## Declaration of Conformity

### EC Declaration of Conformity

**Macro Disc Windrower Header**

**Christoph Martens**

**Product Integrity**

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<td><strong>Ort und Datum der Erklärung:</strong></td>
<td><strong>Místo a datum vyhlášení:</strong></td>
<td><strong>Τοποθεσία και ημερομηνία της δήλωσης:</strong></td>
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<tr>
<td><strong>Name and address of the person authorized to issue the declaration:</strong></td>
<td><strong>Naam en adres van de persoon die gemachtigd is om de deklaratie uit te brengen:</strong></td>
<td><strong>Name und Adresse der Person, die gemachtigtd ist, um die Erklärung auszumachen:</strong></td>
<td><strong>Jméno a adresa osoby vyhlášející vyhlášení technického shromažďovacího zařízení:</strong></td>
<td><strong>Προσωπικό ονόματος και της οποίας αποστέλλεται τη δήλωση:</strong></td>
</tr>
<tr>
<td>Hartmut Hartmann</td>
<td>Wiesener Hütz 2a</td>
<td>D-48604 Lotte (Niederrhein)</td>
<td>Hartmut Hartmann</td>
<td>D-48604 Lotte (Niederrhein)</td>
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</tbody>
</table>

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**Figure 1: EC Declaration of Conformity, Page 1**
EC Declaration of Conformity

IT

Nc. (3) Distilleria che si prodotto
Titn di marchett (2) Nome e modello (4)
Nombre (5) di serie (6) suadette tutte le disposizioni rilevanti della direttiva

EN ISO 4544:1:2013
EN ISO 4544:7:2009

HU

M. (3) Elnézést kérünk, hogy a készülék a technikai
Ido: partn (2) Mátrix: (1)
Módszerek (1) es tevékenység (4) előadókat tartalmazó

EN ISO 4544:1:2013
EN ISO 4544:7:2009

LV

L. (1) Pārvaldītājs, kas piemēro
Pieejamās filtra (2) Rūpniecības
Pieejamās filtra (1) un tās formu

EN ISO 4544:1:2013
EN ISO 4544:7:2009

RO

R. (1) Declarație, că anumitele produse
Tipul produsului (2) Categoriile (1)
Declarație (1) și modelul (1)

EN ISO 4544:1:2013
EN ISO 4544:7:2009

SK

S. (2) Vyhlášenie o výrobku
Výrobné označenie (2) Príslušné (1)
Výrobné označenie (1) a model

EN ISO 4544:1:2013
EN ISO 4544:7:2009

SV

S. (2) Bedömning av produktens
Vidhållningsgräns (2) Tillämpliga (1)
Vidhållningsgräns (1) och modellen

EN ISO 4544:1:2013
EN ISO 4544:7:2009

FI

F. (1) Vahvistettu, että tuotteen
Tyypin nimimerkki (2) Analyytiikka
Vahvistettu, että tuotteen

EN ISO 4544:1:2013
EN ISO 4544:7:2009

NL

NL. (1) Verklaring van het product
Productnaam (2) Toepasselijke (1)
Verklaring van het produkt

EN ISO 4544:1:2013
EN ISO 4544:7:2009

PT

P. (1) Declaração de conformidade
Nome e modelo (2) Normas aplicáveis
Declaração de conformidade

EN ISO 4544:1:2013
EN ISO 4544:7:2009

ES

E. (2) Información sobre el producto
Nombre y modelo (2) Norma aplicable
Información sobre el producto

EN ISO 4544:1:2013
EN ISO 4544:7:2009

DA

D. (2) Erklæring om produktet
Produktnavn (2) Angiv de relevante
Erklæring om produktet

EN ISO 4544:1:2013
EN ISO 4544:7:2009

Figure 2: EC Declaration of Conformity, Page 2
Noise Levels

The A-weighted sound pressure level inside the operator’s station of a typical self-propelled vehicle (e.g., M205), when operated in conjunction with this R85 rotary disc header, is 79 dBA. This measurement was taken in accordance with ISO 5131. The sound pressure level depends upon the rotary disc speed, crop conditions, as well the exact type of self-propelled vehicle used to power the R85.
Introduction

This manual describes operating and maintenance procedures for the MacDon R85 Rotary Disc 13-Foot Self-Propelled Windrower Header.

Your new 13-foot rotary header can be attached to MacDon M150, M155, M155E4, M200 and M205 Self-Propelled Windrowers and is designed to cut, condition, and lay in windrows a wide variety of grasses and hay crops.

Carefully read all the material provided before attempting to use or service the machine.

Use this manual as your first source of information for the machine.

A parts catalog is also supplied with your new header. If you require more detailed service information, contact your MacDon Dealer.

When setting up the machine or making adjustments, review and follow the recommended machine settings in all relevant MacDon publications. Failure to do so may compromise machine function and machine life and may result in a hazardous situation.

Use the Table of Contents and the Index to guide you to specific areas. Study the Table of Contents to familiarize yourself with how the material is organized. Keep this manual handy for frequent reference and to pass on to new Operators or Owners. Call your Dealer if you need assistance, information, or additional copies of this manual.

MacDon provides warranty for Customers who operate and maintain their equipment as described in this manual. A copy of MacDon Industries Limited Warranty Policy, which explains this warranty, should have been provided to you by your Dealer.

Damage resulting from accident, misuse, improper maintenance, abuse, neglect, or from other than normal and ordinary use of the machine, and damage resulting from failure to use the machine, equipment, component, or part in accordance with MacDon or the manufacturer’s instructions will void this warranty.

NOTE: Keep your MacDon publications up-to-date. The most current version can be downloaded from our website www.macdon.com or from our Dealer-only site (https://portal.macdon.com) (login required).

NOTE: A Chinese translation of this manual can be ordered from MacDon, downloaded from the MacDon Dealer Portal (https://portal.macdon.com) (login required), or downloaded from the MacDon internal website (http://www.macdon.com/world).

Store the operator’s manual and the parts catalog in the plastic manual case (A) located at the right-hand side of the header.

Figure 3: Manual Storage Case
Serial Number(s)

Record the serial number of the header in the space provided.

**Header Serial No:** ____________

The serial number plate (A) is located on the top cover at the right side of the header.

*Figure 4: Serial Number Location – Self-Propelled*
List of Revisions

At MacDon, we’re continuously making improvements: occasionally these improvements impact product documentation. The following list provides an account of major changes from the previous version of this document.

<table>
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<tr>
<td>Updated publication date for 2017 Rev A.</td>
<td>Inside Front Cover</td>
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<tr>
<td>Inserted EC Declaration of Conformity document.</td>
<td>Declaration of Conformity, page i</td>
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<td>Inserted topic.</td>
<td>Noise Levels, page iii</td>
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<tr>
<td>Added a statement about following the recommended machine settings in all MacDon publications.</td>
<td>Introduction, page iv</td>
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<tr>
<td>Replaced decal 166833 with decal 194464. 166833 is not used on this machine.</td>
<td>1.7 Safety Decal Locations, page 8</td>
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<tr>
<td>Revised topic title and replaced one of the illustrations.</td>
<td>3.3 Engaging/Disengaging the Header Safety Props, page 26</td>
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<tr>
<td>Inserted CAUTION statement regarding damage or loose cutterblades and attachment hardware.</td>
<td>Inspecting Cutterblades, page 123</td>
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<tr>
<td>Inserted topic.</td>
<td>Inspecting Cutterblade Hardware, page 125</td>
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<tr>
<td>Added notes to the Introduction to reflect statement of limited warranty and availability of Chinese translation.</td>
<td>Introduction, page iv</td>
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<tr>
<td>Updated contents information for Double Windrow Attachment (DWA) kit MD #C1987.</td>
<td>6.1.2 Double Windrow Attachment (DWA), page 153</td>
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<tr>
<td>Corrected instructions for steps 6 and 7 and updated Figure 5.44.</td>
<td>Replacing a Spindle Key, page 136</td>
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<tr>
<td>Corrected wording in Step 8 of Filling the Cutterbar Lubricant, reflects correct machine type (windrower).</td>
<td>Filling the Cutterbar Lubricant, page 117</td>
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<tr>
<td>Added content previously removed from Step 13 in Changing the Bevel Gearbox Lubricant.</td>
<td>Changing the Bevel Gearbox Lubricant, page 141</td>
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<tr>
<td>Added instruction to Step 2 and updated Figure 3.11 to match.</td>
<td>3.5.1 Opening the Cutterbar Doors: North America, page 31</td>
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<tr>
<td>Updated instruction to Step 1 and updated Figure 3.12 to match.</td>
<td>3.5.2 Closing the Cutterbar Doors: North American Header, page 32</td>
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<td>Added note to start of topics indicating the drive tire provisions for attaching the R85 13-ft header to different windrower types, and note about caster wheel width settings.</td>
<td>3.7.2 Attaching Hydraulics and Electrical: M205 Windrowers, page 39</td>
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<tr>
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<td>3.7.3 Attaching Hydraulics and Electrical: M200 Windrowers, page 45</td>
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<tr>
<td></td>
<td>3.7.4 Attaching Hydraulics and Electrical: M150, M155, or M155E4 Windrowers, page 52</td>
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<tr>
<td>Updated Figures 3.20, 3.21, 3.22, and 3.24. Updates and additions to written instructions not necessary.</td>
<td>3.7.1 Attaching the Forming Shield, page 37</td>
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<td>4.5.1 Adjusting the Side Deflectors, page 83</td>
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<tr>
<td>Updated Figure 4.12.</td>
<td>4.5.2 Adjusting the Rear Deflector (Fluffer Shield), page 85</td>
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<tr>
<td>Added note about forming shield under windrower frame, and orientation of plate if installing forming shield with double window attachment (DWA).</td>
<td>3.7.1 Attaching the Forming Shield, page 37</td>
</tr>
<tr>
<td>Added illustration #1018582 to reflect first 50 hours, first 150 hours, and every 250 hours for changing bevel gearbox oil, cutterbar lube, and conditioner gearbox lubricant (Figures 5.4, 5.7, and 5.8).</td>
<td>5.3.6 Lubrication and Servicing Intervals, page 108</td>
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<td>Added figure descriptions to all figures in Lubrication and Servicing Intervals topic.</td>
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<td></td>
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</tbody>
</table>
1 Safety

1.1 Safety Alert Symbols

This safety alert symbol indicates important safety messages in this manual and on safety signs on the machine.

This symbol means:
• ATTENTION!
• BECOME ALERT!
• YOUR SAFETY IS INVOLVED!

Carefully read and follow the safety message accompanying this symbol.

Why is safety important to you?
• Accidents disable and kill
• Accidents cost
• Accidents can be avoided
1.2 Signal Words

Three signal words, DANGER, WARNING, and CAUTION, are used to alert you to hazardous situations. The appropriate signal word for each situation has been selected using the following guidelines:

⚠️ DANGER

Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.

⚠️ WARNING

Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury. It may also be used to alert against unsafe practices.

⚠️ CAUTION

Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It may be used to alert against unsafe practices.
1.3 General Safety

CAUTION

The following are general farm safety precautions that should be part of your operating procedure for all types of machinery.

Protect yourself.

- When assembling, operating, and servicing machinery, wear all the protective clothing and personal safety devices that could be necessary for the job at hand. Do NOT take chances. You may need the following:
  - Hard hat
  - Protective footwear with slip resistant soles
  - Protective glasses or goggles
  - Heavy gloves
  - Wet weather gear
  - Respirator or filter mask

- Be aware that exposure to loud noises can cause hearing impairment or loss. Wear suitable hearing protection devices such as ear muffs or ear plugs to help protect against objectionable or loud noises.

- Provide a first aid kit for use in case of emergencies.

- Keep a fire extinguisher on the machine. Be sure the fire extinguisher is properly maintained. Be familiar with its proper use.

- Keep young children away from the machinery at all times.

- Be aware that accidents often happen when the Operator is tired or in a hurry. Take the time to consider the safest way. Never ignore the warning signs of fatigue.
SAFETY

- Wear close-fitting clothing and cover long hair. Never wear dangling items such as scarves or bracelets.
- Keep all shields in place. NEVER alter or remove safety equipment. Make sure driveline guards can rotate independently of the shaft and can telescope freely.
- Use only service and repair parts made or approved by the equipment manufacturer. Substituted parts may not meet strength, design, or safety requirements.

- Keep hands, feet, clothing, and hair away from moving parts. NEVER attempt to clear obstructions or objects from a machine while the engine is running.
- Do NOT modify the machine. Non-authorized modifications may impair machine function and/or safety. It may also shorten the machine’s life.
- To avoid bodily injury or death from unexpected startup of machine, ALWAYS stop the engine and remove the key from ignition before leaving operator’s seat for any reason.

- Keep the service area clean and dry. Wet or oily floors are slippery. Wet spots can be dangerous when working with electrical equipment. Be sure all electrical outlets and tools are properly grounded.
- Keep work area well lit.
- Keep machinery clean. Straw and chaff on a hot engine is a fire hazard. Do NOT allow oil or grease to accumulate on service platforms, ladders, or controls. Clean machines before storage.
- NEVER use gasoline, naphtha, or any volatile material for cleaning purposes. These materials may be toxic and/or flammable.
- When storing machinery, cover sharp or extending components to prevent injury from accidental contact.
1.4 Maintenance Safety

To ensure your safety while maintaining the machine:

• Review the operator’s manual and all safety items before operation and/or maintenance of the machine.

• Place all controls in Neutral, stop the engine, set the park brake, remove the ignition key, and wait for all moving parts to stop before servicing, adjusting, and/or repairing.

• Follow good shop practices:
  – Keep service areas clean and dry
  – Be sure electrical outlets and tools are properly grounded
  – Use adequate lighting for the job at hand

• Relieve pressure from hydraulic circuits before servicing and/or disconnecting the machine.

• Make sure all components are tight and that steel lines, hoses, and couplings are in good condition before applying pressure to hydraulic systems.

• Keep hands, feet, clothing, and hair away from all moving and/or rotating parts.

• Clear the area of bystanders, especially children, when carrying out any maintenance, repairs or adjustments.

• Install transport lock or place safety stands under the frame before working under the machine.

• If more than one person is servicing the machine at the same time, be aware that rotating a driveline or other mechanically-driven component by hand (for example, accessing a lube fitting) will cause drive components in other areas (belts, pulleys, and knives) to move. Stay clear of driven components at all times.

• Wear protective gear when working on the machine.

• Wear heavy gloves when working on knife components.
1.5 Hydraulic Safety

- Always place all hydraulic controls in Neutral before dismounting.
- Make sure that all components in the hydraulic system are kept clean and in good condition.
- Replace any worn, cut, abraded, flattened, or cramped hoses and steel lines.
- Do **NOT** attempt any makeshift repairs to the hydraulic lines, fittings, or hoses by using tapes, clamps, cements, or welding. The hydraulic system operates under extremely high pressure. Makeshift repairs will fail suddenly and create hazardous and unsafe conditions.
- Wear proper hand and eye protection when searching for high-pressure hydraulic leaks. Use a piece of cardboard as a backstop instead of hands to isolate and identify a leak.
- If injured by a concentrated high-pressure stream of hydraulic fluid, seek medical attention immediately. Serious infection or toxic reaction can develop from hydraulic fluid piercing the skin.
- Make sure all components are tight and steel lines, hoses, and couplings are in good condition before applying pressure to a hydraulic system.
1.6 Safety Signs

- Keep safety signs clean and legible at all times.
- Replace safety signs that are missing or become illegible.
- If original parts on which a safety sign was installed are replaced, be sure the repair part also bears the current safety sign.
- Safety signs are available from your Dealer Parts Department.

1.6.1 Installing Safety Decals

1. Clean and dry installation area.
2. Decide on exact location before you remove decal backing paper.
3. Remove smaller portion of split backing paper.
4. Place sign in position and slowly peel back remaining paper, smoothing sign as it is applied.
5. Prick small air pockets with a pin and smooth out.
1.7 Safety Decal Locations

Figure 1.15: Safety Decal Locations
A - MD #194465  B - MD #194463  C - MD #194466  D - MD #194464
E - MD #113482  F - MD #174436  G - MD #184385  H - MD #184371
J - MD #247166

Figure 1.16: Safety Decals
Figure 1.17: Safety Decal Locations
A - MD #184385
1.8 Understanding Safety Signs

**MD #113482**

General hazard pertaining to machine operation and servicing

**CAUTION**

To avoid injury or death from improper or unsafe machine operation:

- Read the operator’s manual and follow all safety instructions. If you do not have a manual, obtain one from your Dealer.
- Do not allow untrained persons to operate the machine.
- Review safety instructions with all Operators every year.
- Ensure that all safety signs are installed and legible.
- Make certain everyone is clear of machine before starting engine and during operation.
- Keep riders off the machine.
- Keep all shields in place and stay clear of moving parts.
- Disengage header drive, put transmission in Neutral, and wait for all movement to stop before leaving operator’s position.
- Stop the engine and remove the key before servicing, adjusting, lubricating, cleaning, or unplugging machine.
- Engage safety props to prevent lowering of header or reel before servicing in the raised position (refer to the header operator’s manual).
- Use slow moving vehicle emblem and flashing warning lights when operating on roadways unless prohibited by law.

**MD #166466**

High pressure oil hazard

**WARNING**

- Do not go near leaks.
- High pressure oil easily punctures skin causing serious injury, gangrene, or death.
- If injured, seek emergency medical help. Immediate surgery is required to remove oil.
- Do not use finger or skin to check for leaks.
- Lower load or relieve hydraulic pressure before loosening fittings.
SAFETY

MD #174432
Reel hazard

WARNING

• To avoid injury from fall of raised reel; fully raise reel, stop the engine, remove the key, and engage mechanical lock on each reel support arm before working on or under reel.
• Refer to operator's manual.

MD #174434
Header hazard

DANGER

• Rest header on ground or engage mechanical locks before going under unit.

MD #184371
Open drive hazard

WARNING

• Guard missing. Do not operate.
• Keep all shields in place.
SAFETY

MD #184422
Keep shields in place hazard

WARNING
• Do not place hand.
• To avoid injury, stop the engine and remove the key before opening power drive system shield.
• Keep all shields in place.

Figure 1.23: MD #184422

MD #190546
Slippery surface

WARNING
• Do not use this area as a step or platform.
• Failure to comply could result in serious injury or death.

Figure 1.24: MD #190546

MD #194463
Rotating blades

WARNING
• Stop engine and remove the key before opening the header covers.
• Listen and look for evidence of rotation before lifting cover.
• Rotating cutters may continue to rotate after power is shut off.

Figure 1.25: MD #194463
MD #194464
Shut down for service

WARNING
• Stop the engine and remove the key.
• Read tractor and mower manufacturer’s manuals for inspection and maintenance instructions.
• Read the windrower and header manuals for inspection and maintenance instructions.

