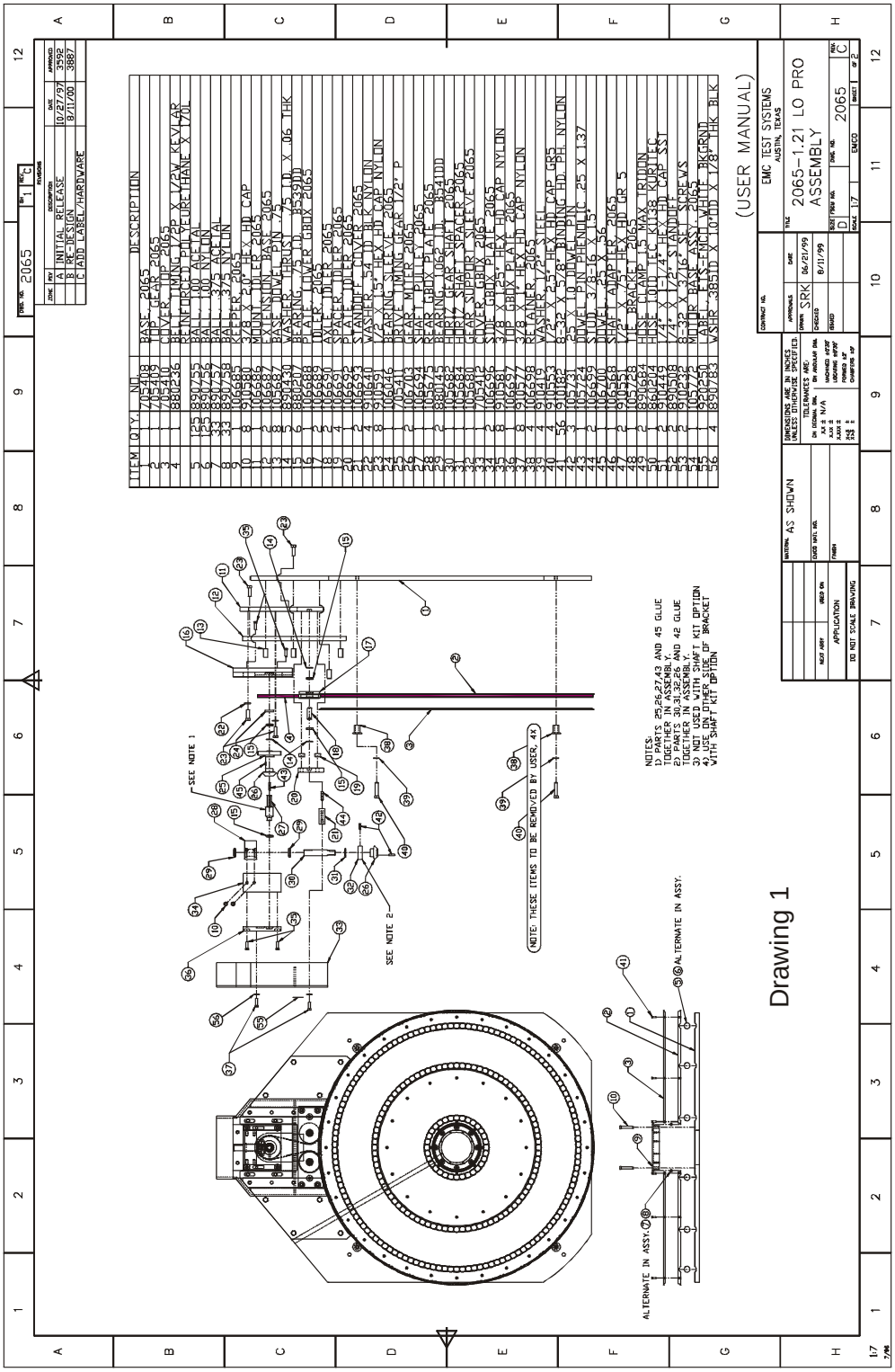
This warranty does not apply to:

