

AgJunction High-Torque Electric Steering System – Gen 5 (MDU-G5 Torque)

MDU-G5 Kit: 900-0061-01

Vehicle-Specific Hardware Kit: 910-0053-01

Review this manual before installing this MDU-G5 Torque kit

Supported Models

This installation manual supports the following John Deere models.

Group A Vehicles

<u>6000 Models*</u>	<u>6100M Models</u>	<u>7000 Models*</u>	<i>*Standard (non-premium) cab models only for 6000 and 7000 models</i>
6100 6310 6600	6105M 6145M	7130 7400 7600	
6110 6320 6610	6110M 6150M	7200 7410 7610	
6120 6330 6620	6115M 6155M	7210 7420 7700	
6130 6400 6800	6120M 6170M	7220 7430 7710	
6200 6410 6810	6125M 6175M	7230 7510 7800	
6210 6420 6820	6130M 6195M	7320 7520 7810	
6220 6430 6910	6140M	7330	
6230 6520 6920			
6300			

Group B Vehicles

<u>7000 Models</u>	<u>8000 Models</u>	<u>8000R Models</u>	<u>9000 Models</u>
7630 7820 7920	8100 8310	8225R 8295R	9100 9300 9430
7720 7830 7930	8110 8320	8235R 8310R	9120 9320 9520
7730	8120 8330	8260R 8335R	9200 9330 9530
	8130 8400	8270R 8345R	9220 9400 9620
	8200 8410	8285R 8360R	9230 9420 9630
	8210 8420		
	8220 8430		
	8230 8520		
	8300 8530		

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Introduction

The MDU-G5 Torque mechanical drive unit is a high-performance steering actuator designed to provide high precision steering when coupled to a GPS automated steering system. The MDU-G5 Torque was designed for ease of installation and a long service life. The MDU-G5 Torque uses a reliable high torque DC motor and a robust and simple gear drive for fast and responsive steering under all field steering conditions.

This manual describes how to install the MDU-G5 Torque in the vehicle makes/models listed in Table 1-1 on page 7. Read and understand the cautions and warnings in this manual before installing or operating the MDU-G5 Torque.

The steering controller (not covered in this manual) of your MDU-G5 Torque system includes a steering controller operator's manual. Read the steering controller operator's manual before operating the MDU-G5 Torque.

Legal Disclaimer

Adhere to the following:

- Read and follow ALL instructions in this manual carefully before installing or operating the MDU-G5 Torque.
- Heed all the safety information in the Safety Information, Warnings, and Cautions section of this manual (starting on the next page) and the additional safety messages provided throughout this manual and any other supplemental material provided.
- The manufacturer disclaims any liability for damage or injury that results from the failure to follow the instructions, cautions, and warnings set forth herein.

Regarding autosteering:

- There is NO obstacle avoidance system included with the manufacturer's product. There must always be a human in the operator's seat of the vehicle when the MDU-G5 Torque is in use to look for obstacles including people, animals, trees, ditches, buildings, and to take manual control of the vehicle to avoid them if necessary.
- The MDU-G5 Torque does NOT control the speed of the vehicle. The operator must always adjust the speed of the vehicle manually so that it is operated at a safe speed that will not cause the vehicle to roll over or go out of control.
- The MDU-G5 Torque will take control of the vehicle's steering system when it is activated during testing, calibration, tuning, and automatic steering operations. The vehicle's steering axles, tracks, articulation point, or wheels may move unpredictably when the MDU-G5 Torque is activated. Before starting the vehicle and/or activating autosteer, ensure that people and obstacles are clear of the vehicle to prevent death, injury, or damage to property.
- Use of the MDU-G5 Torque is NOT permitted while the vehicle is on public roads or in public areas ('roading'). Ensure that the system is powered OFF before driving on roads or in public areas.

Safety Information, Warnings, and Cautions

Safety Information

Read and follow the safety information below, throughout this manual, and in any other supplemental material provided.











Task	Safety Information
Installation	<ul style="list-style-type: none"> • Verify all parts are included in your kit. Use only use original parts; never use third-party or used replacement parts. • When installing the MDU-G5 Torque, adhere to all safety precautions to prevent injury. • Do not force the components when installing the MDU-G5 Torque; this may cause damage to the components. • Only authorized personnel should install the MDU-G5 Torque.
Operation	<ul style="list-style-type: none"> • Do not operate the MDU-G5 Torque if any parts are loose, missing, or damaged. • Always be conscious of your speed and actions when operating the MDU-G5 Torque. • Before starting work activities, operators must know how to safely operate the MDU-G5 Torque. • Do not leave or place objects on or in the area of the MDU-G5 Torque.








Warnings and Cautions

The MDU-G5 Torque installer and manufacturer disclaim any responsibility for damage or physical harm caused by failure to adhere to the following safety requirements:

- As the operator of the vehicle, you are responsible for its safe operation.
- The steering system is not designed to replace the vehicle's operator.

Note: After installing the MDU-G5 Torque, make sure all screws, bolts, nuts, and cable connections are tight. If any hydraulic lines or fittings were disconnected or loosened during installation, make sure they are reattached and tightened to prevent oil leaks. Make sure all cables and hoses are secured to prevent them from being damaged.

