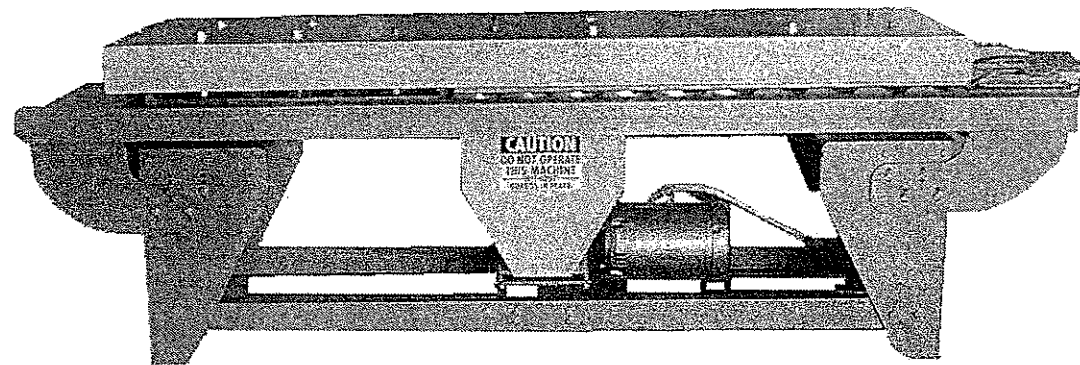


MEMBER OF THE FORMTEK GROUP

ENGEL
INDUSTRIES

182 Northwest Industrial Court
Bridgeton, MO 63044
Phone: (314) 638-0100
Fax: (314) 638-6514
www.engelind.com

HB-1640 TDF Rollformer



TDF® Flange

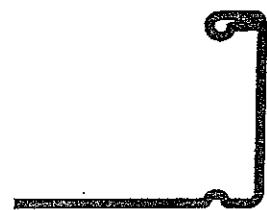
Features

- Sixteen (16) forming stations produce an integral flange on straight ductwork and fittings.
- No adjustment required when changing from 18 to 26 gauge material.
- A 7.5 HP, 230/460 volt motor produces speed of approximately 75 FPM.
- Corners "snap" in without crimping.
- A small parts feeder is included for parts with a minimum length of 6 inches.
- One set of outboard tooling and one set of inboard tooling can be added.



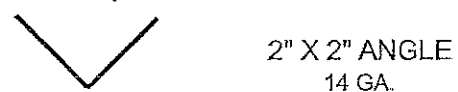
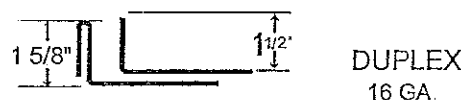
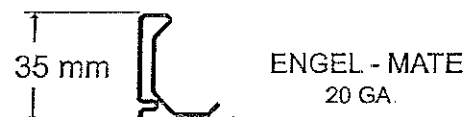
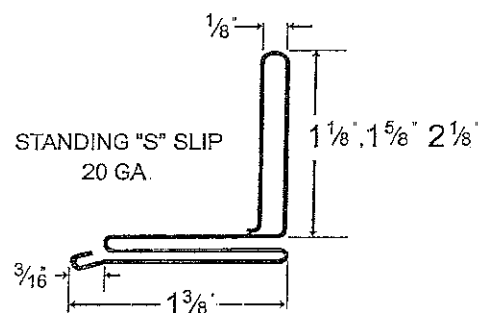
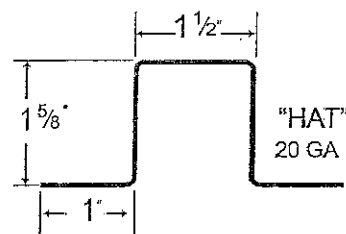
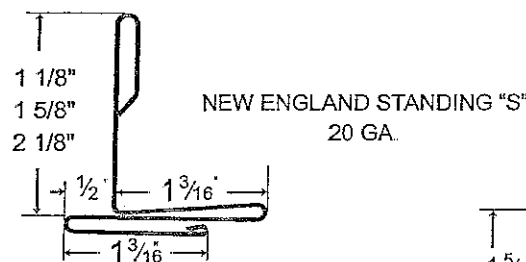
HB-1640 Tooling Profiles

Standard Tooling

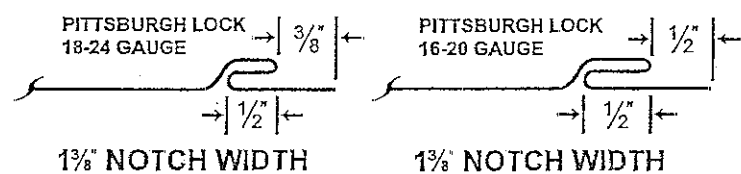


M-TDF®
18 GAUGE MAX.

Optional Tooling



Optional Outboard Tooling



SPECIFICATIONS

| | |
|-------------------|------------------------------------|
| LENGTH: | 127 IN. |
| WORKING HEIGHT: | 34 3/4 IN. |
| WIDTH: | 27 1/2 IN. |
| MOTOR: | 7 1/2 HP, 230/460V, 3 PHASE, 60 Hz |
| SHIPPING WEIGHT: | 3,000 LBS. |
| GAUGE RANGE: | 18 TO 26 GALVANIZED |
| PITCH LINE SPEED: | 75 FPM |

Roll Machine Instruction
Single Head Roll Former M-1640
Index

- I. Receiving Machine – p.1
 - 1. Unloading Procedure – p.1
 - 2. Positioning Machine – p.1
 - 3. Electrical Connections – p.2
 - 4. Lubrication – p.2
 - A. Disconnection
 - B. Roll cover
 - C. Gear grease
 - D. Light oil
 - E. Returning power
 - F. Units with oil bath reducers
- II. Roll Capacities and Material Requirements – p.2
 - 1. IDF
 - 2. Clip Alternate
- III. Operation – p.3
- IV. Roll Clearance Setting and Head Tension – p.4
 - 1. Roll Clearance
 - 2. Head Tension
 - 3. Model 1640 O/S only
- V. Maintenance of Engel Roll Formers – p.5-6
 - 1. Forming heads
 - 2. Speed Reduction
 - A. Open gear type
 - B. Right angle type
 - C. Jackshaft

