

CORNER CADET



OPERATION & MAINTENANCE
MANUAL



LOCKFORMER

E186 Rev 1

June 2011

WARRANTY

Our guarantee on the products we manufacture is limited to repair or replacement without charge, of any part found to be defective in materials or workmanship. This guarantee is for a period of one year (unless otherwise specified) from the date of shipment from our factory, for all mechanical features of the machine, except purchased components that carry the warranty of the original manufacturer.

Warranty parts and components will be shipped freight collect from Lisle, Illinois. If the defective part has not been received by Lockformer within 15 working days after receiving the replacement part, your company will be responsible for the cost of replacement.

The warranty provided in this clause is in lieu of all other warranties, express or implied, arising by law or otherwise, including the implied warranties of merchantability and fitness for a particular purpose which are hereby disclaimed by Lockformer and excluded from this agreement. This warranty shall not be modified for any reason. In no event shall Lockformer be liable for consequential or incidental damages.

© Copyright 2010 by Lockformer

All Rights Reserved

The information in this document has been reviewed and is believed to be completely accurate. However, no responsibility is assumed for inaccuracies. Furthermore, LOCKFORMER reserves the right to make changes to any products herein, at any time, to improve reliability, function, or design. LOCKFORMER does not assume any liabilities arising out of the application or any use of any product described herein, neither does it convey any license under its patent rights nor the rights of others.

TRADEMARK NOTICES

Lockformer is a registered trademark. All other brand and product names are trademarks or registered trademarks of their respective companies.

TABLE OF CONTENTS

TABLE OF CONTENTS
 SAFETY SUMMARY
 LOCKOUT GUIDE
 ELECTRICAL SCHEMATIC *(Back of Manual)*
 ASSEMBLY DRAWINGS *(Back of Manual)*

	<u>Section/Page</u>
1. INSTALLATION.....	1-1
A. SELECTING A LOCATION.....	1-1
B. PNEUMATIC REQUIREMENTS	1-1
C. ELECTRICAL REQUIREMENTS	1-1
D. RECEIVING AND ASSEMBLING THE EQUIPMENT.....	1-1
E. SAFETY REQUIREMENTS	1-5
(1) Safety Precautions Before Starting The Machine	1-5
(2) Safety Precautions When Operating the Machine	1-5
2. SYSTEM OVERVIEW.....	2-1
A. INSULATED DUCT.....	2-2
3. SYSTEM OPERATION	3-1
A. SAFETY PRECAUTIONS	3-1
(1) Before Starting The Machine.....	3-1
(2) When Operating The Machine.....	3-1
B. PREPARATION FOR OPERATION.....	3-2
C. SYSTEM SHUT-DOWN	3-3
4. MAINTENANCE	4-1
A. TORQUE VALUES FOR GENERAL ASSEMBLY.....	4-1
B. MAINTENANCE SAFETY.....	4-4
C. SERVICING.....	4-4
(1) Lubrication, General Requirements.....	4-4
(a) Lubrication Schedule	4-4
D. FEED ADJUSTMENT PROCEDURE.....	4-5
(1) Adjustment Procedure.....	4-5
E. PNEUMATIC ADJUSTMENTS	4-6
(1) Air Valve Station.....	4-7
F. PREVENTIVE MAINTENANCE	4-8
(1) Preventive maintenance checks:.....	4-8
G. CLEANING.....	4-8
H. LUBRICATION.....	4-9

CORNER CADET



I. TROUBLESHOOTING4-9
J. INSTALLING NEW PLC E-PROM.....4-10

LIST OF TABLES

Table 4-1. Metric Bolt And Cap Screw Torque Values.....4-2
Table 4-2. Unified Inch Bolt And Cap Screw Torque Values.....4-3
Table 4-3. Troubleshooting Chart.....4-10

LIST OF FIGURES AND ILLUSTRATIONS

Figure 1-1 Removing Corner Cadet.....1-2
Figure 1-2 Handle & Regulator Installation1-2
Figure 1-3 Installing Corner Magazine.....1-3
Figure 1-4 Duct Guide Installation1-3
Figure 1-5 Deck Mounting Hole Locations.....1-4
Figure 2-2 TDC and TDF Duct Flanges Dimension Requirements2-1
Figure 2-3 Corner Area Free of Insulation Pins2-2
Figure 3-1 Aluminum Loading Sticks3-2
Figure 3-2 Air Regulator Assembly.....3-2
Figure 4-1 Feed Adjustment Components4-5
Figure 4-2 Feeder Speed Adjustment.....4-7
Figure 4-3 Air Valve Station.....4-8
Figure 4-4 Lubrication Points.....4-9
Figure 4-5 PLC Controller4-11

CINCINNATI PRECISION MACHINERY 513-860-4133

SAFETY SUMMARY

INTRODUCTION

Safety is everyone's business... Whether you are an equipment operator, a maintenance person, a supervisor, or business owner, you are directly responsible for the day-to-day safe operation of the equipment under your control. It is your responsibility to maintain and operate this equipment in strict compliance with all applicable laws, safety regulations, and the manufacturer's recommended procedures.

PROMOTING SAFETY

Institute a company safety program. Management has a moral and legal responsibility for promoting industrial safety. The formation of an organized safety program is strongly recommended. This safety program should include the formation of a safety committee to review and update company safety policies on a regular basis. Establish a firm policy on safety regulations in the work place. Publish these objectives, spelling out each employee's responsibilities. ***Make certain that each employee knows what is expected of them.***

SAFETY PROGRAM

The following steps are suggestions that a company developing, or expanding, a comprehensive safety program should consider:

1. Industrial equipment manufacturers carefully design safeguards into their products in order to minimize hazards. However, the manner in which equipment is incorporated into a manufacturing process may inadvertently create a hazard or otherwise defeat built-in safeguards. Closely examine the operation of your company's processing equipment. Take notice of potential hazards. Install guards or take other appropriate action to eliminate hazard risks.
2. Make certain equipment operators and maintenance personnel are properly trained.
3. Setup a program of daily, weekly, and monthly machinery inspection. Make a check list. Keep a historical record of all maintenance work, repairs, and adjustments.
4. Frequently evaluate safety guards and devices during actual production runs. ***Correct any unsafe practice or situation immediately.***
5. Establish safe, convenient material handling systems. If conveyor equipment is installed in your facility, it should conform to recommendations published in the 'American National Standard, Conveyors and Related Equipment, Safety Standards for ANSI/ASME B20.1' which is available from the American National Standards Institute (ANSI).
6. Provide personal protective equipment, such as safety glasses with side shields, safety helmets, tongs, gloves, hand pads, spats, and protective sleeves, as required to suit the operation.
7. Organize a company safety committee. Schedule periodic meetings on a regular basis to review and update all safety policies.
8. Establish a firm policy on safety regulations in the work place. Publish these objectives, spelling out each employees responsibilities. ***Make certain that each employee knows what is expected of them.***

CORNER CADET



9. Investigate all accidents and close calls. Take immediate action to prevent a recurrence of the incident. Keep records of the investigation and the corrective measures taken.
10. Post a list of names, addresses, and phone numbers of physicians and others who are to be called in emergency situations.