 WARNING	
	To understand the potential hazards associated with the operation of a vehicle equipped with MDU-G5 Torque, read the provided documentation before installing or operating the MDU-G5 Torque.
	To prevent accidental death or injury from being run over by the vehicle or automated motion of the MDU-G5 Torque, never leave the vehicle's operator seat with autosteering engaged.
	Electronic control unit (ECU) movement relative to the vehicle may cause erratic steering and sudden loss of vehicle control while in AutoSteer mode. Always keep the ECU firmly secured to the vehicle. Do not operate your MDU-G5 Torque with a loose ECU.
	To prevent accidental death or injury from being run over by the vehicle, make sure the area around the vehicle is clear of people and obstacles before startup, calibration, tuning, or use of the MDU-G5 Torque.
	To prevent the accidental engagement of autosteering and loss of vehicle control while driving on roads, power off the MDU-G5 Torque. Never drive on roads or in public areas with MDU-G5 Torque powered on.
	The MDU-G5 Torque is intended for use with only agricultural vehicles and should not be used with any other type of vehicle or for any other purposes. Unapproved applications may result in loss of vehicle control resulting in injury or death.
	To prevent accidental falls, maintain a stable position on the vehicle's platform or stairs when installing or removing the GPS antenna. If the vehicle does not provide a safe platform, use a ladder to safely access the vehicle's roof.
	To avoid electrical shock hazards, remove the GPS antenna and/or other antennas from the vehicle before driving under low structures or low electrical power lines.
	If the vehicle has a wheel angle sensor as part of the installation, because the steering mechanism can move suddenly and cause severe injury or death, always power off the vehicle when working around the steering axle while installing, checking, and adjusting the wheel angle sensor and rod lengths.

! CAUTION	
	Because the GPS antenna could detach due to wind loads at higher speeds, remove the antenna when transporting or driving the vehicle at speeds above 31 mph (50 km/h).
	The MDU-G5 Torque does not detect obstacles in the vehicle's path. The vehicle operator must observe the path being driven and take over steering manually if an obstacle must be avoided.
	The MDU-G5 Torque does not control the speed of the vehicle. The operator must manually adjust the speed of the vehicle to keep the vehicle safely under control.
	To avoid possible damage to electronic circuits caused by electrostatic discharge, never touch the contacts on the ECU electrical connectors at any time.
	The MDU-G5 Torque must be powered off when installing or removing the GPS antenna, autosteer control unit (ECU), or any other part of the MDU-G5 Torque system.
	The GPS antenna must be firmly secured to the mounting plate via the magnet when the vehicle is in operation to prevent the GPS antenna from releasing from its bracket and falling and to ensure the GPS antenna is placed at the same point every time.
	Make sure the assembly does not interfere with any of the vehicle control levers on the steering column.

Installation Requirements

Standard Tool Requirements

The installer needs to have a complete set of common installation tools that includes those listed below. Always use the correct tools to install the MDU-G5 Torque.

- Wrenches, socket set, and screwdrivers
- Hex keys
- Hammer or steering wheel puller
- Torque wrench
- Blue threadlocker (medium strength)
- Tape measure (for vehicle measurements)

Vehicle Requirements

Before installing the MDU-G5 Torque, ensure the following:

- The vehicle's steering system is in good working order. Drive the vehicle to verify this prior to beginning the installation. There should be no play in the steering and the vehicle should turn proportionally the same to the left and right.
- The vehicle's electrical system and battery must be in good working order.
- The vehicle should be fully cleaned before installing the MDU-G5 Torque. A clean vehicle will improve the overall installation and cable routing
- Verify that you can turn the steered wheels from lock to lock.
- Record the time it takes to manually turn the vehicle's steering mechanism (for example, steering axle, articulation point) from lock to lock (both directions) as fast as you can. This will be used later to ensure steering performance is satisfactory.
- Verify the vehicle steers straight and does not pull to one side when driving in a straight line.
- Check that there are no oil leaks.
- Check for loose or worn steering components.

Any issues/defects with the vehicle must be repaired by a qualified service person before installing the MDU-G5 Torque.

Note: After the installation is complete, store this installation manual and any related documentation in a safe place for future reference.

Technical Support and Contact Information

For technical support and contact information, refer to your steering controller operator's manual.

Installation Overview

Supported Models

Table 1-1 lists the vehicle makes/models supported by hardware installation kit 910-0053-01.