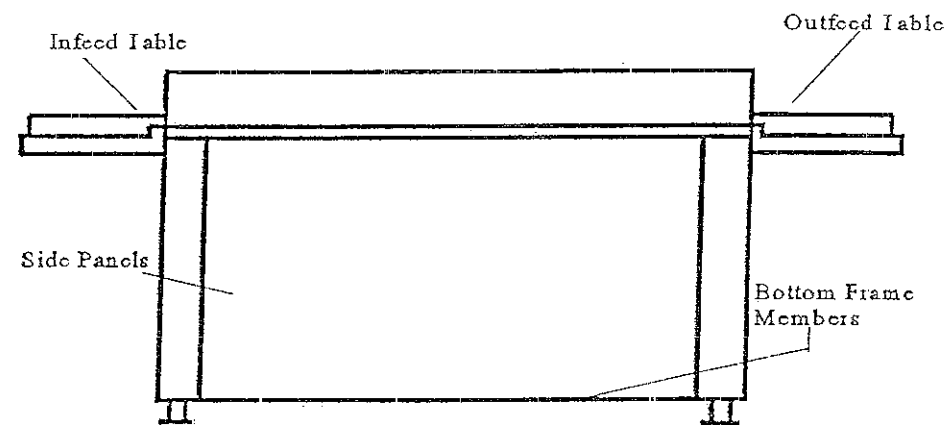
- 3. General
- 4. Suggested Lubricants
- VI. Starting Gauge – p 7
- VII. Settings for TDF Rolls – p 8-10
 - 1. #9, 15 and #16 side rolls
 - 2. #1 top and bottom roll
 - 3. Lance knives
 - 4. Racking Procedure
 - 5. Hem Adjustment Setting
 - 6. Adjustment roll
- VIII. Small Parts Feeder (1640's only) – p 11
- IX. 1640 TDF Side Roll Adjustment – p 8
- X. Trouble-Shooting Guide
- XI. Parts List/Assembly Drawing
- XII. Assembly Drawing

ENGEL INDUSTRIES, INC.
ROLL MACHINE INSTRUCTIONS

Receiving Machine

- Visibly check machine for possible shipping damage.
- When damage is evident, insist on the freight bill.
- If repairs are necessary, contact Engel Industries, Inc.

Unloading Procedure



- When it is necessary to lift the machine off the transport vehicle and lower it to the ground, lift or support the machine by using the skids or by removing the side panels and lifting the machine by the bottom frame members (NOTE: Lifting the machine by the in-feed or out-feed table would result in extensive damage to the machine). If the machine is unloaded onto a loading dock, then rollers can be put under the skids, or the machine can be slid or dragged on the skids.

Positioning Machine

- Move the machine to its desired location.
- Remove the skids.
- Level machine before operation (leveling feet are provided). Once leveled, lock the jam nut at each corner or leg of the machine.

Electrical Connections

- Supply electrical service to the starter box (located under the in-feed table) in accordance with local electrical codes. Refer to the connecting instructions on the inside of the starter box. (NOTE: If the machine is powered by a three (3) phase motor, it is possible to initially wire the motor in reverse. If this happens, switch two (2) of the three (3) supply wires. This will correct the rotation of the motor. Be certain that the machine is wired with a ground connection.)

Lubrication

- After approximately every 400-500 hours of use, or every three (3) months, lubricate the machine in the following manner:
 1. As a safety precaution, disconnect electrical supply.
 2. Open the top roll cover (guard)
 3. If the gears appear dry, apply open-type gear grease to the exposed surfaces of all the gears. Recommended: Chem-A-Lube (made by National Chemsearch Corp. in Dallas, St. Louis, New York, Los Angeles, and Montreal) or equivalent.
 4. Apply light oil to the forming rolls to prevent galvanized build-up. This should be done as required
 5. Connect power, turn machine on, and with a pressure-type grease gun, apply grease to lube fittings. (NOTE: Look under the right apron for access to fittings on side plate for idler gears.) Recommended: Lubriko Grease (made by Master Lubricants Co. in Philadelphia, Boston, Chicago, San Francisco, Los Angeles, and Montreal) or equivalent.
 6. For units with oil bath reducers, change oil at least every one (1) to two (2) years. Check gear reducer manufacturer's recommendations.
- Important: Do not use hypoid grease, as it will cause extensive damage to reducer gears.

Roll Capacities and Material Requirements

| Shape | Material Required | Capacity |
|----------------|-------------------|-------------|
| IDF | 2 1/16" | 18-24 Gauge |
| Clip Alternate | 2 1/4" | 20 Gauge |

Operation

Press the start button on the starter control. The machine will start running with an initial noise that of a slightly loud contact closure on the electric starter. It will then run very quietly.

1. Prepare sheet metal duct pieces as follows:
 - A. Cut the flat sheet panel and notch it as required for the lock seam (Pittsburgh or snap-lock).

CAUTION: The notch depth for the IDF flange must be 2 11/16" deep. The IDF flange uses 2 1/16" material but **MUST** be notched 2 11/16" deep in order to keep double or triple thickness of metal from passing through the IDF rolls. If this happens the machine can be damaged and also the warranty ends.
 - B. Roll-form the lock seams on the sheets with the beads or cross breaks facing Down.
2. Hold the ends to the formed against the in-feed guide and feed the metal into the rolls. Be sure to keep the metal securely against the in-feed guide as it is being formed. Support the metal as it comes out of the forming rolls so that it does not fall to the floor.

DANGER: Be sure to keep clear of the part as it forms. Harm could occur if you were in front of the part as it would press into anything in its way with great force.

M-HB-1640 Roll Machine
Roll Clearance Setting And Head Tension

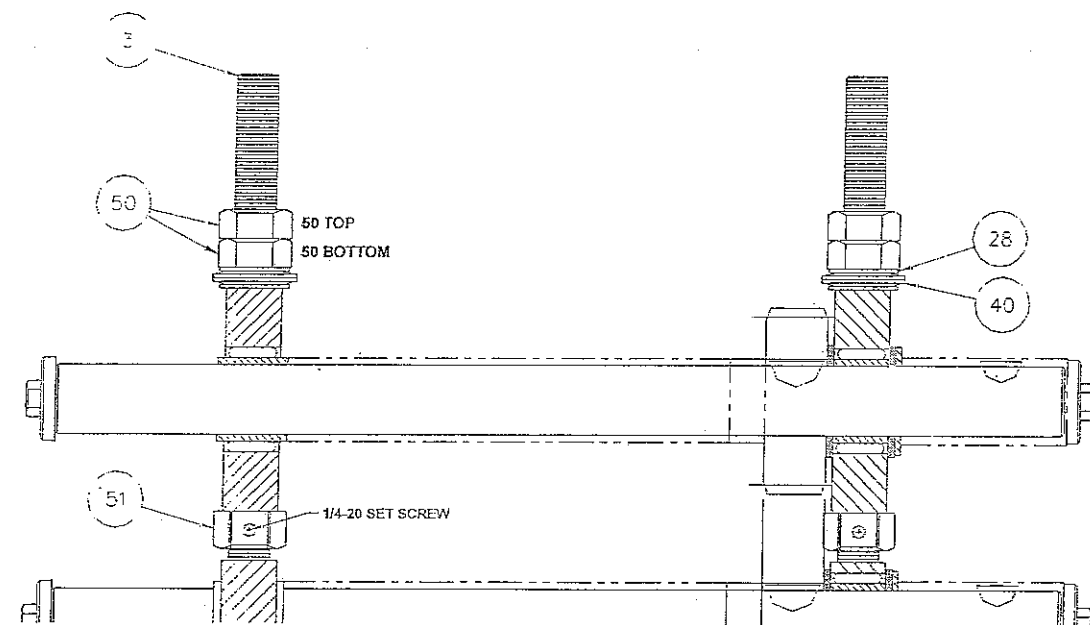
The 1640 Roll Former is factory set and should not require adjustment. Should it be necessary to adjust the machine, the following procedure should be used.

