

ENGEL TDF[®] HB-1640 ROLLFORMER

INSTALLATION, OPERATION & MAINTENANCE MANUAL



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HB-1640 TDF® Rollformer

1. INTRODUCTION

The HB-1640® TDF Rollformer is equipped with Engel's patented TDF flange and clip rolls, which produces integral flange on straight ductwork and fittings. The HB-1640 is equipped with sixteen forming stations, which produces the most consistent flange in the industry.

The patented flange design requires no adjustment when switching from 18 to 26 gauge material. The TDF corners "Snap" into the flange without crimping. A small parts feeder is included for minimum parts of 6 inch lengths.

A 7.5 HP motor is used to power the HB-1640, which in turn produces a production rate of approximately 75 feet per minute. This machine was engineered and designed to provide years of dependable service.

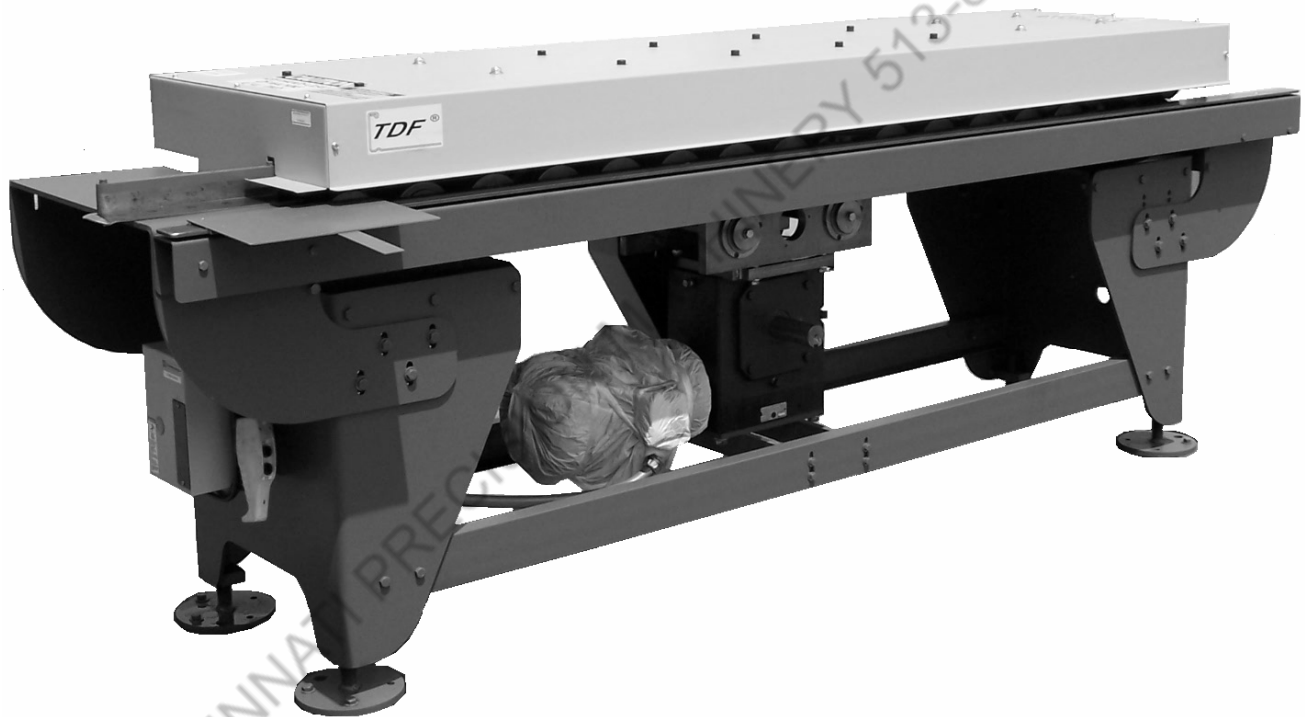


Figure 1-1 Engel HB-1640 TDF® Rollformer

A. INSTALLATION

In selecting a location for the line, consider these factors:

- Working weight (including oil tank filled to capacity) in relation to the building structure for proper support.
- Access to the selected location where the machine will be installed.
- An adequate area to allow sufficient working space around the machine (a clearance of at least 3 feet or 914 mm) for proper ventilation and maintenance.

Some thought should also be given to availability of the required power source (refer to the electrical drawing shipped with the machine or in the back of the manual). The machine should also be located away from grinding machines, sanding machines, spray painting areas and other sources of contamination if practical.

Answers to questions regarding site preparation and other technical assistance is available free of charge via telephone between the hours of 8 AM and 4:30 PM CST Monday through Friday by calling the Engel Customer Service Department at 314-638-0100.

(1) Unpacking The Machine

When the machine arrives, inspect it carefully before accepting the shipment. It is important to note any damage on the Bill of Lading or other shipping documents so that a claim can be filed with the carrier.

Pay special attention to the control console, because it contains delicate electronic devices. Check for physical damage to the switches and the components inside. If anything looks damaged, notify both the carrier (to file a claim) and our Customer Service Department (to order replacement parts). It is important to notify the factory promptly so the new parts arrive before the machine is installed, as it may not be possible to start up and run the machine without them.

Normal procedures should be used to unpack the machine. Remove any covering, steel strapping or skids that may be present. Remove all wooden blocks (used as spacers to prevent movement of the machine parts during shipment). After inspection and unpacking, prepare to move the machine into position, using the floor layout drawing in the back of this manual. This can be done with a fork truck or overhead crane. Once the equipment is in position, fill the hydraulic tank with Mobile Dte 25 hydraulic oil (or equivalent) if applicable and make the necessary electrical connections. Then bring in the required power source to the main control console. When doing the electrical hookups, refer to the electrical drawings supplied with the equipment if necessary.

To safely operate this machinery, all personal must read and understand the safety section of this manual. Study and follow the safety precautions in this section, which are intended to prevent injury to you and your fellow workers. However, they cannot cover all possible situations. Therefore, consider the consequences of your actions before executing any procedure or operation.

B. SAFETY

(1) Safety Precautions (Before Starting The Machine)

- Protect yourself. Wear safety glasses and leather gloves while handling the material. Do not wear loose clothing, neckties, or jewelry. If long sleeves must be worn, avoid cuffs and buttons.

- Keep your work area clean. Remove all scrap, oil spills, rags, tools, and any other loose items that could cause you to slip, trip, or fall.
- Make sure that hydraulic pressures are at specified levels before operating the machine.
- Be alert for loose, worn, or broken parts. Do not attempt to operate the machine with such parts present, or if the machine is making unusual noises or actions.
- Be sure that this manual is kept near the machine so the operator can refer to it when necessary. If you have not already done so, study the manual before operating the machine.
- Be aware of the location of the POWER OFF push-button as well as the Emergency Stop push-button and use them to stop the machine in emergencies.

(2) Safety Precautions (While Operating The Machine)

- Be alert when operating the machine.
- Only one person should control the machine. Never allow anyone to operate the controls while you are working on the machine.
- Remove all Power and tag and lock it out any time someone is working on or repairing the machine.
- Keep your arms and hands away from the internal workings of the machine when starting, running, or stopping the machine.
- Never leave the work area while the machine is running.
- Use good quality metal coils free of damaged or mashed ends.
- Continually observe the punching, shearing, and rollforming of the metal and monitor the machine. If any unusual condition develops, immediately stop the machine and investigate.
- Do not work on any moving device without first powering down the machine and taking every safety precaution.
- When cleaning the machine, or any components, do not use toxic or flammable substances. Do not perform any cleaning while the machine is running. Never override or disable any safety switch or safety interlock.
- Use proper size wrenches and tools. Do not use adjustable crescent wrenches or worn wrenches. A slipping wrench can cause a serious injury. Replace worn nuts, bolts, screws, etc., being sure they are of equivalent quality of those being replaced.
- Use caution when using an air hose to clean in and around the machine. Air pressure may drive dirt and small chips into bearing surfaces or cause bodily injury.