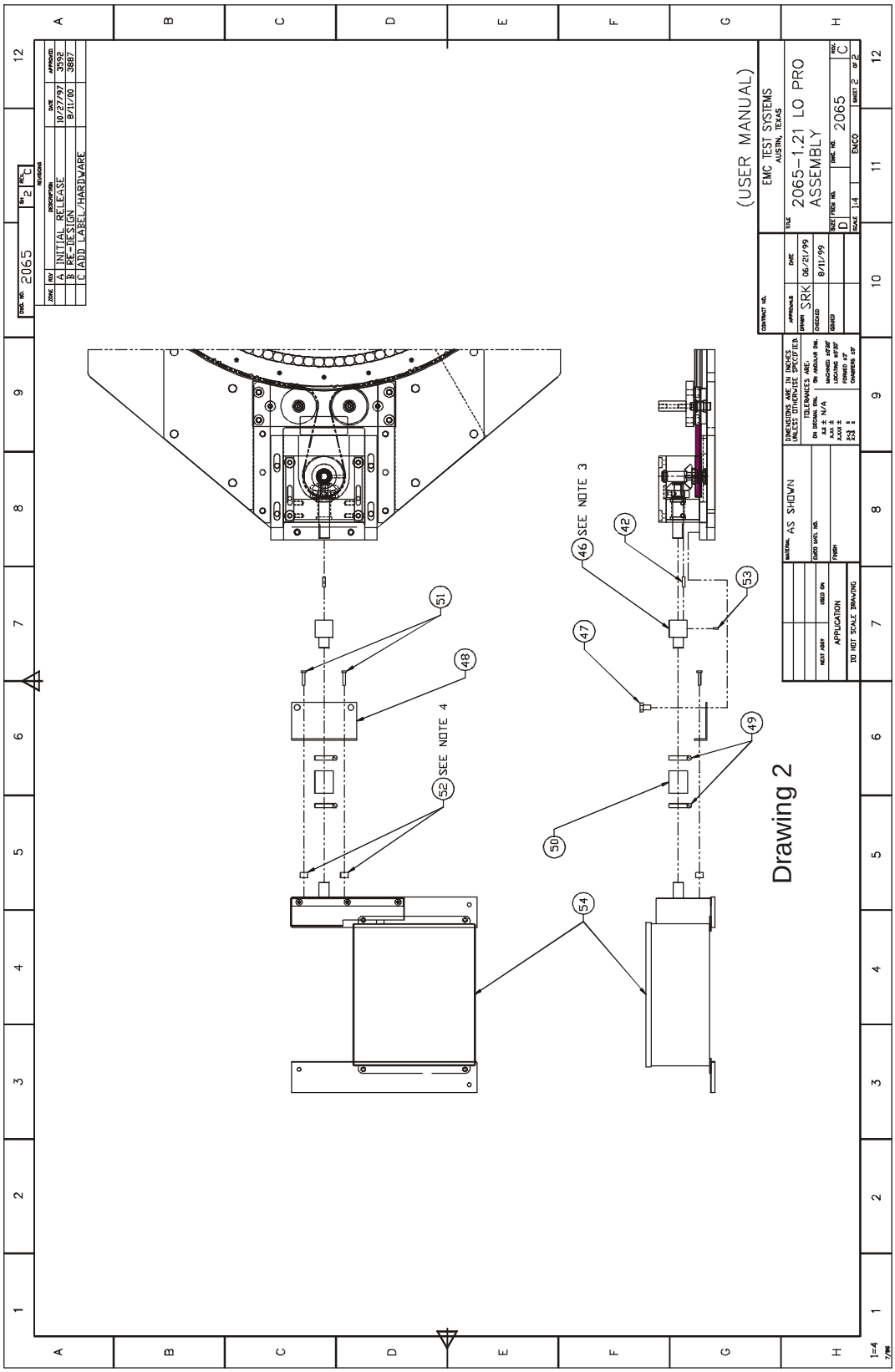
- Normal wear and tear of materials
- Consumable items such as fuses, batteries, etc.
- Products that have been improperly installed, maintained or used
- Products which have been operated outside the specifications
- Products which have been modified without authorization
- Calibration of products,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

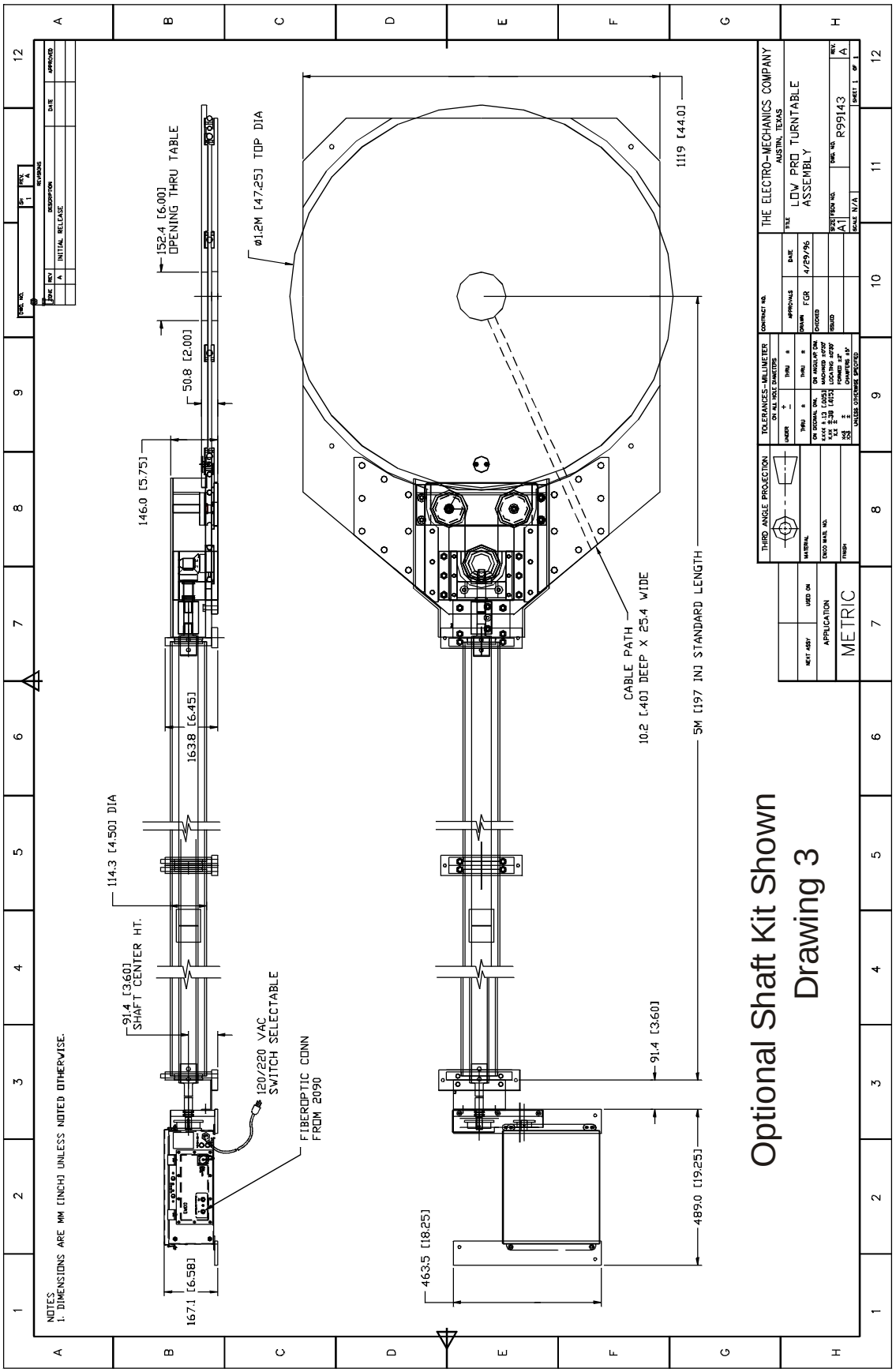
THIS WARRANTY IS EXCLUSIVE. NO OTHER WARRANTY, WRITTEN OR ORAL, IS EXPRESSED OR IMPLIED, INCLUDING BUT NOT LMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE REMEDIES PROVIDED BY THIS WARRANTY ARE THE BUYER'S SOLE AND EXCLUSIVE REMEDIES. IN NO EVENT IS THE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