Roll Clearance:

Set roll clearance at .015 using feeler gauges. To raise or lower rolls for setting clearance use item #51 (adjusting nut with set screw). Loosen the 1/4-20 set screw and turn the adjusting nut counterclockwise to raise the top roll or counterclockwise to lower the roll. After achieving a desired roll clearance, retighten the 1/4-20 set screw.

Head Tension:

Spring deflection is designed into the machine for running 26-18 gauge material without the need for adjustment. To adjust head tension, loosen the upper jam nut item #50. (NOTE: Do not make adjustments by loosening or tightening the threaded spindle housing post, item #3) After loosening the upper jam nut (item #50), tighten the bottom jam nut (item 50) as snug as possible using a 1 1/8" open or box end wrench. Back the bottom jam nut off three flats to allow for the appropriate spring deflection. Use two 1 1/8" wrenches to lock the jam nuts back together. Recheck your roll clearance settings (.015").



Lubrication and Maintenance of Engel Roll Formers

1. Forming Heads:

The forming heads of all standard Engel Roll Forming machines are the same basic construction, and the lubrication procedure is common to all models. Roll shafts have Torrington Inner Races fitted on each end and rotate in Torrington Needle Bearing pressed into the side frames. These bearings are packed with the proper lubricant at assembly and need no further attention for approximately two thousand (2000) to three thousand (3000) hours of normal service.

The roll shaft bearings can be repacked by removing the outboard rolls, sliding the inner races toward the ends of the shafts and filling the void between the shafts and the bearings with a proper bearing grease*, by means of a grease gun equipped with nozzle that can be inserted in this void. The inner races are then slid back into place and the roller dies reinstalled in their proper relation.

WARNING: It will be noted that the extended spindles on one side of the machine will be flushed with the outer face of the rolls, and also the end cap washers "bottomed out". Be sure that this is the case before attempting to operate the machine.

The idler, or transfer gears, that complete the gear train of the lower shafts rotate on Torrington Bearings and are lubricated through grease fittings located in the side-plate underneath the outboard rolls on the right (gear side) of the machine. These should be lubricated with the same grade of bearing grease* used on the roll shafts every forty (40) to every eighty (80) hours.

2. Speed Reduction:

All models come equipped with the open gear type speed reducer bolted to the forming head, are lubricated through grease fittings located in the sheet metal panel on the left side of the machine. These should be lubricated every (8) hours of operation with the same grease* used on roll shafts.

All models equipped with right angle oil bath gear reducers have oil level plug. This level should be maintained by adding, when necessary, manufacturers recommended oil that contains no harmful additives. E.P. or hypoid grease is not to be used.

Power is transmitted from this reducer to a jackshaft mounted to the underside of the forming head by a roller chain. This chain should be lubricated sparingly with 10-20W engine oil when signs of dryness appear.

The transfer shafts rotate in heavy-duty needle bearing assemblies and require the same lubrication schedule as the idler shafts.

3. General:

1. Keep all fasteners tight, with particular attention to cap-screws that retain rolls on shafts and vertical roll adjustments. Check clearances between top and bottom rolls and see that they are maintained
2. Keep all roller dies clean, with special attention to zinc and chip build-up.
3. Oil rolls daily with light machine oil. Keep all roller chains tensioned properly. Replace when excessively worn
4. Avoid impact or heavy loading on entrance and exit tables

4. Suggested Lubricants:

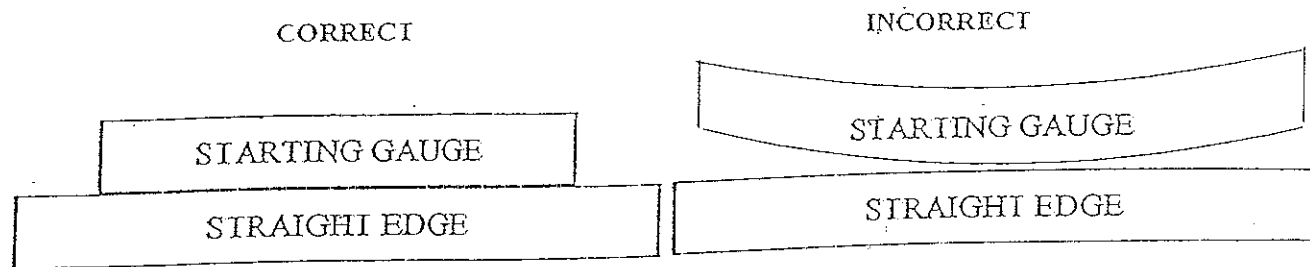
*Lubriko – density M-6 – for all shaft bearings
**Manufacturer's Recommended Oil – for all oil bath reducers
Melcolube for all open gears

In the event the above are not readily available, consult your local supplier for equivalents.

5. If trouble shooting is unsuccessful or additional information is needed, simply call the factory for assistance at (314)-638-0100.

If material runs out along the edge being formed, proceed as follows:

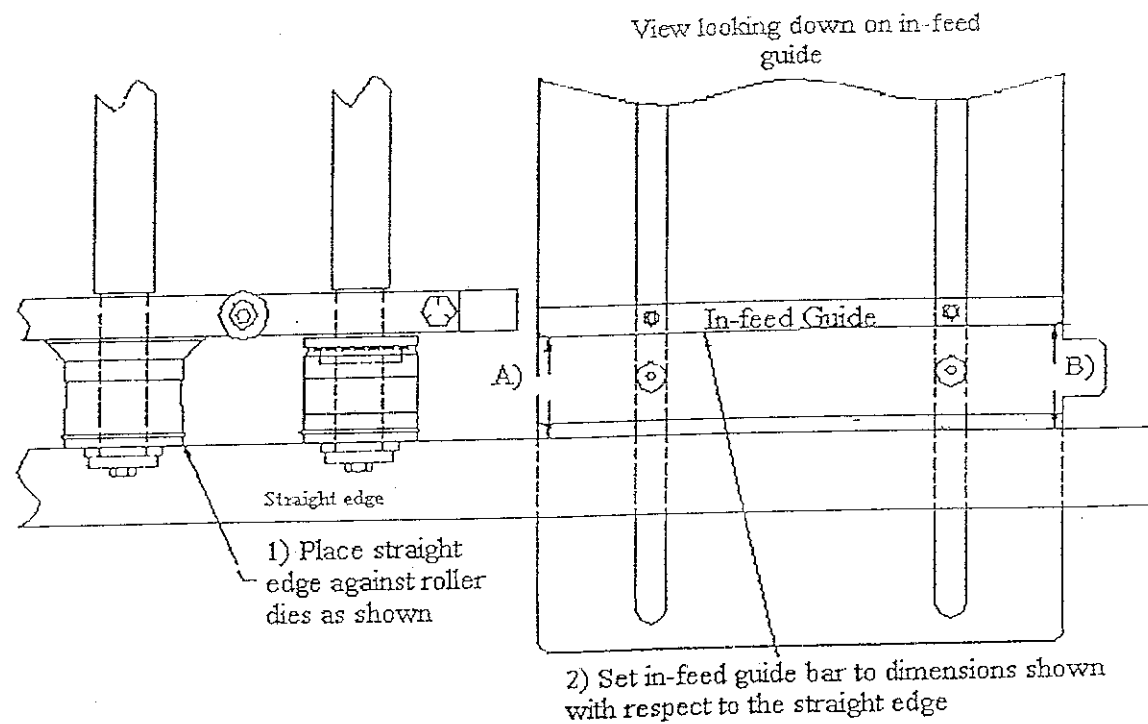
- Check the straightness of the sheared edge of the metal. Any bow or camber along the sheared edge will cause the material to run erratic through the rolls.
- Check the starting gauge to be sure that it is straight and not bowed.



Drawing No. 3

- Check the alignment of the starting gauge with the rolls
(NOTE: Mis-alignment of the starting is the most common cause of run-out. This gauge must be aligned to control the amount of metal as to width to be passed through the roller dies. It must also guide and hold the metal in a straight line as the metal is passing through the roller dies.)
- Instructions for aligning starting gauge: Refer to Drawing No. 4

Set the in-feed guide off outside end of tooling using straight edge, measure from straight edge to in-feed guide.
NOTE: 2 5/8" for dimension "A" and 2 21/32" for dimension "B".

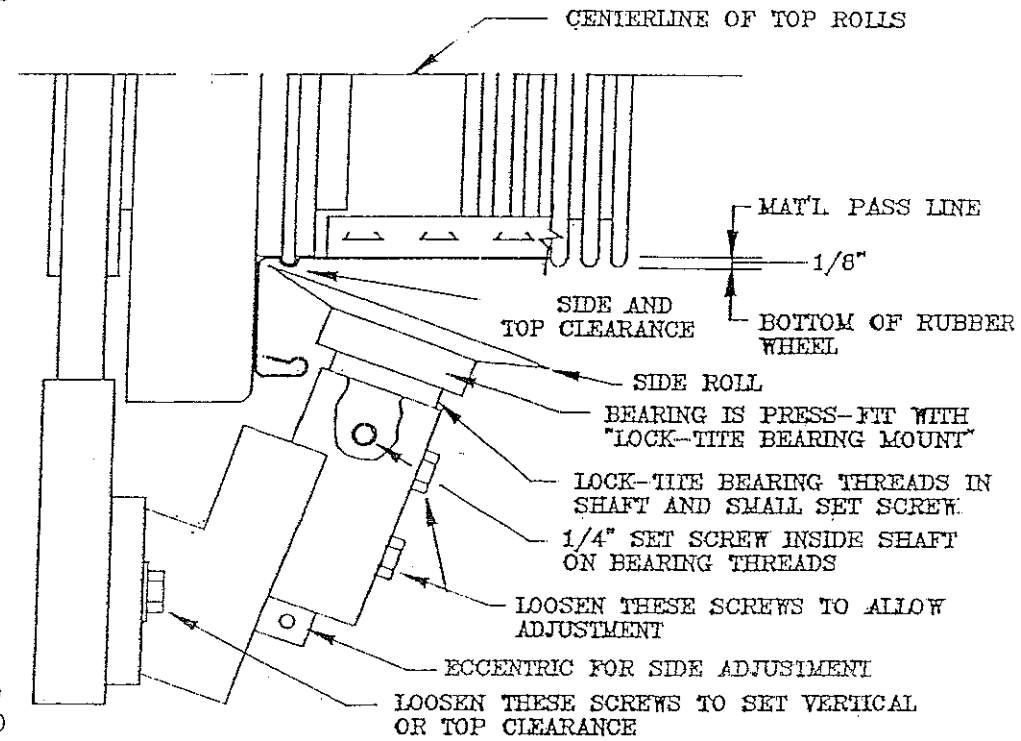


Drawing No. 4

Settings for TDF Rolls

- 1 Set side rolls #9, #15 and #16 as shown. If overhead rubber cushion rolls are not adjusted properly (approximately .120) above the tie plate, you will not be able to obtain 90 degree flanges.

#9 and #15 side roll setting
 Top clearance-.020
 Side clearance-.025

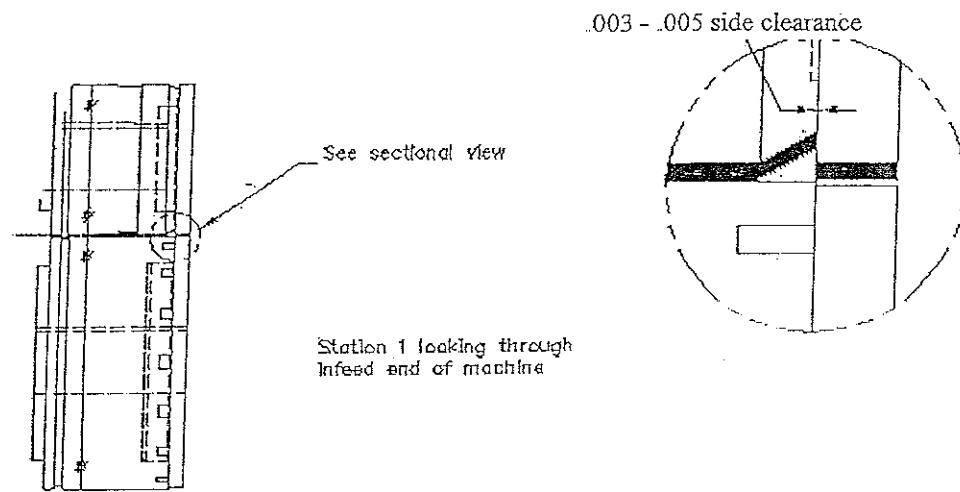


#16 side roll setting
 Top Clearance-.020
 Side Clearance-.030

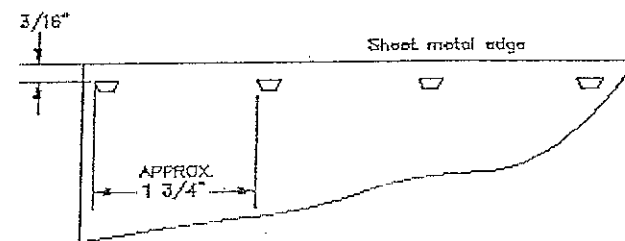
NOTE:
 FRONT OF PART IS OVERBENT APPROX 2 DEGREES
 CENTER SHOULD BE 90 DEGREES
 REAR OF PART IS UNDERBENT 1-2 DEGREES.