Table 1-1: Supported vehicles for kit 910-0053-01

Make	Model
John Deere Group A Models	6100, 6110, 6120, 6130, 6200, 6210, 6220, 6230, 6300, 6310, 6320, 6330, 6400, 6410, 6420, 6430, 6520, 6600, 6610, 6620, 6800, 6810, 6820, 6910, 6920 <i>Note: Standard (non-premium) cab models only for 6000 models listed here.</i>
	6105M, 6110M, 6115M, 6120M, 6125M, 6130M, 6140M, 6145M, 6150M, 6155M, 6170M, 6175M, 6195M
	7130, 7200, 7210, 7220, 7230, 7320, 7330, 7400, 7410, 7420, 7430, 7510, 7520, 7600, 7610, 7700, 7710, 7800, 7810 <i>Note: Standard (non-premium) cab models only for 7000 models listed here.</i>
John Deere Group B Models	7630, 7720, 7730, 7820, 7830, 7920, 7930
	8100, 8110, 8120, 8130, 8200, 8210, 8220, 8230, 8300, 8310, 8320, 8330, 8400, 8410, 8420, 8430, 8520, 8530
	8225R, 8235R, 8245R, 8260R, 8270R, 8285R, 8295R, 8310R, 8320R, 8335R, 8345R, 8360R
	9100, 9120, 9200, 9220, 9230, 9300, 9320, 9330, 9400, 9420, 9430, 9520, 9530, 9620, 9630

Note: You can install the MDU-G5 Torque differently than described in this manual; however, the components may not fit properly or the cables may not be long enough with alternative mounting solutions. If you modify the installation procedure, ensure all the components will work and all component orientation and mounting requirements are met.

Parts for the Installation

Note: The kits described below may contain additional parts not needed for your installation. Use only the parts described in the sections that follow.

Installing the MDU-G5 Torque on your vehicle's steering column requires two kits: the mechanical drive unit (MDU) kit and a vehicle-specific hardware kit, as described in Table 1-2.

Table 1-2: Kits

Item	Component	Part Number	Qty
1	MDU-G5 Torque kit	900-0061-01	1
2	Vehicle-specific hardware kit	910-0053-01	1

Use the sections that follow to:

- Verify you have all MDU-G5 Torque parts (see sections that follow)
- See an overview of cable connections (page 12)

MDU-G5 Torque Kit 900-0061-01

Figure 1-1 shows the components of the MDU-G5 Torque kit.

Figure 1-1: MDU-G5 Torque kit 900-0061-01 parts

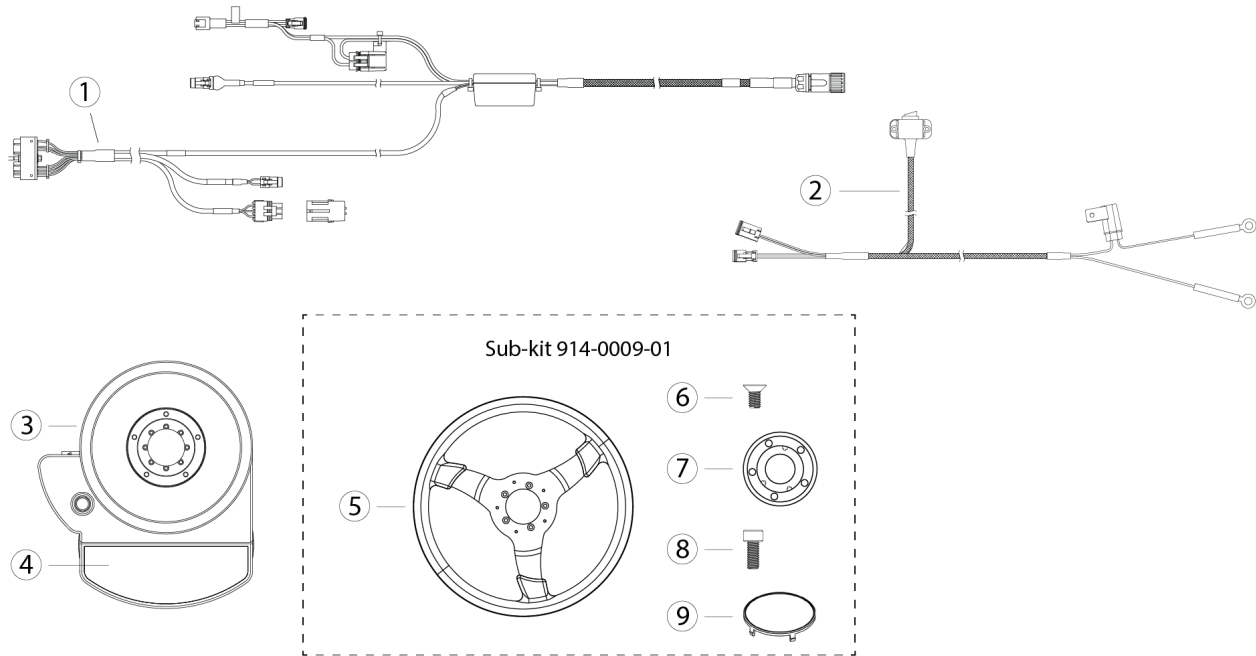


Table 1-3: MDU-G5 Torque kit 900-0061-01 part descriptions

Item	Description	Part Number	Qty
1	MDU-G5 Torque main cable	050-0101-01	1
2	Power cable	201-0590-02	1
3	MDU-G5 Torque	914-0004-02	1
4	Plug-in module for MDU-G5 Torque	700-0094-01	1
5	Steering wheel	750-0170-000#	1
6	Screw, M5 x 10 (secure steering wheel to MDU-G5)	675-1329-000#	5
7	Steering wheel cover	600-1440-000#	1
8	Screw, socket head cap, M5-0.8 x 12 mm (secure cover to steering wheel)	675-1312-000#	5
9	Steering wheel cap	604-0052-000#	1

Vehicle-Specific Hardware Kit 910-0053-01

Figure 1-2 shows the components of the vehicle-specific hardware kit and Table 1-4 describes the parts.