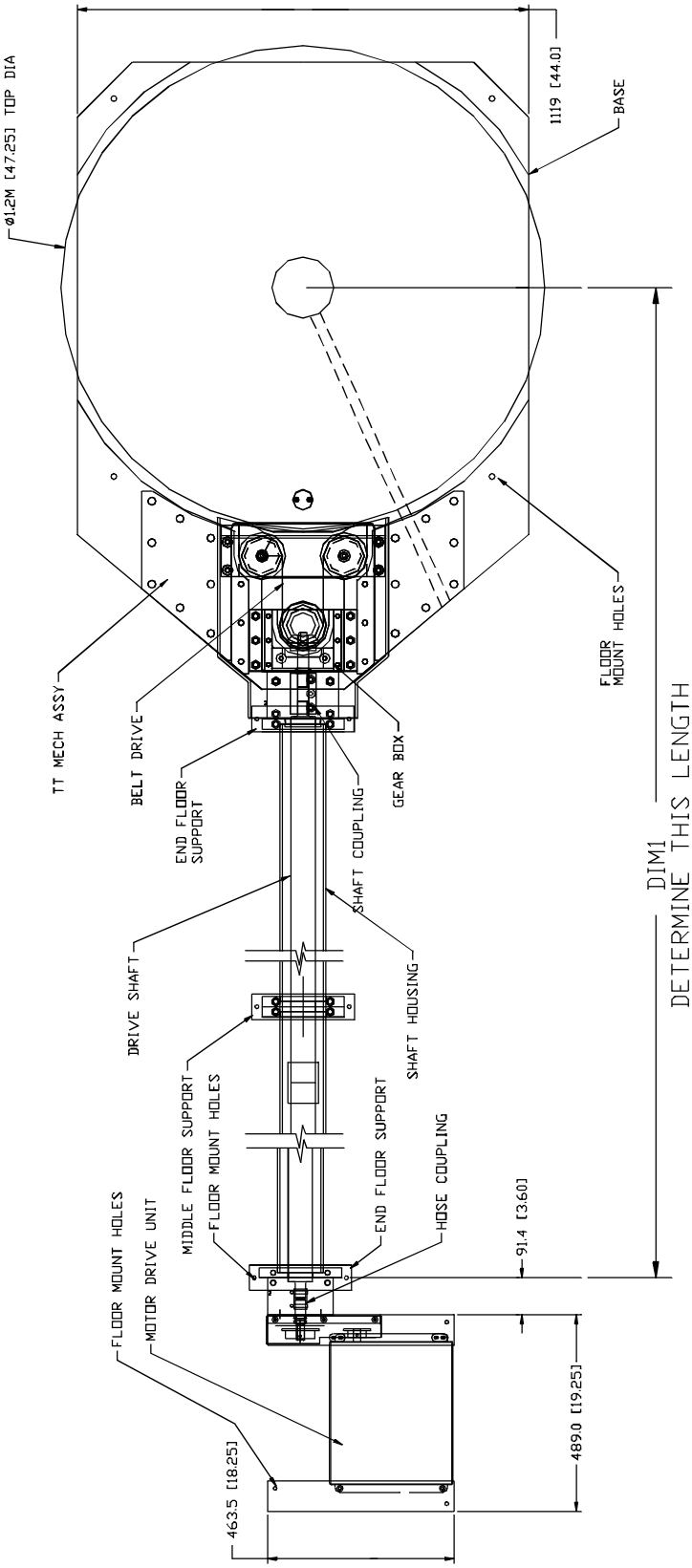
Note: Please contact the Seller's sales department for a Return Materials Authorization (RMA) number before shipping equipment to us.