2. #1 top and bottom rolls are factory set such that the cutting edge of the die roll is approximately 13/32" away from the bearing housing

3. Setting lance knives.



4. Set the in-feed guide such that the buttons are punched as shown.



5. Precision shims would often be placed behind roller dies for precision alignment. A straight edge is used to determine if shims are necessary. Bead alignment from top roll bead to bottom roll bead groove is also often improved by shimming either roll.

Typical shims used are 1 1/4" I.D. with a thickness of .005" or .010"

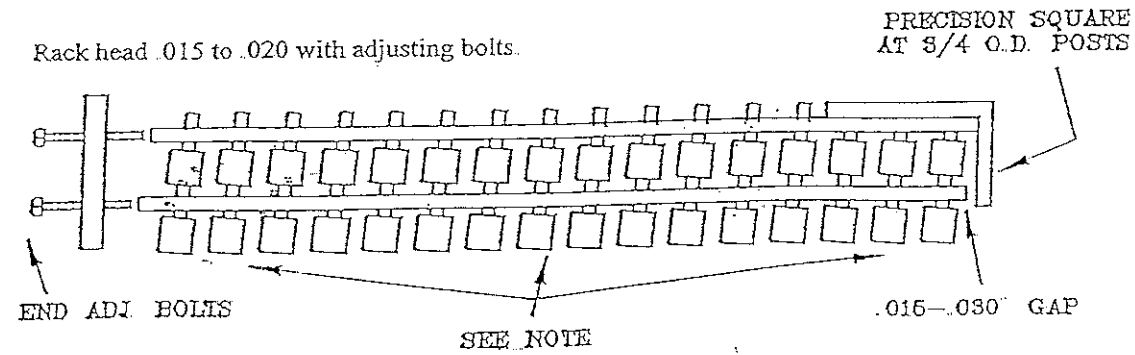
NOTE: THE BEADS CAN BE VIEWED FROM THE IN-FEED END OF THE MACHINE LOOKING STRAIGHT DOWN THEM. THEY MUST BE IN A STRAIGHT LINE.

A STRAIGHT EDGE ALONG THE ENTIRE ROLL-SEI HAS AS SHOWN ON PAGE 7, DRAWING #4, ALSO SHOWS HOW THE ROLLS SHOULD BE IN A STRAIGHT LINE.

PARTICULAR ATTENTION SHOULD BE GIVEN TO STATION #1 IN THAT THE BEAD MUST LINE UP WITH THE REST OF THE ROLLS. SHIMS MAY BE NECESSARY BETWEEN THE THREE (3) ROLL SEGMENTS FOR STATION #1 IN ORDER TO ACHIEVE THE SETTINGS SHOWED IN #3 AND #4 ABOVE.

*When material moves away from in-feed guide, or material runs out of the in-feed guide, see #6

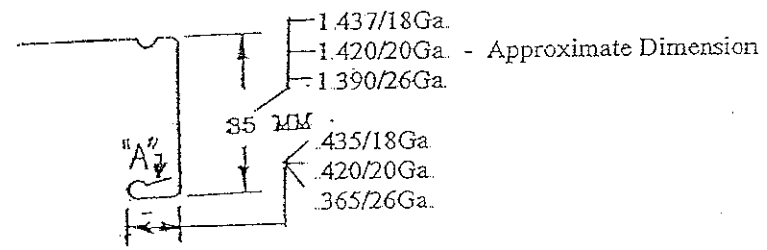
6. Rack head .015 to .020 with adjusting bolts.



NOTE: Rack opposite if tooling is on other side. There are bolts underneath machine head - (3) on each side. Loosen these bolts and turn end adjustment bolts to set gap to .015"-.020". Loosen 1 side and tighten the end bolts and afterward retighten the three (3) bottom bolts to maintain position setting

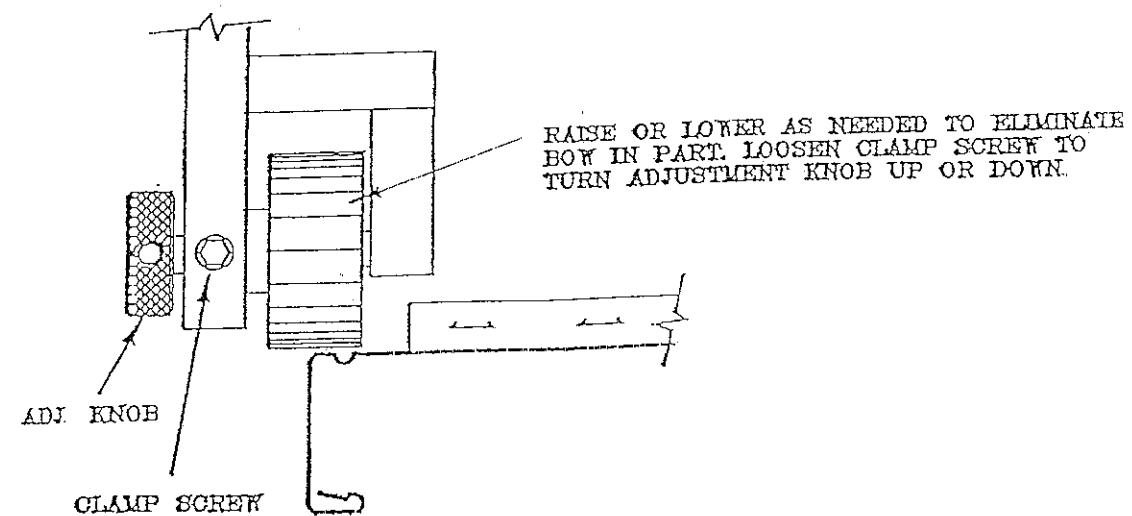
7. If the small edge flange is too large, the clips will not fit. If too much metal is fed into the rolls by means of the in-feed guide being set too deep, the hem is then too long and can cause dimension "A" to be too large.

Dimensions are (+ or -) .015"



Out-feed Straighteners

1. For bow up or bow down, an adjustment roll is provided at the exit end of the machine.



Use of Small Parts Feeder
(1640's only)

The 1640 IDF comes from the factory equipped with a small-parts-feed-system. A small part is anything less than 18 inches in length (direction of flow). (NOTE: Nothing less than 18 inches can be run independently on any IDF roll form machine.)