Figure 1.26: MD #194464

MD #194465
Rotating cutters

WARNING
• Stand clear.
• Stop the engine and remove the key.
• Disengage PTO and shut off tractor.
• Listen and look for evidence of rotation before lifting cover.
• Rotating cutters may continue to rotate after power is shut off.
• Failure to comply could result in serious injury or death.

Figure 1.27: MD #194465

MD #194466
Rotating parts under hood

WARNING
• Stand clear.
• Crop materials exiting at high speed.
• Stop machine, look, listen, and wait for all movement to stop before approaching.
• Failure to comply could result in death or serious injury.

Figure 1.28: MD #194466
SAFETY

MD #194521
Auger entanglement hazard

CAUTION

• To avoid injury from entanglement with rotating auger, stand clear of header/mower while machine is running.

General hazard pertaining to machine operation and servicing.

CAUTION

• Read the operator’s manual and follow safety instructions. If you do not have a manual, obtain one from your Dealer.
• Do not allow untrained persons to operate the machine.
• Review safety instructions with all Operators every year.
• Ensure that all safety signs are installed and legible.
• Make certain everyone is clear of machine before starting engine and during operation.
• Keep riders off the machine.
• Keep all shields in place and stay clear of moving parts.
• Disengage header drive, put transmission in Neutral, and wait for all movement to stop before leaving operator’s position.
• Stop the engine and remove the key from ignition before servicing, adjusting, lubricating, cleaning, or unplugging machine.
• Engage locks to prevent lowering of header or reel before servicing in the raised position.
• Use slow moving vehicle emblem and flashing warning lights when operating on roadways unless prohibited by law.

MD #247166
Moving implement hazard

WARNING

• To avoid injury, do not mount or ride machine while the machine is in motion.
MD #247167
Rotating blades

WARNING

• Disengage power take-off, stop engine, and remove key before opening covers.
• Listen and look for evidence of rotation before lifting cover.
• Rotating cutters may continue to rotate after power is shut off due to inertia.

Figure 1.31: MD #247167
2 Product Overview

2.1 Definitions

The following terms and acronyms may be used in this manual.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
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<tr>
<td>API</td>
<td>American Petroleum Institute</td>
</tr>
<tr>
<td>ASTM</td>
<td>American Society of Testing and Materials</td>
</tr>
<tr>
<td>Bolt</td>
<td>A headed and externally threaded fastener that is designed to be paired with a nut</td>
</tr>
<tr>
<td>Cab-forward</td>
<td>Windrower operation with Operator and cab facing in direction of travel</td>
</tr>
<tr>
<td>CDM</td>
<td>Cab display module on a self-propelled windrower</td>
</tr>
<tr>
<td>Center-link</td>
<td>A hydraulic cylinder link between header and machine to which it is attached: It is used to change header angle</td>
</tr>
<tr>
<td>CGVW</td>
<td>Combined vehicle gross weight</td>
</tr>
<tr>
<td>DWA</td>
<td>Double Windrow Attachment</td>
</tr>
<tr>
<td>ECM</td>
<td>Engine control module</td>
</tr>
<tr>
<td>ECU</td>
<td>Electronic control unit</td>
</tr>
<tr>
<td>Engine-forward</td>
<td>Windrower operation with Operator and engine facing in direction of travel</td>
</tr>
<tr>
<td>Export header</td>
<td>Header configuration typical outside North America</td>
</tr>
<tr>
<td>Finger tight</td>
<td>Finger tight is a reference position where sealing surfaces or components are making contact with each other and fitting has been tightened to a point where fitting is no longer loose</td>
</tr>
<tr>
<td>FFFFT</td>
<td>Flats from finger tight</td>
</tr>
<tr>
<td>GSL</td>
<td>Ground speed lever</td>
</tr>
<tr>
<td>GSS</td>
<td>Grass Seed Special</td>
</tr>
<tr>
<td>GVW</td>
<td>Gross vehicle weight</td>
</tr>
<tr>
<td>Hard joint</td>
<td>A joint made with the use of a fastener where joining materials are highly incompressible</td>
</tr>
<tr>
<td>Header</td>
<td>A machine that cuts and lays crop into a windrow and is attached to a self-propelled windrower</td>
</tr>
<tr>
<td>Hex key</td>
<td>A hex key or Allen key (also known by various other synonyms) is a tool of hexagonal cross-section used to drive bolts and screws that have a hexagonal socket in head (internal-wrenching hexagon drive)</td>
</tr>
<tr>
<td>hp</td>
<td>Horsepower</td>
</tr>
<tr>
<td>ISC</td>
<td>Intermediate Speed Control</td>
</tr>
<tr>
<td>JIC</td>
<td>Joint Industrial Council: A standards body that developed standard sizing and shape for original 37° flared fitting</td>
</tr>
<tr>
<td>M-Series windrower</td>
<td>MacDon M105, M150, M155, M155E4, M200, and M205 windrowers</td>
</tr>
<tr>
<td>n/a</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Nut</td>
<td>An internally threaded fastener that is designed to be paired with a bolt</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>N-DETENT</td>
<td>The slot opposite the NEUTRAL position on operator’s console</td>
</tr>
<tr>
<td>North American header</td>
<td>Header configuration typical in North America</td>
</tr>
<tr>
<td>NPT</td>
<td>National Pipe Thread: A style of fitting used for low pressure port openings Threads on NPT fittings are uniquely tapered for an interference fit</td>
</tr>
<tr>
<td>ORB</td>
<td>O-ring boss: A style of fitting commonly used in port opening on manifolds, pumps, and motors</td>
</tr>
<tr>
<td>ORFS</td>
<td>O-ring face seal: A style of fitting commonly used for connecting hoses and tubes This style of fitting is also commonly called ORS, which stands for O-ring seal</td>
</tr>
<tr>
<td>rpm</td>
<td>Revolutions per minute</td>
</tr>
<tr>
<td>R-Series header</td>
<td>MacDon R80 and R85 rotary disc headers</td>
</tr>
<tr>
<td>RoHS (Reduction of Hazardous Substances)</td>
<td>A directive by the European Union to restrict use of certain hazardous substances (such as hexavalent chromium used in some yellow zinc platings)</td>
</tr>
<tr>
<td>SAE</td>
<td>Society of Automotive Engineers</td>
</tr>
<tr>
<td>Screw</td>
<td>A headed and externally threaded fastener that threads into preformed threads or forms its own thread in one of mating parts</td>
</tr>
<tr>
<td>Self-Propelled (SP) Windrower</td>
<td>Self-propelled machine consisting of a power unit with a header</td>
</tr>
<tr>
<td>Soft joint</td>
<td>A joint made with use of a fastener where joining materials are compressible or experience relaxation over a period of time</td>
</tr>
<tr>
<td>Tension</td>
<td>Axial load placed on a bolt or screw, usually measured in Newtons (N) or pounds (lb.)</td>
</tr>
<tr>
<td>TFFT</td>
<td>Turns from finger tight</td>
</tr>
<tr>
<td>Torque</td>
<td>The product of a force X lever arm length, usually measured in Newton-meters (N·m) or foot-pounds (ft·lb)</td>
</tr>
<tr>
<td>Torque angle</td>
<td>A tightening procedure where fitting is assembled to a precondition (finger tight) and then nut is turned further a number of degrees or a number of flats to achieve its final position</td>
</tr>
<tr>
<td>Torque-tension</td>
<td>The relationship between assembly torque applied to a piece of hardware and axial load it induces in bolt or screw</td>
</tr>
<tr>
<td>Washer</td>
<td>A thin cylinder with a hole or slot located in the center that is to be used as a spacer, load distribution element, or a locking mechanism</td>
</tr>
<tr>
<td>Windrower</td>
<td>Power unit of a self-propelled header</td>
</tr>
<tr>
<td>WCM</td>
<td>Windrower control module</td>
</tr>
</tbody>
</table>
2.2 Component Identification

Figure 2.1: Component Identification M205
A - Doors  
B - Driveshield  
C - Swath Baffle Control  
D - Swath Baffle  
E - Header Boot

Figure 2.2: Component Identification M205
A - Hydraulic Hoses to SP Windrower  
B - Hose Supports  
C - Drive Motor  
D - Rotary Deflector  
E - 8 Disc Cutterbar  
F - Conditioner Rolls  
G - Front Curtains
2.3 Specifications

NOTE:
Specifications and design are subject to change without notice or obligation to revise previously sold units.

S: standard / O_f: optional (factory installed) / O_d: optional (dealer installed) / -: not available

<table>
<thead>
<tr>
<th>Cutterbar</th>
<th>13-Foot R85</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective cutting width</td>
<td>3895 mm (12.78 ft.)</td>
</tr>
<tr>
<td>Number of cutting discs</td>
<td>8</td>
</tr>
<tr>
<td>Number of blades per disc</td>
<td>2</td>
</tr>
<tr>
<td>18 degree bevel down knives</td>
<td>S</td>
</tr>
<tr>
<td>Inline spur gear cutterbar design</td>
<td>S</td>
</tr>
<tr>
<td>Geartrain protection - shearable key in spindle (all discs)</td>
<td>S</td>
</tr>
<tr>
<td>Austempered cutting discs</td>
<td>S</td>
</tr>
<tr>
<td>Range of cutting disc rpm</td>
<td>1800–2600 rpm</td>
</tr>
<tr>
<td>Knife tip speed range</td>
<td>59.2–85.5 mps (131–189 mph)</td>
</tr>
<tr>
<td>Cutterbar spindle anti-wrap ring</td>
<td>S</td>
</tr>
<tr>
<td>Austempered rock guards</td>
<td>S</td>
</tr>
<tr>
<td>Hourglass converging impellers</td>
<td>S</td>
</tr>
<tr>
<td>Heat treated crop lifters</td>
<td>S</td>
</tr>
<tr>
<td>Cutting angle range</td>
<td>0-8° below horizontal</td>
</tr>
<tr>
<td>Cutting angle range - minimum cut height</td>
<td>19 mm (3/4 in.)</td>
</tr>
<tr>
<td>Adjustable shoes</td>
<td>O</td>
</tr>
</tbody>
</table>

Hay Conditioner

| Drive: Bevel gearbox to 3 HB belt drive to enclosed timing gearbox and driveline | S |
| Roll type: Intermeshing steel bars | S |
| Roll length: 3000 mm (118 in.) | S |
| Roll diameter 229 mm (9.0 in.) outside diameter on 179 mm (7.0 in.) O.D. tube | S |
| Roll speed | 730–1040 rpm |

Forming Shield for 915 mm (36 in.) windrow to 2540 mm (102 in.) wide swath | S |

Header mounted adjustable baffle | S |

Tractor mounted side deflector and rear baffle | S |
## PRODUCT OVERVIEW

<table>
<thead>
<tr>
<th>Frame and Structure</th>
<th>13-Foot R85</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounts to self-propelled windrower tractor</td>
<td>S</td>
</tr>
<tr>
<td>Easy access doors to access cutterbar components</td>
<td>2</td>
</tr>
<tr>
<td>Transport width</td>
<td>3952 mm (156 in.)</td>
</tr>
<tr>
<td>Total weight complete with lift arms (estimated)</td>
<td>1360 kg (3000 lb.)</td>
</tr>
</tbody>
</table>

### Drives

<table>
<thead>
<tr>
<th>Model</th>
<th>Horsepower</th>
</tr>
</thead>
<tbody>
<tr>
<td>M150/M155/M155E4 Windrower tractor to 75 CC (4.6 cu in.) Eaton heavy duty hydraulic motor</td>
<td>S</td>
</tr>
<tr>
<td>M205 Windrower tractor to 106 cc (6.4 cu in.) Eaton heavy duty hydraulic motor</td>
<td>S</td>
</tr>
<tr>
<td>M150/M155 maximum hydraulic power developed</td>
<td>97 kW (130 Hp)</td>
</tr>
<tr>
<td>M205 maximum hydraulic power developed</td>
<td>174 kW (231 Hp)</td>
</tr>
</tbody>
</table>

### Hydraulic Header Connection

| Hydraulic couplers for quick attachment                  | Od          |

### Attachments and Accessories

<table>
<thead>
<tr>
<th>Attachment</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Double Windrow Attachment</td>
<td>Od</td>
</tr>
<tr>
<td>Tall Crop Divider kit</td>
<td>O</td>
</tr>
<tr>
<td>Cutterbar Repair Tool kit</td>
<td>O</td>
</tr>
</tbody>
</table>
3  Operation

3.1  Owner/Operator Responsibilities

⚠️ CAUTION

- It is your responsibility to read and understand this manual completely before operating the header. Contact your MacDon Dealer if an instruction is not clear to you.
- Follow all safety messages in the manual and on safety decals on the machine.
- Remember that YOU are the key to safety. Good safety practices protect you and the people around you.
- Before allowing anyone to operate the header, for however short a time or distance, make sure they have been instructed in its safe and proper use.
- Review the manual and all safety related items with all Operators annually.
- Be alert for other Operators not using recommended procedures or not following safety precautions. Correct these mistakes immediately before an accident occurs.
- Do NOT modify the machine. Unauthorized modifications may impair the function and/or safety and affect machine life.
- The safety information given in this manual does not replace safety codes, insurance needs, or laws governing your area. Be sure your machine meets the standards set by these regulations.
- Ensure that the windrower is properly equipped to safely operate the header. This may include adding ballast according to windrower operator’s manual requirements for attachments of this size and mass.
3.2 Operational Safety

⚠️ CAUTION

Follow these safety precautions:

• Follow all safety and operational instructions given in your windrower operator’s manuals. If you do not have an operator’s manual, get one from your Dealer and read it thoroughly.

• Never attempt to start the windrower’s engine or operate the machine except from the windrower seat.

• Check the operation of all controls in a safe clear area before starting work.

• Do NOT allow riders on the windrower or header.

⚠️ CAUTION

• Never start or move the machine until you are sure all bystanders have cleared the area.

• Avoid travelling over loose fill, rocks, ditches, or holes.

• Drive slowly through gates and doorways.

• If cutting ditch banks, use extreme caution. If the header hits an obstruction, the front of the windrower will usually swerve toward the ditch.

• When working on inclines, travel uphill or downhill when possible. Be sure to keep the windrower transmission in gear when travelling downhill.

• Never attempt to get on or off a moving machine.

• Do NOT get off the windrower while the header is in operation.

• To avoid bodily injury or death from unexpected startup of machine, always stop the windrower engine and remove the key before adjusting or removing plugged material from the machine.

• Check for excessive vibration and unusual noises. If there is any indication of trouble, shut down and inspect the machine.

⚠️ CAUTION

Follow proper shut down procedure:

• Engage the windrower brake.

• Stop the engine and remove the key.

• Wait for all movement to stop.

• Engage the header safety props before inspecting a raised machine.
CAUTION

- Operate only in daylight or good artificial light
- Keep everyone several hundred feet away from your operation
- Ensure bystanders are never in line with the front or rear of the machine. Stones or other foreign objects can be ejected with force from either end
- Extreme care must be exercised to avoid injury from thrown objects. Do NOT, under any circumstances, operate the header when other people are in the vicinity. Stones and other objects can be thrown great distances by the rotating cutting blades
- The cutterbar curtains are very important to reduce the potential for thrown objects. Always keep the cutterbar curtains down when operating the header. Replace the curtains if they become worn or damaged
3.3 Engaging/Disengaging the Header Safety Props

Safety props are located on both header lift cylinders on the windrower.

⚠️ DANGER

To avoid bodily injury from fall of raised header, always engage safety props when working on or around raised header, and before going under header for any reason.

Engage safety props as follows:

1. Start engine and press header up (A) switch to raise header to maximum height.

2. Rephase cylinders if one end of the header does not raise fully. If rephasing is required, proceed as follows:
   a. Press and hold the header up (A) switch until both cylinders stop moving.
   b. Continue to hold the switch for 3–4 seconds. Cylinders are now phased.

3. Pull lever (A) and rotate toward header to lower safety prop (B) onto cylinder. Repeat for opposite cylinder.
OPERATION

Disengage safety props as follows:

1. Turn lever (A) away from header to raise safety prop until lever locks into vertical position. Repeat for opposite cylinder.

2. Start engine, choose a level area, and lower header to the ground.

3. Stop the engine and remove the key.

Figure 3.4: Safety Prop
3.4 Driveshields

⚠️ WARNING

Do NOT operate the machine with the driveshields open. High-speed rotating components may throw debris and could result in death or serious injury.

The R85 13-Foot Header for Self-Propelled Windrowers comes in two configurations—one configured for use in North America and one configured for use outside of North America. The configuration is specified in the title when necessary.

3.4.1 Opening the Driveshield: North American Headers

Follow these steps to open the driveshield (A) on North American headers:

1. Disengage rubber latch (B) from hook (C).
2. Lift driveshield (A) to the open position.

![Figure 3.5: Driveshield]

3.4.2 Closing the Driveshield: North American Headers

Follow these steps to close the driveshield on North American headers:

1. Lower driveshield (A) so that tabs at lower end of shield engage holes in lower panel.
2. Engage rubber latch (B) on hook (C).

![Figure 3.6: Driveshield]
3.4.3 Opening the Driveshield: Export Headers

Follow these steps to open the driveshield on export headers:

1. Release rubber latch (A).
2. Insert a screwdriver (or equivalent) through hole (B) in driveshield and into the notch in latch (C) and disengage latch.
3. Open driveshield (D).

3.4.4 Closing the Driveshield: Export Headers

Follow these steps to close the driveshield on export headers:

1. Lower driveshield (A) so that lower end of driveshield engage holes in the lower panel, and latch (B) reengages shield.
2. Engage rubber latch (C).
3.5 Cutterbar Doors

The R85 comes in two configurations—one configured for use in North America and one configured for use outside of North America. The configuration is specified in the title when necessary.

⚠️ CAUTION

Do NOT operate the machine without all the cutterbar doors down. The curtains should be installed and in good condition.

Two doors provide access to the cutterbar area.

Rubber curtains are attached to each door at the front corners and center fixed cover. Latches at the lower corners of each curtain keep the curtains together to minimize the risk of thrown objects.

The cutterbar curtains reduce the potential for thrown objects. Always keep curtains down when operating the header.

Replace the worn or damaged curtains. Refer to your Dealer for replacement instructions.
3.5.1 Opening the Cutterbar Doors: North America

Follow these steps to open the cutterbar doors on a North American header:

1. Unhook the curtain latches (A).

2. Lift front of door to the open position. The front cover safety latch (A) will automatically drop into position and keep the cover from falling closed again during maintenance.

---

**Figure 3.10: Curtain Latches**

**Figure 3.11: Cutterbar Doors**
3.5.2 Closing the Cutterbar Doors: North American Header

Follow these steps to close the cutterbar doors on a North American header:

⚠️ CAUTION

To avoid injury, keep hands and fingers away from corners of doors when closing.