2. SYSTEM OVERVIEW

A. ROLLFORMER

The Engel TDF Rollformer utilizes 16 forming stations to produce an integral TDF flange on straight ductwork and fittings. It is powered by a 7.5 HP motor, with a production rate of approximately 75 feet per minute.

The forming rolls were factory pre-gapped and should require little or no adjustment. The pre-gap settings allow the production of various gauges, without resetting any roll gap.



Figure 2-1 Rollformer Assembly

(1) Entrance Guide

Located at the entrance end of the rollformer is a single guide which is used to support the material as it enters the first set of forming rolls, which sets the location of the roll knives, used to create the male button lock. The entrance guide also determines the position of the profile on the short leg of the TDF pocket. The inside of the short leg should end at the bottom of the pocket (see photo).

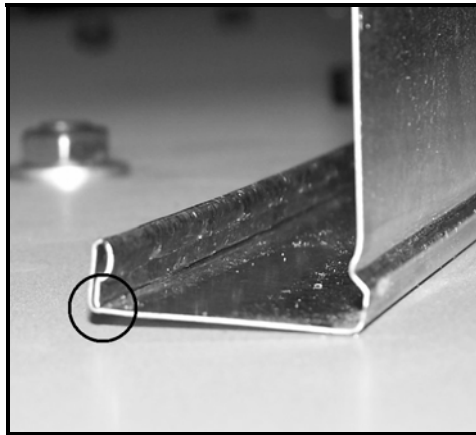


Figure 2 TDF Profile

The face of the Entrance Guide just before the material enters the first forming roll is set approximately 2 5/8" from the outside face of the first forming roll and is tailed out (see illustration) approximately .030 on the entrance end, which allows the material to be pulled straight as it enters the forming rolls.

⚠ DANGER:

NEVER perform maintenance or make any adjustments without removing power from any power source and locking out that source. SAFETY IS ALWAYS FIRST!!!!!!

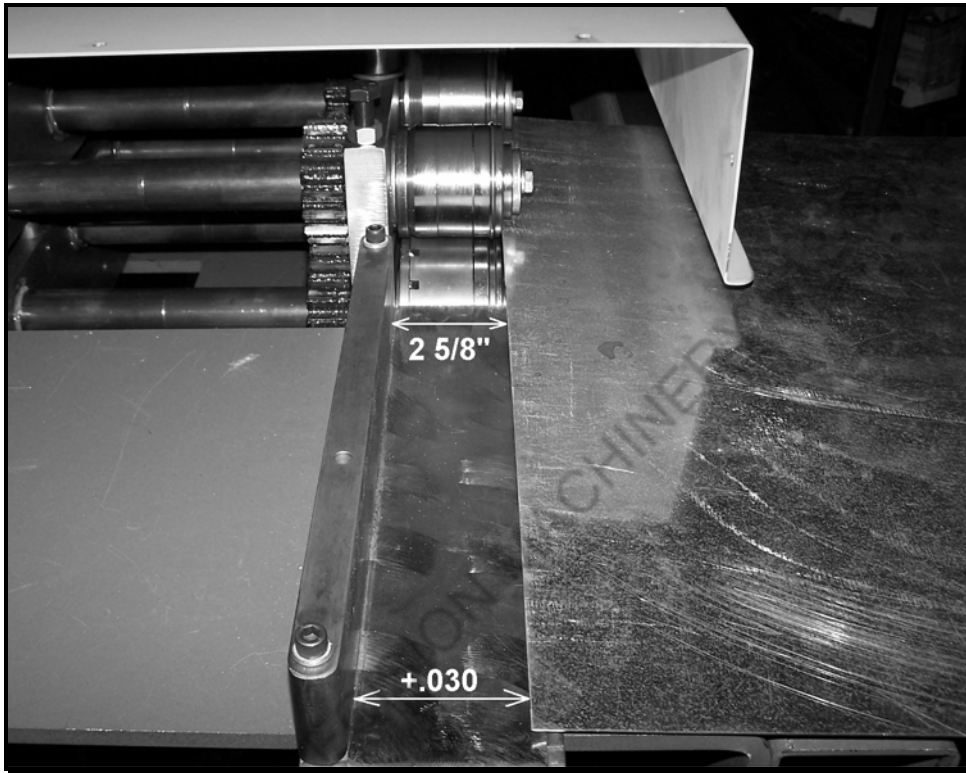


Figure 2-3 Entrance Guide Setup

(a) Male Button Lock Adjustment

The male button lock location, 3/16" from the side of the sheet to the knives, was set at the factory and should require little or no adjustment. This location is determined by the location of the entrance guide. If the male button lock dimension is incorrect, the male lock may be flattened as the part is formed, resulting in NO button lock on the inside of the TDF pocket.

To check the location of the male button lock, run a short piece of 20 gauge material to check for knife location. Adjust entrance guide as needed to ensure the desired distance is achieved.

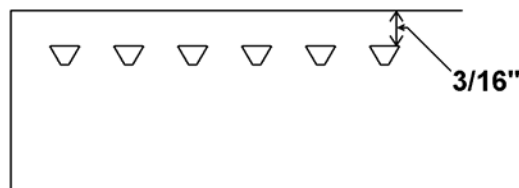


Figure 4 Male Button Lock Locations

(2) Factory Roll Gap Settings

The forming rolls were factory pre-gapped and should require little or no adjustment. The pre-gap settings allow the production of various gauges, without resetting roll gap.

All 16 stations are factory gapped at .015 with the exception of the side rollers on stations 9, 15 and 16, which require special pre-gaps. Each set of four forming stations is equipped with four Tensioning Assemblies (Items A-D) and four Roll Gapping Assemblies (Items E and F). All four of each type of assembly must be adjusted during this procedure.

A	Tension Bolt
B	Locking Jam Nut
C	Adjusting Jam Nut
D	Tension Spring Washers
E	Roll Gap Adjustment Bolt
F	Jam Nut

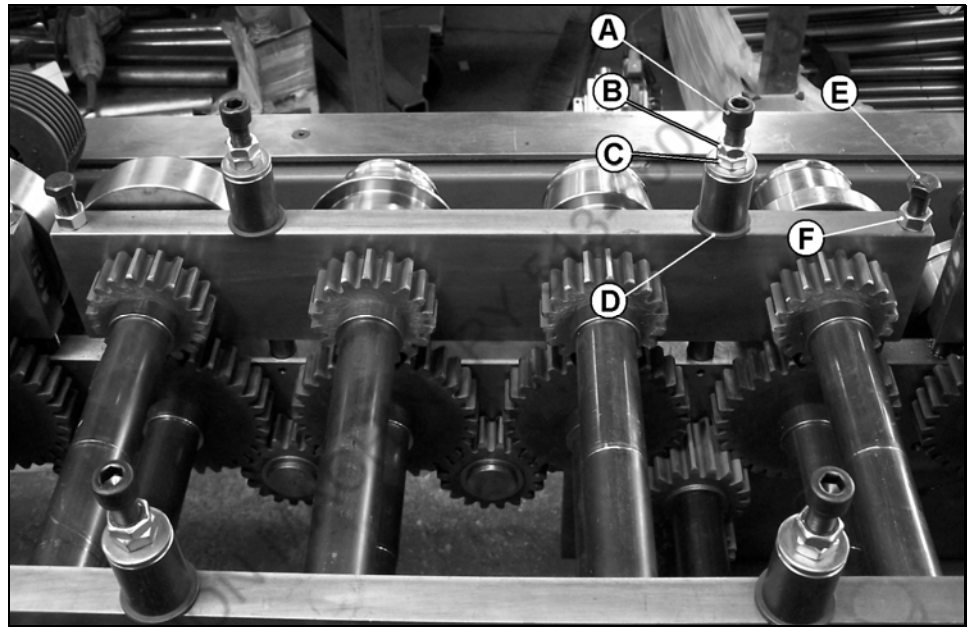


Figure 5 Roll Gap Adjustment Components

(a) Resetting Roll Gap & Tension

The following is the recommended procedure for resetting the forming rolls to factory specifications.