CUSTOMER'S RESPONSIBILITIES

There are certain hazards associated with the operation of any equipment or system of machinery that are impractical, *if not impossible*, for equipment suppliers to safeguard. The user must address these hazards and be responsible for providing guards or barriers for establishing appropriate work procedures and for training personnel in the safe operation of that equipment.

With respect to coil and strip processing equipment, the following hazards should be noted:

- Open pits and depressions or raised areas in the floor.
- Space between machines, where strip edges and ends are exposed during feed-up, run, and tail-out conditions. This includes carry-over tables and both roller and belt conveyors.
- Nip and pinch points of machinery, coils, and strip which may be exposed in feed-up, run, and tail-out.
- Areas surrounding payoff reels and recoilers, where clock-springing strip ends present a hazard during banding, un-banding, feed-up and tail-out conditions.
- Sheet and pack handling devices (*including conveyors*) where the motion, as well as shifting of sheets or packs, may present a hazard.
- The area surrounding sheet stacking devices, which must be approached for setup, but which should be clear of personnel during operation because of moving machinery or material.
- Areas associated with high temperatures, high pressure fluids (*hydraulic, air, or water*) and electrical devices and connections.
- The vicinity of machinery which moves into or out of the line.

REFERENCE SOURCES

Questions concerning specific hazards or safeguarding of equipment may be addressed to the equipment manufacturer. For additional information, refer to the sources listed here:

American National Standards Institute (ANSI)

ANSI B11.18, "Machinery and Machine Systems for the Processing of Coiled Strip, Sheet and Plate - Safety Requirements for Construction, Care and Use." **ANSI B11.4**, "Shears: Safety Requirements for Construction, Care and Use." **ANSI B11.14**, "Coil-Slitting Machines/Systems Safety Requirements for Construction, Care and Use." **ANSI B11.18**, "Machinery and Machine Systems for the Processing of Coiled Strip, Sheet and Plate - Safety Requirements for Construction, Care and Use."

National Fire Protection Association (NFPA)

NFPA 79, "Electrical Standards for Industrial Machinery."

European Union

“Directives on Safety of Machinery” and “CE Marking”

WARNING LABELS

Warning and safety related informational labels are placed on the Lockformers' equipment at strategic points. It is important that these labels are not removed, covered, hidden, or defaced. The purpose of these labels is to alert personnel to potential personal injury hazards or *other* direct or indirect safety concerns.

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



WARNING indicates a potentially hazardous situation which, if not avoided, could result in minor or serious injury.



CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.



NOTICE indicates a company policy that relates directly or indirectly to the safety of personnel or protection of property.



“It is important that the meaning of a safety sign is clearly understood by those who may come in contact with the hazard. To increase the understanding of a safety sign's components, the ANSI Z535 committee encourages safety sign manufacturers and owners of facilities to publish and exhibit the following (*above*) information on safety posters, safety bulletins or the like. Doing so will assist in the objective of achieving a national uniform system for the recognition of potential personal injury hazards and accident prevention.” - ANSI Z535.2, Annex A1

WARNING MESSAGES IN THIS MANUAL

Throughout this manual various **▲DANGER**, **▲WARNING**, **▲CAUTION**, and safety related **NOTICE** messages appear. The intent is to alert operator and maintenance personnel to potential hazards. In addition, *important* operation and maintenance details are emphasized with the **NOTE** heading.

SAFETY FIRST

The equipment in this line was designed and manufactured for a specific task. **DO NOT** use the equipment for any other function or to process material that is beyond the equipment's design specifications. Modifications or additions to this equipment line should not be made without first consulting Lockformer. Replacement and maintenance parts should be equal to original equipment. Use of other parts may result in unsafe operating conditions. If there is a question as to the suitability of a part, Lockformer should be consulted.

In general, every piece of equipment must be treated as dangerous. While operating or maintaining this equipment, each person must be aware of their own safety as well as the safety of all others around the line.

Material Coils

Coils present numerous hazards. They may shift, roll or fall without warning. Some coils may spring open without warning. Sharp edges of the strip in the coil are hazardous. Stay clear of coils as they are being moved. Use extreme caution any time a coil is approached or handled.

Metal Strips

The metal strip may have sharp or ragged edges. The strip is under tension and is subject to abrupt tension changes. This can result in strip breakage with the ends flying without warning. Stay clear of the strip whenever possible. When it is necessary to approach or handle the strip, use extreme caution. Use protective devices such as tongs, gloves, eye protection, and wrist guards as required for safety. The strip presents many pinch hazards with the machinery. Stay clear of these. Never step on or over strip in the line.

Machinery

Never reach into any piece of machinery which is operating or which is capable of operation. Loose clothing or jewelry should be kept clear of machinery at all times. When working on one piece of equipment, be aware of hazards of surrounding equipment. Any item inserted into a machine may be thrown or may cause a dangerous malfunction or breakage.

Safe Guards

No equipment should be operated unless the safe guards or devices supplied with the product are securely in place and properly adjusted.

▲WARNING

LOCKFORMER has conducted hazard evaluation and risk analysis studies for their products. *Safe guards installed on the equipment are there for a reason. BEFORE EQUIPMENT IS PLACED INTO SERVICE, ALL SAFE GUARDS OR DEVICES MUST BE IN PLACE AND PROPERLY ADJUSTED.*

Maintenance

Before performing any maintenance on a piece of equipment, insure that all power is locked off in accordance with your company's lockout/tagout policy. Be sure that all movable members (*such as rolls, arms, tables, etc.*) are securely blocked from inadvertent motion which might be hazardous. Treat all electrical lines as being live and all piping as being under high pressure. Insure that all items are properly reassembled before placing them into operation. *Before equipment is returned to service, ALL safe guards or devices MUST BE in place and properly adjusted.*

NOTICE

Before doing any WELDING ON EQUIPMENT, the following precautions must be taken to insure against damage:

- 1) All power is removed from system.
- 2) The weld ground is connected to the closest possible location on the unit where the welding is being performed.
- 3) All encoders, sense eyes, and controls should be electronically disconnected if at all possible to avoid possible damage.

Operation

This equipment is capable of speeds, tensions, and adjustments which may be hazardous for some of the materials within the line specification. For example, thin, narrow strip may be subjected to tensions sufficient to cause breakage. Never attempt to process any material unless the safe adjustments for that particular are known and can be implemented.

Traffic Around Equipment

Care should be taken at all times in moving around the equipment, whether on foot or in a vehicle. Changes in floor elevation, machine bases and debris around the equipment are trip hazards. Take care that personnel are not trapped between vehicles and equipment.

▲DANGER

Do not attempt to walk or climb on any machine while in operation. Failure to observe this warning may result in death or serious injury.

HAZARD REMINDER

Use the following HAZARD REMINDER sheet to reinforce awareness of the hazards associated with coil processing lines. This reminder can be a useful supplement to your company's safety program. *IPI suggests the following steps:*

CORNER CADET



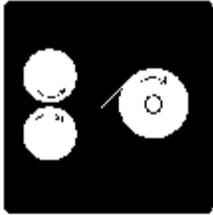
1. SHOW each individual the HAZARD REMINDER sheet and explain each category of hazard.
2. POINT OUT EXAMPLES of each type of hazard on the actual equipment the individual operates or works around.
3. EXPLAIN HOW TO AVOID HAZARDS in the individuals work environment.
4. GIVE a copy of the HAZARD REMINDER sheet to each individual.