1. Push at the top of the cutterbar door to release the safety door latch (A) from its locked position, then move the door down to its closed position over the auger.

2. Hook curtain latches (A).

**NOTE:**
Ensure that curtains hang properly and completely enclose cutterbar area.
3.5.3 Opening the Cutterbar Doors: Export Header

Follow these steps to open the cutterbar doors on an export header:

1. Unhook curtain latches (A).

Figure 3.14: Curtain Latches
2. Insert a screwdriver (or equivalent) through hole (A) in door into notch in latch (B) and push latch to disengage.

3. Lift at front of door to open.

3.5.4 Closing the Cutterbar Doors: Export Header

To close the cutterbar doors on an export header follow these steps:

⚠️ CAUTION

To avoid injury, keep hands and fingers away from corners of doors when closing.
1. Pull at top and move to closed position. Ensure latch (A) has engaged the door.

2. Hook curtain latches (A).
3.6 Daily Start-Up Check

CAUTION

- Be sure windrower and header are properly attached, all controls are in NEUTRAL, and windrower brake is engaged.
- Clear the area of other persons, pets etc. Keep children away from machinery. Walk around the header to be sure no one is under, on or close to it.
- Wear close fitting clothing and protective shoes with slip resistant soles. As well, carry with you any protective clothing and personal safety devices that COULD be necessary through the day. Don’t take chances.
- Remove foreign objects from the machine and surrounding area.

You may need the following:

- A hard hat
- Protective footwear with slip resistant soles
- Protective glasses or goggles
- Heavy gloves
- A respirator or filter mask
- Wet weather gear

- Be aware that exposure to loud noise can cause impairment or loss of hearing. Wear suitable hearing protection devices such as ear muffs or ear plugs to help protect against objectionable or loud noises.

Do the following each day before start-up:

1. Check the machine for leaks or any parts that are missing, broken, or not working correctly.

   **NOTE:**
   Use proper procedure when searching for pressurized fluid leaks. Refer to 5.6.2 Hydraulic Hoses and Lines, page 151.

2. Perform all daily maintenance. Refer to 5.3.1 Maintenance Schedule/Record, page 103.
3.7 Attaching the Header

3.7.1 Attaching the Forming Shield

⚠️ DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

1. Stop the engine and remove the key.
2. Remove the two clevis pins (A) from the forming shield forward end.

3. Position the forming shield (A) under the windrower frame.

---

Figure 3.20: Forming Shield

Figure 3.21: Forming Shield under Windrower Frame
4. Position the forming shield onto spacers (B) on windrower legs. Secure with clevis pins (A) and lynch pin.

**IMPORTANT:**
Forming shield plate (A) is shown in standard position. If installing double windrow attachment (DWA), install plate in inverted position.

*Figure 3.22: Attaching Forming Shield to Windrower Legs*

*Figure 3.23: Forming Shield under Windrower Frame*
5. Lift the aft end of the forming shield and attach straps (B) to pins (A) on the windrower frame.

6. Install washer and hairpin to secure strap. Use the middle hole and adjust height to suit the crop.

7. Set the forming shield side deflectors to the desired width by repositioning the adjuster bars (A). Use the same hole location on both sides.

8. Adjust the rear fluffer deflector (C) to the middle position. Loosen handles (B) if required.

9. Attach the R85 header to the windrower. Refer to the windrower operator’s manual, and then return to this manual to complete the attachment.

10. Connect the hydraulics and electrical harness.
    - For M205, refer to 3.7.2 Attaching Hydraulics and Electrical: M205 Windrowers, page 39.
    - For M200, refer to 3.7.3 Attaching Hydraulics and Electrical: M200 Windrowers, page 45.

### 3.7.2 Attaching Hydraulics and Electrical: M205 Windrowers

**DANGER**

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator's seat for any reason.

**NOTE:**
The 18.4x26 drive tire (MD #B5447) is recommended on the M205 Self-Propelled Windrower. These drive tires are reversible and should be mounted inset at 3792 mm (149.3 in.) to provide maximum clearance to uncut crop. Mounting these tires outset and mounting all other drive tire options will result in windrower tires slightly wider than the header width. This may cause some uncut crop to be trampled by tires in turns and corners during windrower operation, and may leave some uncut strips of crop in the windrower’s next pass.

**NOTE:**
If the caster wheels are set at maximum width and are damaging crops in turns, narrow the caster width settings. Refer to your windrower operator’s manual for wheel position settings.

Refer to your windrower operator’s manual for procedures to mechanically attach the header to the windrower. Refer to the following procedures for electrical and hydraulic connections:
The R85 13-foot header requires motor/hose kit (MD #B5456) installed to enable operation on an M205 Self-Propelled Windrower.

If required, obtain the kit through your MacDon Dealer and install it in accordance with the instructions supplied with the kit.

1. Move windrower left-hand (cab-forward) platform (A) to OPEN position.
2. Route the hose bundle (A) from the header, under the windrower frame, and insert pin (B) into hole in windrower frame.

3. Place hoses on support (C) and on the hose support on the forming shield (not shown).

4. If optional couplers and lock are installed on hoses and lines, proceed as follows. Otherwise, proceed to Step 13., page 44.

5. Remove coupler lock as follows:
   a. Remove lynch pin (A) and open up coupler lock (B).
   b. Remove lock from coupler.
6. Connect the rear pump hose (A) to outboard line (D) on windrower using coupler (C).

7. Connect the front pump hose (B) to the inboard line (E) on windrower using coupler (C).

8. Position the lock onto the couplers so that retainer (A) rests under the fitting next to the sleeve on each coupler.

NOTE:
The retainer can be adjusted by loosening bolts (B). Tighten bolts after adjusting.
9. Lower holder (A) onto sleeves (B) so that the flats are positioned on the holder.

**NOTE:**
Holder can be adjusted by loosening bolts (C). Tighten bolts after adjusting.

10. Insert lynch pin (A) to secure the lock.
11. Attach case drain hose coupler at (B).
12. Proceed to Step 17., page 44.
13. Connect the rear pump hose (A) to outboard line (F) on windrower using fitting (D).

14. Connect the front pump hose (B) to the inboard line (G) on windrower using fitting (D).

15. Torque fittings to 183 N·m (135 ft·lbf).

16. Attach case drain hose and coupler (C) to (E).

17. Connect the electrical harness to connector HC-2A (A) (located beside the forward valve block on the windrower).

**NOTE:**
Valve block hidden to show the electrical connector.
18. Move the windrower platform (A) to the CLOSED position.

![Figure 3.36: Windrower with LH Platform in Closed Position](image)

### 3.7.3 Attaching Hydraulics and Electrical: M200 Windrowers

**DANGER**

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

**NOTE:**

The 18.4x26 drive tire (MD #B5447) is recommended on the M200 Self-Propelled Windrower. These drive tires are reversible and should be mounted inset at 3792 mm (149.3 in.) to provide maximum clearance to uncut crop. Mounting these tires outset and mounting all other drive tire options will result in windrower tires slightly wider than the header width. This may cause some uncut crop to be trampled by tires in turns and corners during windrower operation, and may leave some uncut strips of crop in the windrower’s next pass.

**NOTE:**

If the caster wheels are set at maximum width and are damaging crops in turns, narrow the caster width settings. Refer to your windrower operator’s manual for wheel position settings.

Refer to **3.7 Attaching the Header, page 37** for procedure to mechanically attach the header to the windrower. Refer to the following procedures for electrical and hydraulic connections:
To operate the 13-foot header on an M200 windrower, installation of a motor/hose kit (MD #B5511) is required. If required, obtain the kit through your MacDon Dealer. Install kit in accordance with the supplied instructions.

1. Disengage and rotate lever (A) counterclockwise to the UP position.

2. Remove the cap (B) securing the electrical connector to the frame.
3. Move hose bundle (A) from the windrower and rest the bundle on the header.

4. Position the hose support with the lower bolt (A) in the forward hole, as shown. Loosen both bolts and adjust as required.

5. Route hose bundle (A) from the windrower through the support (B) on header.

6. Route header return and pressure hose bundle (C) through support (B) on header to the windrower.
7. Secure hose bundles with three cinch straps (B).
8. Lower and lock lever (A).

9. Move the windrower’s left-hand side (cab-forward) platform (A) to the OPEN position to access the valve blocks.
IMPORTANT:
Keep open lines and ports clean.

10. Connect the pressure hose (C) from port (A) on the header motor to port (M2) on the header drive valve block.

11. Connect the return hose (D) coming from port (B) on the header motor to port (R2) on the header drive valve block.

NOTE:
If the windrower is equipped with a reverser valve for an auger header, replace the 90° fitting on hose (D) with a 45° fitting. Refer to Figure 3.47: M200 Windrower Hose Connections with Reverser, page 50.

12. Connect the return hose (A) from the header drive valve block port (R1) to the steel line attached to motor port (B).
13. Connect the pressure hose (B) from the header drive valve block port (M1) to the steel line attached to motor port (A).

**NOTE:**
Final hose configuration shown for an M200 Self-Propelled Windrower equipped with a reverser valve.
14. Connect the case drain hose (A) from the header lift valve block port (T3) to the hose attached to motor port (D).

**NOTE:**
Hydraulic pressure lines and hoses hidden to show the case drain hose.

15. Connect the electrical harness (A) from windrower to the electrical connector on the header.

**NOTE:**
Hydraulic lines and hoses removed from illustration to show clarity of the electrical connection.
16. Move platform (A) to the CLOSED position.

![Figure 3.50: Top View of Windrower](image)

**3.7.4 Attaching Hydraulics and Electrical: M150, M155, or M155E4 Windrowers**

⚠️ **DANGER**

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

Refer to your windrower operator’s manual for procedures to mechanically attach the header to the windrower. Refer to the following procedures for electrical and hydraulic connections.

**NOTE:**

The 18.4x26 drive tire (MD #B5447) is recommended on the M150, M155, and M155E4 Self-Propelled Windrower. These drive tires are reversible and should be mounted inset at 3792 mm (149.3 in.) to provide maximum clearance to uncut crop. Mounting these tires outset and mounting all other drive tire options will result in windrower tires slightly wider than the header width. This may cause some uncut crop to be trampled by tires in turns and corners during windrower operation, and may leave some uncut strips of crop in the windrower’s next pass.

**NOTE:**

If the caster wheels are set at maximum width and are damaging crops in turns, narrow the caster width settings. Refer to your windrower operator’s manual for wheel position settings.

**NOTE:**

The M150, M155, and M155E4 Self-Propelled Windrowers require the disc drive manifold kit (MD #B4657) to hydraulically connect the R85 13-foot header.
The R85 13-foot header requires motor/hose kit (MD #B5510) installed to enable operation on an M150, M155, or M155E4 Self-Propelled Windrower.

If required, obtain the kit through your MacDon Dealer. Install kit in accordance with the supplied instructions.

1. Disengage and rotate lever (A) counterclockwise to FULLY UP position.
2. Remove the cap (B) securing the electrical connector to the frame.
OPERATION

3. Move hose bundle (A) from the windrower and rest the bundle on the header.

4. Position the hose support with lower bolt (A) in the forward hole, as shown. Loosen both bolts, and adjust as required.
5. Move the windrower’s left side (cab-forward) platform (A) to the OPEN position.

6. Route the windrower hose bundle (A) through hose support (B) on the header.

7. Route the hose (C) from the header through support (B) to the windrower.

Figure 3.55: Windrower LH Platform in Open Position

Figure 3.56: Hose Bundle
**OPERATION**

**IMPORTANT:**
Keep open lines and ports clean.

8. Connect the single pressure hose (A) routed from the header to port M2 on the disc drive valve (middle block).

9. Remove caps and plugs on hoses from windrower and lines on header.

10. Connect the pressure hose (B) from the drive manifold port M1 to the steel line attached to motor port (A).

![Figure 3.57: Hydraulic Connections](image1)

![Figure 3.58: Hydraulic Connections](image2)
11. Connect the return hose (A) from the drive manifold port R1 to the steel line attached to motor port (B).

**NOTE:**
If the windrower is equipped with a reverser valve (A) for an auger header, route the return hose (B) from port R1 on the reverser valve to the steel line attached to motor port (C).
12. Connect the case drain hose (A) from the lift manifold port T3 to the fitting attached to motor port (D).

13. Connect the electrical harness (A) from windrower to the electrical connector on the header.

**NOTE:**
Hydraulic hoses removed from the illustration to improve clarity.
14. Lower and lock lever (A). Secure hose (B) with three cinch straps (C).

![Figure 3.63: Hose Bundle](image)

15. Move platform (A) to the CLOSED position.

![Figure 3.64: Top View of Windrower](image)
3.8 Detaching the Header

3.8.1 Detaching the Header: M205 Windrowsers

Refer to your windrower operator’s manual for procedure to mechanically detach the header from a windrower. Refer to the following procedure to disconnect electrical and hydraulic systems:

⚠️ DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

1. Lower header to ground. If ground is soft, place blocks under header.
2. Stop the engine and remove the key.
3. Move the left side (cab-forward) platform (A) to the open position.

Figure 3.65: Windrower LH Platform
4. Disconnect the electrical harness at connector (A).

**NOTE:**
Valve block hidden to show the electrical connector.

5. If couplers and coupler lock are installed on lines, proceed as follows. Otherwise, proceed to Step 13., page 62.

6. Disconnect 12.7 mm (1/2 in.) hose (B) from windrower coupler and remove lynch pin (A).

7. Open up coupler lock (A).
8. Remove lock from couplers (B).
9. Unscrew sleeves (A) on couplers and separate couplers.

10. Install caps and plugs on open lines.

11. Attach coupler lock (B) to hoses and secure with lynch pin (A).


13. Disconnect hoses from lines (A), (B), and (C) on windrower. Install caps and plugs on open lines.
14. Remove hose support (A) from the windrower frame.

15. Route hoses (B) and electrical harness onto the header.

16. Move maintenance platform (A) to the CLOSED position.

17. Refer to the windrower operator's manual to mechanically detach the header from the windrower.
3.8.2 Detaching the Header: M200 Windrowers

Refer to your windrower operator’s manual for procedure to mechanically detach the header from a windrower. Refer to the following procedure to disconnect electrical and hydraulic systems:

⚠️ DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator's seat for any reason.

1. Lower the header to ground. If ground is soft, place blocks under header.
2. Stop the engine and remove the key.
3. Move the left side (cab-forward) platform (A) to the open position.

4. Disconnect the pressure hose (A) from port (M2) on the header drive valve block.
5. Disconnect the return hose (B) from port (R2) on the header drive valve block.
6. Install plugs and caps on open windrower lines and header hoses.
7. Raise and unlock lever (A) and undo the three cinch straps (B).

8. Move hose bundle to store on header.

9. Disconnect the electrical connector (A) at the header by turning the collar counterclockwise and pulling the connector to disengage.

**NOTE:**
Hydraulic lines and hoses hidden on illustration to show the electrical connection.
10. Disconnect the following hoses from the hydraulic motor:
   - Pressure hose (A)
   - Return hose (B)
   - Case drain hose (C)

11. Install caps on the connectors and hose ends (if equipped).

   **NOTE:**
   Hydraulic hoses from the header hidden on illustration for clarity.

12. Move the hose bundle from header to the left-side (cab-forward) hose support (B).

13. Rotate lever (A) clockwise and push to engage bracket.

14. Route the electrical harness through the hose support (B) and attach cap to electrical connector (C).
15. Move the windrower platform (A) back to the CLOSED position.

16. Refer to the windrower operator’s manual to mechanically detach header from the windrower.

3.8.3 Detaching the Header: M150, M155, or M155E4 Windrowers

Refer to your windrower operator’s manual for the procedure to mechanically detach the header from a windrower. Refer to the following procedure to disconnect electrical and hydraulic systems.

⚠️ DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

1. Lower the header to the ground. If the ground is soft, place blocks under the header.

2. Stop the engine and remove the key.
3. Move the left side (cab-forward) platform (A) to the open position.

4. Disconnect hose (A) from port (M2) on the disc drive valve.
5. Raise lever (A) and undo the three cinch straps (C).
6. Move hose (B) to store on header.

7. Disconnect the following hoses from the hydraulic motor:
   - Pressure hose (A)
   - Return hose (B)
   - Case drain hose (C)

8. Install caps on the connectors and hose ends (if equipped).
9. Disconnect the electrical connector (A) by turning the collar counterclockwise and pulling connector to disengage.

**NOTE:**
Hydraulic lines and hoses hidden on illustration to show the electrical connection.

10. Move the hose bundle from header to the left-side (cab-forward) hose support (B).

11. Rotate lever (A) clockwise and push to engage bracket.

12. Route the electrical harness through the hose support (B) and attach cap to electrical connector (C).
13. Move the windrower platform (A) to the CLOSED position.

14. Refer to the windrower operator’s manual to mechanically detach the header from the windrower.
3.9 Break-In Period

After attaching the header to the windrower for the first time, operate the machine slowly for five minutes, watching and listening from the windrower seat for binding or interfering parts.

NOTE:
Until you become familiar with the sound and feel of your new header, be extra alert and attentive.

⚠️ CAUTION

Before investigating an unusual sound or attempting to correct a problem, stop the engine, engage parking brake, and remove the key.

NOTE:
Perform the items specified in 5.3.1 Maintenance Schedule/Record, page 103.
3.10 Shutting down the Windrower

CAUTION

Before leaving the windrower seat for any reason:

1. Park on level ground (if possible).
2. Lower the header fully.
3. Place ground speed control in N-DETENT.
4. Stop the engine and remove the key.
5. Wait for all movement to stop.
3.11 Transporting the Header

For information on transporting the header when attached to the windrower, refer to your windrower operator’s manual.

IMPORTANT:
For cab-forward road travel the windrower must have the lighting and marking bundle installed (MD #B5412).
4 Operating the Header

Your header will provide the best performance when it is properly adjusted to suit the crop and conditions. Correct operation reduces crop loss and increases productivity. As well, proper adjustments and timely maintenance will increase the length of service you receive from the machine.

The variables listed below and detailed on the following pages will affect the performance of the header. You will quickly become familiar with adjusting the machine to give you the desired results. Most of the adjustments have been set at the factory, but if desired, the settings can be changed to suit crop conditions.

### Table 4.1 Header Adjustment Procedures

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#### 4.1 Header Float

Header float springs are normally set so 422–467 N (95–105 lbf) of force is required to lift the header at either end. In rough or stony conditions, it may be desirable to maintain a lighter setting to protect cutting components.

When float setting is light, it may be necessary to use a slower ground speed to avoid excessive bouncing resulting in a ragged cut. Faster ground speeds may require additional ground pressure.

Up to three—user defined—float positions can be stored in the windrower's control system. For information on setting float, refer to the Float Options topic in the windrower operator's manual.