1. Ensure ALL power sources are shutoff and locked out.

⚠ DANGER:

NEVER perform maintenance or make any adjustments without removing power from any power source and locking out that source. SAFETY IS ALWAYS FIRST!!!!!!

2. Remove the top cover.
3. Loosen Locking Jam Nut (B) on each Tensioning Assembly.
4. Turn Adjusting Jam Nut (C) clockwise until snug on each Tensioning Assembly.
5. Now, turn Adjusting Jam Nut (C) counter clockwise three flats on the nut on each Tensioning Assembly, which sets the proper tension on the forming rolls.
6. Retighten all Locking Jam Nuts (B).
7. Loosen the Jam Nut (F) on each Roll Gapping Assemblies.
8. Turn each Roll Gap Adjustment Bolt (E) counter clockwise on each Tensioning Assembly until the forming rolls are seated on top of each other.

9. With a feeler gauge, raise the forming rolls slowly with the Roll Gap Adjustment Bolts (Item E), until the desired gap (.015) is obtained.

▲ NOTE:

Each set of four forming rolls are contained by a single side plate, so adjusting the first roll and the last roll in each set of side plate is all that is required. The second and third roll gaps will be set once the first and fourth are set.



Figure 6 Roll Gap Locations

10. This may take several adjustments to achieve the desired results.
11. Once the adjustment has been made retighten all Jam Nuts (F) on each Tensioning Assembly and then confirm proper gap.

(3) Side Roll Adjustment

Located at stations 9, 15 and 16 are Side Rolls used in conjunction with the stacked forming rolls. The Side Rolls assist in completing two separate 90° bends. They are equipped with an eccentric cam used to adjust the rolls laterally and one or two sets of push/pull bolts used to set the vertical clearance.

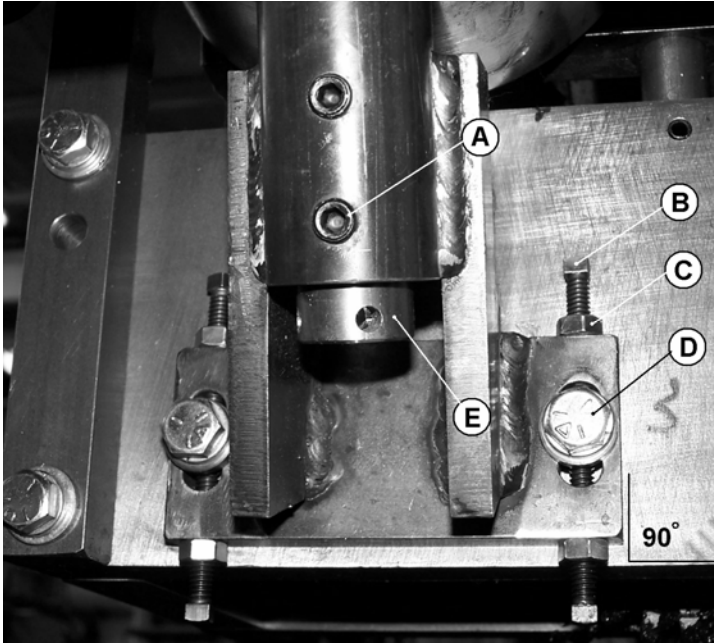


Figure 7 Side Roll Adjusting Components

A	Eccentric Cam Set Screw
B	Vertical Clearance Adjustment Bolt
C	Lock Nut
D	Lock Bolt
E	Eccentric Cam

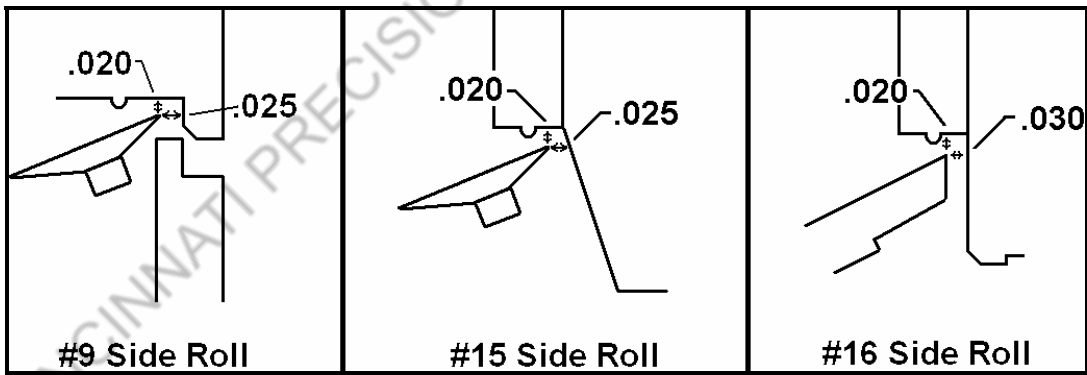


Figure 8 Side Roll Clearances

1. Vertical Adjustment

1. Ensure ALL power sources are shutoff and locked out.

⚠ DANGER:
NEVER perform maintenance or make any adjustments without removing power from any power source and locking out that source. SAFETY IS ALWAYS FIRST!!!!!!

2. Remove the top cover.
3. Loosen both Lock Bolts (D).

4. Loosen all Lock Nuts (C).
5. Using a feeler gauge, raise or lower the Side Roll assembly until the desired clearance is obtained. Ensure the Side Roll assembly maintains a 90° angle to the bottom of the side plate.
6. Once the desired clearance is set, tighten the Lock Nuts (C) and Lock Bolts (D).
7. Recheck clearance.

2. Lateral (Horizontal) Adjustment

1. Ensure ALL power sources are shutoff and locked out.

⚠ DANGER:

NEVER perform maintenance or make any adjustments without removing power from any power source and locking out that source. SAFETY IS ALWAYS FIRST!!!!!!

2. Remove the top cover.
3. With an Allen wrench, loosen both Eccentric Cam Set Screws (A).
4. With the same wrench, insert the wrench into the positioning hole exposed at the bottom of the Eccentric Shaft.
5. Using a feeler gauge, rotate the Eccentric Shaft (E) until the desired clearance is obtained.
6. Secure both Eccentric Cam Set Screws (A).
7. Verify clearance.

(4) Short Part Assist Platform

For parts shorter than twelve inches, a Short Part Assist Platform is used to support the material as it's formed. Before using, ensure the guide rail is straight for proper tracking and has a light coat of grease so the platform slides without binding.

To use the platform, position the platform over the guide rail at the entrance end of the rollformer. Slide the part to be formed against the entry guide and secure it with two sets of Vice Grips™ or similar clamps. Apply power to the unit and slide the platform into the first set of forming rolls.

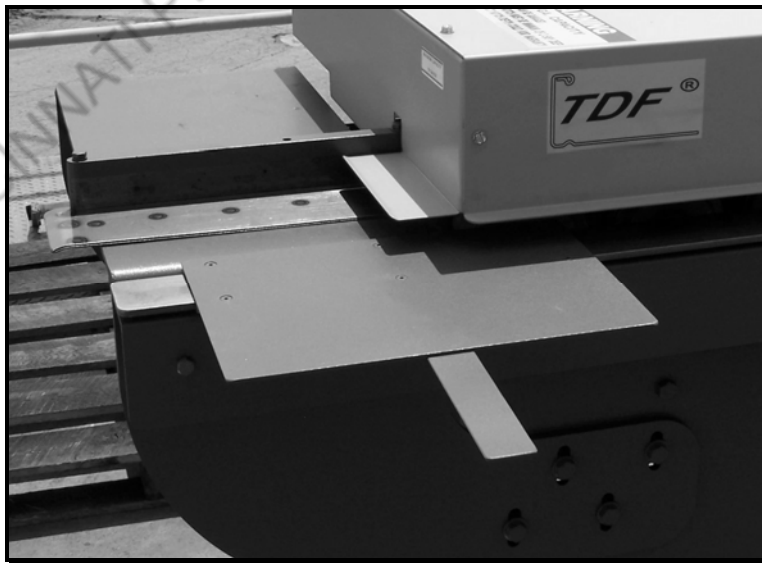


Figure 9 Short Part Assist Platform

(5) Straightener Roll

Located on the exit end of the Rollformer is an adjustable roller (A) that can be raised or lowered to remove down or up bow in the parts. If up bow is present, loosen the lock screw (B) and lower the roll with the adjustment knob (C) or raise the roll if down bow is present and retighten the lock screw.