DRAWINGS

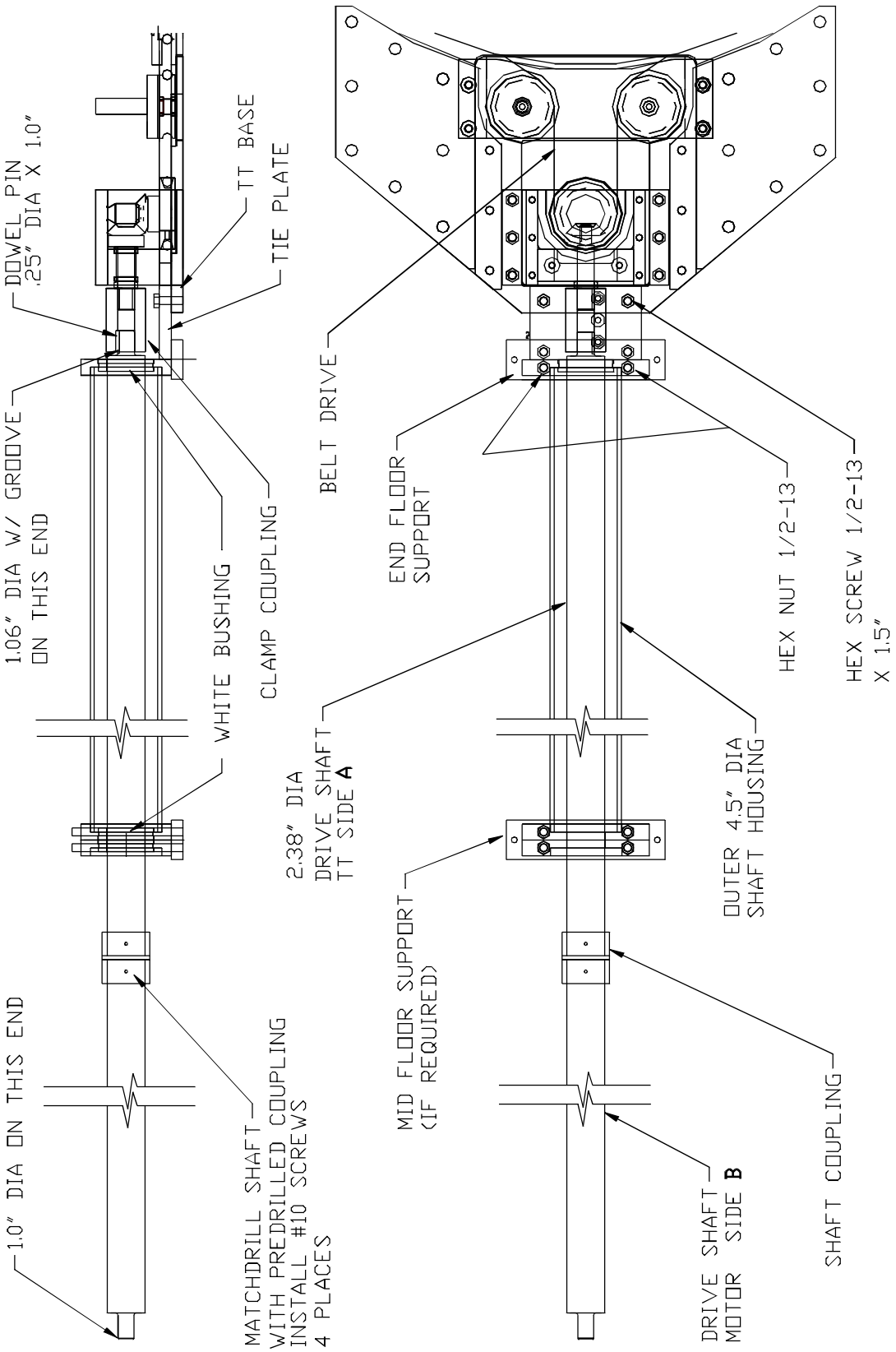






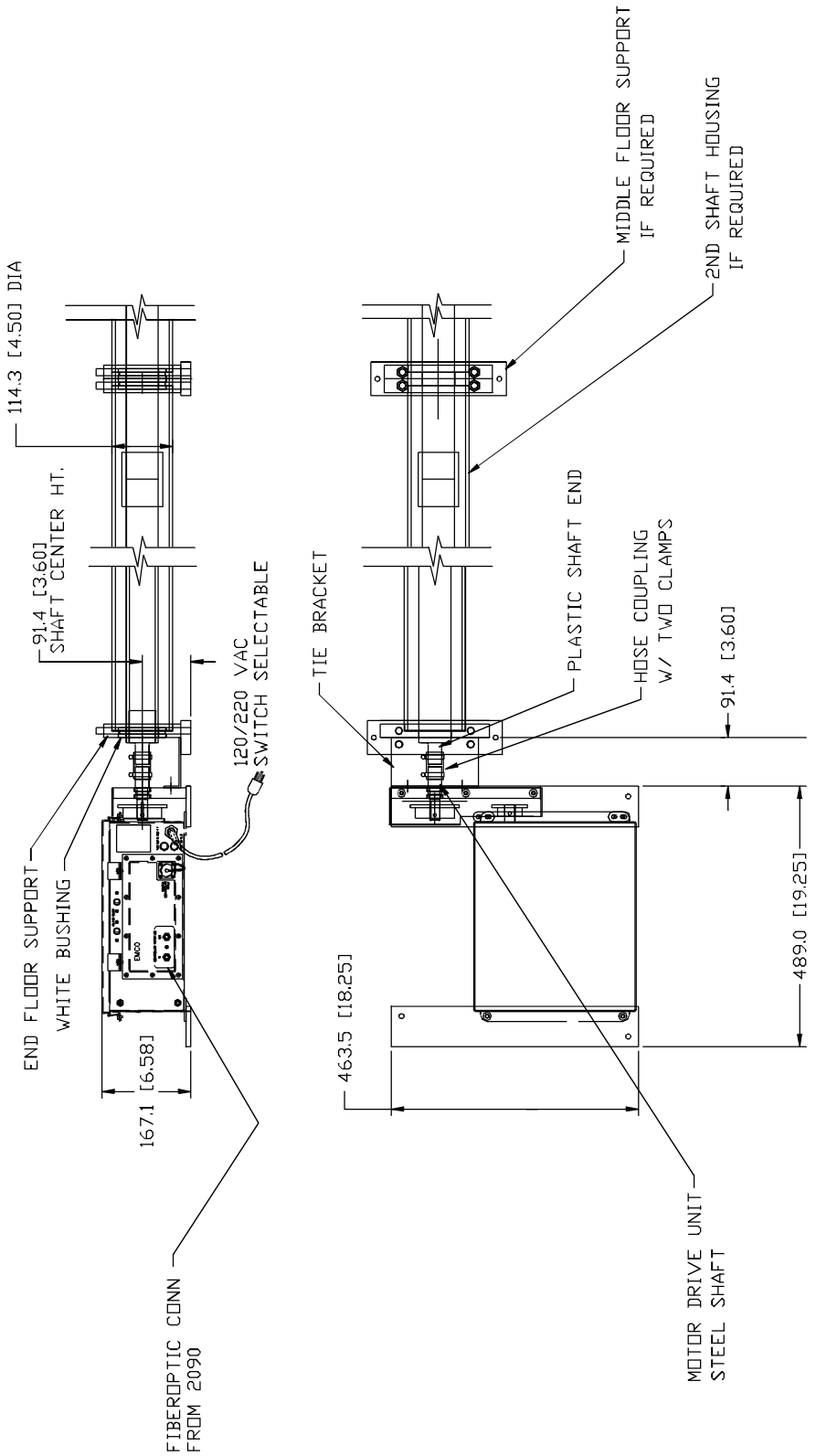


Drawing 4 Optional Shaft Kit Shown