#### 4.1.1 Checking Float

**DANGER**

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator's seat for any reason.

1. Lower the header until lift cylinders are fully retracted.
2. Stop the engine and remove the key.
3. Grasp the front corner of the header and lift. The force to lift should be 426–471 N (95–105 lbf) and should be approximately the same at both ends. If adjustment is required, refer to 4.1.2 Adjusting Float, page 76.
4.1.2 Adjusting Float

⚠️ DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

Set the float fine adjustment to **MID-RANGE** with the windrower float adjustment system in the cab (refer to your windrower operator’s manual).

Check the float by grasping the front corner of the header and lifting. The force to lift should be 426–471 N (95–105 lbf) and should be approximately the same at both ends.

If adjustment is required, follow these steps:

1. Raise the header fully
2. Stop the engine and remove the key.
3. Turn drawbolt (A):
   a. Clockwise to **INCREASE** float (makes header lighter).
   b. Counterclockwise to **DECREASE** float (makes header heavier).
4. Recheck the float.

![Figure 4.1: Windrower Lift Linkage](image-url)
4.2 Roll Gap

Steel rolls condition the crop by crimping and crushing the stem in several places. This allows moisture release for quicker drying. The degree to which the crop is conditioned as it passes through the rolls is controlled by roll gap, which is factory set at 13 mm (1/2 in.).

Correct conditioning of alfalfa, clover, and other legumes is usually indicated when 90% of the stems show cracking, but no more than 5% of the leaves are damaged. Set enough roll gap to achieve this result.

A larger gap (up to 25.4 mm [1 in.]) may be desirable in thick stemmed cane-type crops. However, too large a gap may cause feeding problems. Grass type crops may require less gap for proper feeding and conditioning.

**IMPORTANT:**
If settings below the factory setting are used, it is recommended that the actual gap be visually checked.

4.2.1 Checking Roll Gap

⚠️ DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator's seat for any reason.

1. Lower the header fully.
2. Stop the engine and remove the key.
3. Open the driveshield. Refer to 3.4 Driveshields, page 28.
4. Loosen bolts (B) that secure conditioner shield (A).
5. Remove the conditioner shield (A) by sliding it up.

![Figure 4.2: Conditioner Shield](image)
6. Center the upper roll bar (B) between two lower roll bars.

7. Inspect roll gap at both ends of the rolls. Gap (C) should be 12.7 mm (0.5 in.).

**NOTE:**
Factory setting is 12.7 mm (1/2 in.). A gap of 16 mm (5/8 in.) is strongly recommended for heavier crop conditions.

**IMPORTANT:**
Roll timing is critical when the roll gap is decreased because the bars may contact each other if the timing is wrong.

8. To check roll timing, refer to 4.4 Roll Timing, page 81.

9. Reinstall the conditioner shield (A) and secure with bolts (B).


---

### 4.2.2 Adjusting Roll Gap

⚠️ **DANGER**

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

1. Lower the header fully.
2. Stop the engine and remove the key.
3. Open the driveshield. Refer to 3.4 Driveshields, page 28.
4. Loosen upper jam nut (A) on both sides of conditioner.

5. To increase roll gap (increase conditioning action), turn lower nut (B) clockwise.

6. To decrease roll gap (reduce conditioning action), turn lower nut (B) counterclockwise.

7. Measurement at (C) should be 25.4 mm (1 in.). This equates to 12.7 mm (0.5 in.) of roll gap.

8. Once adjustment is complete, hold nut (B) and torque jam nut (A) to 102 N·m (75 ft·lbf).

**NOTE:**
When adjusting roll gap, be sure that the thread protruding at the adjustment is the same on both ends of the conditioner rolls. This will achieve consistent intermesh across the rolls.

9. Check the roll gap. Refer to [4.2.1 Checking Roll Gap, page 77](#).

**IMPORTANT:**
Roll timing is critical when the roll gap is decreased because the bars may contact each other if the timing is wrong.

10. Check the timing. Refer to [4.4 Roll Timing, page 81](#).

11. Close the driveshield. Refer to [3.4 Driveshields, page 28](#).
4.3 Roll Tension

Roll tension (the force holding the rolls together) is factory set with a spring type adjustable linkage.

The roll tension factory setting is the spring fully tensioned.

Heavy crops or tough forage tend to separate the rolls and require more tension to ensure material is sufficiently crimped. Light alfalfa and short grasses require less tension to minimize over-conditioning.

4.3.1 Adjusting Roll Tension

⚠️ DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

1. Lower the header fully.
2. Stop the engine and remove the key.
3. Open the driveshield. Refer to 3.4 Driveshields, page 28.
4. To decrease the roll tension, turn the spring drawbolts counterclockwise to loosen the springs.
5. To increase the roll tension, loosen jam nut (A) and turn the spring drawbolt (B) clockwise to tighten the spring at each end of the roll. Spring is fully tensioned at the factory.

IMPORTANT:
Turn each bolt equal amounts. Each turn of the bolt changes the roll tension by approximately 44.5 N (10 lbf).

6. Tighten jam nut (A) against casting after adjusting tension.
7. Close the driveshield. Refer to 3.4 Driveshields, page 28.

Figure 4.6: Spring Tension (LH Side)
4.4 Roll Timing

For proper conditioning, the rolls must be properly timed. Each steel bar on one of the rolls should be centered between two bars of the other roll. The factory setting should be suitable for most crop conditions.

**IMPORTANT:**
Roll timing is especially critical when roll gap is decreased because the bars can contact each other if the timing is wrong.

4.4.1 Checking Roll Timing

⚠ **DANGER**

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

1. Lower the header fully.
2. Stop the engine and remove the key.
3. Open the driveshield. Refer to 3.4 Driveshields, page 28.
4. Loosen nuts (B) and slide conditioner shield (A) up to remove.

5. Measure the roll timing distance (B) at each end of the rolls. Each steel bar on one roll should be centered between two bars of the other roll so that the distance (B) is approximately equal on both sides of the bar.

6. If adjustment is required, refer to 4.4.2 Adjusting Roll Timing, page 82.

**NOTE:**
Roll spacing not to scale in illustration.

7. Close the driveshield. Refer to 3.4 Driveshields, page 28.
4.4.2 Adjusting Roll Timing

Follow these steps to adjust the roll timing (if necessary):

1. Lower the header fully.
2. Stop the engine and remove the key.
3. Open the driveshield. Refer to 3.4 Driveshields, page 28.
4. Loosen four bolts (A) in slots of yoke plate (B) on upper roll universal shaft.
5. Manually rotate upper roll until it stops. Make a mark on yoke flange to align with the center of one of the bolt heads (A).
6. Manually rotate upper roll in opposite direction until it stops. Make a second mark on yoke flange to align with the bolt.
7. Determine the center between the two marks, and mark a third line on the yoke flange.
8. Rotate the upper roll until the bolt lines up with the third line.
9. Tighten bolts (A) to secure the position. Torque to 95 N·m (70 ft lbf).

**NOTE:**
For additional conditioning action in lighter or thin stem crops, the distance between the conditioner roll bars can be adjusted (advanced timing).

4.5 Forming Shields

WARNING

Keep hands and feet away from discharge opening. Keep everyone several hundred feet away from your operation. Never direct the discharge toward anyone. Stones or other foreign objects can be ejected with force.

The position of the forming shields controls the width and placement of the windrow. The decision on forming shield position should be based on the following factors:

- Weather conditions (rain, sun, humidity, wind)
- Type and yield of crop
- Drying time available
- Method of processing (green-feed, bales, silage)

A wider windrow will generally dry faster and more evenly resulting in less protein loss. Fast drying is especially important in areas where the weather allows only a few days to cut and bale. For more information, refer to 4.13 Haying, page 96.

A narrower windrow may be preferred for ease of pickup and when drying is not critical (for example, when cutting for silage or green-feed).

4.5.1 Adjusting the Side Deflectors

The position of the side deflectors controls the width and placement of the windrow.

DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

1. Set forming shield side deflectors (A) to desired width by repositioning adjuster bars (B) in holes in forming shield cover. To ensure windrow placement is centered, adjust both side deflectors to the same position.

Figure 4.10: Forming Shield
2. If side deflector attachment is too tight or too loose, tighten or loosen nut (A) as required.

Figure 4.11: Forming Shield
4.5.2 Adjusting the Rear Deflector (Fluffer Shield)

DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

The rear deflector (fluffer shield) slows the crop exiting the conditioner rolls, directs the flow downward, and fluffs the material.

1. For more crop control in light material, lower the deflector (A) by pushing down on one side of the deflector and then on the other side.

   NOTE:
   Locking handles (B) are located at both ends of the deflector and may be loosened slightly.

2. For heavier crops, raise the deflector by pulling up on one side and then on the other side.

   NOTE:
   For even windrow formation, be sure the deflector (A) is not twisted.

3. Tighten handles (B) to secure deflector position.

4.5.3 Adjusting the Swath Baffle

The swath baffle determines the width and height of the windrow.

DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.
The swath baffle (A) is located immediately behind and above the conditioning rolls and can be positioned to:

- Direct the crop flow into the forming shield for narrow and moderate width windrows
- Direct crop downward to form a wide swath

1. Remove lynch pin from pin (B) and remove pin from lever (C).
2. Move lever to middle hole in bracket and reinstall pin (B) through lever and bracket.
3. Secure with lynch pin.

**NOTE:**
Swath baffle position may need to be adjusted for proper pin engagement. Loosen bolts (A) and adjust bracket (B) and baffle as required. Tighten bolts (A).
4.6 Header Angle

Header (or cutterbar) angle can be varied from 0–8° below horizontal. Choose an angle that maximizes performance for your crop and field conditions. A flatter angle provides better clearance in stony conditions while a steeper angle provides better lifting action in down crops.

The header angle may be hydraulically adjusted from the windrower cab using the hydraulic cylinder (A)—if equipped—without shutting down the windrower.

Refer to your windrower operator’s manual.

Figure 4.15: Hydraulic Center-Link
4.7 Cutting Height

Cutting height is determined by a combination of the angle of the cutterbar/header and the optional skid shoe settings if installed. Cutting height should be adjusted for optimum cutting performance without excessive mud build-up inside the header that can lead to poor crop flow and increased wear on cutting components. Choose an angle that maximizes performance for your crop and field conditions. Refer to 4.6 Header Angle, page 87.

Optional adjustable skid shoes are also available to provide different cutting heights. Refer to:

- 6.1 Options and Attachments: Kits, page 153
- 4.7.1 Adjusting the Skid Shoe Height, page 88

Lowering the skid shoes or decreasing header angle increases the cutting height. This may reduce damage to cutting components in stony conditions. Also, a longer stubble length helps material dry faster.

Raising the skid shoes and increasing header angle allows the crop to be cut lower.

To minimize damage to cutterbar components, scooping soil, or soil build-up at the cutterbar in damp conditions, set header float as light as possible without excessive bouncing.

A light float setting may require reduced ground speeds to avoid excess bouncing and a ragged cut.

4.7.1 Adjusting the Skid Shoe Height

⚠️ DANGER
To avoid bodily injury or death from unexpected start-up or fall of raised machine: stop engine, remove key, and engage header safety props before going under machine for any reason.

1. Raise header fully.
2. Stop the engine and remove the key.
4. Remove bolts (A).
5. Raise or lower skid shoe (B).
6. Reinstall bolts (A).
7. Repeat for skid shoe at opposite end of header.
8. Check header float as described in 4.1 Header Float, page 75.
9. Adjust header angle to desired working position using the machine’s header angle controls. If angle is not critical, set it to mid-position. Refer to 4.6 Header Angle, page 87.

Figure 4.16: Skid Shoe
4.8 Disc Speed

The disc header can be used to cut a variety of crops. For the best cutting results, a range of disc speeds is recommended for each type of crop and condition. Refer to table below.

Table 4.2 Disc Speed Recommendations

<table>
<thead>
<tr>
<th>Crop</th>
<th>Condition</th>
<th>Disc rpm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa</td>
<td>Heavy</td>
<td>2300–2500</td>
</tr>
<tr>
<td></td>
<td>Light</td>
<td>1600–2000</td>
</tr>
<tr>
<td>Sudan, Sorghum, Haygrazer,</td>
<td>Tall and stemmy</td>
<td>2300–2500</td>
</tr>
<tr>
<td>Timothy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short grass</td>
<td>Dense</td>
<td>2500</td>
</tr>
<tr>
<td></td>
<td>Thin</td>
<td>1800–2000</td>
</tr>
</tbody>
</table>
4.9 Ground Speed

⚠️ CAUTION

Reduce speed when turning, crossing slopes, or when travelling over rough ground.

Choose a ground speed that allows the cutterbar and conditioner to cut the crop smoothly and evenly. Try different combinations of header speed and ground speed to suit your specific crop.

Refer to your windrower operator’s manual for changing ground speed.

In tough cutting conditions, such as native grasses, the disc speed will need to be increased.

In light crops, the header speed can be reduced while maintaining ground speed.

NOTE:
Operating the header at the minimum disc speed will extend the wear life of cutting components.

The chart below indicates the relationship between ground speed and area cut for a 13-foot header.

Example: at a ground speed of 21 km/h (13 mph) a 13-foot header would cut approximately 20 acres (8 hectares) per hour.
4.10 Double Windrowing

If your windrower is equipped with the Double Windrow Attachment (DWA [A]), refer to the MacDon DWA Manual for operating and maintenance instructions. The manual is shipped with the DWA Kit.

4.10.1 Returning Tall Crop Feed Plates to Storage

⚠️ DANGER
To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

1. Lower the header fully.
2. Stop the engine and remove the key.
3. Open the right-hand end driveshield. Refer to Removing Right Endshield.
4. Remove the four nuts (A) and secure the nut shields (B) and feed plates (C) to side of compartment. Reinstall nuts (A).

**NOTE:** Nut shields will not be in storage location if they are installed on the cutterbar.
5. Install right-hand shield. Refer to Installing Right Endshield.

---

Figure 4.18: DWA

Figure 4.19: Nut Deflector and Feed Plate Storage
4.11 Tall Crop Divider Option

Tall crop dividers (one on each end of the header) assist in clean crop dividing and cutterbar entry in tall crops. Tall crop dividers are not adjustable, but they are removable.

4.11.1 Installing Tall Crop Divider

To install the tall crop divider kit (MD #B5509), follow these steps:

⚠️ DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

1. Lower header fully.
2. Stop the engine, and remove the key.
3. Unpack kit.
4. Open cutterbar doors. Refer to 3.5 Cutterbar Doors, page 30.
5. Remove the four bolts (A) from the divider (B).

**NOTE:**
Mounting holes in header should be vacant. Remove fasteners, if necessary.
6. Position left-hand divider (B) on header left front corner, and install with four bolts (A) and nuts in existing holes. Tighten hardware.

7. Repeat for right-hand side.

8. Lower cutterbar doors.

4.11.2 Removing Tall Crop Divider

⚠️ DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

1. Lower the header fully.

2. Stop the engine and remove the key.

3. Open the cutterbar doors. Refer to 3.5 Cutterbar Doors, page 30.

4. Remove the four bolts (A) and remove deflector (B).

5. Reinstall the four bolts (A).

6. Close the cutterbar doors. Refer to 3.5 Cutterbar Doors, page 30.
4.12 Header Pan

The header pan is located behind the cutterbar and helps prevent material loss and wrapping in certain crops, such as grass seed, oats, and tall stalky crops.

In conditions where more soil and stones are being picked up by the cutterbar, it may be desirable to remove the pan to allow the debris to fall out before being fed into the conditioner.

4.12.1 Removing Header Pan

⚠️ DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

1. Raise the header fully.
2. Stop the engine and remove the key.
4. Open the cutterbar doors. Refer to 3.5 Cutterbar Doors, page 30.
5. Remove six bolts (A) securing pan (B) to header and remove pan.

![Figure 4.24: Underside of Header](image)
4.12.2 Installing Header Pan

To install the header pan, follow these steps:

1. Locate pan (B) under header frame and hold in place.
2. Install six 1/2 x 1 in. carriage bolts (A) and flanged lock nuts. Tighten hardware.
3. Close the cutterbar doors. Refer to 3.5 Cutterbar Doors, page 30.

Figure 4.25: Underside of Header
4.13 Haying

4.13.1 Curing

Curing crops quickly helps maintain the highest quality because for each day that hay lies on the ground, 5% of the protein is lost.

Leaving the windrow as wide and fluffy as possible results in the quickest curing. Cured hay should be baled as soon as possible.

4.13.2 Topsoil Moisture

Table 4.3 Topsoil Moisture Levels

<table>
<thead>
<tr>
<th>Level</th>
<th>% Moisture</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet</td>
<td>Over 45%</td>
<td>Soil is muddy</td>
</tr>
<tr>
<td>Damp</td>
<td>25–45%</td>
<td>Shows footprints</td>
</tr>
<tr>
<td>Dry</td>
<td>Under 25%</td>
<td>Surface is dusty</td>
</tr>
</tbody>
</table>

- On wet soil, the general rule of wide and thin does not apply. A narrower windrow will dry faster than hay left flat on wet ground.
- When the ground is wetter than the hay, moisture from the soil is absorbed by the hay above it. Determine topsoil moisture level before cutting. Use a moisture tester or estimate level.
- If ground is wet due to irrigation, wait until soil moisture drops below 45%.
- If ground is wet due to frequent rains, cut when weather allows and let the forage lie on wet ground until it dries to the moisture level of the ground.
- Cut hay will dry only to the moisture level of the ground beneath it, so consider moving the windrow to drier ground.

4.13.3 Weather and Topography

- Cut as much hay as possible by midday when drying conditions are best.
- Fields sloping south get up to 100% more exposure to the sun’s heat than do north sloping fields. If hay is baled and chopped, consider baling the south facing fields and chopping those facing north.
- When relative humidity is high, the evaporation rate is low and hay dries slowly.
- If there is no wind, saturated air becomes trapped around the windrow. Raking or tedding will expose the hay to fresh, less saturated air.
- Cut hay perpendicular to the direction of the prevailing winds if possible.

4.13.4 Windrow Characteristics

Producing windrows with the recommended characteristics will achieve the greatest results. Refer to 4 Operating the Header, page 75 for instructions on adjusting the header.
Table 4.4 Recommended Windrow Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>High and fluffy</td>
<td>Enables airflow through windrow which is more important to the curing</td>
</tr>
<tr>
<td></td>
<td>process than direct sunlight</td>
</tr>
<tr>
<td>Consistent formation (not bunching)</td>
<td>Permits an even flow of material into the baler, chopper, etc.</td>
</tr>
<tr>
<td>Even distribution of material</td>
<td>Results in even and consistent bales to minimize handling and</td>
</tr>
<tr>
<td>across windrow</td>
<td>stacking problems</td>
</tr>
<tr>
<td>Properly conditioned</td>
<td>Prevents excessive leaf damage</td>
</tr>
</tbody>
</table>

4.13.5 Driving on Windrow

Driving on previously cut windrows that will not be raked can lengthen drying time by a full day. If practical, set forming shields to produce a narrower windrow that the machine can straddle.