This roll is typically only required when running 26 gauge material.

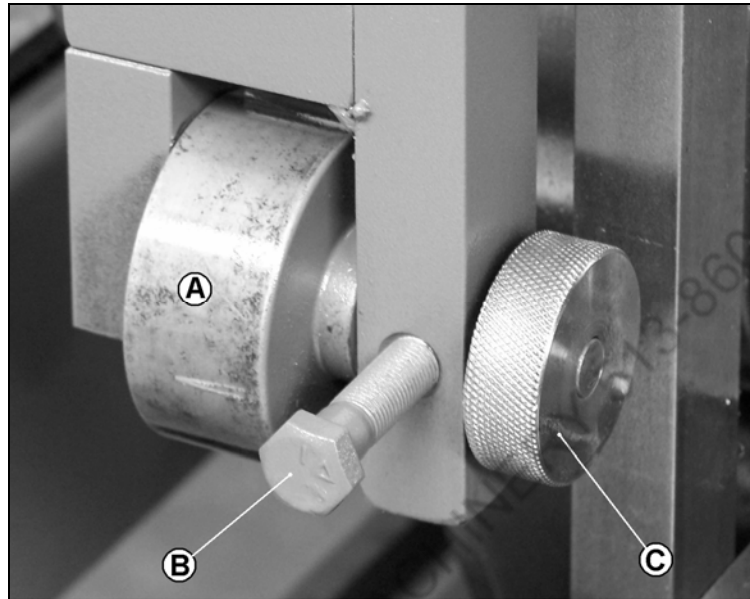


Figure 10 Straightening Roll

(6) Rubber Support Rollers

Located at stations 13 through 16 are four rubber support rollers that are used to hold the material down as it passes through the last four stations of the rollformer. These rolls enable the flange to be formed at a 90° angle.

If the flange is less than 90°, lower the rolls until they ride firmly on the material as it passes underneath. If the flange is greater than 90°, raise the rolls slightly.

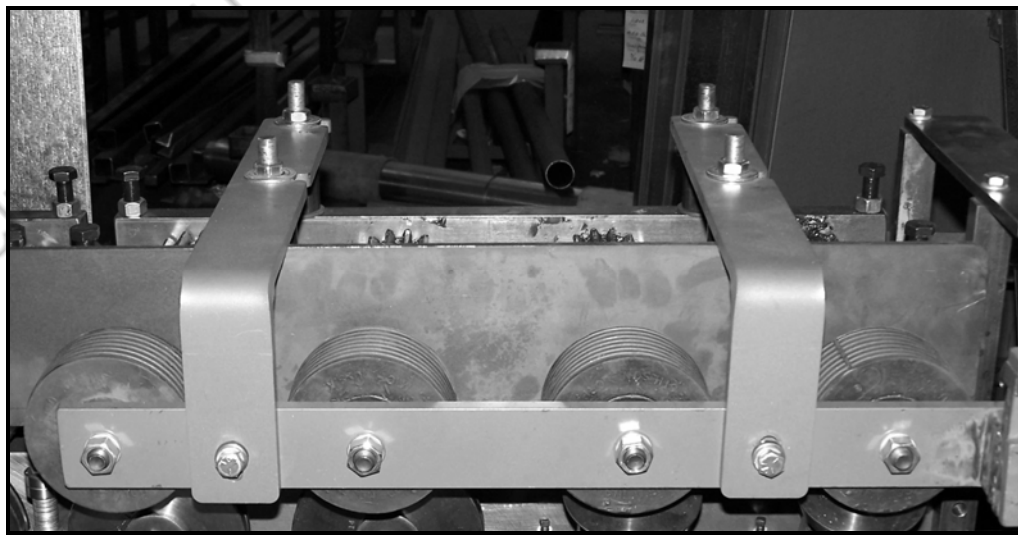


Figure 11 Rubber Support Rollers

3. SYSTEM CONTROLS

This section describes the operational controls for the rollformer. The only control of the Engel HB-1640 is a single hand held control pendent. This pendent is used to start and stop the forming rolls.

(1) ROLLFORMER START/STOP PENDENT

A handheld controller used to start and stop the forming rolls. To utilize this switch, the Rollformer must have power applied to the unit.



Figure 3-1 Start/Stop Pendent

4. MAINTENANCE

A. TORQUE VALUES FOR GENERAL ASSEMBLY

The torque chart value (*Table 1 and 2*) is provided for reference when performing general assembly of various components. These values should be used only if torque values are not otherwise specified for a particular assembly. Refer to the associated assembly drawings for assemblies or other component assemblies that may require special torque specifications.

The following conditions must be observed when using the general assembly torque values:

- Joints are assumed to be metal and rigid. Do not use these values where gaskets or compressed material may be damaged by over-torquing.
- During disassembly, note bolt head markings and always reassemble the same hardware or equivalent new hardware in the correct locations.
- As a general rule, when reusing previously removed hardware, apply the minimum values from the table.
- Reduce the table values by 20% when assembling plated hardware or phosphate coated hardware.
- Reduce table values by 30% when molykote, white lead, or similar mixtures are used to lubricate threads.
- Reduce the table values by 35% when torquing jam nut (*thin nuts*).
- Special use column values in the table are for capscrews in gray iron castings when thread length engagement is at least 1.5 times the capscrew diameter.

Table 4-1. Metric Bolt And Cap Screw Torque Values

Property Class and Head Markings					
Property Class and Nut Markings					

size	Class 4.8				Class 8.8 or 9.8				Class 10.9				Class 12.9			
	Lubricated*		Dry*		Lubricated*		Dry*		Lubricated*		Dry*		Lubricated*		Dry*	
	N-m	Lb-ft	N-m	Lb-ft	N-m	Lb-ft	N-m	Lb-ft	N-m	Lb-ft	N-m	Lb-ft	N-m	Lb-ft	N-m	Lb-ft
M6	4.8	3.5	6	4.5	9	6.5	11	8.5	13	9.5	17	12	15	11.5	19	14.5
M8	12	8.5	15	11	22	16	28	20	32	24	40	30	37	28	47	35
M10	23	17	29	21	43	32	55	40	63	47	80	60	75	55	95	70
M12	40	29	50	37	75	55	95	70	110	80	140	105	130	95	165	120
M14	63	47	80	60	120	88	150	110	175	130	225	165	205	150	260	190
M16	100	73	125	92	190	140	240	175	275	200	350	225	320	240	400	300
M18	135	100	175	125	260	195	330	250	375	275	475	350	440	325	560	410
M20	190	140	240	180	375	275	475	350	530	400	675	500	625	460	800	580
M22	260	190	330	250	510	375	650	475	725	540	925	675	850	625	1075	800
M24	330	250	425	310	650	475	825	600	925	675	1150	850	1075	800	1350	1000
M27	490	360	625	450	950	700	1200	875	1350	1000	1700	1250	1600	1150	2000	1500
M30	675	490	850	625	1300	950	1650	1200	1850	1350	2300	1700	2150	1600	2700	2000
M33	900	675	1150	850	1750	1300	220	1650	2500	1850	3150	2350	2900	2150	3700	2750
M36	1150	850	1450	1075	2250	1650	2850	2100	3200	2350	4050	3000	3750	2750	4750	3500

DO NOT use these values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only. Check tightness of fasteners periodically.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical property class.


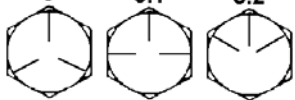




Fasteners should be replaced with the same or higher property class. If higher property class fasteners are used, these should only be tightened to the strength of the original.

* "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated without any lubrication.

Make sure fasteners threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

Tighten plastic insert or crimped steel-type lock nuts to approximately 50 percent of the dry torque shown in the chart, applied to the nut, not to the bolt head. Tighten toothed or serrated-type lock nuts to the full torque value.