Figure 1-2: Vehicle-specific hardware kit 910-0053-01 parts

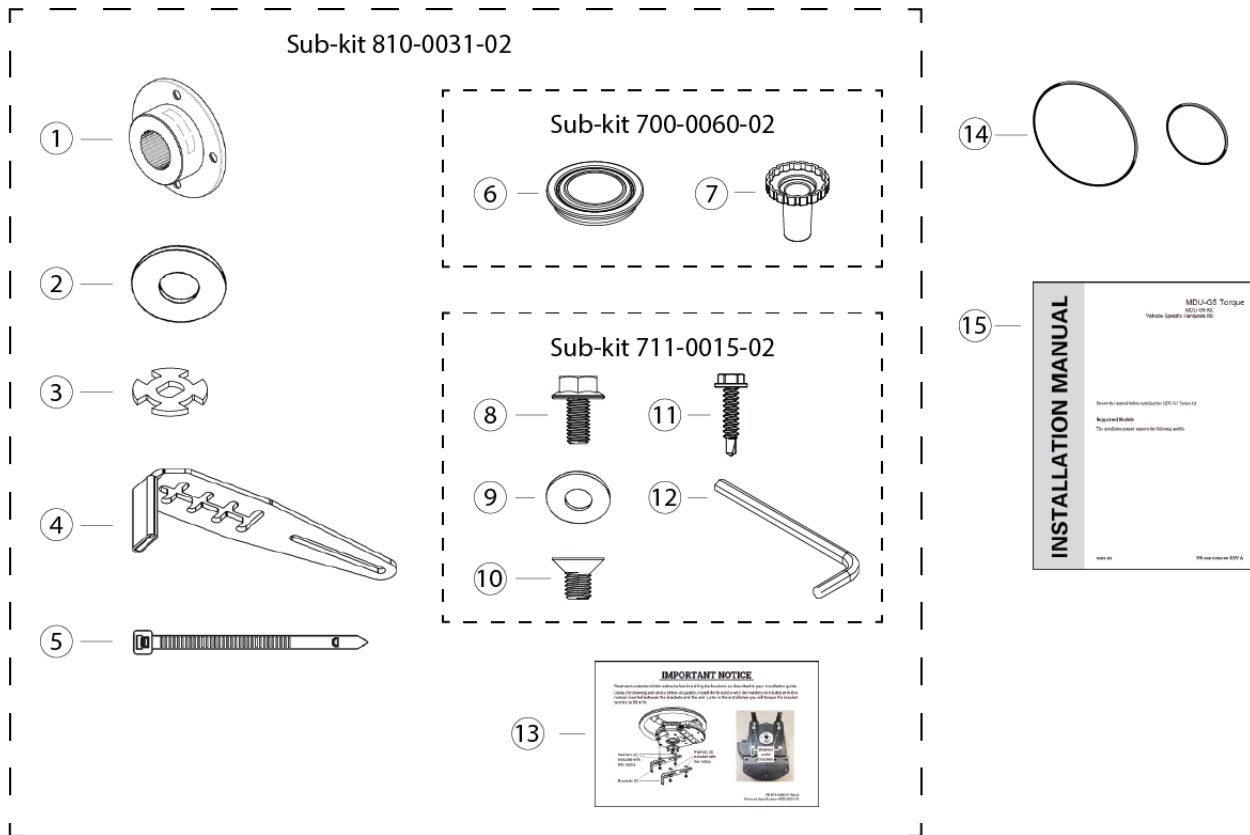


Table 1-4: Vehicle-specific hardware kit 910-0053-01 part descriptions

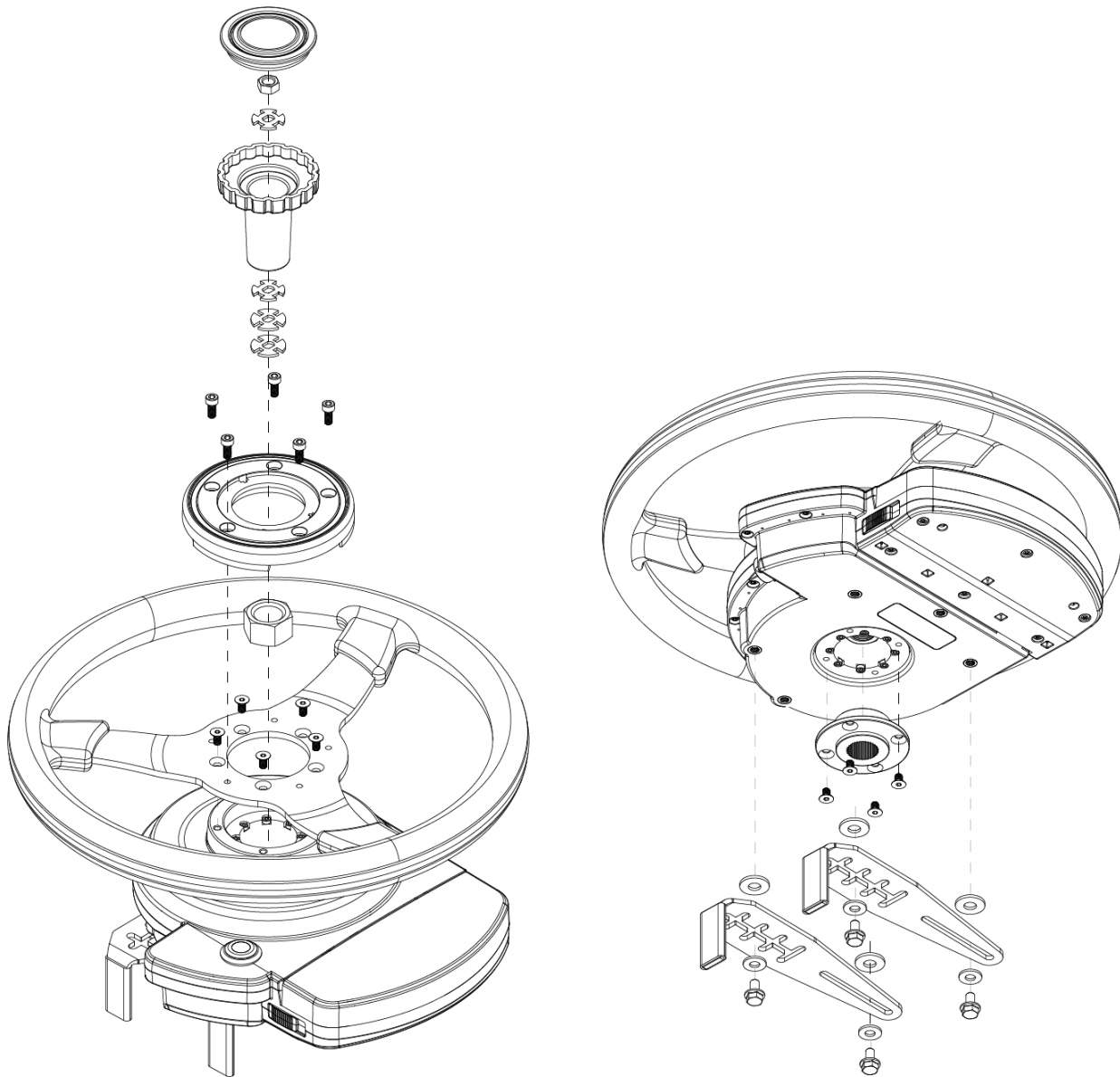
Item	Description	Part Number	Qty
1	Spline adapter	506-0193-01	1
2	Anti-rotation bracket washer, large, flat, M6	517-0032-01	4
3	Telescoping actuator plate, 0.25	601-1278-000	2
4	Anti-rotation bracket	607-0024-01	2
5	Cable tie	677-2010	20
6	Center cap (with O-ring 681-1070-000# preinstalled)	600-1437-000#	1
7	Telescoping actuator	604-0042-000#	1
8	Anti-rotation bracket screw, hex, M6 x 1 x 12	515-0143-01	4
9	Anti-rotation bracket washer, small, flat, 1/4	516-0002-01	4
10	Spline adapter screw, countersink, M5 x 8	675-1300-000	4
11	Power cable switch screw, #8-18 x 3/4", hex	675-1138-000	2
12	Hex key, 3 mm	675-0189-000	1

Item	Description	Part Number	Qty
13	Pamphlet, install large anti-rotation bracket washers	875-0460-01	1
14	Logos, generic (set of 2; one each for telescoping and non-telescoping installations)	850-0003-01	1
15	Installation manual (this document)	875-0474-01	1

MDU-G5 Torque Assembly for Installation on Steering Column

Figure 1-3 shows how the MDU-G5 Torque and its associated hardware kit are assembled. Use this figure in conjunction with the instructions in the next chapter to install the MDU-G5 Torque on the steering column.