**NOTE:**
Driving on the windrow in high-yield crops may be unavoidable if a full width windrow is necessary.

4.13.6 Raking and Tedding

Raking or tedding speeds up drying; however, the resulting leaf loss may outweigh the benefits. There is little or no advantage to raking or tedding if the ground beneath the windrow is dry.

Large windrows on damp or wet ground should be turned over when moisture levels reach 40–50%. Hay should not be raked or tedded at moisture levels below 25%, however, or excessive yield loss will result.

4.13.7 Using Chemical Drying Agents

Hay drying agents work by removing wax from legume surfaces and enabling water to escape and evaporate faster. However, treated hay lying on wet ground will absorb ground moisture faster.

Before deciding to use a drying agent, carefully compare the relative costs and benefits for your area.
4.14 Levelling the Header

Windrower linkages are factory-set to provide the proper level for the header and should not normally require adjustment. The float springs are NOT used to level the header.

If the header is not level, check the tire pressures on the windrower ensuring they are properly inflated. Refer to your windrower operator’s manual.

If the header is still not level, then adjustment to the windrower linkages is required. Refer to the appropriate section in the windrower operator’s manual.
4.15 Unplugging the Header

Follow these steps to remove plugged material from the header:

⚠️ DANGER

To avoid bodily injury or death from unexpected startup of machine, always stop the engine and remove the key before removing plugged material from header.

1. Stop forward movement of the windrower and disengage the header.
2. Raise the header fully.
3. Stop the engine and remove the key.

⚠️ WARNING

Wear heavy gloves when working around cutterbar.

5. Open the cutterbar doors. Refer to 3.5 Cutterbar Doors, page 30.
6. Clean off the cutterbar or rolls by hand.

**NOTE:**
Header reversing feature is standard to M205 windrowers.

Figure 4.26: Cutterbar Doors
5 Maintenance and Servicing

Use the following instructions as your first source of information for servicing the header. A parts catalog is located in a plastic case at the right end of the header. If more detailed maintenance and service information is required, contact your Dealer.

Log the hours of operation and use the Maintenance Schedule/Record provided to keep a record of scheduled maintenance. Refer to 5.3.1 Maintenance Schedule/Record, page 103.

5.1 Preparation for Servicing

⚠️ CAUTION

To avoid personal injury, before servicing the header or opening drive covers, perform the following:

1. Lower the header fully.
2. Stop the engine and remove the key.
3. Engage park brake.
4. Wait for all moving parts to stop.
5.2 Recommended Fluids and Lubricants

Your machine can operate at top efficiency only if clean lubricants are used.

- Use clean containers to handle all lubricants.
- Store in an area protected from dust, moisture, and other contaminants.

Table 5.1 Fluids and Capacities

<table>
<thead>
<tr>
<th>Lubricant</th>
<th>Location</th>
<th>Description</th>
<th>Capacities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grease</td>
<td>As required unless otherwise specified</td>
<td>SAE Multi-Purpose, High temperature extreme pressure (EP) performance with 0–1% max. Molybdenum Disulphide (NLGI Grade 2) Lithium complex base</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Driveline slip-joints</td>
<td>High temperature extreme pressure (EP) performance with 10% max. Molybdenum Disulphide (NLGI Grade 2) Lithium base</td>
<td>—</td>
</tr>
<tr>
<td>Gear Lubricant</td>
<td>Cutterbar</td>
<td>80W-90 gear lubricant with high thermal and oxidation stability conforming to API gear lubricant service GL-5 minimum (SAE J2360 preferred) specifications such as Traxon 80W-90 gear oil</td>
<td>3.25 l (3.43 US quarts)</td>
</tr>
<tr>
<td></td>
<td>Conditioner gearbox</td>
<td>75W-90 synthetic gear lubricant with high thermal and oxidation stability conforming to API GL-5 minimum (SAE J2360 preferred) specifications such as Traxon E Synthetic 75W-90 gear oil</td>
<td>750 ml (0.79 US quarts)</td>
</tr>
<tr>
<td></td>
<td>Bevel gearbox</td>
<td></td>
<td>400 ml (13.6 oz.)</td>
</tr>
</tbody>
</table>
5.3 Maintenance Requirements

In this manual, periodic maintenance requirements are organized by service intervals. For detailed instructions, refer to the specific headings in this section.

Regular maintenance is the best insurance against early wear and breakdowns. Use the following schedule and recommendations to increase machine life.

- Use fluids and lubricants specified in 5.2 Recommended Fluids and Lubricants, page 102.
- Make copies of the 5.3.1 Maintenance Schedule/Record, page 103 and log the hours of operation.

Where a service interval is given with more than one timeframe, e.g., 100 hours or Annually, service the machine at whichever interval is reached first.

IMPORTANT:
Recommended intervals are for average conditions. Service the machine more often if operated under adverse conditions (severe dust, extra heavy loads, etc.).

⚠ CAUTION
Carefully follow safety messages given in 1 Safety, page 1.

5.3.1 Maintenance Schedule/Record

<table>
<thead>
<tr>
<th>Action</th>
<th>✓ Check</th>
<th>♦ Lubricate</th>
<th>▲ Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hour meter reading</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service date</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serviced by</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Preseason or Annual. Refer to 5.3.2 Preseason/Annual Service, page 105.

End of season. Refer to 5.3.3 End-of-Season Service, page 106.

First 5 hours

✓ Check for loose hardware.
  Refer to 8.1 Torque Specifications, page 161.

✓ Check drive belt tension.
  Refer to Inspecting the Conditioner Drive Belt, page 142.

First 10 hours then daily

✓ Check hydraulic hoses and lines.
  Refer to 5.6.2 Hydraulic Hoses and Lines, page 151.

✓ Check cutterblades, deflectors, and discs.
  Refer to 5.4.2 Inspecting the Cutterbar Discs, page 121.
<table>
<thead>
<tr>
<th>Action</th>
<th>✓ Check</th>
<th>♦ Lubricate</th>
<th>▲ Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First 25 hours</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>✓ Check drive belt tension.  Refer to <em>Inspecting the Conditioner Drive Belt, page 142</em>.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Every 25 hours</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>♦ Lube roll universal joints.  Refer to <em>5.3.4 Lubrication and Servicing, page 106</em>.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>♦ Lube cutterbar driveline bearings.  Refer to <em>5.3.4 Lubrication and Servicing, page 106</em>.</td>
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<tr>
<td><strong>First 50 hours</strong></td>
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<tr>
<td>✓ Check drive belt tension.  Refer to <em>Inspecting the Conditioner Drive Belt, page 142</em>.</td>
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<tr>
<td>▲ Change cutterbar lubricant.  Refer to <em>5.3.7 Lubricating the Cutterbar, page 115</em>.</td>
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<tr>
<td>▲ Change bevel gearbox lubricant.  Refer to <em>5.5.1 Bevel Gearbox, page 141</em>.</td>
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<tr>
<td>▲ Change conditioner gearbox lubricant.  Refer to <em>5.5.1 Bevel Gearbox, page 141</em>.</td>
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<tr>
<td><strong>Every 50 hours</strong></td>
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<tr>
<td>♦ Lube drive belt tensioner.  Refer to <em>5.3.4 Lubrication and Servicing, page 106</em>.</td>
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<tr>
<td>♦ Lube roll shaft bearings.  Refer to <em>5.3.4 Lubrication and Servicing, page 106</em>.</td>
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<tr>
<td>♦ Lube gauge roller bearings.¹</td>
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<tr>
<td><strong>Every 100 hours or annually</strong></td>
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<tr>
<td>✓ Check conditioner drive belt.  Refer to <em>Inspecting the Conditioner Drive Belt, page 142</em>.</td>
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<tr>
<td>✓ Check conditioner gearbox lubricant.  Refer to <em>5.5.3 Conditioner Gearbox, page 146</em>.</td>
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</tbody>
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¹ Use only the specified amount. DO NOT overfill
² Optional
## MAINTENANCE AND SERVICING

<table>
<thead>
<tr>
<th>Action</th>
<th>✓ Check</th>
<th>♦ Lubricate</th>
<th>▲ Change</th>
</tr>
</thead>
</table>
| ✓ Check bevel gearbox lubricant.  
Refer to 5.5.1 Bevel Gearbox, page 141. | | | |

### First 150 hours

| ▲ Change cutterbar lubricant.  
Refer to 5.3.7 Lubricating the Cutterbar, page 115. | | | |
| ▲ Change bevel gearbox lubricant.  
Refer to 5.5.1 Bevel Gearbox, page 141. | | | |
| ▲ Change conditioner gearbox lubricant.  
Refer to 5.5.3 Conditioner Gearbox, page 146. | | | |

### Every 250 hours

| ▲ Change cutterbar lubricant.  
Refer to 5.3.7 Lubricating the Cutterbar, page 115. | | | |
| ▲ Change bevel gearbox lubricant.  
Refer to 5.5.1 Bevel Gearbox, page 141. | | | |
| ▲ Change conditioner gearbox lubricant.  
Refer to 5.5.3 Conditioner Gearbox, page 146. | | | |

### 5.3.2 Preseason/Annual Service

**CAUTION**

- Review the operator’s manual to refresh your memory on safety and operating recommendations.
- Review all safety signs and other decals on the header and note hazard areas.
- Be sure all shields and guards are properly installed and secured. Never alter or remove safety equipment.
- Be sure you understand and have practiced safe use of all controls. Know the capacity and the operating characteristics of the machine.
- Check the first aid kit and fire extinguisher. Know where they are and how to use them.

Perform the following at the beginning of each operating season:

- Lubricate machine completely. Refer to 5.3.4 Lubrication and Servicing, page 106.
- Perform all annual maintenance. Refer to 5.3.1 Maintenance Schedule/Record, page 103.

---

3. Begins after the first 150 hour service
5.3.3 End-of-Season Service

**CAUTION**

Never use gasoline, naphtha, or any volatile material for cleaning purposes. These materials may be toxic and/or flammable.

Do the following at the end of each operating season:

- Clean the header thoroughly.
- Store in a dry, protected place if possible. If stored outside, always cover the header with a waterproof canvas or other protective material.
- Raise the header and engage header safety props.
- If possible, block up the header to take weight off tires.
- Repaint all worn or chipped painted surfaces to prevent rust.
- Loosen drive belt.
- Lubricate the header thoroughly, leaving excess grease on fittings to keep moisture out of bearings.
- Apply grease to exposed threads, cylinder rods, and sliding surfaces of components.
- Oil cutterbar components to prevent rust.
- Check for worn components and repair as necessary.
- Check for broken components and order replacements from your Dealer. Attention to these items right away will save time and effort at beginning of next season.
- Replace or tighten any missing or loose hardware. Refer to 8.1 Torque Specifications, page 161.
- Remove divider rods (if equipped) to reduce space required for inside storage.

5.3.4 Lubrication and Servicing

**WARNING**

To avoid personal injury, before servicing the header or opening drive covers, follow procedures in 5.1 Preparation for Servicing, page 101.

Log hours of operation and use the Maintenance Checklist provided to keep a record of scheduled maintenance. Refer to 5.3.1 Maintenance Schedule/Record, page 103.
MAINTENANCE AND SERVICING

To access the drive systems, open the driveshield and cutterbar doors. Refer to:

- 3.4 Driveshields, page 28
- 3.5 Cutterbar Doors, page 30

5.3.5 Greasing Procedure

⚠️ DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

The greasing points are marked on the machine by decals showing a grease gun and grease interval in hours of operation.

Use the recommended lubricants specified in this manual. Refer to 5.2 Recommended Fluids and Lubricants, page 102.

1. Wipe grease fitting with a clean cloth to avoid injecting dirt and grit.

2. Inject grease through fitting with grease gun until grease overflows fitting, except where noted.

3. Leave excess grease on fitting to keep out dirt.

4. Replace any loose or broken fittings immediately.

5. If fitting will not take grease, remove and clean thoroughly. Also, clean lubricant passageway. Replace fitting, if necessary.
5.3.6 Lubrication and Servicing Intervals

To identify the various locations that require lubrication and servicing, refer to the following illustrations (organized by the frequency of service that is required).
Every 25 Hours

Figure 5.3: Universal Joints and Cutterbar Driveline Bearings

A - Cutterbar Driveline Universals (2 Places)  
B - Driveshaft
C - Conditioner Driveline Universals (4 Places)  
D - Driveline Shaft

NOTE:
Use high temperature extreme pressure (EP2) performance with 1% max molybdenum disulphide (NLGI grade 2) lithium base except where noted.

4. 10% moly grease is recommended for driveline shaft slip joint only
First 50 Hours

Figure 5.4: Bevel Gearbox, Cutterbar, and Conditioner Gearbox
A - Change Bevel Gearbox Oil  
B - Change Cutterbar Lube  
C - Change Conditioner Gearbox Lubricant
Every 50 Hours

Figure 5.5: Drive Belt Tensioner and Roll Shaft Bearings
A - Roll Shaft Bearing (2 Places)  B - Belt Tensioner Pivot (1 Place)  C - Roll Shaft Bearing (2 Places)

NOTE:
Use high temperature extreme pressure (EP2) performance with 1% max molybdenum disulphide (NLGI grade 2) lithium base except where noted.
Every 100 Hours or Annually

Figure 5.6: Conditioner Drive Belt and Gearbox
A - Conditioner Drive Belt Tension
B - Gearbox Lubricant Level (Check with Top of Header Horizontal)
First 150 Hours

Figure 5.7: Bevel Gearbox, Cutterbar, and Conditioner Gearbox

A - Change Bevel Gearbox Oil  
B - Change Cutterbar Lube  
C - Change Conditioner Gearbox Lubricant
Every 250 Hours

Figure 5.8: Bevel Gearbox, Cutterbar, and Conditioner Gearbox
A - Change Bevel Gearbox Oil  B - Change Cutterbar Lube  C - Change Conditioner Gearbox Lubricant
5.3.7 Lubricating the Cutterbar

The lubricant level in the cutterbar CANNOT be checked. If the cutterbar lubricant quantity is in doubt, do NOT add lubricant. Drain the cutterbar and refill with new clean lubricant.

Draining the Cutterbar Lubricant

IMPORTANT:
Drain the cutterbar when the lubricant is warm. If the lubricant is cold, idle the machine for about 10 minutes prior to draining.

⚠️ DANGER
To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

⚠️ CAUTION
Be careful when working around the blades. Blades are sharp and can cause serious injury. Wear gloves when handling blades.

⚠️ DANGER
To avoid bodily injury or death from unexpected start-up or fall of raised machine: stop engine, remove key, and engage header safety props before going under machine for any reason.

1. Place a block under each end of the header (A).

   NOTE:
The block under the left end of the header should be higher than the right end.


3. Start the windrower and lower header onto blocks.

4. Stop the engine and remove the key.

5. Open cutterbar doors (B). Refer to 3.5 Cutterbar Doors, page 30.

Figure 5.9: Header Raised Left Side
6. Locate one of the two filler plugs along the top of the cutterbar. Refer to 5.10: Cutterbar Filler Plug Locations, page 116.

![Figure 5.10: Cutterbar Filler Plug Locations](image1)

7. Clean around either filler plug (A) and remove one plug with an 8 mm hex key.

   **NOTE:**
   Rotate disc to expose filler plug if necessary.

8. Place a suitably sized container under the cutterbar drain hole (A).

9. Remove plug (A) with an 8 mm hex key and allow sufficient time for lubricant to drain.

   **IMPORTANT:**
   Do NOT flush the cutterbar.

10. Replace drain plug (A) and tighten.

11. Safely dispose of lubricant.


![Figure 5.11: Cutterbar Lubricant Drain](image2)
Filling the Cutterbar Lubricant

DANGER

To avoid bodily injury or death from unexpected start-up or fall of raised machine: stop engine, remove key, and engage header safety props before going under machine for any reason.

1. Park the machine on level ground.
2. Raise the header fully.
3. Stop the engine and remove the key.
5. Move higher block to right end of header.

NOTE:
Having the fill end higher allows for quicker filling of cutterbar.


CAUTION

Never start or move the machine until you are sure all bystanders have cleared the area.

7. Start windrower and lower header onto blocks (A).
8. Stop the engine and remove the key.
9. Verify that drain plug (A) has been installed before adding new lubricant.
10. Locate one of the two filler plugs along the top of the cutterbar. Refer to Figure 5.14: Cutterbar Filler Plug Locations, page 118.

11. Clean around either filler plug (A) and remove one plug with an 8 mm hex key.

   **NOTE:**
   Rotate disc to expose filler plug if necessary.

12. Add lubricant to cutterbar through filler hole (A). Refer to 5.2 Recommended Fluids and Lubricants, page 102.

   **IMPORTANT:**
   DO NOT overfill the cutterbar. Overfilling can cause overheating and damage to or failure of the cutterbar.

13. Install the filler plug that was removed.
14. Close the cutterbar door(s). Refer to 3.5 Cutterbar Doors, page 30.
15. Start engine and raise header off blocks.
17. Remove blocks and lower the header fully.
18. Stop the engine and remove the key.
20. Start engine and lower the header fully.
5.3.8 Rock Guards

Inspecting the Rock Guards

Check rock guards periodically for severe damage or wear as follows:

⚠️ DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

⚠️ DANGER

To avoid bodily injury or death from unexpected start-up or fall of raised machine: stop the engine, remove the key, and engage header safety props before going under machine for any reason.

⚠️ CAUTION

Exercise caution when working around the blades. Blades are sharp and can cause serious injury. Wear gloves when handling blades.

1. Raise the header fully.
2. Stop the engine and remove the key.
3. Engage header safety props.
5. Inspect rock guards (A) for severe damage, wear, and distortion. The guards should be replaced if severely damaged or worn.
6. Check for loose or missing fasteners and tighten or replace fastener if missing.
7. Contact your MacDon Dealer for replacement procedures.

Figure 5.15: Rock Guards
5.4 Cutterbar Disc Maintenance

Perform daily inspections to ensure that cutterbar discs have not suffered damage from rocks, or experienced excessive wear from abrasive working conditions.

Cutterbar discs are interchangeable and can be moved to a spindle that rotates in the opposite direction as long as it is in usable condition and the blades are oriented to cut in the correct direction.

The cutterbar discs are NOT repairable and must be replaced if severely damaged or worn.

IMPORTANT:
If holes appear in a cutterbar disc, replace the disc immediately. Do NOT attempt to repair the cutterbar discs. Always use factory replacement parts.