Table 4-2. Unified Inch Bolt And Cap Screw Torque Values

SAE Grade and Head Markings	NO MARK	1 or 2 ^b 	5 5.1 5.2 	8 8.2 
SAE Grade and Nut Markings	NO MARK	2 	5 	8 

size	Grade 1				Grade 2 ^b				Grade 5, 5.1, or 5.2				Grade 8 or 8.2			
	Lubricated*		Dry*		Lubricated*		Dry*		Lubricated*		Dry*		Lubricated*		Dry*	
	N-m	Lb-ft	N-m	Lb-ft	N-m	Lb-ft	N-m	Lb-ft	N-m	Lb-ft	N-m	Lb-ft	N-m	Lb-ft	N-m	Lb-ft
1/4	3.7	2.8	4.7	3.5	6	4.5	7.5	5.5	9.5	7	12	9	13.5	10	17	12.5
5/16	7.7	5.5	10	7	12	9	15	11	20	15	25	18	28	21	35	26
3/8	14	10	17	13	22	16	27	20	35	26	44	33	50	36	63	46
7/16	22	16	28	20	35	26	44	32	55	41	70	52	80	58	100	75
1/2	33	25	42	31	53	39	67	50	85	63	110	80	120	90	150	115
9/16	48	36	60	45	75	56	95	70	125	90	155	115	175	130	225	160
5/8	67	50	85	62	105	78	135	100	170	125	215	160	215	160	300	225
3/4	120	87	150	110	190	140	240	175	300	225	375	280	425	310	550	400
7/8	190	140	240	175	190	140	240	175	490	360	625	450	700	500	875	650
1	290	210	360	270	290	210	360	270	725	540	925	675	1050	750	1300	975
1-1/8	470	300	510	375	470	300	510	375	900	675	1150	850	1450	1075	1850	1350
1-1/4	570	425	725	530	570	425	725	530	1300	950	1650	1200	2050	1500	2600	1950
1-3/8	750	550	950	700	750	550	950	700	1700	1250	2150	1550	2700	2000	3400	2550
1-1/2	1000	725	1250	925	990	725	1250	930	2250	1650	2850	2100	3600	2650	4550	3350

DO NOT use these values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only. Check tightness of fasteners periodically.

Make sure fasteners threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical property class.

Tighten plastic insert or crimped steel-type lock nuts to approximately 50 percent of the dry torque shown in the chart, applied to the nut, not to the bolt head. Tighten toothed or serrated-type lock nuts to the full torque value.

Fasteners should be replaced with the same or higher property class. If higher property class fasteners are used, these should only be tightened to the strength of the original.

* "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated without any lubrication.

^b Grade 2 applies for hex cap screws (not hex bolts) up to 152mm (6 in.) long. Grade 1 applies to hex hex cap screws over 152 mm (6 in.) long, and for all other types of bolts and screws of any length.

B. SERVICING

(1) Lubricant Recommendations / Specifications

To ensure that the system is kept in a correct operating condition, it must be inspected and maintained on a regular basis. Proper cleaning and/or replacement of filters, the periodic lubrication of bearings, bushings, chains and other moving friction and wear generating points will prevent damage to or failure of the unit, and provide optimum performance.

Table 4-3 lists the types of lubricants used to maintain the equipment. The **LUBE TYPE** code on the left side of the table is utilized to identify the lubricant used in the text of this manual.

Table 4-3. Recommended Lubrication Products

Lube Type	Description	Recommended Products
A	CHAIN OIL	WAY LUBRICANT 220
B	MULTI-PURPOSE LUBE	LUBRIKO M6 MARFAX MULTI-PURPOSE #2 (TEXACO) MULTI-PURPOSE #2 GREASE (AMACO) MOBILITH AW #2 (MOBIL)
C	GEARBOX OIL	SYNTHETIC OIL 634 (MOBILE) VAN GUARD CYLINDER OIL 680 (TEXACO) CYLINDER OIL 680 (AMACO)
D	HYDRAULIC OIL	DTE #25 MOBILE (NON-HYPOID) RANDO HYD AW46 HYDRAULIC OIL (TEXACO) AW-68 HYDRAULIC OIL (AMACO)
E	GEAR GREASE	ENLUBE S-CHEM 10M-2

(2) Lubrication, General Requirements

Table 4-5 shows some of the lubrication points on the system. The maintenance technician must become familiar with all the lubrication points located throughout the line. Chain drives, rack and pinion locations, dies, rollers, hand wheels, and those points where metal-to-metal contact of movable surfaces are located must be adequately lubricated. The lubrication schedule shown in Table 4 was developed as a "general" application. The actual lubrication requirements for the line and for individual points will be determined by usage requirements. These requirements will be based on line setup, usage, and equipment environment.

During lubrication procedures, a preventative maintenance inspection should also be conducted. Check the machine visually for loose nuts, bolts, parts out of adjustment, etc. Correct all deficiencies while they are small, and before they become operational problems.

Certain parts of the machine are left unpainted to aid in the movement of the slide assembly when changing dies, etc. Keep these areas clean and coated with light grease.

(3) Lubrication Schedule

The lubrication schedule shown in Table 4-4 was developed as a "general" application. The actual lubrication requirements for the line and for individual points will be determined by usage requirements. These requirements will be based on line setup, usage, and equipment environment.

1. Do not over-lubricate.

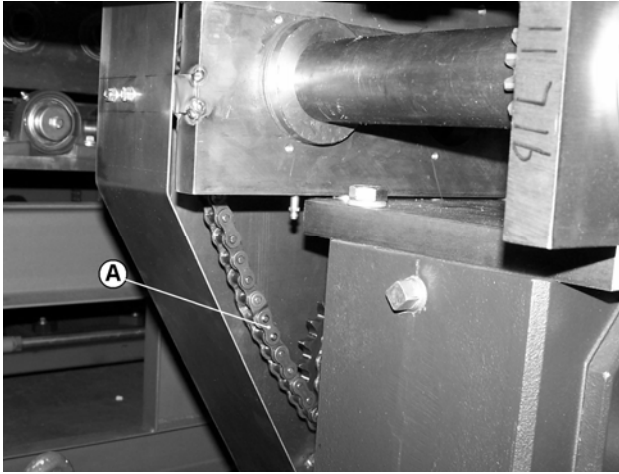
2. When using a low pressure grease gun, lubricate only to the point of grease starting to come out of the edges of the seals, etc., of the item being lubricated.
3. Do not over lubricate chains. Chain drives should not be lubricated to the point that oil is "flung" off during operation.
4. Ensure that proximity sensor heads are kept clean and free of lubricant. Dirty sensor heads will affect system operation.
5. NOT ALL lubrication points are shown in "System Lubrication Points" photos, ensure ALL points are identified and properly lubricated.

Table 4-4. Lubrication Schedule

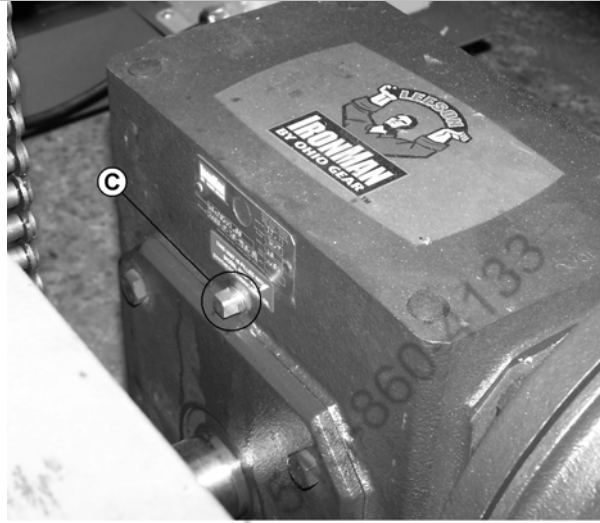
Procedure	Lube Type	Weekly	Monthly	6 Months	12 Months
ROLLFORMER					
Shaft Support Bearings	B			X	
Ball Screws	C			X	
Gears	E		X		
Roll Bearings	B			X	