Safety is everyone's business!

CINCINNATI PRECISION MACHINERY 513-860-4133

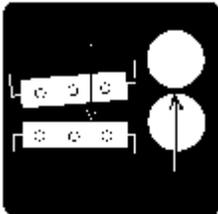
THINK

SAFETY FIRST



NIP POINT

WHEN ONE OBJECT ROTATES NEAR ANOTHER, IT CAN PULL YOU IN *and* CRUSH YOU



PINCH POINT

WHEN ONE OBJECT MOVES CLOSER TO ANOTHER, IT CAN CUT *or* PINCH YOU.



MOVING EQUIPMENT *and* COILS

CAN KNOCK YOU OFF BALANCE *or* CRUSH YOU



STRIP EDGES *and* ENDS

CAN CUT *or* STRIKE YOU.



ELECTRICAL *and* FLUID SYSTEMS

CAN SHOCK *and* BURN YOU *and* CAN EXPLODE.



CLIMBING ON MACHINES

CAN MAKE YOU FALL - MAYBE INTO ONE OF THE HAZARDS ABOVE.

CINCINNATI PRECISION MACHINERY 513-860-4133

LOCKOUT GUIDE

The protection of life and limb through responsible actions and adequate safeguards are the responsibility of all individuals in a workplace environment, or any environment where action or inaction could possibly endanger the safety and wellbeing of others.

All maintenance, repair and adjustment procedures performed on this equipment shall comply with existing established **Lockout** requirements. At a minimum, these requirements must include the use of a keyed padlock or similar device utilized to physically and securely remove and isolate any power source from the equipment, preventing accidental reapplication while personnel may be in exposed circumstances, subject to possible injury or death.

These requirements must also include the **tagging** of the lockout device to notify all individuals working in the area, or anyone who could for whatever reason be in a position to possibly remove or otherwise defeat the purpose of the lockout device, as to its installation, why, and the individual responsible for its application.

Power sources include electrical, pneumatic, hydraulic, or any other hazardous energy source. This procedure shall be used to ensure that the machine is stopped and isolated from all potentially hazardous energy sources and that these energy sources are locked out before employees perform any servicing or maintenance when the unexpected energization, start-up of the machine, or the release of stored energy could cause injury.

FOR THIS UNIT *(where applicable)*

- **Hydraulic power** sources are provided with a lockable valve to block hydraulic pressure from the system. Where applicable, this valve shall be placed in the off position and locked in place.
- **Electrical power** sources are provided either with a male plug for connection to the electrical source, or are hardwired to the source distribution panel. When a plug is provided, the plug shall be disconnected from the source power and secured within a covering and tagged appropriately.

When hardwired to the source distribution panel, the panel shall have a manual disconnect which is lockable in the off position, or in the event of a circuit breaker, the panel will have a lockable door which will deny access to unauthorized personnel.

- **Pneumatic power** is applied to the machine through a quick disconnect fitting. This quick disconnect fitting shall be disconnected from the pneumatic power source and secured within a covering and tagged appropriately.

CORNER CADET



CINCINNATI PRECISION MACHINERY 513-860-4133

INSTALLATION

1. INSTALLATION

A. SELECTING A LOCATION

Select a location that will save the most work and time in moving ductwork about in your shop. A table that matches the height of the bottom head base plate of the Corner Cadet is a must in helping to position the duct sections into the Corner Cadet, especially if only one person may be handling the duct.

B. PNEUMATIC REQUIREMENTS

A clean, dry air supply of **5 CFM at 100 PSI** (*not to exceed 120 PSI*) must be made available to the equipment. This can be a rigid supply line such as pipe, but the terminating line to the equipment should be a non-rigid air line to isolate the compressor and machine from each other's vibrations.

▲ NOTE

A dedicated filter, lubricator, and regulator is recommended for the air source supplying the Corner Cadet.

C. ELECTRICAL REQUIREMENTS

Electrical power requires only the availability of a **115 VAC** three prong grounded **15 Amp** outlet to plug in the connector on the Corner Cadet. The machine should also be located away from grinding machines, sanding machines, spray painting areas, and other sources of contamination if at all practical. Answers to questions regarding site preparation and other technical assistance is available by calling our Service Department.

D. RECEIVING AND ASSEMBLING THE EQUIPMENT

When the equipment 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 wiring, air regulator, gauges, etc. Check for physical damage to the switches and the components inside the Corner Cadet. If anything looks damaged, notify both the carrier (*to file a claim*) and the Service Department at the factory (*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 and run the machine without them.

1. Carefully uncrate machine, ensuring **NOT TO DAMAGE THE SHIPPING PLATFORM (A)**. This platform is designed to be positioned at the front of the unit, thus facilitating easy insertion of duct.
2. Remove any debris, packing material, etc., that may have accumulated during shipping.
3. Remove the four mounting screws **(B)** and carefully remove the machine.

▲ NOTICE

DO NOT dry run the Corner Cadet, or damage to the machine will result.

CORNER CADET

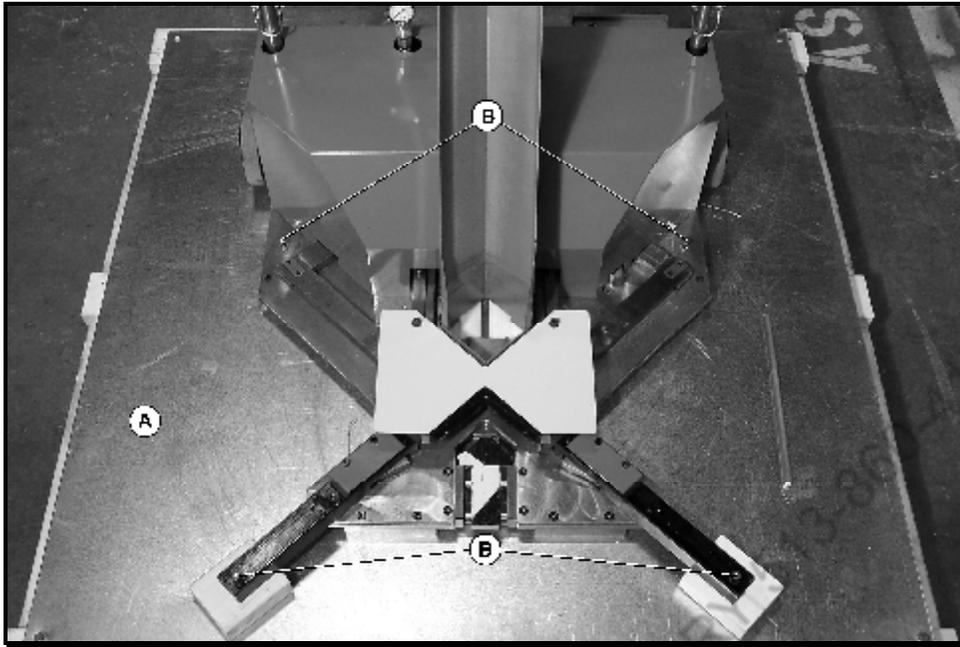


Figure 1-1 Removing Corner Cadet

4. Move the machine and accompanying parts to a level assembly area.
5. Slide the handle (C) onto the mounting posts and secure by inserting a snap pin (D) (both sides).
6. Press the air supply inlet/regulator assembly (E) onto the quick disconnect male fitting on top of the unit.