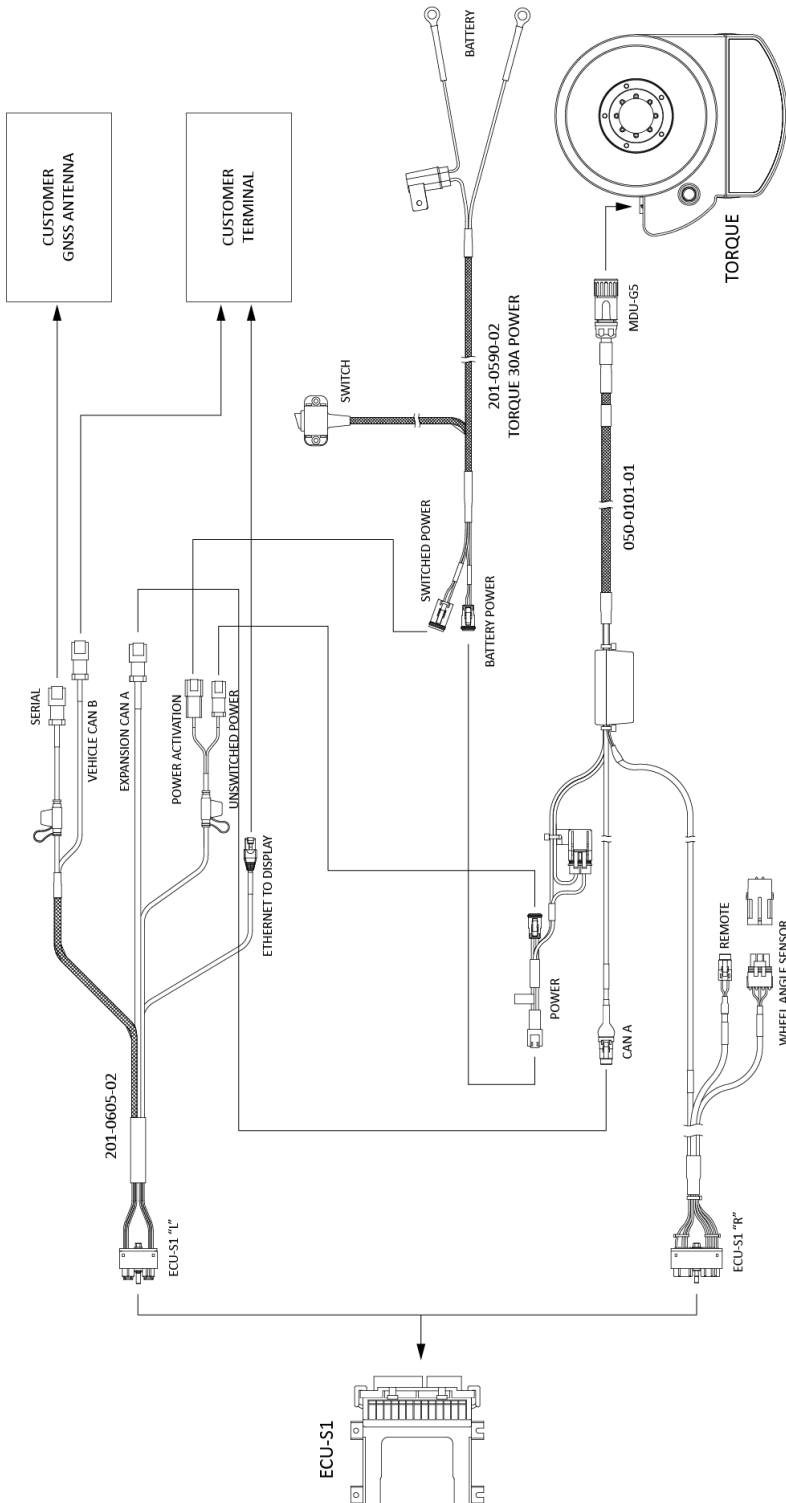
Figure 1-3: MDU-G5 Torque assembly diagram



MDU-G5 Torque Connection Diagram

Figure 1-4 shows how the MDU-G5 Torque connects to other components of the MDU-G5 Torque system.

Figure 1-4: MDU-G5 Torque connection diagram



Installing the MDU-G5 Torque

Before beginning the installation:

- On a clean surface lay out all the components and check them against “Parts for the Installation” starting on page 8.
- Become familiar with the components and where they are to be installed.
- Work out how the MDU-G5 Torque harness is to be routed into/out of the cab (typically, through the rear window for closed cabs) to the battery and antenna. It is recommended to start at the battery and work back into the cab.

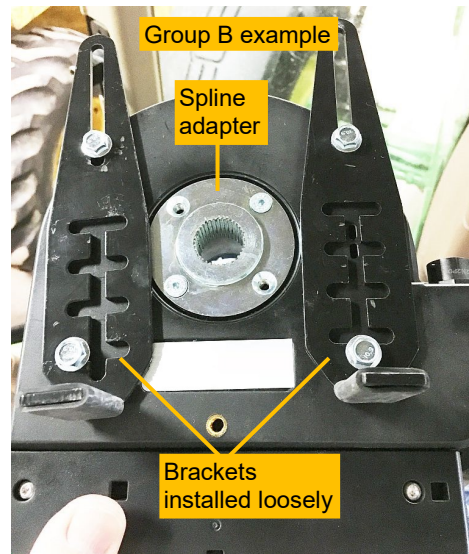
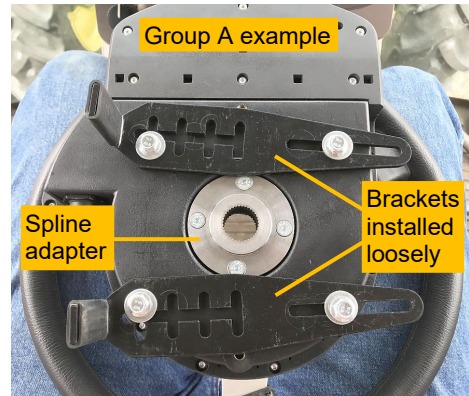
Assembling the Components to Install on the Steering Column

You may want to perform these steps on a flat surface, such as a work bench. These steps show installing the following on the MDU-G5 Torque: spline adapter, then brackets, and finally the wheel; however, you may install them in any order. You can then install this assembly as one piece on the steering column (see “Installing the MDU-G5 Torque Assembly on the Steering Column” on page 18).