Table 4-5. System Lubrication Points

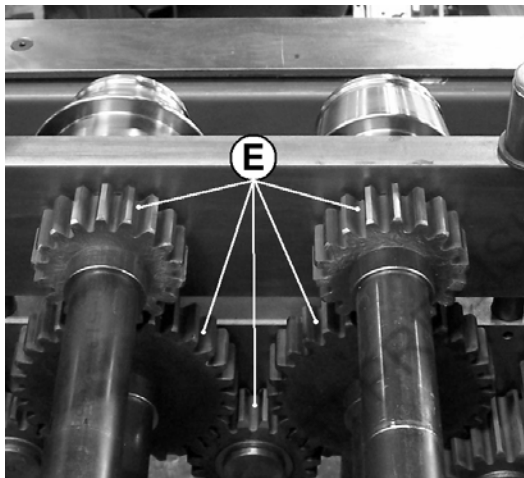
ROLLFORMER



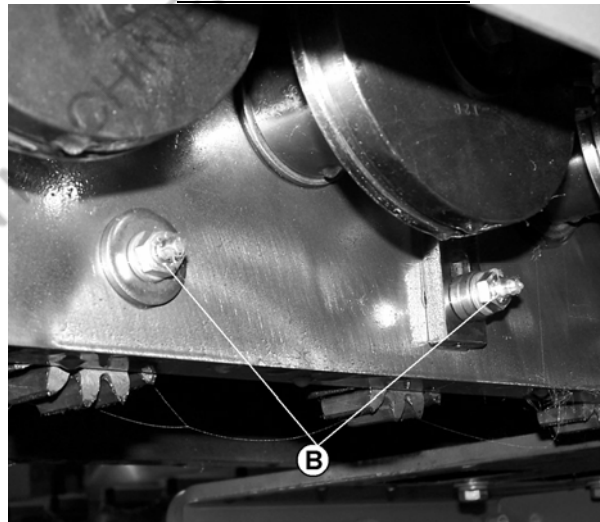
Drive Chains



Drive Gear Box
Located on Frame Base.



ALL Gear Surfaces



Roll Bearings

⚠ NOTICE

NOT ALL lubrication points are shown in "System Lubrication Points" photos, ensure ALL points are identified and properly lubricated

C. PREVENTIVE MAINTENANCE

A periodic inspection schedule should be established and maintained. A suggested inspection/check schedule is provided in Table 4-6. The criteria listed meet the minimum requirements necessary to ensure safe reliable service under normal operating conditions. It should be modified as required to meet varying operating and environmental conditions.

Table 4-6. Inspection Schedules

Procedure	As Req'd	Weekly	Monthly	6 Months	12 Months
GENERAL MAINTENANCE					
Chains, sprockets, idler pulleys and guide surfaces: Inspect for excessive wear, looseness. Repair/replace as required			X		
Motor Brushes: Inspect for burnt surface, chipped or damaged condition. Replace as required. Semi-annually or every 2000 operating hours, whichever comes first.				X	

(1) Daily Maintenance

Check the machine visually for loose nuts or bolts, parts out of adjustment, etc. Correct problems while they are small.

(2) Monthly Maintenance

Check all drive chains and rack and pinions for proper tension. Tighten as necessary. Grease all fittings and wipe off excess grease.

D. ASSEMBLY DRAWINGS & ELECTRICAL SCHEMATICS

This Assembly Drawing and Electrical Schematic sections contain drawings and schematics for your processing line equipment. The drawings contain pertinent information for the operation, maintenance, and repair of your equipment. Refer to the drawings when working on the equipment and when ordering replacement parts.

E. ORDERING PARTS

A Parts Order form is provided for your convenience. Photocopy the form for shop use. Fill out all required spaces. Parts orders may be placed by telephone, or may be faxed to Engel Industries.

F. RETURNS

(1) Returning Parts For Repair

Prior to parts being returned for repair, Engel Industries Customer Service must be contacted. A **Return Material Authorization (RMA)** worksheet must be used. A **Return Material Authorization** worksheet is provided in this section for your convenience. Photocopy the worksheet for shop use. Fill out all required spaces. Telephone Engel Industries Customer Service. The following information must be received/provided through Engel Industries Customer Service.

- Name of individual requesting return.
- Component Part Number and Name.
- Cause or indication of component failure.
- Purchase Order number for repair charges and return shipping.

An RMA number will be provided by customer service, log this number on the the RMA worksheet. The statement **RETURN FOR REPAIR** and the **RMA number must be marked on the outside of the shipping carton**. Carefully pack the faulty part for shipping, and include a completed copy of the RMA Worksheet with the part. Return freight charges are paid by the customer.

- Mark the outside of the carton "RETURNED FOR REPAIR," and the RMA number.

(2) Warranty Returns

When a component covered by warranty fails, it must be returned to Engel Industries for evaluation and processing. A customer provided Purchase Order number is utilized to order a replacement part and cover shipping. Return freight charges are paid by the customer.

The following procedures for warranty returns and service are provided as an operating guide. Special circumstances that require variance from these procedures must be pre-approved by the Engel Warranty Administrator.

- Engel will **not** provide "loaner" parts or components while a warranty claim is being evaluated.
- Engel warrants that new equipment it *manufacturers* shall at the time of shipment, and for a period of one year on parts, be free from defects in material and workmanship. This warranty applies only to machines installed, operated, and maintained in accordance with Engel's recommendations and quotes for field specifications.

- Warranty claims may be disallowed if it is determined that any claimed defect is a result of misuse, neglect, improper maintenance or repair, alterations, accident or excessive deterioration due to environmental contamination.
- The warranty does not apply to normal wear items such as lamps, switches, belts, drive chains, or electrical connectors. Warranty does not cover normal maintenance items or maintenance functions.
- Engel's obligation under this warranty is limited to repairing or replacing the failed component that Engel's inspection determines to be defective. Warranty claim items must be returned to Engel, freight prepaid, for inspection and warranty determination.
- Purchased parts (*items not manufactured by Engel*) are warranted by their vendor or manufacturer. Engel is not liable for this warranty, but will, for the convenience of our customers, process such warranty claims to the vendor.
- Hydraulic cylinders normally will not be returned to Engel. Cylinder leakage is a result of loose packing or bad seals. The tightening of packing or the replacement of seals is a normal maintenance procedure and not a warranty item.
- Assemblies will not be returned to Engel for warranty evaluation or replacement. Only the failed component of the assembly may be returned for warranty. If the customer desires to return an assembly, all labor and parts for repairing the assembly will be at a cost plus basis, with only the failed component will be covered by warranty claim. A repair PO must accompany the repair order.

Prior to parts being returned for warranty exchange or warranty repair, Engel Industries Customer Service must be contacted. An **RMA number** provided by the Service Department and a **Return Material Authorization (RMA)** worksheet must be utilized for returns. An RMA Worksheet is provided for your convenience in this section. Photocopy the worksheet for shop use. Fill out all required spaces. The following information must be entered on the RMA form:

- Customer business name and address.
- Contact telephone and fax number.
- Name of the individual requesting return (customer point of contact).
- Equipment Model and serial number of the top level equipment assembly.
- Line installation date.
- Component description, part number and serial number (if applicable).
- Part failure description. Be specific and describe the problem or failure for which the part is being returned.
- Purchase Order number for the ordered replacement part.
- Warranty Return Parts Authorization Number (RA) provided by Engel Industries .
- Reason for the part return (*warranty, repair or credit*).

Carefully pack the part for shipping, and include a completed copy of the RMA Worksheet with the part.

Mark "**WARRANTY RETURN**" and the **RMA** number on the outside of the carton.

(a) Warranty Claim Approved

Once the warranty claim has been approved, a **Customer Credit** for the purchase replacement item will be issued against the purchase order under which the customer received their replacement part. Shipping costs are not reimbursed.



A **Warranty Inspection Report** for the item will be completed and mailed/faxed/or emailed to the customer.

(b) Warranty Claim Disapproved.