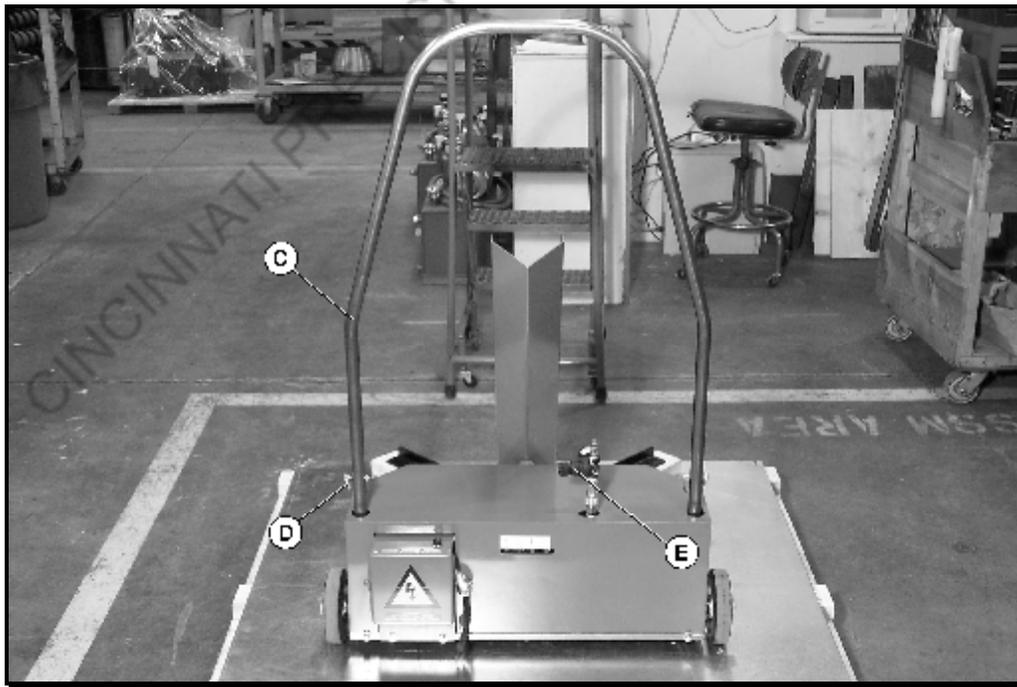


Figure 1-2 Handle & Regulator Installation

- Using the (2) screws (F) provided install the magazine as shown in photo no. 3 (DO NOT OVER TIGHTEN).



Figure 1-3 Installing Corner Magazine

- The arms are mounted for TDC corner installation as shipped. When using TDF corners move each arm to the outer mounting holes as shown.

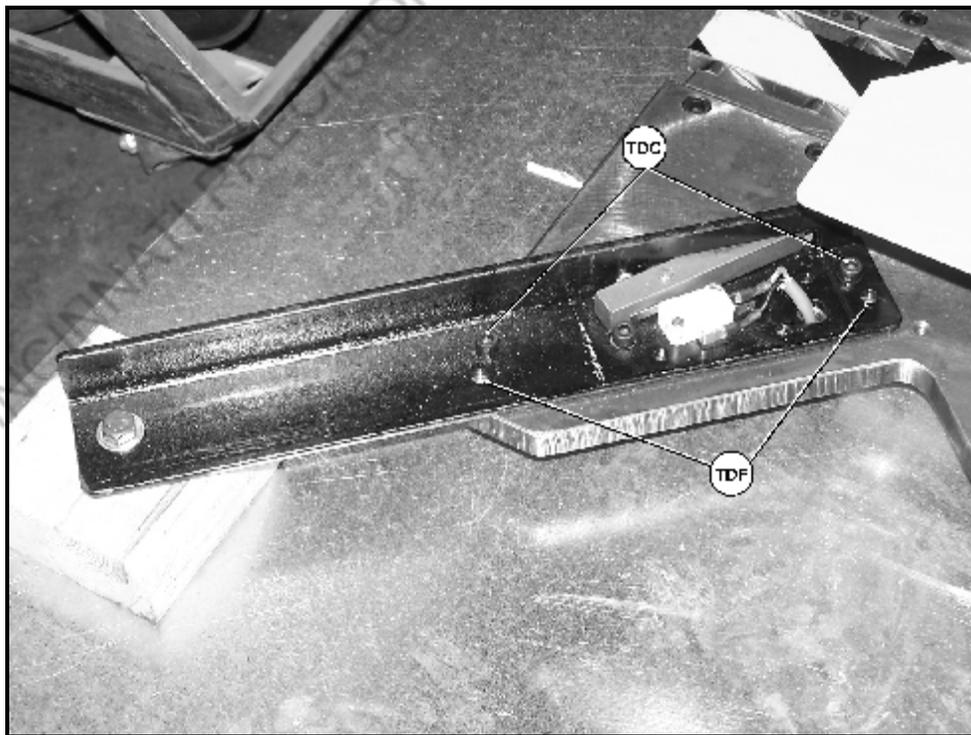


Figure 1-4 Duct Guide Installation

CORNER CADET



9. Insert the power cord into the machine mounted receptacle.
10. Grasp the handle firmly and place one foot against a wheel while tilting backward. Transport to the desired operating site. Slowly lower while once again applying foot pressure against a wheel.

▲ CAUTION

This machine is front heavy. Use care when lowering it in place, especially if bystanders are present.

11. Place the shipping platform in front of the machine. Align the two mounting holes (TDC or TDF) with the holes in the end of the duct guides.

▲ CAUTION

When working with very large duct, it is recommended that a proportionally larger platform be built for greater stability.

12. For **TDC** corners use the holes that are **26** inches apart. For **TDF** corner use the holes that are **26-1/8** inches apart.



Figure 1-5 Deck Mounting Hole Locations

13. Insert and firmly tighten the two 5/16-18 x 2" mounting screws and washers provided.

E. SAFETY REQUIREMENTS

Before operating the machine, read this section. Study and follow the safety precautions listed here which is intended to prevent injury to you and your fellow workers. The precautions listed cannot cover all possible situations. Therefore, consider the consequences of your actions before executing any procedure or operation.

(1) Safety Precautions Before Starting The Machine

1. Protect yourself. Wear safety glasses and leather gloves when handling metal. Do not wear loose clothing, neckties, or jewelry. If long sleeves must be worn, avoid cuffs and buttons.
2. Keep your work area clean. Remove all scrap, oil spills, rags, tools, and other loose items that could cause you to slip, trip, and fall.
3. Make sure that the electrical supply and air pressures are at specified levels before operating the machine.
4. Be sure that all guards are in place when operating the machine. Keep the equipment properly maintained.
5. 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.
6. Be sure this operation 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.
7. Be aware of the location of the power off push-pull switch and use it to stop the machine in case of emergencies.