Using the parts diagrams from “Parts for the Installation” starting on page 8 and the photos in the steps that follow for reference, assemble the components while noting the following:

- Leave the brackets loose—you will tighten these later.
- Do not install the telescoping assembly yet—you will install the appropriate parts later.

1. On the underside of the MDU-G5 Torque, install the spline adapter and the brackets:
 - a. Apply blue threadlocker to the four spline adapter countersink screws, then using the screws and the hex key, install the spline adapter on the bottom of MDU-G5 Torque. Torque the screws to 50 in-lb (5.65 N·m).
 - b. Using the four bracket screws, four small bracket washers, and four large bracket washers, attach the two brackets as shown at right (large washers installed between the brackets and the MDU-G5 Torque; small washers installed between the brackets and the screws). Leave the screws loose (do not tighten). Later in the installation you will torque the bracket screws to 50 in-lb (5.65 N·m).



2. On the top side of the MDU-G5 Torque, install the new steering wheel (top photo) and the steering wheel cover (bottom photo)—although the photos at right show the MDU-G5 Torque already placed on the steering column, you may assemble these components on a flat surface, such as a workbench, before installing the assembly on the steering column.

If you want to assemble these components while installing the MDU-G5 Torque on the steering column, remove the existing steering wheel first (see next page).

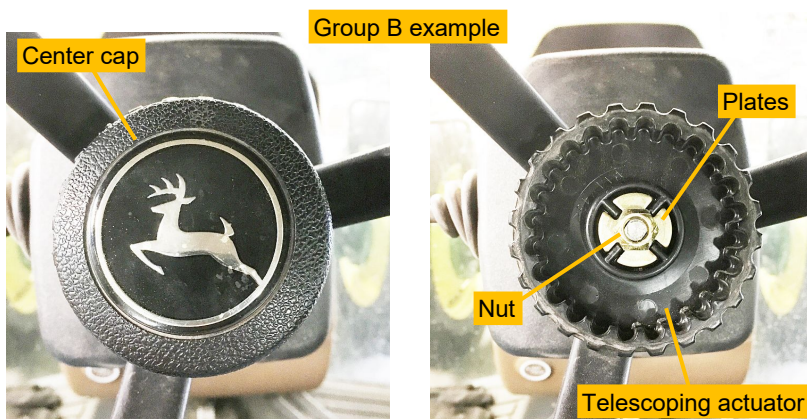
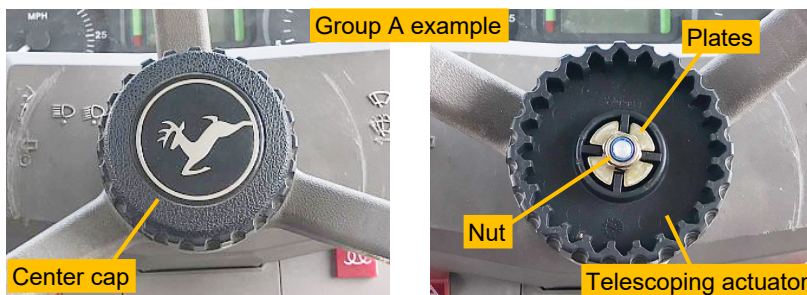
- a. Place the new steering wheel on top of the MDU-G5 Torque, then using the five countersink screws that came with the steering wheel, fasten the wheel to the MDU-G5 Torque.
- b. Carefully pop the MDU-G5 Torque center cap out of the steering wheel cover—retain the cap, you will reinsert it later. Using the five socket head cap screws, install the steering wheel cover. Do not overtighten.



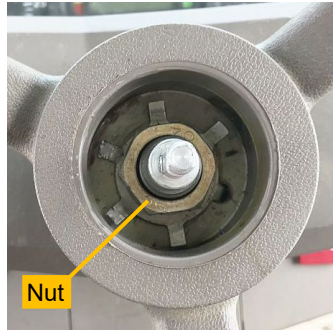
Removing the Existing Steering Wheel

If necessary, consult your equipment dealer if you are unsure of the correct procedure for removing the steering wheel.

1. Remove and discard the steering wheel center cap (left photos) and telescoping actuator nut (right photos).
2. Remove and retain the two telescoping actuator plates (right photos)— you may need to reuse them later.
3. Remove and discard the telescoping actuator (right photos).



4. Remove and retain the steering wheel nut (top photos)—you will reuse it later.
5. Using a steering wheel puller, rubber mallet, or suitable tool, remove the steering wheel (bottom photo).