No credit is issued against the purchase order under which the customer received their replacement part. A **Warranty Inspection Report** is prepared and mailed/faxed/or emailed to the customer. This report requests part disposition from the customer. The part will be held at Engel for 30 days. Within that time frame the customer must select to have the part:

- Repaired (*if practical*) and returned at customer expense (*a repair PO must be issued*). Customer is charged parts, labor and shipping.
- Returned not repaired, freight/postage collect.
- Scrapped.

If customer direction is not received within the 30 day time frame, the part is scrapped.

(3) Returning Unused Parts For Credit

Unused, undamaged, parts still in their original packaging, which are approved by Engel Industries for credit return, are subject to a 35% restocking fee based on current price lists.

An **Return Material Authorization (RMA)** number is required for the part return, with the CREDIT box checked. Once received, the part will be inspected for acceptability. If the part is free from defects, and in the original packaging, a customer credit, less the **35% restocking fee**, will be issued to the customer. If the part does not meet restock requirements, a **Warranty Inspection Report** will be generated informing the customer of the inspection results and asking his disposition of the part. If disposition is not received within 30 days, the part will be returned to the customer freight collect.

Carefully pack the part(s) for shipping, and include a completed copy of the RMA Worksheet with the part.

Mark "**CREDIT RETURN**" and the **RMA** number on the outside of the carton.

ENGEL INDUSTRIES

8122 Reilly Avenue,
St. Louis, MO 63111 U.S.A.

Telephone (314) 638-0100

Fax (314) 638-6514

Web: www.engelind.com

E-Mail: Gary Paszkiewicz gpaszkiewicz@engelind.com



CUSTOMER PARTS ORDER FORM

INSTRUCTIONS

Please fill out the form with the information requested. Use extra sheet if additional parts are required. Fax to Engel Industries and we will process your order.

PARTS ORDER INFORMATION					
Customer Name:		Purchase Order No.:			
Bill To Address:		Customer Contact:			
Bill To City, State, Zip:					
Ship To Address (if different than Bill to):		Telephone No.:			
Ship To City, State, Zip (if different than Bill to):					
Payment Terms:		Parts Needed By Date:			
Shipping Information: Ship VIA: Surface <input type="checkbox"/> Air <input type="checkbox"/> Other <input type="checkbox"/> _____		Freight: Prepaid <input type="checkbox"/> Collect <input type="checkbox"/> Shipment Insured <input type="checkbox"/>		Call upon arrival?: <input type="checkbox"/> YES <input type="checkbox"/> NO Telephone No.:	
Qty	Part No.	Description	Information Source (i.e., Drawing No., Manual No., Figure, Item No.)		
Special Instructions:					



RETURN MATERIAL AUTHORIZATION (RMA) FORM

CUSTOMER:		RMA No. (from IPI): RMA- _____	
ADDRESS:		CUSTOMER POINT OF CONTACT (who may we call?):	DATE:
		E-mail Address:	P.O. No. (replacement part ordered):
Telephone No.: () ____-_____	Fax. No.: () ____-_____	EQUIPMENT MODEL (Duct-O-Matic, Whisper-Loc, etc.):	
Returned Part Information Description: Part No.: Serial No.:		Line Serial No.:	Line Installation Date:
		Reason for Return:	
		<input type="checkbox"/> Warranty <input type="checkbox"/> Repair <input type="checkbox"/> Credit	
PART FAILURE DESCRIPTION (describe reason for return in detail. Insufficient description such as Broke, Doesn't Work, etc., are not acceptable and may delay your warranty claim):			
<p style="text-align: center;">RMA approved items must be received by Engel within 15 days of the RMA issue date. Items not received within that time period will not be accepted and will not be considered for warranty coverage.</p> <p>Note: For commercially purchased parts, Engel acts as an intermediary for the benefit of the customer. Parts are returned to the original vendor or manufacturer for warranty evaluation. Any delays in notifying you of the warranty status for commercial parts is due to the manufacturer's procedures. Notification of status for Engel manufactured components is normally completed within ten business days of receipt.</p> <p>A written evaluation of your warranty claim will be provided to you. If warranty is denied, the reason will be explained and you will be asked for the disposition of the part. You may have the part returned to you as-is, freight collect; have the part repaired/rebuilt at time/material charge and returned to you; or you may request the part be scrapped. Warranty denied parts will only be held by Engel for 30 days from the date of customer notification. After that date, unless instructed otherwise, the part will be scrapped.</p> <p>Return Instructions: Place a copy of this completed form with the component being returned. On the outside of the shipping carton, mark the carton PART RETURN, and below this write the RMA number.</p>			