NOTICE

DO NOT dry run the Corner Cadet, or damage to the machine will result.

(2) Safety Precautions When Operating the Machine

1. Be alert whenever operating the machine.
2. Only one person should control the machine. Never allow anyone to operate the controls while you are working on the machine. Use "WORK" tags and warning signs to indicate that someone is working on or repairing the machine.
3. Keep your arms and hands away from the internal workings of the machine when starting or stopping the machine.
4. Never leave the work area while the machine is running.
5. Do not try to process material that is beyond the specified thickness or width for your machine. Use good quality metal coils that are free from camber, burrs, and other irregularities.
6. When cleaning the machine, or any components of the machine, do not use toxic or flammable substances. Do not perform any cleaning operations while the machine is running.
7. Never override or disable any safety switch or safety interlock.
8. Use proper size wrenches and tools, most of which are furnished with the machine. Do not use adjustable crescent wrenches or worn wrenches. A slipping wrench can cause injury. Replace worn nuts, bolts, screws, etc., being sure they are of equivalent quality of those being replaced.

CORNER CADET



CINCINNATI PRECISION MACHINERY 513-860-4133

SYSTEM OVERVIEW

2. SYSTEM OVERVIEW

The Lockformer Corner Cadet is a compact, pneumatically operated machine that inserts specific style TDC/F corners into the ends of assembled duct sections. The unit will automatically place a corner piece in a duct corner and crimp it securely and permanently into place.

The unit is designed so that the base plate of the head is at the operator's foot level. The operator can slide the duct into the Corner Cadet without having to lift it, saving the operator time and energy, and reducing the possibility of damage to the duct with less handling.

When a piece of air duct with the TDC/F type end connector is manufactured, it is necessary to install corner pieces into the four corners of each end of the duct. When the corner of the end of the air duct is positioned properly into the Corner Cadet, the unit will automatically begin the sequence required to insert a corner piece into the positioned corner. The duct is first clamped into position, then a corner piece is slid into position on the inside edges of the bottom corner. The corner is then immediately pressed into the flange corner and the corner piece is crimped securely into place with the edges of the TDC/F flanges on the duct. The machine head retracts to its home position, ready for the next insert cycle to be initiated. The operator removes the duct, rotates the duct to the next corner, and repeats the procedure as required.



Figure 2-1 TDC & TDF Corner Pieces

The Corner Cadet is specifically designed to insert TDC/F corners into the end of duct pieces. It is especially helpful when working with shorter joints of duct where only a single machine head is required or for a special duct joint requiring corner pieces on one end only.

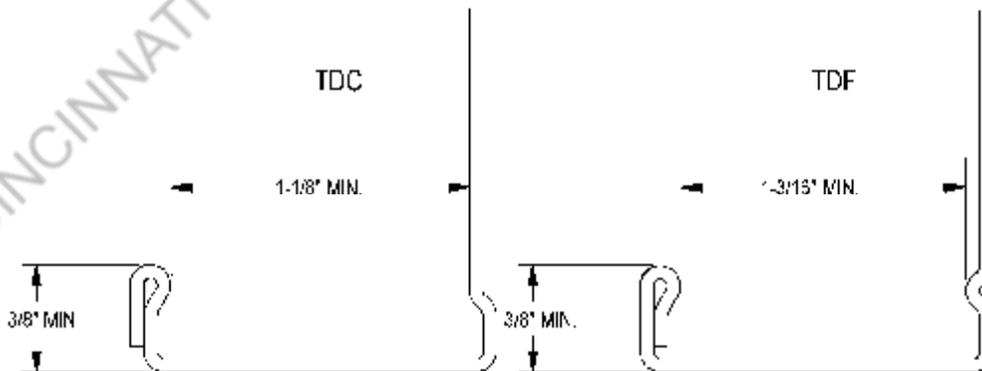


Figure 2-2 TDC and TDF Duct Flanges Dimension Requirements

CORNER CADET



A. INSULATED DUCT

If a duct is insulated, before positioning the duct joint into the Corner Cadet, ensure there are no insulation pins that will interfere with the corner insertion process. Refer to the figure below for a detailed illustration of the area that should be free of insulation pins.

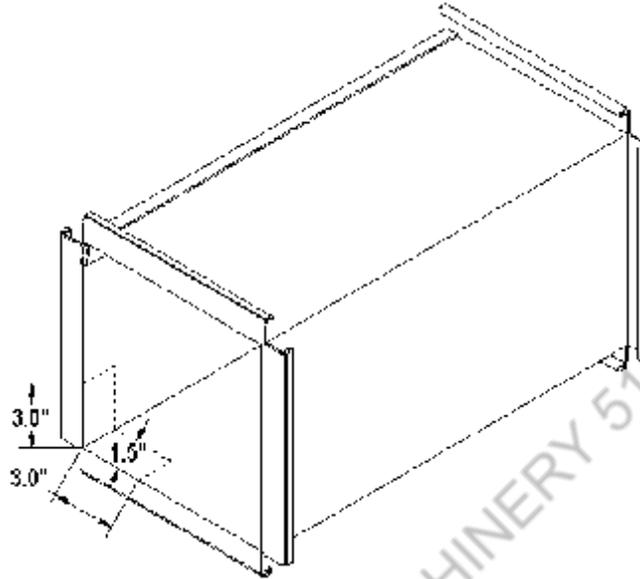


Figure 2-3 Corner Area Free of Insulation Pins

▲ NOTICE

DO NOT dry run the Corner Cadet, or damage to the machine will result.

SYSTEM OPERATION**3. SYSTEM OPERATION**

After completely reading this manual, the safety warnings and cautions, and the system overview, the operator should be ready to put the Corner Cadet into operation.

A. SAFETY PRECAUTIONS**(1) Before Starting The Machine**

1. Protect yourself. Wear safety glasses and leather gloves when handling metal. Do not wear loose clothing, neckties, or jewelry. If long sleeves must be worn, avoid cuffs and buttons.
2. Keep your work area clean. Remove all scrap, oil spills, rags, tools, and other loose items that could cause you to slip, trip, and fall.
3. Make sure that the electrical supply and air pressures are at specified levels before operating the machine.
4. Be sure that all guards are in place when operating the machine. Keep the equipment properly maintained.
5. 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.
6. Be sure this operation 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.
7. Be aware of the location of the power off push-pull switch and use it to stop the machine in case of emergencies.

▲ NOTICE

DO NOT dry run the Corner Cadet, or damage to the machine will result.

(2) When Operating The Machine

1. Be alert whenever operating the machine.
2. Only one person should control the machine. Never allow anyone to operate the controls while you are working on the machine. Use "WORK" tags and warning signs to indicate that someone is working on or repairing the machine.
3. Keep your arms and hands away from the internal workings of the machine when starting or stopping the machine.
4. Never leave the work area while the machine is running.
5. Do not try to process material that is beyond the specified thickness or width for your machine. Use good quality metal coils that are free from camber, burrs, and other irregularities.
6. When cleaning the machine, or any components of the machine, do not use toxic or flammable substances. Do not perform any cleaning operations while the machine is running.