5.4.1 Direction of Spindle Rotation

When installing cutterblades or disc accelerators, the direction of rotation determines proper crop positioning. Refer to Figure 5.16: Spindle Rotation, page 120 to determine the direction of spindle rotation.

![Figure 5.16: Spindle Rotation](image)

5. Driveline deflector installed here.
6. Driven deflector installed here.
5.4.2 Inspecting the Cutterbar Discs

Perform the following cutterbar disc inspection daily:

⚠️ **DANGER**

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator's seat for any reason.

1. Lower the header fully.
2. Stop the engine and remove the key.
3. Open the cutterbar doors. Refer to 3.5 Cutterbar Doors, page 30.
4. Check discs (A) for damage or loose fasteners.
5. Replace damaged discs. Refer to:
   - 5.4.3 Removing a Cutterbar Disc, page 121
   - 5.4.4 Installing a Cutterbar Disc, page 122
6. Replace damaged fasteners. Tighten loose fasteners.
7. Close the cutterbar doors. Refer to 3.5 Cutterbar Doors, page 30.

5.4.3 Removing a Cutterbar Disc

⚠️ **CAUTION**

Exercise caution when working around the blades. Blades are sharp and can cause serious injury. Wear gloves when handling blades.

1. Open cutterbar door(s). Refer to 3.5 Cutterbar Doors, page 30.
2. Identify which disc needs to be replaced.
3. Place a block of wood between two discs to prevent disc rotation while loosening bolts.
4. If the disc has a deflector installed on it, remove the rotary deflector. Refer to:
   - Removing the Driveline Deflector, page 134
   - Removing the Driven Deflector, page 133
5. Remove four bolts (A) on disc cover (B) and remove cover and disc (C).

**NOTE:**
If removing multiple discs, mark the position of each disc to assist in reinstallation. The blades on each disc are direction-specific. Refer to 5.4.1 Direction of Spindle Rotation, page 120.

### 5.4.4 Installing a Cutterbar Disc

**CAUTION**
Exercise caution when working around the blades. Blades are sharp and can cause serious injury. Wear gloves when handling blades.

1. Install the new disc on spindle positioned at a 90° angle to the adjacent discs.

2. Install cover (B) and secure with four bolts (A). Tighten bolts.

3. Reinstall previously removed rotary deflector (if applicable). Refer to:
   - *Installing the Driveline Deflector, page 135*
   - *Installing the Driven Deflector, page 134*

4. Close the cutterbar door(s). Refer to 3.5 Cutterbar Doors, page 30.
5.4.5 Cutterblades

Each disc has two cutterblades (A) attached at each end with a specially designed shoulder bolt that allows the blades to swivel horizontally.

Since each blade has two cutting edges, they can be flipped over to extend the life of the blades.

The blades are NOT repairable and must be replaced if damaged or worn.

**IMPORTANT:**
Always use MacDon factory replacement parts.

---

**Inspecting Cutterblades**

⚠️ **DANGER**

To avoid bodily injury or death from unexpected startup of machine, always stop engine and remove key from ignition before leaving operator’s seat for any reason.

⚠️ **CAUTION**

Cutterblades have two cutting edges. Exercise caution when working around the blades. Blades are sharp and can cause serious injury. Wear gloves when handling blades.

⚠️ **CAUTION**

Damaged blades may damage the cutterbar and result in poor cutting performance. Replace damaged blades at earliest possible opportunity.

⚠️ **CAUTION**

Damaged or loose cutterblades or blade attachment hardware can be ejected during machine operation and may cause personal injury or machine damage.
1. Check daily that the cutterblades are securely attached to the disc.
2. Inspect blades for cracks, wear beyond safe operating limits (C), and distortion.
3. Replace blades immediately if any problems occur.

**IMPORTANT:**
Blades should be replaced in pairs, or the disc may become unbalanced and cause damage to the cutterbar.

**IMPORTANT:**
The cutterblades have cutting edges on both sides so the blades can be turned over and reused. The twist in each blade determines the cutting direction. If you are unsure which direction the spindles rotate, refer to 5.4.1 Direction of Spindle Rotation, page 120.
Inspecting Cutterblade Hardware

⚠️ CAUTION

Damaged or loose cutterblades or blade attachment hardware can be ejected during machine operation and may cause personal injury or machine damage.
Check blade attachment hardware each time blades are changed. Refer to *Replacing the Cutterblades, page 127* for hardware replacement procedure.

Check bolts and replace bolt if:

- Bolt has been removed and installed five times
- Head (A) is worn flush with bearing surface of blade
- Diameter of bolt neck is worn (B) 3 mm (1/8 in.)
- Bolt is cracked (C)
- Bolt is visibly distorted (D)
- There is evidence of interference (E) with adjacent parts

**Figure 5.25: Cutterblade Bolt**
Check nuts and replace nut if:
- Nut has been removed and installed five times
- Worn height (A) is less than half original height (B)
- Nut is cracked

Figure 5.26: Cutterblade Nut

Replacing the Cutterblades

Follow these steps to replace the cutterblades:

⚠️ DANGER
To avoid bodily injury or death from unexpected start-up or fall of raised machine: stop engine, remove key, and engage header safety props before going under machine for any reason.

⚠️ CAUTION
Cutterblades have two cutting edges. Be careful when working around the blades. Blades are sharp and can cause serious injury. Wear gloves when handling blades.

1. Raise the header fully.
2. Stop the engine and remove the key.
4. Open the cutterbar door(s). Refer to 3.5 Cutterbar Doors, page 30.
5. Rotate disc (A) so that blade (B) faces forward and lines up with hole (C) in rock guard.
6. Place a block of wood between two discs to prevent disc rotation while loosening blade bolts.
7. Clean debris from blade attachment area.

Figure 5.27: Cutterblades
8. Remove nut (A).
9. Remove shoulder bolt (B) and blade (C).
10. Install new or reversed blade (C) with shoulder bolt (B) onto disc.

**NOTE:**
Ensure shoulder bolt is fully engaged into blade before tightening nut.

**NOTE:**
Ensure blade is installed correctly to suit rotation of disc. Refer to:
- 5.23: **Counterclockwise Disc Rotation Direction**, page 124
- 5.24: **Clockwise Disc Rotation Direction**, page 124

If you are unsure which direction the spindle rotates, Refer to **5.4.1 Direction of Spindle Rotation**, page 120.

11. Install nut (A). Tighten nut to 135 N·m (100 ft·lbf).
12. Remove block of wood (if used).

**WARNING**
Ensure cutterbar is completely clear of foreign objects. These objects can be ejected with considerable force when the machine is started and may result in serious injury or machine damage.


### 5.4.6 Accelerators

Two accelerators (A) are mounted on each disc. They are designed to quickly move the cut material off the disc and into the conditioner.

Accelerators are replaceable and should be inspected periodically for damage and loose or missing fasteners.
Inspecting Accelerators

Follow these steps to inspect accelerators:

⚠️ DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

1. Raise the header fully.
2. Stop the engine and remove the key.
4. Open the cutterbar doors. Refer to 3.5 Cutterbar Doors, page 30.

⚠️ CAUTION

Cutterblades have two cutting edges. Exercise caution when working around the blades. Blades are sharp and can cause serious injury. Wear gloves when handling blades.

5. Inspect accelerators (A) and replace if severely damaged or worn.
6. Check for loose or missing fasteners and tighten or replace fastener if missing.
Replacing Accelerators

Follow these steps to replace the accelerators:

1. Raise the header fully.
2. Stop the engine and remove the key.
4. Remove disc (D). Refer to 5.4.3 Removing a Cutterbar Disc, page 121.
5. Remove bolt and nut (A) and nut (B).
6. Remove accelerator (C) from disc (D).

**IMPORTANT:**
Do NOT remove cutterblade bolt unless it or the blade is being replaced. Repeat for other accelerator.

7. Install a new accelerator on disc onto existing cutterblade bolt. Install nut (B).

**NOTE:**
Accelerators are handed for clockwise or counterclockwise operation. Verify the direction of disc before installing accelerators.

8. Install hex bolt (A) and nut at inboard hole. Bolt head faces up.
9. Tighten both nuts to 135 N·m (100 ft·lbf).
10. Repeat for other accelerator.
11. Reinstall disc (D) on spindle. Refer to 5.4.4 Installing a Cutterbar Disc, page 122.

12. Remove block of wood (if used).

**WARNING**
Ensure cutterbar is completely clear of foreign objects. These objects can be ejected with considerable force when the machine is started and may result in serious injury or machine damage.

13. Close the cutterbar doors. Refer to 3.5 Cutterbar Doors, page 30.
5.4.7 Nut Shield

If accelerators are not used, nut shields will be required to protect the cutterblade nuts.

Nut shields are mounted on each outboard disc. Nut shields are replaceable and should be inspected periodically for damage and loose or missing fasteners.

**Inspecting Nut Shield**

1. Raise the header fully.
2. Stop the engine and remove the key.
4. Open the cutterbar doors. Refer to 3.5 Cutterbar Doors, page 30.
5. Inspect nut shields (A) and replace if severely damaged or worn.
6. Check for loose or missing fasteners and tighten or replace fastener if missing. If replacement is required, refer to Replacing Nut Shield, page 132.
7. Close the cutterbar doors. Refer to 3.5 Cutterbar Doors, page 30.
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Replacing Nut Shield

1. Raise the header fully.
2. Stop the engine and remove the key.
4. Open the cutterbar doors. Refer to 3.5 Cutterbar Doors, page 30.
5. Remove disc (C). Refer to 5.4.3 Removing a Cutterbar Disc, page 121.
6. Remove nut shield by loosening nut (A) and removing nut shield (B) from disc (C).
   IMPORTANT:
   Do NOT remove cutterblade bolt unless it or the blade is being replaced. Repeat for other accelerator.
7. Locate new nut shield (B) on disc (C) and align with existing cutterblade bolt. Install nut (A).
8. Tighten nut. Torque to 135 N·m (100 ft·lbf).
9. Reinstall disc (D) on spindle. Refer to 5.4.4 Installing a Cutterbar Disc, page 122.
10. Remove block of wood (if used).

WARNING

Ensure cutterbar is completely clear of foreign objects. These objects can be ejected with considerable force when the machine is started and may result in serious injury or machine damage.

11. Close the cutterbar doors. Refer to 3.5 Cutterbar Doors, page 30.

5.4.8 Rotary Deflectors

The rotary cage deflectors are designed to deliver an even flow of cut material from the ends of the cutterbar into the conditioner roll.

Rotary deflectors should be checked daily for damage or wear.

Inspecting Rotary Deflectors

DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator's seat for any reason.

1. Lower the header fully.
2. Stop the engine and remove the key.

3. Open the cutterbar doors. Refer to 3.5 Cutterbar Doors, page 30.

4. Check that deflectors (A) are not damaged or bent, also check for loose hardware.

5. Replace deflectors (A) if they are severely damaged or worn. Do NOT repair. Refer to:
   - Removing the Driven Deflector, page 133
   - Installing the Driven Deflector, page 134
   - Removing the Driveline Deflector, page 134
   - Installing the Driveline Deflector, page 135

6. Tighten loose fasteners.

**WARNING**

Ensure cutterbar is completely clear of foreign objects. These objects can be ejected with considerable force when the machine is started and may result in serious injury or machine damage.

7. Close the cutterbar doors. Refer to 3.5 Cutterbar Doors, page 30.

---

**Removing the Driven Deflector**

Follow these steps to replace the driven rotary deflector:

**DANGER**

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

1. Lower the header fully.

2. Stop the engine and remove the key.

3. Open the cutterbar doors. Refer to 3.5 Cutterbar Doors, page 30.

4. Remove four bolts (A).

5. Remove cover (B) and deflector (C).
Installing the Driven Deflector

Follow these steps to replace the driven rotary deflector:

1. Position new deflector (C) on spindle so that it clears accelerators (D).
2. Install cover (B) and secure with four bolts (A).
3. Tighten bolts.
4. Remove block of wood (if used).

⚠️ WARNING

Ensure cutterbar is completely clear of foreign objects. These objects can be ejected with considerable force when the machine is started and may result in serious injury or machine damage.

Removing the Driveline Deflector

Follow these steps to replace the driveline deflector:

⚠️ DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

1. Lower the header fully.
2. Stop the engine and remove the key.
3. Open the cutterbar doors. Refer to 3.5 Cutterbar Doors, page 30.
4. Locate the deflector (C) with the driveline in the center of it.
5. Remove the four bolts (A) that secure the driveline (B) and disc to the spindle.
6. Rotate the deflector (C) as required so the large opening in deflector faces you.
7. Remove the driveline (B) through the larger opening in the deflector.
8. Remove spacer plate (D).
9. Loosen the four bolts (A) in the two plates (B) that hold the upper driveline shield (C) in place.

10. Move the plates (B) so that shield (C) can be lowered into deflector (D).

11. Remove the deflector (D).

**Installing the Driveline Deflector**

Follow these steps to replace the driveline deflector:

1. Position the deflector (D) and upper driveline shield onto spindle.

2. Raise the upper driveline shield (C) into position and slide plates (B) into slots in shield. Do not tighten bolts.

3. Insert spacer (D) onto disc.

4. Insert driveline (B) into deflector (C) and install onto shaft. Ensure that driveline (B) grease zerks will be accessible through large opening in deflector.

5. Align mounting holes in deflector (C), spindle, and driveline (B) and reinstall four bolts (A). Tighten bolts.

6. Adjust the upper driveline shield to achieve consistent gap around deflector shield (C).
7. Tighten bolts (A) on shield plates (B).
8. Remove block of wood (if used).
9. Manually rotate discs to check for interference of adjacent parts.
10. Close the cutterbar doors. Refer to 3.5 Cutterbar Doors, page 30.

**WARNING**

Ensure cutterbar is completely clear of foreign objects. These objects can be ejected with considerable force when the machine is started and may result in serious injury or machine damage.

### 5.4.9 Disc Spindles

To prevent damaging the cutterbar and drive systems, each disc is attached to a spindle which incorporates a key that shears if the disc contacts a large stone, a stump, or other large object. In the event of a sheared key, the disc stops rotating, but remains attached to the spindle.

**Replacing a Spindle Key**

Follow these steps to replace a spindle key:

**DANGER**

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

1. Lower the header fully.
2. Stop the engine and remove key.
3. Open cutterbar doors. Refer to 3.5 Cutterbar Doors, page 30.

**CAUTION**

Cutterblades have two cutting edges. Exercise caution when working around the blades. Blades are sharp and can cause serious injury. Wear gloves when handling blades.

4. Remove cutter disc (A) from failed spindle. Refer to 5.4.3 Removing a Cutterbar Disc, page 121.
5. Using a 34 mm socket wrench, remove nut (A) and washer (B) from spindle.

6. Install four M12 mm x 60 mm long bolts (A) into holes in disc (B).

7. Use bolts (A) as jacking screws to remove disc (B) from gear. Remove bolts from disc.

8. Pry out failed key (A) from gear (B).

9. Thoroughly clean metal debris from disassembled components and cutterbar.
10. Inspect disc (C) and gear shaft (E) for damage. If seriously damaged, replace entire spindle assembly. Contact your MacDon Dealer.

11. Install new key (D) into gear (E) keyway as shown.

12. Align keyway in disc (C) with key in gear (E) and install disc (C) onto gear until sufficient threads are exposed to install washer (B) and nut (A).

13. Tighten nut (A) until disc is in final position. Torque nut to 440 N·m (325 ft-lbf).


5.4.10 Cutterbar Doors

Inspecting Curtains

Replace the curtains if they should become worn or damaged. Contact your Dealer for replacement instructions.

Inspecting Door Latches: Export Header

The cutterbar door latches should operate smoothly and remain engaged when the doors are down. Tighten latch hardware if loose. If the rubber bushing is damaged or does not allow the latch to operate properly, the latch should be replaced.

Adjusting Latches

Follow these steps to adjust the door latches:

⚠️ DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

1. Unlatch and lift curtain.
2. Loosen bolts (A) and move latch assembly to position as shown so that latch (B) engages pin.

3. Tighten bolts (A).

4. If necessary, loosen nut (C) and rotate latch (B) to position as shown.

5. Tighten nut (C).

Replacing Latches

To replace cutterbar door latches, follow these steps:

1. Unlatch and lift curtain.

2. Remove bolts (A) and remove latch assembly from frame.

3. Locate new latch assembly on frame and reinstall bolts (A).

4. Adjust to position shown and tighten bolts (A).
ReReplacing Latch Brackets

To replace the cutterbar door latch brackets, follow these steps:

1. Open cutterbar door.
2. Remove bolts (A), washers, and nuts, and remove latch bracket (B) from door.
3. Locate new latch bracket (B) on door and reinstall bolts (A), washers, and nuts. Use three washers on aft bolt as spacers between bracket (B) and door.

Figure 5.52: Latch Bracket
5.5 Drive Systems

5.5.1 Bevel Gearbox

The bevel gearbox (A), which transfers power from the hydraulic motor to the header drives, is located inside the drive compartment at the left end of the header.

If repairs are required, it should be removed and serviced at your Dealer.

The only regular servicing required is maintaining the lubricant level and changing the lubricant according to the intervals specified in this manual. Refer to 5.3.1 Maintenance Schedule/Record, page 103.

Changing the Bevel Gearbox Lubricant

Follow these steps to change the bevel gearbox lubricant:

⚠️ DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

1. Drain the gearbox when the lubricant is warm. If the lubricant is cold, idle the machine for about 10 minutes prior to draining.

2. Raise the header fully.

3. Stop the engine and remove the key.


5. Open the driveshield. Refer to 3.4 Driveshields, page 28.
6. Place a suitable container under drain plug (A).
7. Remove plug (A).
8. Allow sufficient time for lubricant to drain.
10. Start engine, and lower the header until the gearbox is level with the ground.
11. Stop the engine and remove the key.
12. Install plug (A).
13. Remove breather and bushing from filler elbow (B) and remove plug (C).
14. Add gear lubricant to gearbox through elbow (B). Lubricant should slightly run out of port (C) when at the proper level. Refer to 5.2 Recommended Fluids and Lubricants, page 102 for quantity and specification.
15. Install plug (C), bushing and breather (B), and tighten.
16. Properly dispose of used lubricant and clean up any spilled lubricant.
17. Close the driveshield. Refer to 3.4 Driveshields, page 28.

5.5.2 Conditioner Drive Belt

Inspecting the Conditioner Drive Belt

Check the belt tension and inspect for damage or wear every 100 hours or annually (preferably before the start of the cutting season).

⚠️ DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

1. Lower the header fully.
2. Stop the engine and remove the key.
3. Open the driveshield. Refer to 3.4 Driveshields, page 28.
4. Check that adjuster nuts (A) and (B) are tight.

5. When properly tensioned, tensioner spring (A) should measure approximately 141–151 mm (5-9/16 to 5-15/16 in.) in length.