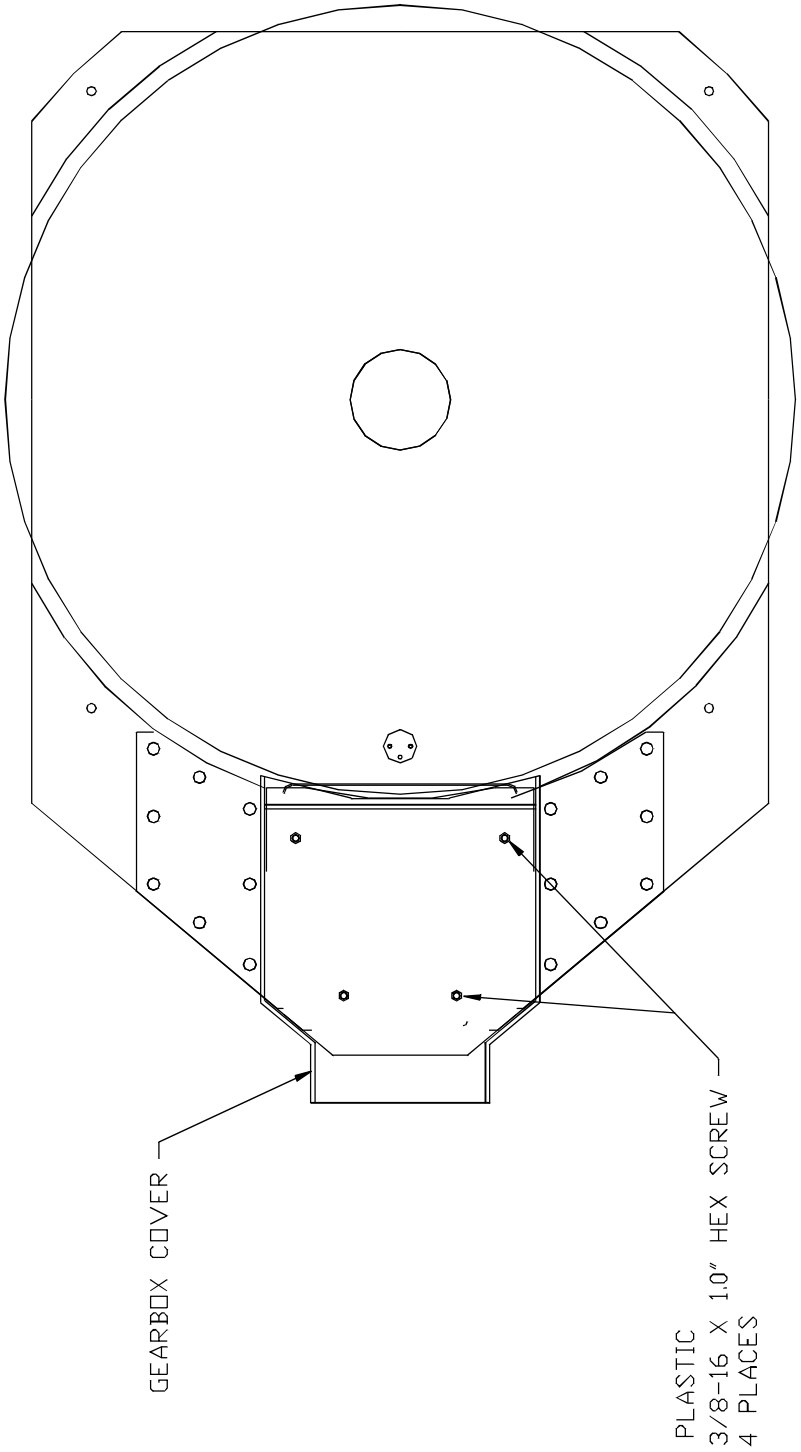
Optional Shaft Kit Shown

Drawing 5

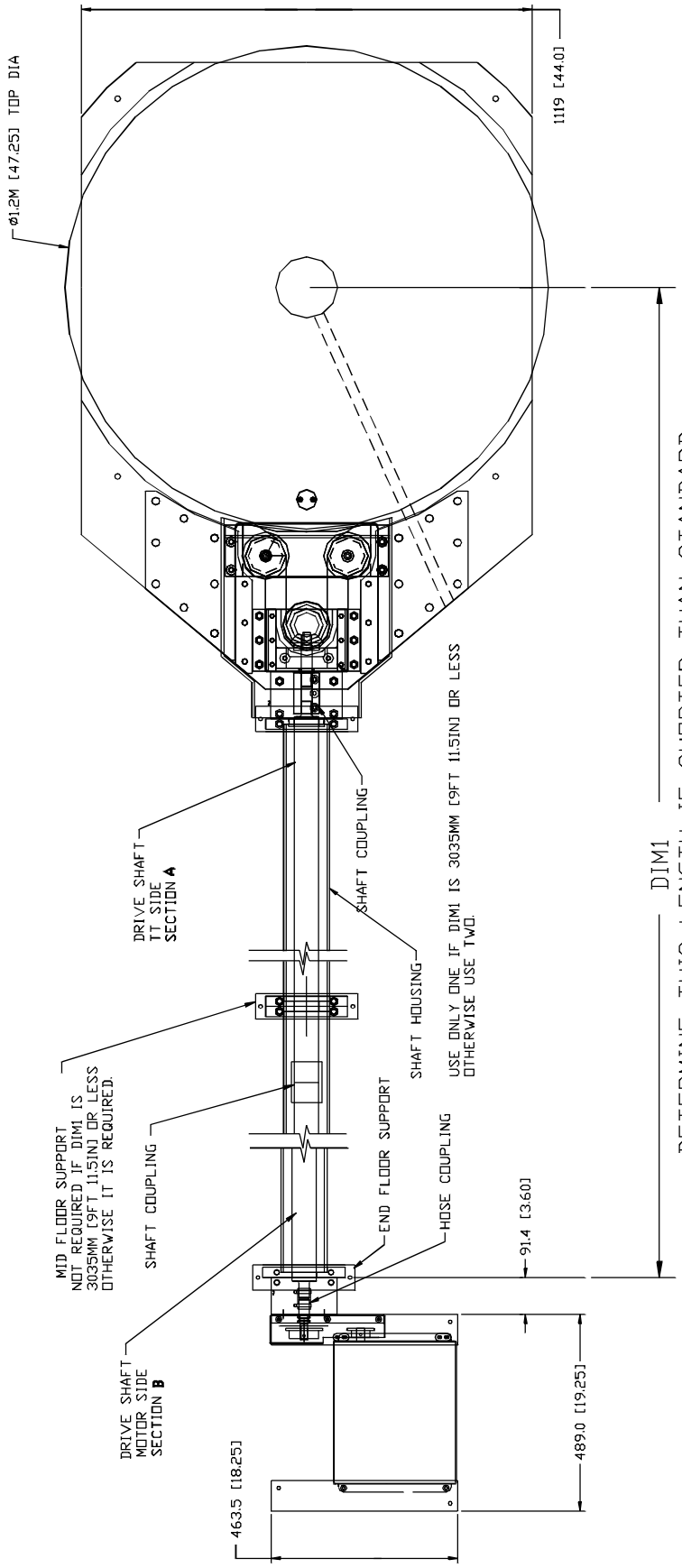


Drawing 6

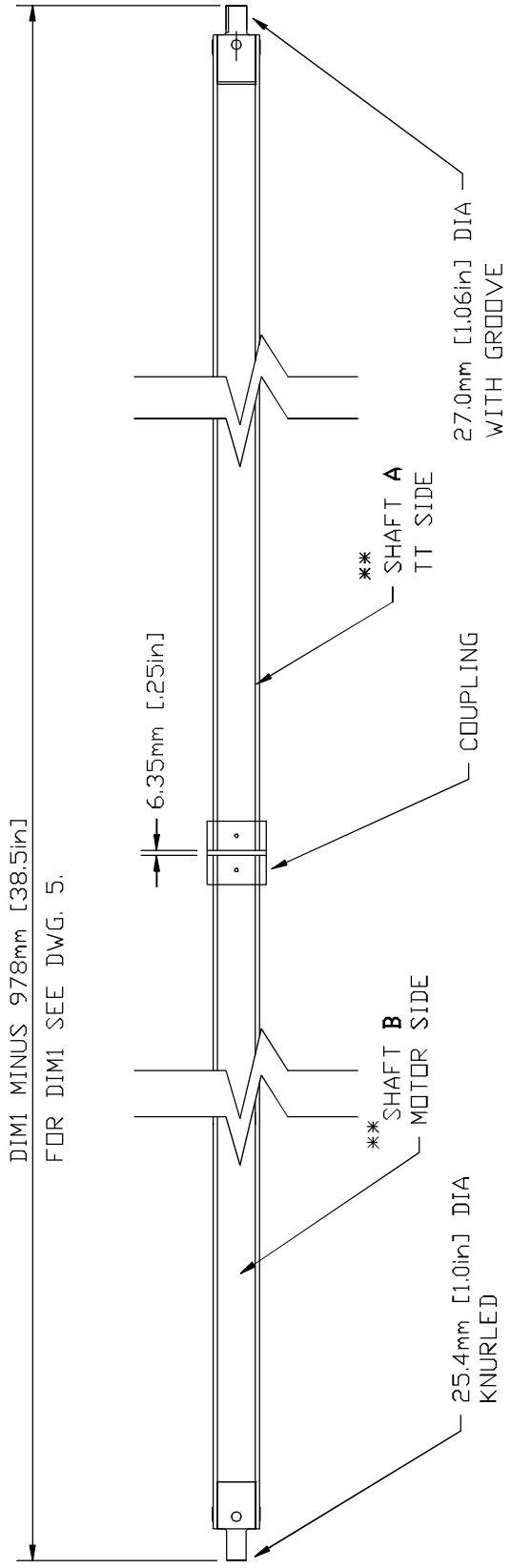