CORNER CADET



7. Never override or disable any safety switch or safety interlock.
8. Use proper size wrenches and tools, most of which are furnished with the machine. Do not use adjustable crescent wrenches or worn wrenches. A slipping wrench can cause injury. Replace worn nuts, bolts, screws, etc., being sure they are of equivalent quality of those being replaced.
9. Do not use an air hose to clean the machine. Air pressure may drive dirt and small chips into bearing surfaces or cause bodily injury.

B. PREPARATION FOR OPERATION

1. Using the aluminum rods provided, Load the magazine with corners. The corner pieces are provided in stacked bundles. An aluminum rod is inserted through the holes of a stack so the complete stack can be picked up and slid easily into the magazine.



Figure 3-1 Aluminum Loading Sticks

▲ NOTICE

The corners are loaded with the patent number *UP* in the *magazine*.

2. Apply electrical power by plugging in the power cord to the wall receptacle. The indicator will illuminate and the machine is ready for operation.
3. Apply air pressure to the machine. System pressure should be approximately 80-100 PSI.



Figure 3-2 Air Regulator Assembly

▲ NOTICE

DO NOT dry run the Corner Cadet, or damage to the machine will result.

4. Slide the duct with the TDC/F flange into position in the Corner Cadet. When the two levers, one located on each side of the bottom head duct corner, are both activated by the duct, the insertion cycle will start. After completion of the cycle, pull the duct away from the



CORNER CADET

heads, rotate the duct to the next corner, and repeat the procedure. Repeat this procedure until all four corners of the duct are completed, if applicable.

C. SYSTEM SHUT-DOWN

1. Remove Air Pressure from the system.
2. Unplug the unit from the electrical power source.

▲ NOTICE

DO NOT dry run the Corner Cadet, or damage to the machine will result.

CINCINNATI PRECISION MACHINERY 513-860-4133

CINCINNATI PRECISION MACHINERY 513-860-4133

MAINTENANCE**4. MAINTENANCE**

Assembly drawings of the equipment, along with electrical schematics which are helpful in servicing our equipment, are provided in the back sections of this manual. Exact component data is not always available from our suppliers, and some parts may be modified by Lockformer. We recommend that you contact our Service Department to ensure that you use proper replacement components. Please take time to become familiar with the maintenance section, which can speed servicing of your equipment.

Precision components, skilled assembly and sophisticated engineering enable Lockformer to produce machinery capable of long, trouble-free operation. However, few machines, if any, are totally exempt from the wear and tear resulting from heat, friction, dirt, and neglect. Even with good maintenance, parts eventually wear out and have to be replaced. However, regularly scheduled maintenance will lead to longer machine life. Because your new machine requires minimal maintenance (*and because internal damage may remain hidden for some time*), it is easy to put off maintenance procedures. Without maintenance, damage is almost certain to occur, even though the system appears to be operating satisfactorily. Too often, this results in machine failure.

A. TORQUE VALUES FOR GENERAL ASSEMBLY

The torque chart value (*Table 1 and 2*) are 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 which may require special torque specifications.

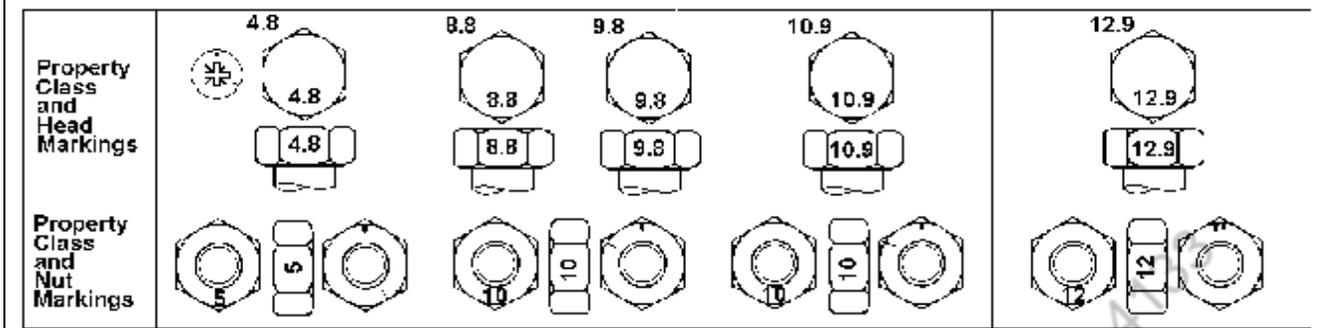
The following conditions must be observed when using the general assembly torque values:

- Joints are assumed to be metal and rigid. Do 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.

CORNER CADET



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



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	2200	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

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.

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.

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

B. MAINTENANCE SAFETY

1. Never put your hands in the operating area of the machine unless power and air are completely removed from the machine. This includes:
 - Over duct clamps
 - Under or in front of the press head
 - In front of the feed plate in the magazine or in front of the magazine
 - In the crimper slots
2. While placing duct in the machine, keep hands well above the surface of the base plate.
3. Should a corner piece get caught under the press head, **DO NOT** try to remove with it using your fingers. Use a long probe and keep away from the path of the duct clamp.
4. Monitor the magazine, and always reload the magazine before it is empty.
5. Do not try to initiate machine operation by depressing the actuating fingers other than with the duct flange. Failure to comply may damage the press blocks.
6. NEVER have power ON or air pressure applied when the machine is unattended.
7. REMOVE ALL POWER AND AIR FROM THE MACHINE BEFORE WORKING ON A PROBLEM OR PERFORMING ANY TYPE OF EQUIPMENT MAINTENANCE.

C. SERVICING

(1) Lubrication, General Requirements

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

The maintenance technician must become familiar with all the lubrication points located on the machine. Those points where metal-to-metal contact of movable surfaces are located must be adequately lubricated.

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 slide assemblies, etc. Keep these areas clean and coated with a light film of grease.

(a) Lubrication Schedule

Do not over-lubricate.

- 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.
- Ensure that proximity sensor heads are kept clean and free of lubricant. Dirty sensor heads will affect system operation.

D. FEED ADJUSTMENT PROCEDURE

After a corner is installed, it is held by the lower pusher bar while crimping takes place. If the corner is not held firmly in place, perform the following adjustment.

Tools Required: (1) 3/32" hex key, (1) 1/4" hex key, (1) 5/16" hex key, (1) 3/16" wide slotted screwdriver.

(1) Adjustment Procedure

1. DISCONNECT and LOCKOUT THE ELECTRICAL POWER.
2. Remove the magazine and cover.
3. Connect the pneumatic supply line.
4. Use a screwdriver to turn the Clamp manual override (A), one eighth turn clockwise. This will activate the clamp and hold the duct in place.
5. Place a corner in the V-notch on the front of the pusher.
6. Use a screwdriver to turn the Feed manual override (B), one eighth turn clockwise. This will advance the pusher and insert the corner into the duct flange.
7. The lower pusher should hold the corner in place.