1. To feed small parts through the 1640 IDF, move small parts feeder up to the in-feed guide on the tie plate.
2. Place small part on the feed assembly with the raw edge against the in-feed guide.
3. Use two (2) clamps, one (1) at each end of small part, always clamp small parts to small parts feeder as far away from the rolls as possible, to insure there will be no interference with guard or overhead rubber cushion rolls.
4. Push feeder and part into the first station. If part is smaller than eight (8) inches, you will need to push the part completely through from start to finish. If larger than eight (8) inches, you will have to help it out of station #15 and #16.

If over head rubber cushion rolls are not adjusted properly (approximately .120) above tie plate, you will not be able to obtain 90 degrees at point #5.

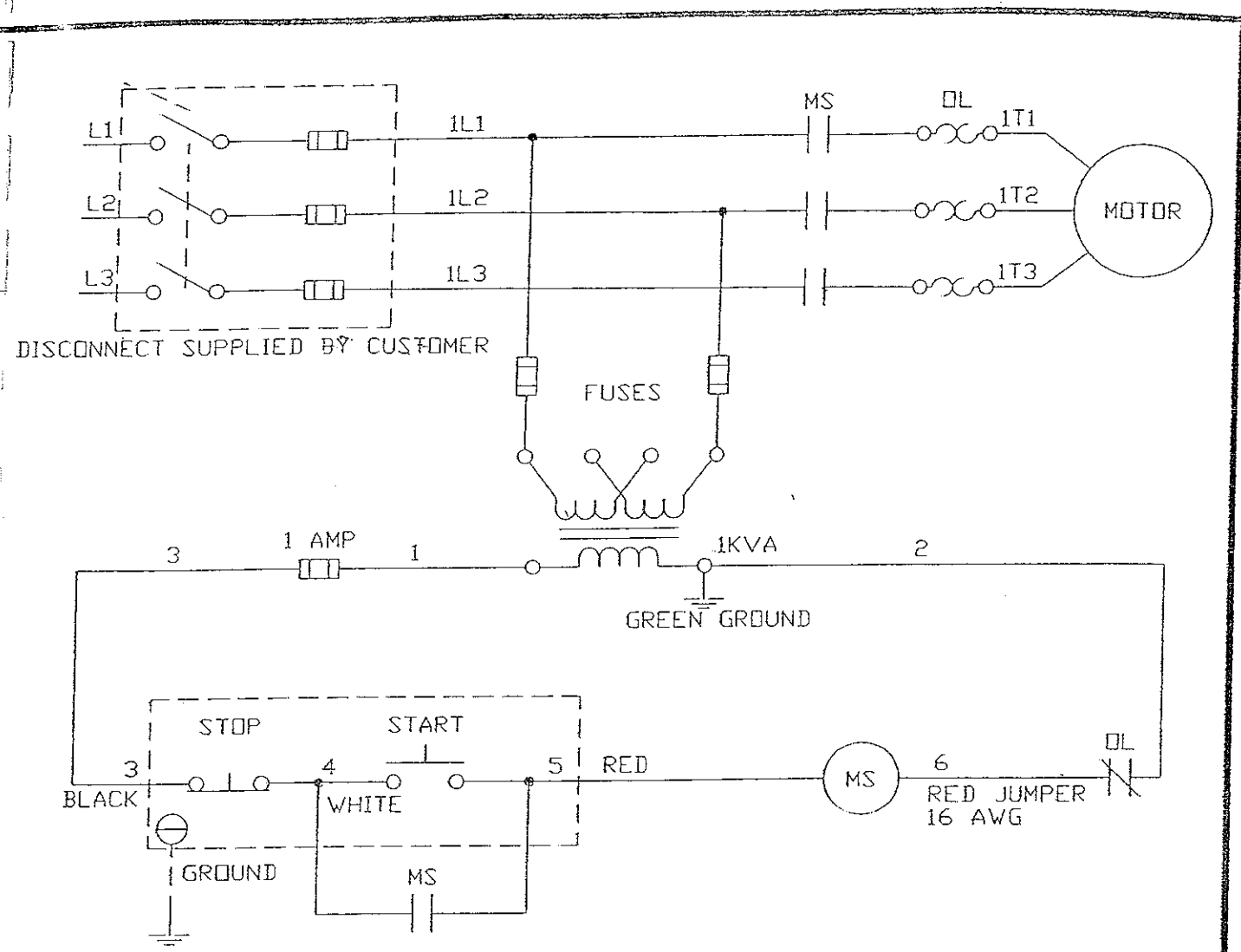
Troubleshooting

1. Metal runs away from in-feed guide
 - A. Fasteners may have come loose
 - B. Check in-feed guide adjustment (p.7)
 - C. Machine must be level
 - D. Roll adjustment (p 8-9)
 - E. Check rack adjustment (p.10)
2. Flanges are not 90 degrees
 - A. See page 8 for side rolls
 - B. See page 8 for rubber cushion rolls
3. Hem is too short or too long

Move the in-feed guide in accordance with instructions on page 7 and page 10, #6
4. Machine will not start or motor makes loud humming noise