Optional Shaft Kit Shown



Drawing 7



Drawing 8 Optional Shaft Kit Shown

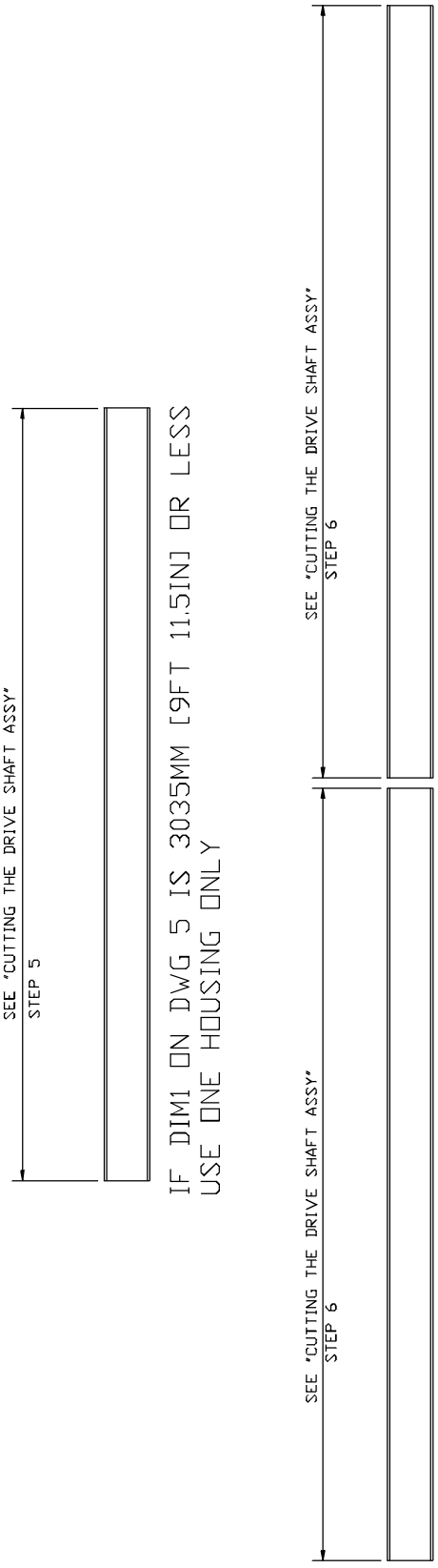