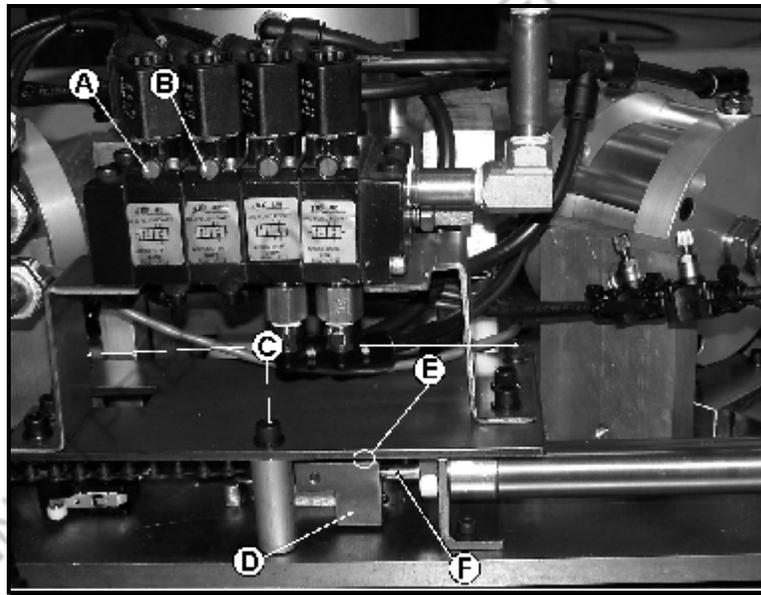


Figure 4-1 Feed Adjustment Components

NOTE: On earlier version units, the feed cylinder forward limit feed switch was a roller arm actuated micro switch, as shown in the picture. On later or newer version units, this switch has been replaced with a cylinder mounted reed switch that is mounted directly on the feed cylinder body. The operation in the controls is identical with both.

CORNER CADET



IF THE CORNER IS LOOSE:

1. Use a 1/4" hex key to remove the three valve mounting bracket screws (C). *Do not lose the lock washers.*
2. Lift the valve assembly bracket out of the way to expose the cylinder rod end block (D).
3. Use a 3/32" hex key to loosen, but do not remove, the cylinder rod end block set screw (E will be exposed after valve mount is removed).
4. Unscrew the cylinder rod (F) 1/2 turn or until the pusher bar applies slight pressure against the corner. (Air pressure may have to be removed to turn rod.)
5. Replace the three bracket mounting screws and tighten firmly.
6. Tighten the set screw.
7. Turn both solenoid screws counter clockwise to their original position. (Override slots must be vertical)
8. Remove duct and corner.
9. Install the cover and magazine
10. Connect electrical power, then test operate the machine

Ø IF THE CORNER IS TOO TIGHT:

Perform all steps of the procedure outlined above, but screw the cylinder rod into the block to reduce the pusher's pressure.

E. PNEUMATIC ADJUSTMENTS

When performing adjustments to this machine:

1. Disconnect electrical and pneumatic power and deplete accumulated air.
2. Remove cover.
3. Make adjustments as outlined below.
4. REPLACE THE COVER
5. Test the operation and if necessary repeat the adjustment steps.

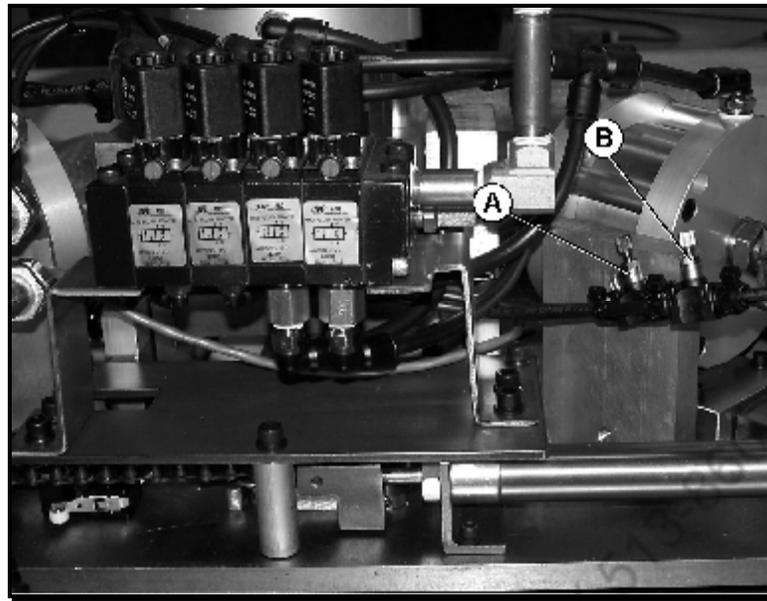


Figure 4-2 Feeder Speed Adjustment

NOTE: On earlier version units, the feed cylinder forward limit feed switch was a roller arm actuated micro switch, as shown in the picture. On later or newer version units, this switch has been replaced with a cylinder mounted reed switch that is mounted directly on the feed cylinder body. The operation in the controls is identical with both.

The valve marked (A) controls the advance speed of the feeder. The valve marked (B) controls the retract speed. Rotate the control knobs (clockwise) to slow speed and counter clockwise to increase speed. Make all adjustments in small increments.

(1) Air Valve Station

Located on the backside of the Corner Cadet is an air valve station access hole. The station controls the head functions. The air valves and their functions are detailed in the following illustration.

Each valve may be manually activated for test and setup purposes. To manually activate a valve use a small flat tipped screwdriver, and rotate the individual valve's trigger screw clockwise. Ensure the manual overrides are vertical (as shown) before running the Corner Cadet or the machine will not function correctly.

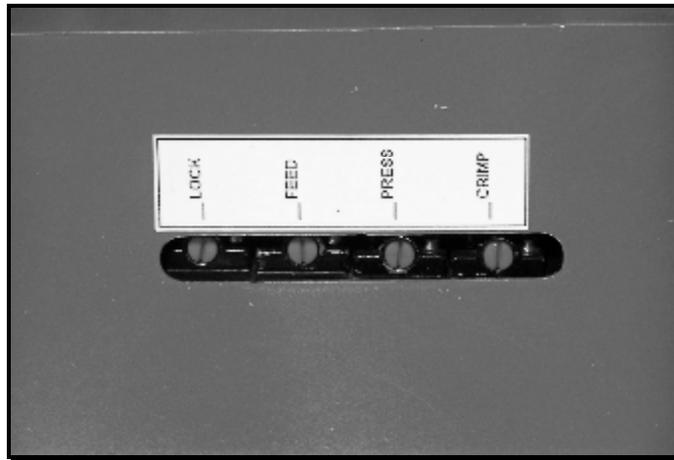


Figure 4-3 Air Valve Station

F. PREVENTIVE MAINTENANCE

A periodic inspection schedule should be established and maintained. The periodic inspection criteria should meet the minimum requirements necessary to ensure safe reliable service under the equipment's operating conditions. It should be modified as required to meet varying operating and environmental conditions.

(1) Preventive maintenance checks:

1. The system air supply is at a specified level at all times during the operating cycle of the equipment.
2. Check the air supply for excessive moisture. In some areas of high humidity, it may be necessary to drain the water more often on the compressor or add more moisture removing capability.
3. 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.
4. Ensure the machine is sitting level (*bottom head base plate should be level horizontally*) and with all the leg supports planted firmly on the floor.
5. With power and air removed from the machine, clean the machine at least weekly by blowing it out and off with compressed air.
6. With power and air removed from the machine, periodically add a light coat of oil on all the sliding and moving parts on the head.
7. With power and air removed from the machine periodically check that all wire connections and terminal connections are tight.
8. Check that the supply voltage is within a 10% tolerance of the specified voltage on the electrical schematic.