See page 14
4. Severe jam occurs and parts are broken

Call the factory for assistance



PENDANT CORD IS 16/4

| ST REVISION | |
|-------------|---------|
| TIER | DATE |
| B | 6-17-97 |

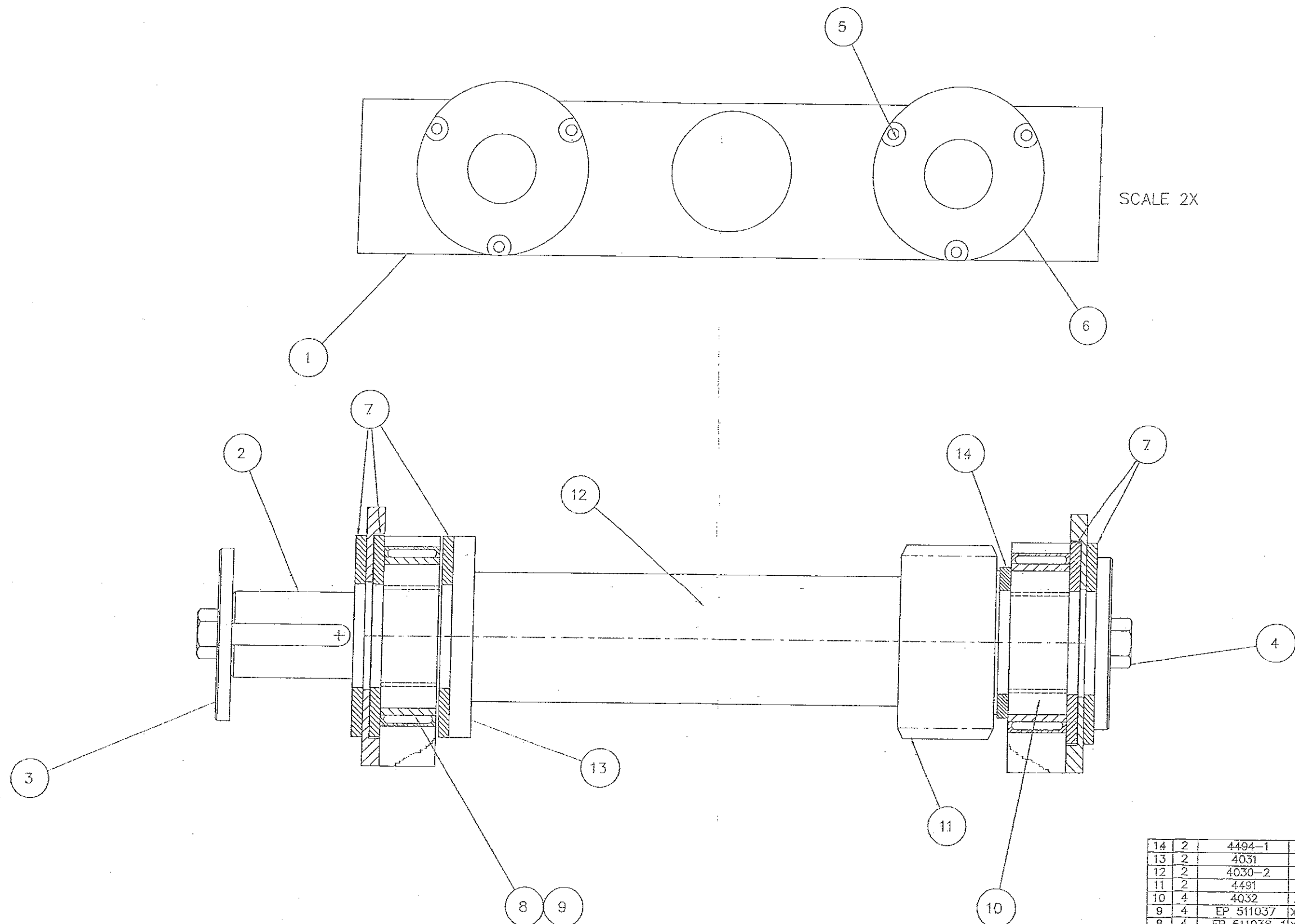
| M | REQ'D | PUR MAKE | DESCRIPTION |
|---|-------|-------------|--------------------------|
| | | DATE 5-9-95 | 3 PHASE PREWIRED STARTER |
| | | SCALE | |
| | | DRAWN CAM | |
| | | CHECKED | |
| | | ASSY. NO. | DWG. NO. EL-760-A |



WARNING

NEVER PUT YOUR HANDS IN THE POINT OF OPERATION OF ANY MECHANICAL OR ELECTRICAL DEVICE.

IF A MACHINE IS JAMMED, NEEDS ADJUSTMENTS, NEEDS DIE CHANGES, ETC. ALWAYS DO A LOCK-OUT/TAG-OUT PROCEDURE WHICH MEANS THE POWER MUST BE OFF AND LOCKED-OUT AND ANY RAMS OR BEAMS WILL BE BLOCKED TO ENSURE SAFETY. THIS IS A FEDERAL OSHA REQUIREMENT AND MUST BE A WRITTEN AND TRAINING TYPE OF PROGRAM.



SCALE 2X

VIEW LOOKING FROM INFEED OF MACHINE

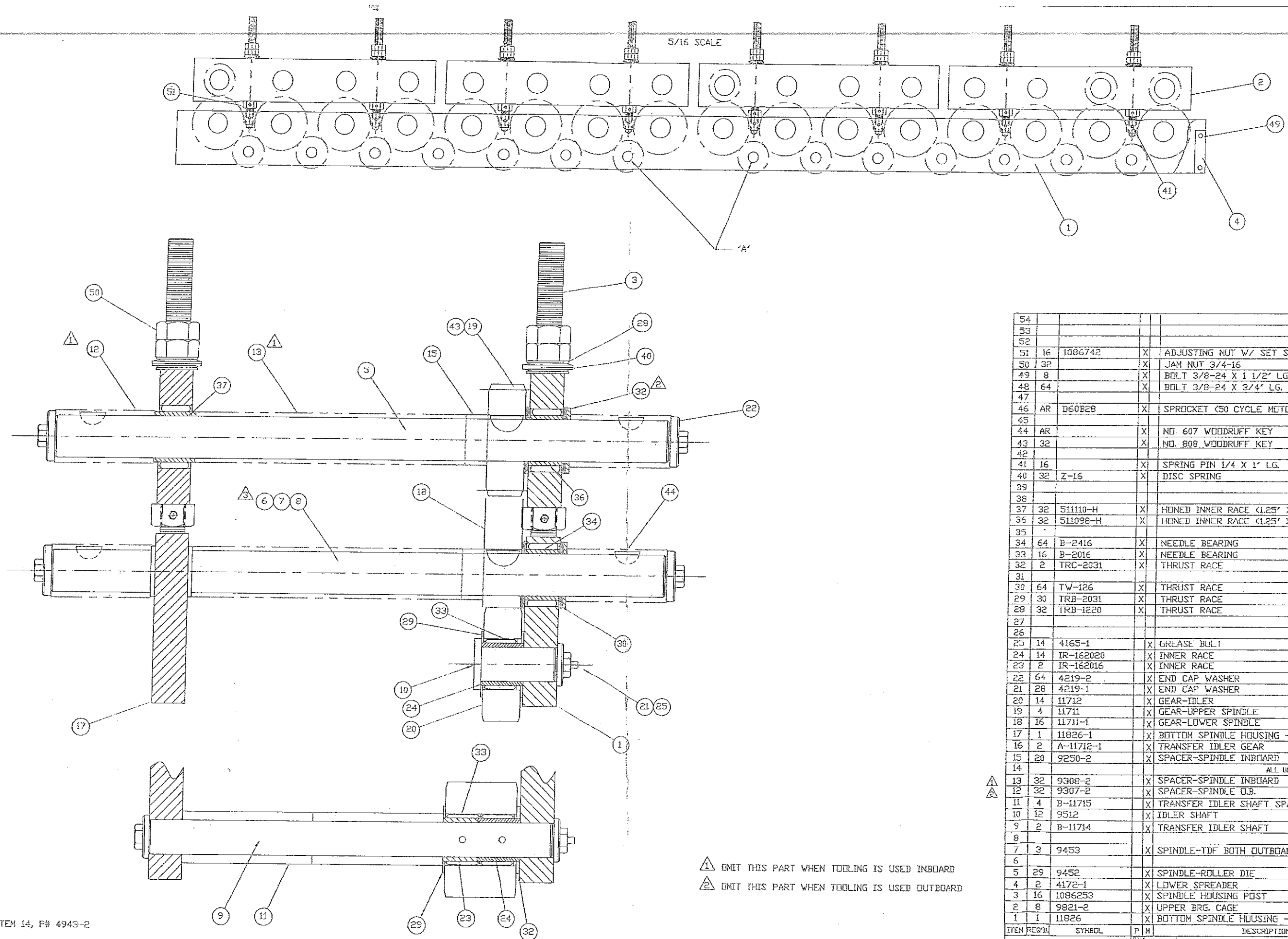
| ITEM | QTY | PART NO. | UNIT | DESCRIPTION |
|------|-----|-------------|------|-------------------------------|
| 14 | 2 | 4494-1 | X | BRONZE THRUST WASHER |
| 13 | 2 | 4031 | X | SPACER RACE SUPPORT |
| 12 | 2 | 4030-2 | X | SPLINE SHAFT SPACER |
| 11 | 2 | 4491 | X | 3" 18 TOOTH SPLINE GEAR |
| 10 | 4 | 4032 | X | SPLINE INSERT |
| 9 | 4 | EP 511037 | X | IR4016 |
| 8 | 4 | EP 511038-1 | X | B4416-OH |
| 7 | 10 | 4494 | X | BRONZE THRUST WASHER |
| 6 | 4 | 4033 | X | CAP RING |
| 5 | 12 | | X | 1/4-20 X 5/8" FHCS |
| 4 | 4 | | X | 1/2-20 X 3/4" LG HHCS GRADE 5 |
| 3 | 4 | 4219-19 | X | END CAP WASHER |
| 2 | 2 | B-11713 | X | SPLINE SHAFT |
| 1 | 2 | B-11716 | X | TRANSFER BEARING CAGE |