Optional Shaft Kit Shown

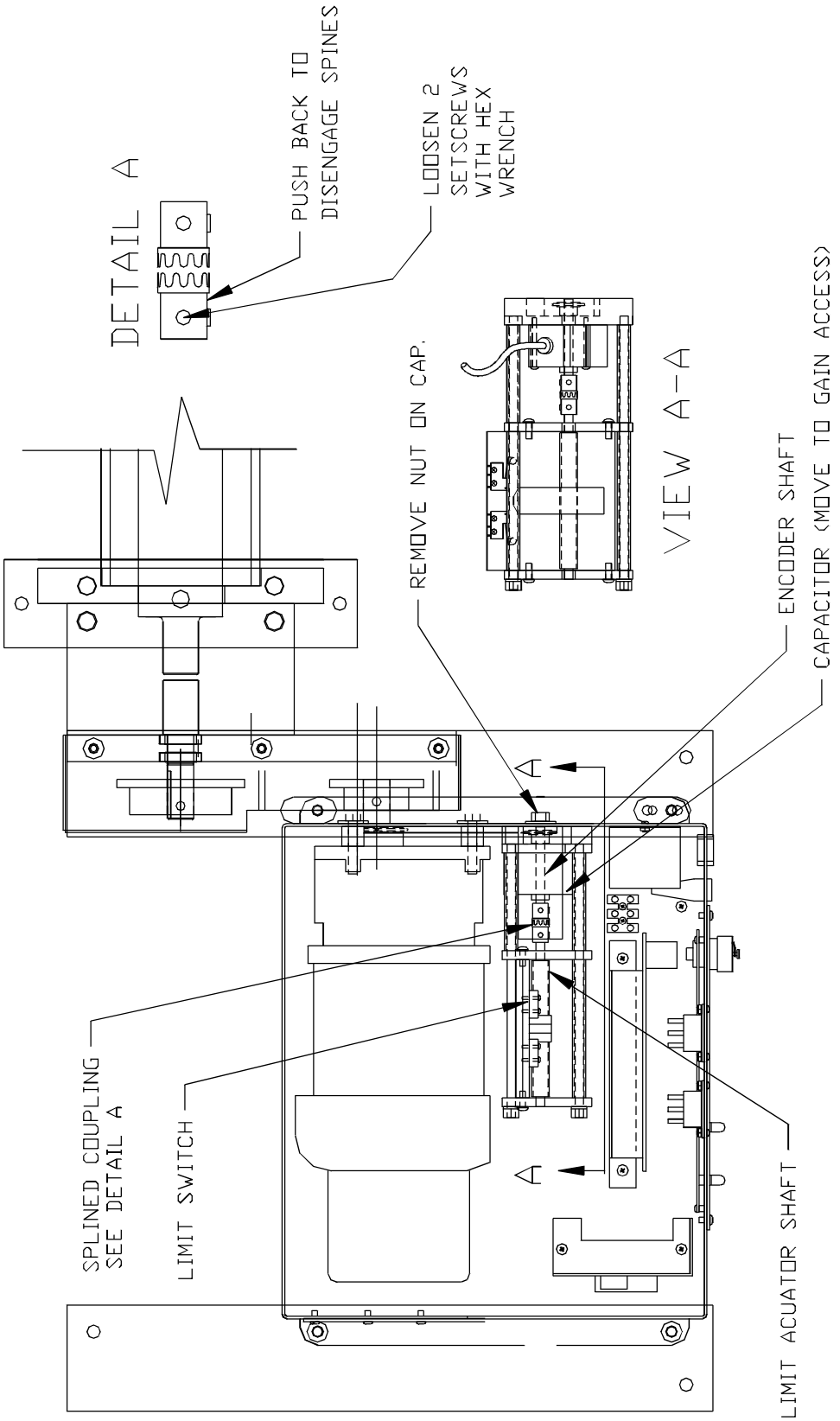
Drawing 9

REFER TO "CUTTING DRIVE SHAFT ASSY"

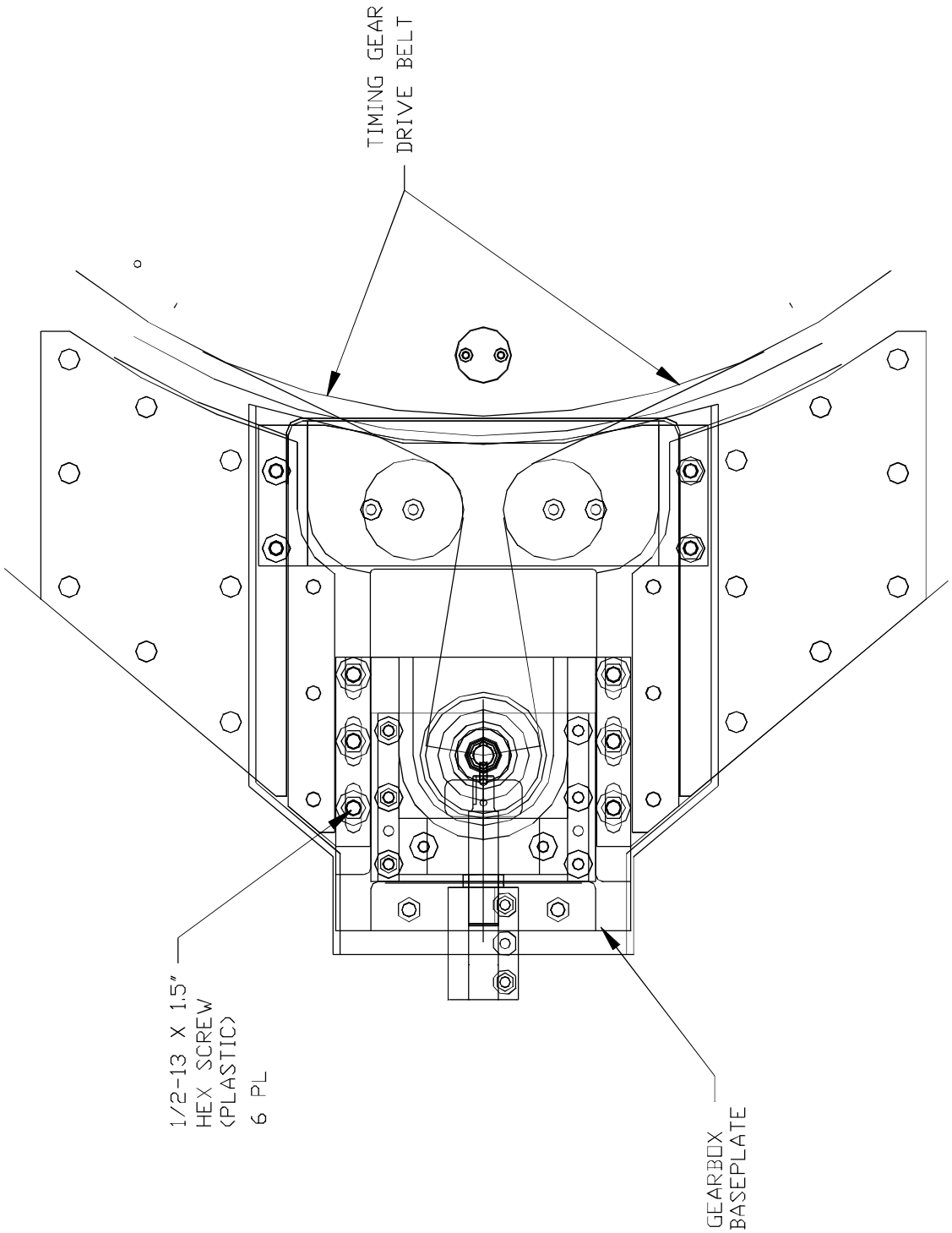
** CUT SHAFT A 150MM [6.0IN] LONGER THAN B



Drawing 10 Optional Shaft Kit Shown



Drawing 11
DISABLING MECH. LIMITS



Drawing 12
BELT TENSION