G. CLEANING

For optimum performance this machine should be kept clean. Be sure that all moving parts are free from debris and accumulations of dirt and grease. Wipe clean with a rag and apply a light film of oil to all unpainted surfaces. Storing indoors in a dry environment will help reduce rust and corrosion.

H. LUBRICATION

This machine was lubricated prior to shipment. Frequent lubrication will allow this unit to operate efficiently and prolong the life of the moving parts. A lubrication schedule should be established and maintained. Refer to the chart below for lube point locations and minimum lubrication intervals.

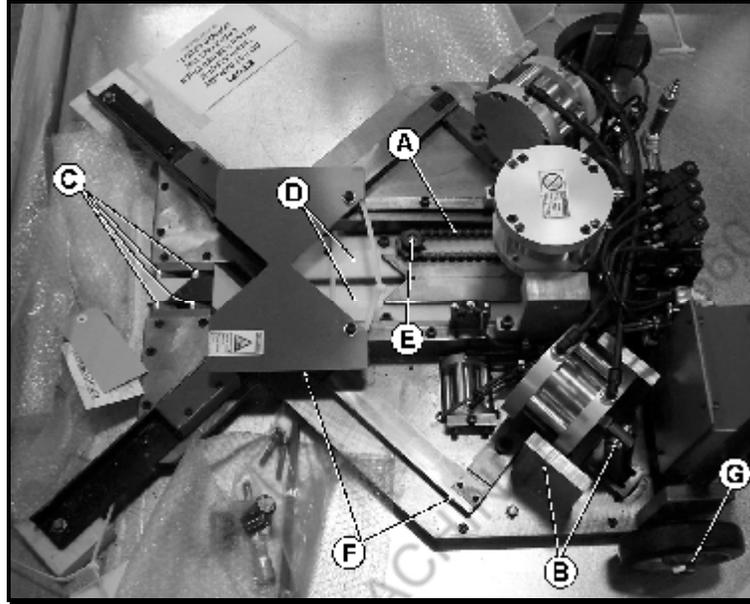


Figure 4-4 Lubrication Points

ITEM	DESCRIPTION	LUBRICANT	APPLICATION	SCHEDULE
A	CHAIN	LIGHT OIL	MAINTAIN A LIGHT FILM	EVERY 40 HOURS
B	PIVOT PINS/JOINTS	LIGHT OIL	APPLY A FEW DROPS	EVERY 40 HOURS
C	CLAMP PIVOT PINS	LIGHT OIL	APPLY A FEW DROPS	EVERY 40 HOURS
D	TOP OF SLIDE BAR	LIGHT OIL	APPLY SEVERAL DROPS	EVERY 40 HOURS
E	SPROCKETS	LIGHT OIL	APPLY SEVERAL DROPS	EVERY 40 HOURS
F	CRIMP BAR JOINTS	LIGHT OIL	APPLY SEVERAL DROPS	EVERY 40 HOURS
G	WHEELS	GREASE	GREASE GUN	MONTHLY
*	ALL MOVING PARTS	LIGHT OIL	AS REQUIRED	EVERY 40 HOURS

I. TROUBLESHOOTING

This section contains troubleshooting information to assist in locating and correcting operating troubles which may develop in the Corner Cadet. Each malfunction for an individual component, unit or system, is followed by a list of tests or inspections which will help the technician to determine probable causes and corrective action to take.

The tests/inspections and corrective actions should be performed in the order listed. Troubleshooting is a logical and systematic process of determining and correcting the cause of a malfunction. The process begins with verification of the malfunction. This may often involve

CORNER CADET



an operation checkout of the unit. After the trouble has been verified, identify all components in the circuit whose failure could cause the symptoms observed during the operational checkout. The technician should start by checking those items which are highest in probability of causing the problem. Inspect and test each component, until the exact cause of the problem is determined and corrected.

Table 4-3. Troubleshooting Chart

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Machine will not start the operating cycle when the duct is correctly positioned into the Corner Cadet	One or both of the start switches are not being activated	1. Remove electrical power completely from the machine.
		2. Push each start lever in and listen for each switch to click once. The sooner you hear the click while pushing in on the lever, the less sensitive the machine will be to locating the duct squarely into the machine. 3. If you here the switch click twice when pushing in the start lever, it probably clicked on and back off. Carefully bend the switch lever so the switch is activated after just a few degrees of rotation of the lever, and remains activated for the maximum possible rotation of the lever.
The machine won't start or will not complete the operation cycle but both start switches are working properly.	Air valve malfunction.	Each air valve for the complete operating cycle can be manually actuated by turning the little red screw on each valve CW approximately a quarter turn. Turning the screw back CCW will turn the valve back off. With the POWER off, cycle each valve at least 3 or 4 times, observing the mechanical operation of each step to ensure there is no mechanical binding. This procedure will show problems such as mechanical binding, any broken parts, pinched or plugged air lines, low air pressure or valve contamination.

J. INSTALLING NEW PLC E-PROM

Due to a loss of the program or replacement of the PLC (Programmable Logic Controller) the E-Prom which controls the Corner Cadet may have to be reloaded into the PLC. Use the directional arrow pad (A), located on the face of the PLC, to scroll between settings. The following is the recommended procedure.

1. UNPLUG THE CORNER CADET
2. Install the E-PROM in the PLC, which is located under the E-Prom access panel (B)
3. Plug In Corner Cadet

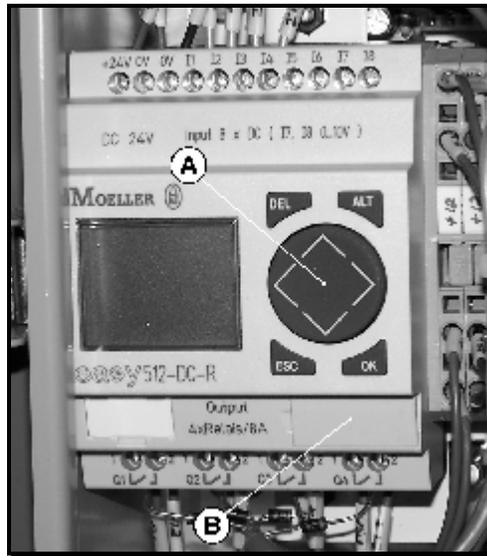


Figure 4-5 PLC Controller

4. Press **OK**
5. Arrow down to **Stop** and press **OK**, (*Skip if already has Run*)
6. Arrow up to **Program** and press **OK**
7. Arrow down to **CARD...** and press **OK**
8. Arrow down to **Card.>Easy** and press **OK**
9. **At Replace?** Press **OK**
10. Press **ESC** *twice* to menu with RUN Option.
11. Arrow Down to **Run** and press **OK**
12. UNPLUG THE CORNER CADET
13. Remove E-PROM
14. PLUG IN THE CORNER CADET