6. If necessary, adjust tension as follows:
   a. Loosen jam nut (B).
   b. Turn nut (A) clockwise to increase spring length (increase tension).
   c. Turn nut (A) counterclockwise to decrease spring length (decrease tension).

7. Tighten jam nut (B).

8. Close the driveshield. Refer to 3.4 Driveshields, page 28.
Replacing the Conditioner Drive Belt

Follow these steps to replace the conditioner drive belt:

⚠️ **DANGER**

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

**IMPORTANT:**
Change all three belts when replacing as they are a matched set.

1. Lower the header fully.
2. Stop the engine and remove the key.
3. Open the driveshield. Refer to 3.4 Driveshields, page 28.
4. Remove three bolts (A), then remove lower shield (B).

5. Release tension on conditioner drive belt (A).
6. Remove conditioner drive belt (A) from drive pulley (B). Tensioner (C) can be forced away from belt to ease removal.

---

**Figure 5.58: Driveshield**

**Figure 5.59: Conditioner Drive Belt**
7. Remove the four bolts (A) and washers attaching upper driveline to driven pulley (B) and slide driveline away from pulley.

8. Remove drive belt (C) from driven pulley.

9. Install new belts (A) onto driven pulley (B) first and then onto drive pulley (D). Ensure belts are in the pulley grooves.

10. Tension belt (A).

11. Reattach upper driveline to driven pulley (B) with bolts and washers (A). Check roll timing before fully tightening bolts. Refer to 4.4.1 Checking Roll Timing, page 81.

12. Torque bolts to 102 N·m (75 ft·lbf).
13. Install the lower shield (B). Secure with three bolts (A).


5.5.3 Conditioner Gearbox

The conditioner gearbox (A), which transfers power from the bevel gearbox to the conditioner rolls, is located inside the drive compartment at the left end of the header.

The only regular servicing required is maintaining the lubricant level and changing the lubricant according to the intervals specified in this manual. Refer to 5.3.1 Maintenance Schedule/Record, page 103.

If repairs are required, the conditioner gearbox should be removed and serviced at your MacDon Dealer.

5.5.4 Gearbox Speed Sensor

The gearbox speed sensor monitors the rotational speed of the gearbox output shaft and sends a signal to the system monitor in the operator’s station that is displayed as disc speed.

The sensor does not require regular maintenance; if it malfunctions or is damaged, it can be easily adjusted or replaced.

Adjusting the Gearbox Speed Sensor

⚠️ DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

1. Lower header to ground, turn off engine, and remove key.
2. Loosen bolts (A) and slide cover (B) off opening.

3. Check gap (E) between sensor (A) and pulley. If required, adjust gap by loosening bolts (B) and moving bracket (C) to achieve 2 mm (0.08 in.) gap (E). When correct gap is achieved, tighten bolts (B).

4. Check position of sensor. If required, adjust position by loosening bolt (D) and moving sensor to align it with rim of pulley.

**NOTE:**
Top panel removed for clarity.

*Replacing the Gearbox Speed Sensor*

1. Loosen bolts (A) and remove the cover (B).
2. Disconnect the sensor wire from the header wiring harness at connector (A).
3. Remove bolt through clip (B).
4. Pull the harness through grommet and into the drive compartment.
5. Remove nut and bolt (C) securing sensor (D) to bracket and remove the sensor.
6. Install the new sensor (D) onto the bracket with bolt and nut (C). Ensure sensor is aligned with the pulley rim.
7. Check that gap between sensor and pulley is 2 mm (0.08 in.). Adjust as required.
8. Route connector and harness through hole in the frame and through grommet in cover.
9. Connect sensor wiring to existing connector (A).
10. Reinstall cover (B) and secure with bolts (A).

Figure 5.68: Gearbox Speed Sensor

Figure 5.69: Gearbox Cover
5.6 Hydraulics

Refer to your windrower operator’s manual for hydraulic system maintenance procedures.

5.6.1 Hydraulic Motor

The hydraulic motor does not require regular maintenance or servicing. If repairs are required, it should be serviced at your Dealer.

Removing the Hydraulic Motor

Follow these steps to remove the hydraulic motor:

⚠️ DANGER

To avoid bodily injury or death from unexpected startup of the machine, always stop the engine and remove the key from the ignition before leaving the operator’s seat for any reason.

1. If the machine is connected to the windrower, lower header to ground.
2. Stop the engine and remove the key.
3. Disconnect case drain hose (A) from motor (B).
4. Disconnect pressure and return hoses at fittings (C).

**IMPORTANT:**
To protect the motor from contamination and prevent spillage of excess fluid, install caps and plugs on open fittings and hoses.

5. Remove four bolts (D).
6. Use a sling and a lifting device to remove the motor.
7. Cover gearbox opening (A) with a rag or plastic.

Figure 5.72: Hydraulic Motor Removed

Installing the Hydraulic Motor

Follow these steps to install the hydraulic motor:

1. Remove covering from gearbox opening (A).

2. Attach a sling to the motor with the opposite end to a lifting device.

   **NOTE:**
   Do not lift the motor with hydraulic lines.

   Figure 5.73: Hydraulic Motor Removed

3. Lower the motor (B) on gearbox opening.

4. Install four bolts (D). Torque to 140 N·m (103 ft·lbf).

5. Remove caps from motor ports and hoses and reconnect hoses (A and C) to motor.

   **NOTE:**
   Hydraulic connections vary depending on the windrower. Refer to the specific instructions supplied with your hydraulic drive kit.

   Figure 5.74: Hydraulic Motor (M200 Shown)
5.6.2 Hydraulic Hoses and Lines

Check hydraulic hoses and lines daily for signs of leaks.

**WARNING**

- Avoid high-pressure fluids. Escaping fluid can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic lines. Tighten all connections before applying pressure. Keep hands and body away from pin holes and nozzles which eject fluids under high pressure.

- If any fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type of injury or gangrene may result.

- Use a piece of cardboard or paper to search for leaks.

**IMPORTANT:**

Keep hydraulic coupler tips and connectors clean. Allowing dust, dirt, water, or foreign material to enter the system is the major cause of hydraulic system damage. Do NOT attempt to service hydraulic systems in the field. Precision fits require a perfectly clean connection during overhaul.
6 Options and Attachments

6.1 Options and Attachments: Kits

The following kits are available through your MacDon Dealer. The Dealer will require the "B" number for pricing and availability.

6.1.1 Cutterbar Repair Tool Kit

The cutterbar repair tool kit contains the tools required to replace the cutterbar idler gears.

MD #B4905

![Figure 6.1: MD #B4905](image)

6.1.2 Double Windrow Attachment (DWA)

Allows auger, and draper headers (without deck shift) to lay a double windrow when installed on a self-propelled windrower. The kit includes a draper deck, linkage assembly, hydraulics, and installation instructions.

MD #C1987 consists of:

- MD #B5973 Deck
- MD #B5974 Linkage assembly
- MD #B5301 Hydraulic kit
- Double Windrow Attachment (DWA) manual
6.1.3 Skid Shoes

MD #B5457
Instruction Part Number: MD #169465

6.1.4 Tall Crop Divider Kit

The tall crop dividers attach to the ends of the header for clean crop dividing and reel entry in tall crops. The kit includes left and right dividers and attachment hardware.

MD #B5509
Instruction Part Number: MD #169485
## 7 Troubleshooting
### 7.1 Header Performance

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## TROUBLESHOOTING

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<td>Mud on cutterbar</td>
<td>Remove mud from cutterbar: do NOT allow mud to dry on cutterbar.</td>
<td>—</td>
</tr>
<tr>
<td>Machine pulling to one side</td>
<td>Header dragging on one end and pulling to that side</td>
<td>Adjust header flotation on both ends.</td>
<td>4.1.2 Adjusting Float, page 76</td>
</tr>
<tr>
<td></td>
<td>Belt not in proper groove in pulley</td>
<td>Move belt to proper groove.</td>
<td>Replacing the Conditioner Drive Belt, page 144</td>
</tr>
<tr>
<td></td>
<td>Foreign object between rolls</td>
<td>Disengage header and stop the engine. When all moving parts are completely stopped, remove foreign object.</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Belt pulleys and idlers misaligned</td>
<td>Align pulleys and idler.</td>
<td>See MacDon Dealer</td>
</tr>
<tr>
<td>Disc does not turn when engaging header</td>
<td>Mud on cutterbar</td>
<td>Remove mud from cutterbar: do NOT allow mud to dry on cutterbar.</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Hoses not connected</td>
<td>Connect hoses.</td>
<td>3.7 Attaching the Header, page 37</td>
</tr>
<tr>
<td></td>
<td>Faulty drive belt</td>
<td>Check drive belt pulleys.</td>
<td>Inspecting the Conditioner Drive Belt, page 142</td>
</tr>
<tr>
<td></td>
<td>Poor electrical connection at pump solenoid</td>
<td>Check connection at windrower.</td>
<td></td>
</tr>
<tr>
<td>Header slows when going uphill</td>
<td>Hydraulic oil level in windrower is low</td>
<td>Add oil to windrower reservoir.</td>
<td>Refer to windrower operator’s manual</td>
</tr>
<tr>
<td>Header runs while unloaded, but slows or stops when starting to cut</td>
<td>Defective hydraulic motor</td>
<td>Repair/replace hydraulic motor.</td>
<td>See MacDon Dealer</td>
</tr>
<tr>
<td></td>
<td>Defective hydraulic pump in windrower</td>
<td>Repair/replace pump.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Defective relief valve in windrower</td>
<td>Repair/replace relief valve.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cold oil in hydraulic drive system</td>
<td>Reduce ground speed until oil reaches operating temperature.</td>
<td>4.9 Ground Speed, page 90</td>
</tr>
</tbody>
</table>
8 Reference

8.1 Torque Specifications

The following tables provide the correct torque values for various bolts, cap screws, and hydraulic fittings.

- Tighten all bolts to torque values specified in charts (unless otherwise noted throughout this manual).
- Replace hardware with same strength and grade of bolt.
- Use torque value tables as a guide and periodically check tightness of bolts.
- Understand torque categories for bolts and cap screws by using their identifying head markings.

8.1.1 SAE Bolt Torque Specifications

Torque values shown in the following tables are valid for non-greased, or non-oiled threads and heads; therefore, do NOT grease or oil bolts or cap screws unless otherwise specified in this manual.

### Table 8.1 SAE Grade 5 Bolt and Grade 5 Free Spinning Nut

<table>
<thead>
<tr>
<th>Nominal Size (A)</th>
<th>Torque (N·m)</th>
<th>Torque (ft-lbf) (*in-lbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min.</td>
<td>Max.</td>
</tr>
<tr>
<td>1/4-20</td>
<td>11.9</td>
<td>13.2</td>
</tr>
<tr>
<td>5/16-18</td>
<td>24.6</td>
<td>27.1</td>
</tr>
<tr>
<td>3/8-16</td>
<td>44</td>
<td>48</td>
</tr>
<tr>
<td>7/16-14</td>
<td>70</td>
<td>77</td>
</tr>
<tr>
<td>1/2-13</td>
<td>106</td>
<td>118</td>
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<tr>
<td>9/16-12</td>
<td>153</td>
<td>170</td>
</tr>
<tr>
<td>5/8-11</td>
<td>212</td>
<td>234</td>
</tr>
<tr>
<td>3/4-10</td>
<td>380</td>
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<td>7/8-9</td>
<td>606</td>
<td>669</td>
</tr>
<tr>
<td>1-8</td>
<td>825</td>
<td>912</td>
</tr>
</tbody>
</table>

Figure 8.1: Bolt Grades
A - Nominal Size  B - SAE-8  C - SAE-5  D - SAE-2
Table 8.2 SAE Grade 5 Bolt and Grade F Distorted Thread Nut

<table>
<thead>
<tr>
<th>Nominal Size (A)</th>
<th>Torque (N·m)</th>
<th>Torque (ft·lbf) (*in·lbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min.</td>
<td>Max.</td>
</tr>
<tr>
<td>1/4-20</td>
<td>8.1</td>
<td>9</td>
</tr>
<tr>
<td>5/16-18</td>
<td>16.7</td>
<td>18.5</td>
</tr>
<tr>
<td>3/8-16</td>
<td>30</td>
<td>33</td>
</tr>
<tr>
<td>7/16-14</td>
<td>48</td>
<td>53</td>
</tr>
<tr>
<td>1/2-13</td>
<td>73</td>
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<tr>
<td>9/16-12</td>
<td>105</td>
<td>116</td>
</tr>
<tr>
<td>5/8-11</td>
<td>144</td>
<td>160</td>
</tr>
<tr>
<td>3/4-10</td>
<td>259</td>
<td>286</td>
</tr>
<tr>
<td>7/8-9</td>
<td>413</td>
<td>456</td>
</tr>
<tr>
<td>1-8</td>
<td>619</td>
<td>684</td>
</tr>
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</table>

Table 8.3 SAE Grade 8 Bolt and Grade G Distorted Thread Nut

<table>
<thead>
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<th>Nominal Size (A)</th>
<th>Torque (N·m)</th>
<th>Torque (ft·lbf) (*in·lbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min.</td>
<td>Max.</td>
</tr>
<tr>
<td>1/4-20</td>
<td>16.8</td>
<td>18.6</td>
</tr>
<tr>
<td>5/16-18</td>
<td>24</td>
<td>26</td>
</tr>
<tr>
<td>3/8-16</td>
<td>42</td>
<td>46</td>
</tr>
<tr>
<td>7/16-14</td>
<td>67</td>
<td>74</td>
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<tr>
<td>1/2-13</td>
<td>102</td>
<td>113</td>
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<tr>
<td>9/16-12</td>
<td>148</td>
<td>163</td>
</tr>
<tr>
<td>5/8-11</td>
<td>204</td>
<td>225</td>
</tr>
<tr>
<td>3/4-10</td>
<td>362</td>
<td>400</td>
</tr>
<tr>
<td>7/8-9</td>
<td>583</td>
<td>644</td>
</tr>
<tr>
<td>1-8</td>
<td>874</td>
<td>966</td>
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</table>
Table 8.4 SAE Grade 8 Bolt and Grade 8 Free Spinning Nut

<table>
<thead>
<tr>
<th>Nominal Size (A)</th>
<th>Torque (N·m)</th>
<th>Torque (ft·lbf) (*in·lbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min.</td>
<td>Max.</td>
</tr>
<tr>
<td>1/4-20</td>
<td>16.8</td>
<td>18.6</td>
</tr>
<tr>
<td>5/16-18</td>
<td>35</td>
<td>38</td>
</tr>
<tr>
<td>3/8-16</td>
<td>61</td>
<td>68</td>
</tr>
<tr>
<td>7/16-14</td>
<td>98</td>
<td>109</td>
</tr>
<tr>
<td>1/2-13</td>
<td>150</td>
<td>166</td>
</tr>
<tr>
<td>9/16-12</td>
<td>217</td>
<td>239</td>
</tr>
<tr>
<td>5/8-11</td>
<td>299</td>
<td>330</td>
</tr>
<tr>
<td>3/4-10</td>
<td>531</td>
<td>587</td>
</tr>
<tr>
<td>7/8-9</td>
<td>855</td>
<td>945</td>
</tr>
<tr>
<td>1-8</td>
<td>1165</td>
<td>1288</td>
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</table>

8.1.2 Metric Bolt Specifications

Table 8.5 Metric Class 8.8 Bolts and Class 9 Free Spinning Nut

<table>
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<th>Nominal Size (A)</th>
<th>Torque (N·m)</th>
<th>Torque (ft·lbf) (*in·lbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min.</td>
<td>Max.</td>
</tr>
<tr>
<td>3-0.5</td>
<td>1.4</td>
<td>1.6</td>
</tr>
<tr>
<td>3.5-0.6</td>
<td>2.2</td>
<td>2.5</td>
</tr>
<tr>
<td>4-0.7</td>
<td>3.3</td>
<td>3.7</td>
</tr>
<tr>
<td>5-0.8</td>
<td>6.7</td>
<td>7.4</td>
</tr>
<tr>
<td>6-1.0</td>
<td>11.4</td>
<td>12.6</td>
</tr>
<tr>
<td>8-1.25</td>
<td>28</td>
<td>30</td>
</tr>
<tr>
<td>10-1.5</td>
<td>55</td>
<td>60</td>
</tr>
<tr>
<td>12-1.75</td>
<td>95</td>
<td>105</td>
</tr>
<tr>
<td>14-2.0</td>
<td>152</td>
<td>168</td>
</tr>
<tr>
<td>16-2.0</td>
<td>236</td>
<td>261</td>
</tr>
<tr>
<td>20-2.5</td>
<td>460</td>
<td>509</td>
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<td>24-3.0</td>
<td>796</td>
<td>879</td>
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### Table 8.6 Metric Class 8.8 Bolts and Class 9 Distorted Thread Nut

<table>
<thead>
<tr>
<th>Nominal Size (A)</th>
<th>Torque (N·m)</th>
<th>Torque (ft·lbf) (*in·lbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min.</td>
<td>Max.</td>
</tr>
<tr>
<td>3-0.5</td>
<td>1</td>
<td>1.1</td>
</tr>
<tr>
<td>3.5-0.6</td>
<td>1.5</td>
<td>1.7</td>
</tr>
<tr>
<td>4-0.7</td>
<td>2.3</td>
<td>2.5</td>
</tr>
<tr>
<td>5-0.8</td>
<td>4.5</td>
<td>5</td>
</tr>
<tr>
<td>6-1.0</td>
<td>7.7</td>
<td>8.6</td>
</tr>
<tr>
<td>8-1.25</td>
<td>18.8</td>
<td>20.8</td>
</tr>
<tr>
<td>10-1.5</td>
<td>37</td>
<td>41</td>
</tr>
<tr>
<td>12-1.75</td>
<td>65</td>
<td>72</td>
</tr>
<tr>
<td>14-2.0</td>
<td>104</td>
<td>115</td>
</tr>
<tr>
<td>16-2.0</td>
<td>161</td>
<td>178</td>
</tr>
<tr>
<td>20-2.5</td>
<td>314</td>
<td>347</td>
</tr>
<tr>
<td>24-3.0</td>
<td>543</td>
<td>600</td>
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### Table 8.7 Metric Class 10.9 Bolts and Class 10 Free Spinning Nut