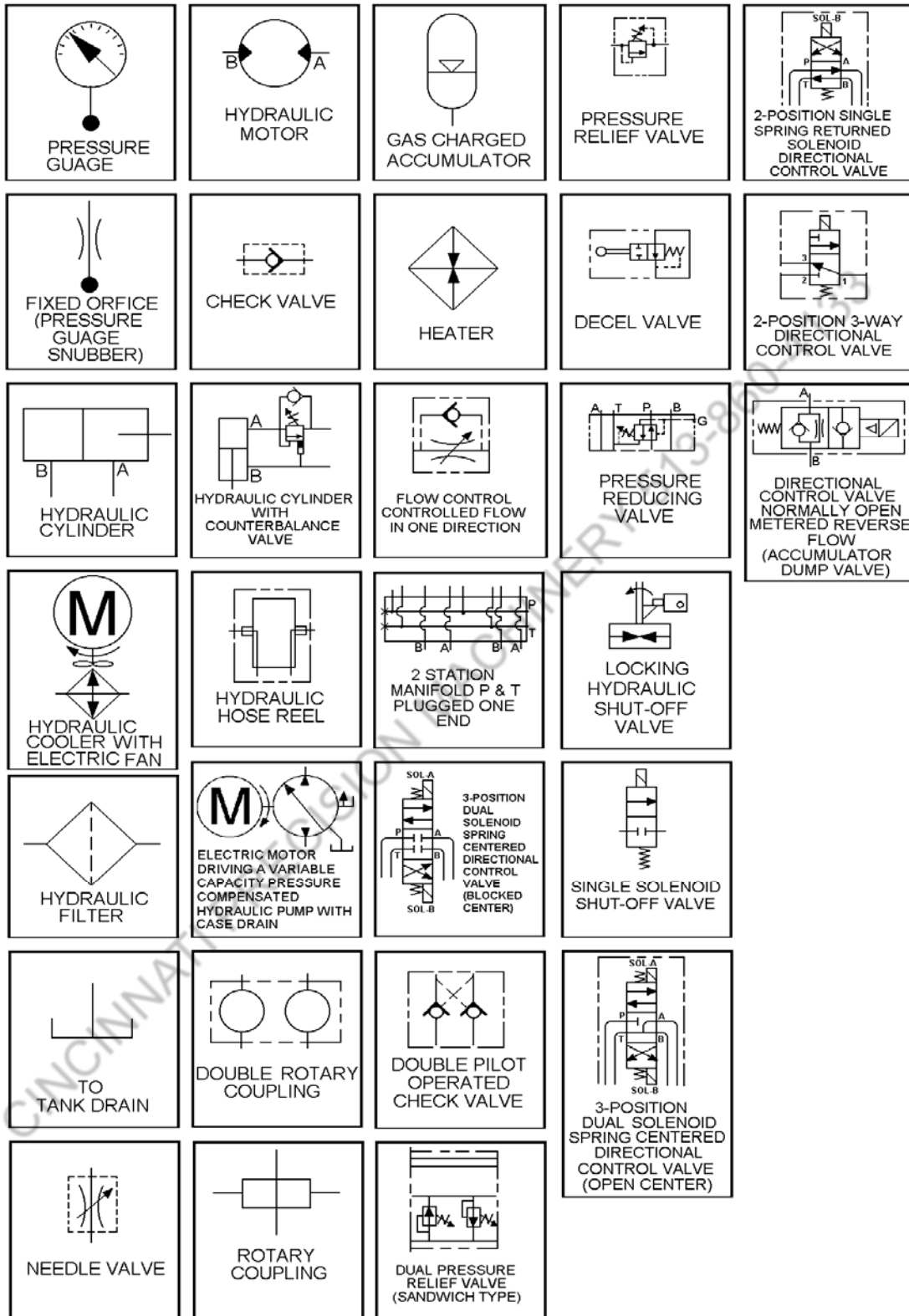


Figure 4-1 Hydraulic Symbols Used On Assembly Drawings

Electrical Drawings

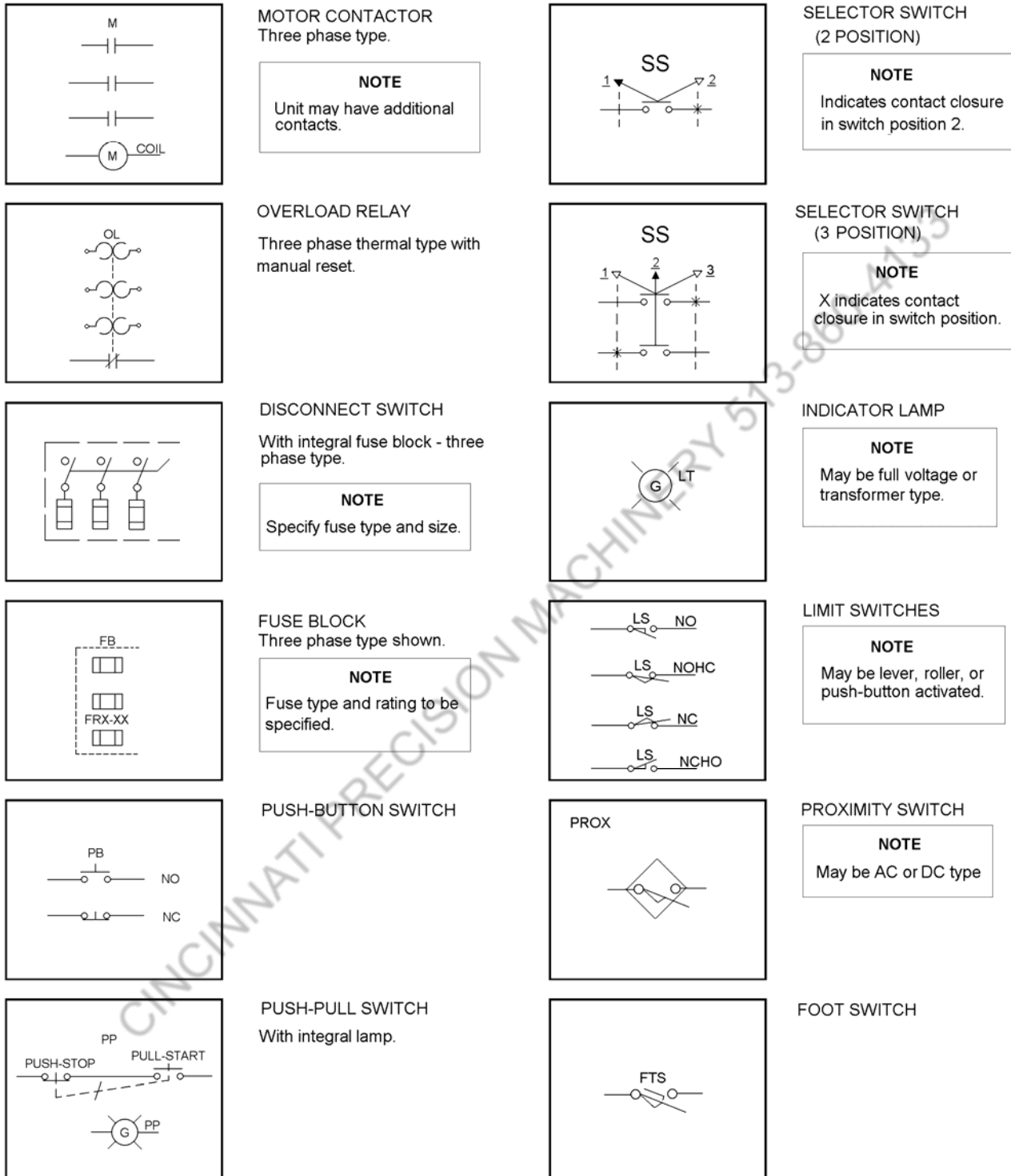
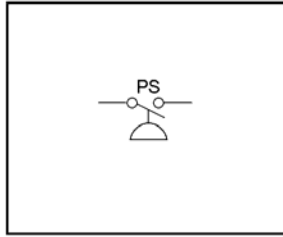
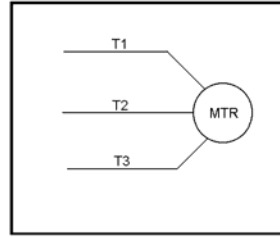


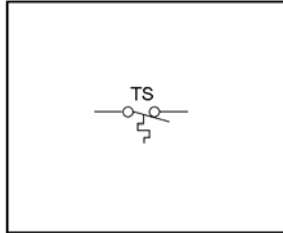
Figure 4-2 Electrical Symbols Used On Assembly Drawings (Sheet 1 of 2)



PRESSURE SWITCH

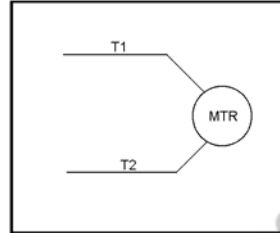


MOTOR
Three phase type.

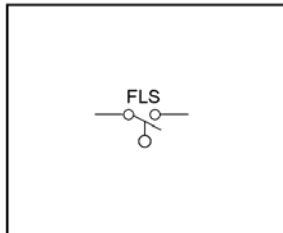


TEMPERATURE SWITCH

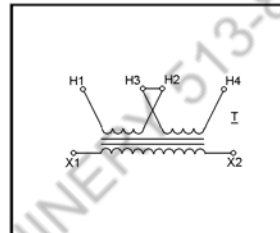
NOTE
Operating temperature to be specified.



MOTOR CONTACTOR
One phase type.

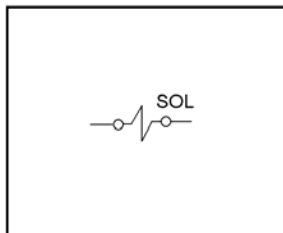


FLOAT SWITCH

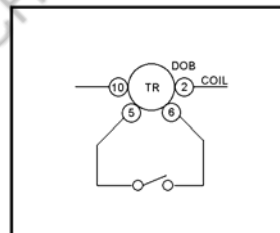


TRANSFORMER
Single phase type with dual voltage primary.

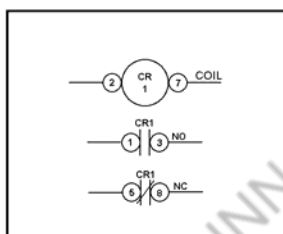
NOTE
Specify primary and secondary voltage.



SOLENOID

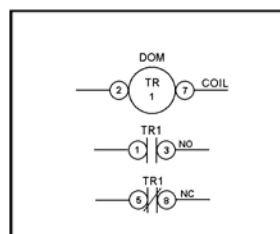


TIMER
Delay on break type. Contact operation is delayed after switch is opened.



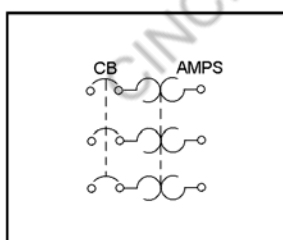
CONTROL RELAY

NOTE
Numbers indicate socket terminal numbers.



TIMER
Delay on make type. Contact operation is delayed after power is applied to coil.

NOTE
Numbers indicate socket terminal numbers.



CIRCUIT BREAKER
Three phase thermal type with manual reset.

NOTE
Specify amperage.

Electrical Symbols Used On Assembly Drawings (Sheet 2 of 2)

G. ASSEMBLY & ELECTRICAL DRAWINGS

The Assembly and Electrical drawings are furnished in this section for troubleshooting, parts ordering and component identification. Please use these drawings when replacement parts are required to help speed up the ordering process.

CINCINNATI PRECISION MACHINERY 513-860-4133