ENGEL INDUSTRIES
 ST. LOUIS, MISSOURI

DATE: 5/20/02
 SCALE: 3/8
 DRAWN: PLB
 CHECKED:

TRANSFER CAGE ASSEMBLY
 HP-1640

D-11722-1



▲ OMIT THIS PART WHEN TOOLING IS USED INBOARD
 △ OMIT THIS PART WHEN TOOLING IS USED OUTBOARD

| | | | | |
|------------------------|----|-----------|--------|--|
| 54 | | | | |
| 53 | | | | |
| 52 | | | | |
| 51 | 16 | 1086742 | X | ADJUSTING NUT W/ SET SCREW |
| 50 | 32 | | X | JAM NUT 3/4-16 |
| 49 | 8 | | X | BOLT 3/8-24 X 1 1/2' LG. HHCS |
| 48 | 64 | | X | BOLT 3/8-24 X 3/4' LG. HHCS |
| 47 | | | | |
| 46 | AR | D60B28 | X | SPROCKET (50 CYCLE MOTOR) 1 1/2 B 3/8 K |
| 45 | | | | |
| 44 | AR | | X | NO. 607 WOODRUFF KEY |
| 43 | 32 | | X | NO. 808 WOODRUFF KEY |
| 42 | | | | |
| 41 | 16 | | X | SPRING PIN 1/4 X 1' LG. |
| 40 | 32 | Z-16 | X | DISC SPRING |
| 39 | | | | |
| 38 | | | | |
| 37 | 32 | 511110-H | X | HONED INNER RACE (1.25' X 1.25') |
| 36 | 32 | 511098-H | X | HONED INNER RACE (1.25' X 1') |
| 35 | | | | |
| 34 | 64 | B-2416 | X | NEEDLE BEARING |
| 33 | 16 | B-2016 | X | NEEDLE BEARING |
| 32 | 2 | TRC-2031 | X | THRUST RACE |
| 31 | | | | |
| 30 | 64 | TW-126 | X | THRUST RACE |
| 29 | 30 | TRB-2031 | X | THRUST RACE |
| 28 | 32 | TRB-1220 | X | THRUST RACE |
| 27 | | | | |
| 26 | | | | |
| 25 | 14 | 4165-1 | X | GREASE BOLT |
| 24 | 14 | IR-162020 | X | INNER RACE |
| 23 | 2 | IR-162016 | X | INNER RACE |
| 22 | 64 | 4219-2 | X | END CAP WASHER |
| 21 | 28 | 4219-1 | X | END CAP WASHER |
| 20 | 14 | 11712 | X | GEAR-IDLER |
| 19 | 4 | 11711 | X | GEAR-UPPER SPINDLE STA 1, 9, 15, & 16 |
| 18 | 16 | 11711-1 | X | GEAR-LOWER SPINDLE |
| 17 | 1 | 11826-1 | X | BOTTOM SPINDLE HOUSING - NON-GEAR SIDE |
| 16 | 2 | A-11712-1 | X | TRANSFER IDLER GEAR |
| 15 | 20 | 9250-2 | X | SPACER-SPINDLE INBOARD |
| 14 | | | | ALL UPPER STA. W/O GEARS |
| 13 | 32 | 9308-2 | X | SPACER-SPINDLE INBOARD |
| 12 | 32 | 9307-2 | X | SPACER-SPINDLE O.B. |
| 11 | 4 | B-11715 | X | TRANSFER IDLER SHAFT SPACER |
| 10 | 12 | 9512 | X | IDLER SHAFT |
| 9 | 2 | B-11714 | X | TRANSFER IDLER SHAFT |
| 8 | | | | |
| 7 | 3 | 9453 | X | SPINDLE-TDF BOTH OUTBOARDS STA 9, 15, & 16 B |
| 6 | | | | |
| 5 | 29 | 9452 | X | SPINDLE-ROLLER DIE |
| 4 | 2 | 4172-1 | X | LOWER SPREADER |
| 3 | 16 | 1086253 | X | SPINDLE HOUSING POST |
| 2 | 8 | 9821-2 | X | UPPER BRG. CAGE |
| 1 | 1 | 11826 | X | BOTTOM SPINDLE HOUSING - GEAR SIDE |
| ITEM REQ'D | | SYMBOL | P | M |
| | | DATE | 4/8/02 | |
| ENGEL INDUSTRIES, INC. | | SCALE | NOTED | |
| ST LOUIS, MISSOURI | | DRAWN | PLB | ASSY. NO. |
| | | CHECKED | | DWG. NO. D-11825 |

REV C 8/18/03 SNP DELETED ITEM 14, P# 4943-2
 REV A 8/18/03 SNP CHANGED ITEM 51 FROM 1075934-1 TO 1086742

2-REQ'D AT TRANSFER STATIONS
 SEE LEADER 'A' ABOVE