<table>
<thead>
<tr>
<th>Nominal Size (A)</th>
<th>Torque (N·m)</th>
<th>Torque (ft·lbf) (*in·lbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min.</td>
<td>Max.</td>
</tr>
<tr>
<td>3-0.5</td>
<td>1.8</td>
<td>2</td>
</tr>
<tr>
<td>3.5-0.6</td>
<td>2.8</td>
<td>3.1</td>
</tr>
<tr>
<td>4-0.7</td>
<td>4.2</td>
<td>4.6</td>
</tr>
<tr>
<td>5-0.8</td>
<td>8.4</td>
<td>9.3</td>
</tr>
<tr>
<td>6-1.0</td>
<td>14.3</td>
<td>15.8</td>
</tr>
<tr>
<td>8-1.25</td>
<td>38</td>
<td>42</td>
</tr>
<tr>
<td>10-1.5</td>
<td>75</td>
<td>83</td>
</tr>
<tr>
<td>12-1.75</td>
<td>132</td>
<td>145</td>
</tr>
<tr>
<td>14-2.0</td>
<td>210</td>
<td>232</td>
</tr>
<tr>
<td>16-2.0</td>
<td>326</td>
<td>360</td>
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<tr>
<td>20-2.5</td>
<td>637</td>
<td>704</td>
</tr>
<tr>
<td>24-3.0</td>
<td>1101</td>
<td>1217</td>
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</table>
### Table 8.8 Metric Class 10.9 Bolts and Class 10 Distorted Thread Nut

<table>
<thead>
<tr>
<th>Nominal Size (A)</th>
<th>Torque (N·m)</th>
<th>Torque (ft·lbf) (*in·lbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min.</td>
<td>Max.</td>
</tr>
<tr>
<td>3-0.5</td>
<td>1.3</td>
<td>1.5</td>
</tr>
<tr>
<td>3.5-0.6</td>
<td>2.1</td>
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<tr>
<td>4-0.7</td>
<td>3.1</td>
<td>3.4</td>
</tr>
<tr>
<td>5-0.8</td>
<td>6.3</td>
<td>7</td>
</tr>
<tr>
<td>6-1.0</td>
<td>10.7</td>
<td>11.8</td>
</tr>
<tr>
<td>8-1.25</td>
<td>26</td>
<td>29</td>
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<td>10-1.5</td>
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<td>57</td>
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<td>434</td>
<td>480</td>
</tr>
<tr>
<td>24-3.0</td>
<td>750</td>
<td>829</td>
</tr>
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</table>

**Figure 8.8: Bolt Grades**
8.1.3 Metric Bolt Specifications Bolting into Cast Aluminum

### Table 8.9 Metric Bolt Bolting into Cast Aluminum

<table>
<thead>
<tr>
<th>Nominal Size (A)</th>
<th>Bolt Torque</th>
<th>8.8 (Cast Aluminum)</th>
<th>10.9 (Cast Aluminum)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N·m</td>
<td>ft·lbf</td>
<td>N·m</td>
</tr>
<tr>
<td>M3</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>M4</td>
<td>–</td>
<td>–</td>
<td>4</td>
</tr>
<tr>
<td>M5</td>
<td>–</td>
<td>–</td>
<td>8</td>
</tr>
<tr>
<td>M6</td>
<td>9</td>
<td>6</td>
<td>12</td>
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<td>14</td>
<td>28</td>
</tr>
<tr>
<td>M10</td>
<td>40</td>
<td>28</td>
<td>55</td>
</tr>
<tr>
<td>M12</td>
<td>70</td>
<td>52</td>
<td>100</td>
</tr>
<tr>
<td>M14</td>
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<td>–</td>
<td>–</td>
</tr>
<tr>
<td>M16</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

Figure 8.9: Bolt Grades

8.1.4 Flare-Type Hydraulic Fittings

1. Check flare (A) and flare seat (B) for defects that might cause leakage.

2. Align tube (C) with fitting (D) and thread nut (E) onto fitting without lubrication until contact has been made between flared surfaces.

3. Torque fitting nut (E) to specified number of flats from finger tight (FFFT) or to a given torque value in Table 8.10 Flare-Type Hydraulic Tube Fittings, page 167.

4. Use two wrenches to prevent fitting (D) from rotating. Place one wrench on fitting body (D), and tighten nut (E) with other wrench to torque shown.

5. Assess final condition of connection.

Figure 8.10: Hydraulic Fitting
Table 8.10 Flare-Type Hydraulic Tube Fittings

<table>
<thead>
<tr>
<th>SAE Dash Size</th>
<th>Thread Size (in.)</th>
<th>Torque Value[^]</th>
<th>Flats from Finger Tight (FFFT)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>N·m</td>
<td>ft·lbf</td>
</tr>
<tr>
<td>-2</td>
<td>5/16–24</td>
<td>4–5</td>
<td>3–4</td>
</tr>
<tr>
<td>-3</td>
<td>3/8–24</td>
<td>7–8</td>
<td>5–6</td>
</tr>
<tr>
<td>-4</td>
<td>7/16–20</td>
<td>18–19</td>
<td>13–14</td>
</tr>
<tr>
<td>-5</td>
<td>1/2–20</td>
<td>19–21</td>
<td>14–15</td>
</tr>
<tr>
<td>-6</td>
<td>9/16–18</td>
<td>30–33</td>
<td>22–24</td>
</tr>
<tr>
<td>-8</td>
<td>3/4–16</td>
<td>57–63</td>
<td>42–46</td>
</tr>
<tr>
<td>-10</td>
<td>7/8–14</td>
<td>81–89</td>
<td>60–66</td>
</tr>
<tr>
<td>-12</td>
<td>1-1/16–12</td>
<td>113–124</td>
<td>83–91</td>
</tr>
<tr>
<td>-14</td>
<td>1-3/16–12</td>
<td>136–149</td>
<td>100–110</td>
</tr>
<tr>
<td>-16</td>
<td>1-5/16–12</td>
<td>160–176</td>
<td>118–130</td>
</tr>
<tr>
<td>-20</td>
<td>1-5/8–12</td>
<td>228–250</td>
<td>168–184</td>
</tr>
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<td>-24</td>
<td>1-7/8–12</td>
<td>264–291</td>
<td>195–215</td>
</tr>
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<td>-32</td>
<td>2-1/2–12</td>
<td>359–395</td>
<td>265–291</td>
</tr>
<tr>
<td>-40</td>
<td>3–12</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

[^]: Torque values shown are based on lubricated connections as in reassembly.
REFERENCE

8.1.5 O-Ring Boss (ORB) Hydraulic Fittings (Adjustable)

1. Inspect O-ring (A) and seat (B) for dirt or obvious defects.

2. Back off lock nut (C) as far as possible. Ensure that washer (D) is loose and is pushed toward lock nut (C) as far as possible.

3. Check that O-ring (A) is NOT on threads and adjust if necessary.

4. Apply hydraulic system oil to O-ring (A).

5. Install fitting (B) into port until back up washer (D) and O-ring (A) contact part face (E).

6. Position angle fittings by unscrewing no more than one turn.

7. Turn lock nut (C) down to washer (D) and tighten to torque shown. Use two wrenches, one on fitting (B) and other on lock nut (C).

8. Check final condition of fitting.
### Table 8.11 O-Ring Boss (ORB) Hydraulic Fittings (Adjustable)

<table>
<thead>
<tr>
<th>SAE Dash Size</th>
<th>Thread Size (in.)</th>
<th>Torque Value&lt;br&gt;N·m</th>
<th>ft·lbf (*in·lbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>5/16–24</td>
<td>6–7</td>
<td>*53–62</td>
</tr>
<tr>
<td>-3</td>
<td>3/8–24</td>
<td>12–13</td>
<td>*106–115</td>
</tr>
<tr>
<td>-4</td>
<td>7/16–20</td>
<td>19–21</td>
<td>14–15</td>
</tr>
<tr>
<td>-5</td>
<td>1/2–20</td>
<td>21–33</td>
<td>15–24</td>
</tr>
<tr>
<td>-6</td>
<td>9/16–18</td>
<td>26–29</td>
<td>19–21</td>
</tr>
<tr>
<td>-8</td>
<td>3/4–16</td>
<td>46–50</td>
<td>34–37</td>
</tr>
<tr>
<td>-10</td>
<td>7/8–14</td>
<td>75–82</td>
<td>55–60</td>
</tr>
<tr>
<td>-12</td>
<td>1-1/16–12</td>
<td>120–132</td>
<td>88–97</td>
</tr>
<tr>
<td>-14</td>
<td>1-3/8–12</td>
<td>153–168</td>
<td>113–124</td>
</tr>
<tr>
<td>-16</td>
<td>1-5/16–12</td>
<td>176–193</td>
<td>130–142</td>
</tr>
<tr>
<td>-20</td>
<td>1-5/8–12</td>
<td>221–243</td>
<td>163–179</td>
</tr>
<tr>
<td>-24</td>
<td>1-7/8–12</td>
<td>270–298</td>
<td>199–220</td>
</tr>
<tr>
<td>-32</td>
<td>2-1/2–12</td>
<td>332–365</td>
<td>245–269</td>
</tr>
</tbody>
</table>

---

8. Torque values shown are based on lubricated connections as in reassembly.
8.1.6 O-Ring Boss (ORB) Hydraulic Fittings (Non-Adjustable)

1. Inspect O-ring (A) and seat (B) for dirt or obvious defects.
2. Check that O-ring (A) is **NOT** on threads and adjust if necessary.
3. Apply hydraulic system oil to O-ring.
4. Install fitting (C) into port until fitting is hand tight.
5. Torque fitting (C) according to values in Table 8.12 O-Ring Boss (ORB) Hydraulic Fittings (Non-Adjustable), page 170.
6. Check final condition of fitting.

![Figure 8.13: Hydraulic Fitting](image)

Table 8.12 O-Ring Boss (ORB) Hydraulic Fittings (Non-Adjustable)

<table>
<thead>
<tr>
<th>SAE Dash Size</th>
<th>Thread Size (in.)</th>
<th>Torque Value&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>N·m</td>
</tr>
<tr>
<td>-2</td>
<td>5/16–24</td>
<td>6–7</td>
</tr>
<tr>
<td>-3</td>
<td>3/8–24</td>
<td>12–13</td>
</tr>
<tr>
<td>-4</td>
<td>7/16–20</td>
<td>19–21</td>
</tr>
<tr>
<td>-5</td>
<td>1/2–20</td>
<td>21–33</td>
</tr>
<tr>
<td>-6</td>
<td>9/16–18</td>
<td>26–29</td>
</tr>
<tr>
<td>-8</td>
<td>3/4–16</td>
<td>46–50</td>
</tr>
<tr>
<td>-10</td>
<td>7/8–14</td>
<td>75–82</td>
</tr>
<tr>
<td>-12</td>
<td>1-1/16–12</td>
<td>120–132</td>
</tr>
<tr>
<td>-14</td>
<td>1-3/8–12</td>
<td>153–168</td>
</tr>
<tr>
<td>-16</td>
<td>1-5/16–12</td>
<td>176–193</td>
</tr>
<tr>
<td>-20</td>
<td>1-5/8–12</td>
<td>221–243</td>
</tr>
<tr>
<td>-24</td>
<td>1-7/8–12</td>
<td>270–298</td>
</tr>
<tr>
<td>-32</td>
<td>2-1/2–12</td>
<td>332–365</td>
</tr>
</tbody>
</table>

---

9. Torque values shown are based on lubricated connections as in reassembly.
8.1.7 O-Ring Face Seal (ORFS) Hydraulic Fittings

1. Check components to ensure that sealing surfaces and fitting threads are free of burrs, nicks, scratches, or any foreign material.

2. Apply hydraulic system oil to O-ring (B).

3. Align tube or hose assembly so that flat face of sleeve (A) or (C) comes in full contact with O-ring (B).

4. Thread tube or hose nut (D) until hand-tight. The nut should turn freely until it is bottomed out.

5. Torque fittings according to values in Table 8.13 O-Ring Face Seal (ORFS) Hydraulic Fittings, page 172.

**NOTE:**
If applicable, hold hex on fitting body (E) to prevent rotation of fitting body and hose when tightening fitting nut (D).

6. Use three wrenches when assembling unions or joining two hoses together.

7. Check final condition of fitting.
Table 8.13 O-Ring Face Seal (ORFS) Hydraulic Fittings

<table>
<thead>
<tr>
<th>SAE Dash Size</th>
<th>Thread Size (in.)</th>
<th>Tube O.D. (in.)</th>
<th>Torque Value&lt;sup&gt;10&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>N·m</td>
</tr>
<tr>
<td>-3</td>
<td>Note&lt;sup&gt;11&lt;/sup&gt;</td>
<td>3/16</td>
<td>–</td>
</tr>
<tr>
<td>-4</td>
<td>9/16</td>
<td>1/4</td>
<td>25–28</td>
</tr>
<tr>
<td>-5</td>
<td>Note&lt;sup&gt;11&lt;/sup&gt;</td>
<td>5/16</td>
<td>–</td>
</tr>
<tr>
<td>-6</td>
<td>11/16</td>
<td>3/8</td>
<td>40–44</td>
</tr>
<tr>
<td>-8</td>
<td>13/16</td>
<td>1/2</td>
<td>55–61</td>
</tr>
<tr>
<td>-10</td>
<td>1</td>
<td>5/8</td>
<td>80–88</td>
</tr>
<tr>
<td>-12</td>
<td>1-3/16</td>
<td>3/4</td>
<td>115–127</td>
</tr>
<tr>
<td>-14</td>
<td>Note&lt;sup&gt;11&lt;/sup&gt;</td>
<td>7/8</td>
<td>–</td>
</tr>
<tr>
<td>-16</td>
<td>1-7/16</td>
<td>1</td>
<td>150–165</td>
</tr>
<tr>
<td>-20</td>
<td>1-11/16</td>
<td>1-1/4</td>
<td>205–226</td>
</tr>
<tr>
<td>-24</td>
<td>1–2</td>
<td>1-1/2</td>
<td>315–347</td>
</tr>
<tr>
<td>-32</td>
<td>2-1/2</td>
<td>2</td>
<td>510–561</td>
</tr>
</tbody>
</table>

<sup>10</sup> Torque values and angles shown are based on lubricated connection as in reassembly.

<sup>11</sup> O-ring face seal type end not defined for this tube size.
**8.1.8 Tapered Pipe Thread Fittings**

Assemble pipe fittings as follows:

1. Check components to ensure that fitting and port threads are free of burrs, nicks and scratches, or any form of contamination.

2. Apply pipe thread sealant (paste type) to external pipe threads.

3. Thread fitting into port until hand-tight.

4. Torque connector to appropriate torque angle. The Turns From Finger Tight (TFFT) values are shown in Table 8.14 Hydraulic Fitting Pipe Thread, page 173. Make sure that tube end of a shaped connector (typically 45° or 90°) is aligned to receive incoming tube or hose assembly. Always finish alignment of fitting in tightening direction. Never back off (loosen) pipe threaded connectors to achieve alignment.

5. Clean all residue and any excess thread conditioner with appropriate cleaner.

6. Assess final condition of fitting. Pay special attention to possibility of cracks to port opening.

7. Mark final position of fitting. If a fitting leaks, disassemble fitting and check for damage.

**NOTE:**
Over-torque failure of fittings may not be evident until fittings are disassembled.

<table>
<thead>
<tr>
<th>Tapered Pipe Thread Size</th>
<th>Recommended T.F.F.T</th>
<th>Recommended F.F.F.T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8–27</td>
<td>2–3</td>
<td>12–18</td>
</tr>
<tr>
<td>1/4–18</td>
<td>2–3</td>
<td>12–18</td>
</tr>
<tr>
<td>3/8–18</td>
<td>2–3</td>
<td>12–18</td>
</tr>
<tr>
<td>1/2–14</td>
<td>2–3</td>
<td>12–18</td>
</tr>
<tr>
<td>3/4–14</td>
<td>1.5–2.5</td>
<td>12–18</td>
</tr>
<tr>
<td>1–11 1/2</td>
<td>1.5–2.5</td>
<td>9–15</td>
</tr>
<tr>
<td>1 1/4–11 1/2</td>
<td>1.5–2.5</td>
<td>9–15</td>
</tr>
<tr>
<td>1 1/2–11 1/2</td>
<td>1.5–2.5</td>
<td>9–15</td>
</tr>
<tr>
<td>2–11 1/2</td>
<td>1.5–2.5</td>
<td>9–15</td>
</tr>
</tbody>
</table>
### 8.2 Conversion Chart

<table>
<thead>
<tr>
<th>Quantity</th>
<th>SI Units (Metric)</th>
<th>Factor</th>
<th>Inch-Pound Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unit Name</td>
<td>Abbreviation</td>
<td></td>
</tr>
<tr>
<td>Area</td>
<td>hectares</td>
<td>ha</td>
<td>x 0.4047 =</td>
</tr>
<tr>
<td>Flow</td>
<td>liters per minute</td>
<td>L/min</td>
<td>x 3.7854 =</td>
</tr>
<tr>
<td>Force</td>
<td>Newtons</td>
<td>N</td>
<td>x 4.4482 =</td>
</tr>
<tr>
<td>Length</td>
<td>millimeters</td>
<td>mm</td>
<td>x 25.4 =</td>
</tr>
<tr>
<td></td>
<td>meters</td>
<td>m</td>
<td>x 0.305 =</td>
</tr>
<tr>
<td>Power</td>
<td>kilowatts</td>
<td>kW</td>
<td>x 0.7457 =</td>
</tr>
<tr>
<td>Pressure</td>
<td>kilopascals</td>
<td>kPa</td>
<td>x 6.8948 =</td>
</tr>
<tr>
<td></td>
<td>megapascals</td>
<td>MPa</td>
<td>x .00689 =</td>
</tr>
<tr>
<td></td>
<td>bar (Non-SI)</td>
<td>bar</td>
<td>+ 14.5038 =</td>
</tr>
<tr>
<td>Torque</td>
<td>Newton meters</td>
<td>N·m</td>
<td>x 1.3558 =</td>
</tr>
<tr>
<td></td>
<td>Newton meters</td>
<td>N·m</td>
<td>x 0.1129 =</td>
</tr>
<tr>
<td>Temperature</td>
<td>Celsius</td>
<td>'C</td>
<td>(°F-32) x 0.56 =</td>
</tr>
<tr>
<td>Velocity</td>
<td>meters per minute</td>
<td>m/min</td>
<td>x 0.3048 =</td>
</tr>
<tr>
<td></td>
<td>meters per second</td>
<td>m/s</td>
<td>x 0.3048 =</td>
</tr>
<tr>
<td></td>
<td>kilometers per hour</td>
<td>km/h</td>
<td>x 1.6093 =</td>
</tr>
<tr>
<td>Volume</td>
<td>liters</td>
<td>L</td>
<td>x 3.7854 =</td>
</tr>
<tr>
<td></td>
<td>milliliters</td>
<td>ml</td>
<td>x 29.5735 =</td>
</tr>
<tr>
<td></td>
<td>cubic centimeters</td>
<td>cm³ or cc</td>
<td>x 16.3871 =</td>
</tr>
<tr>
<td>Weight</td>
<td>kilograms</td>
<td>kg</td>
<td>x 0.4536 =</td>
</tr>
</tbody>
</table>
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