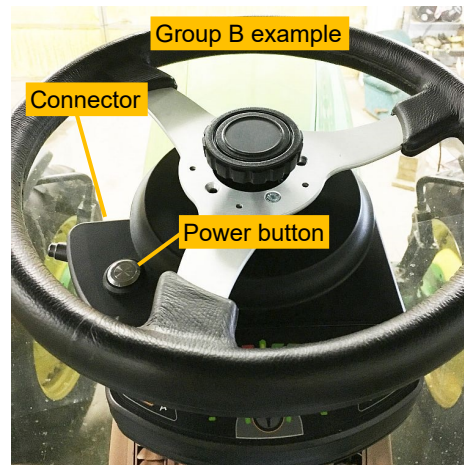
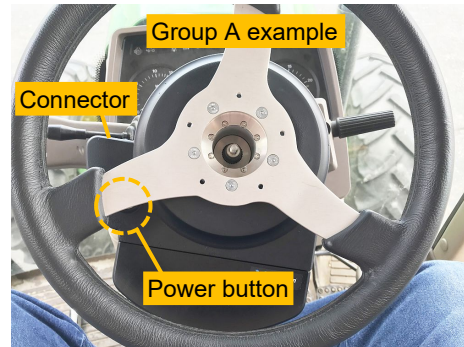


Installing the MDU-G5 Torque Assembly on the Steering Column

Make sure you have a 10 mm wrench—you will need it in step 2 below.

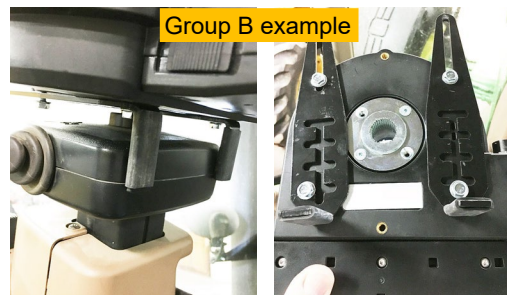
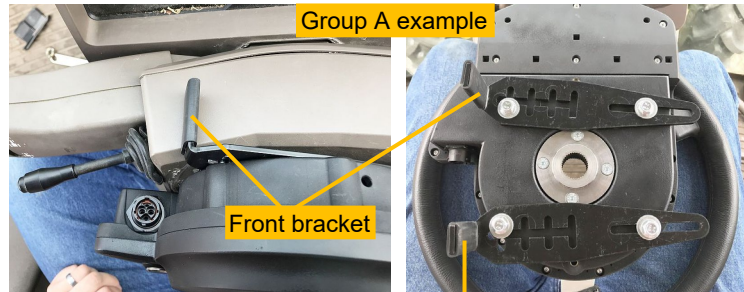
1. Place the MDU-G5 Torque assembly (see “Assembling the Components to Install on the Steering Column” starting on page 13) on the steering column with the power button and connector to the left of the steering column.

Note: When completing the next step, make sure the brackets are snug against the steering console and that there is proper clearance between MDU-G5 Torque components and vehicle levers and switches for proper operation.

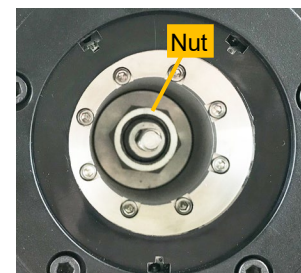
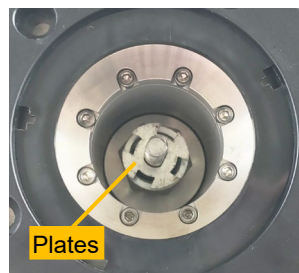


2. Push the two bracket tabs against the upper and lower left of the steering column housing then torque the bracket screws with a 10 mm wrench to 50 in-lb (5.65 N·m).
3. Using the steering wheel nut from when you removed the old steering wheel, secure the MDU-G5 Torque to the steering column. Tighten the nut. **DO NOT OVERTIGHTEN.**

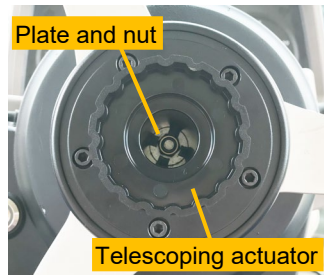
Note: In step 4 that follows, you may use none, one, or both original telescoping actuator plates (from when you removed the steering wheel, see page 16) before installing the nut. You will use however many are necessary to provide the proper spacing when installing the telescoping assembly—you may discover this by trying each option (none, one, or two plates) before installing and tightening the telescoping actuator nut later in this procedure).



4. Install the telescoping actuator plates on the steering shaft—you may need to use the original plates (see *Note* in previous step). However many original plates you use, the top plate must always be one of the new actuator plates.



5. Install the new telescoping actuator on the steering shaft (left photo), install the other new actuator plate in the center of the actuator on the steering shaft, then using the original telescoping actuator nut secure the telescoping actuator to the steering shaft. **DO NOT OVERTIGHTEN.**
6. Snap the center cap into the steering wheel cover (right photo).



Routing and Connecting the MDU-G5 Torque Main Harness

Caution: The vehicle must be power off during the installation of cable harness. To prevent the system from any unexpected shut down while operating, check the cable insulation and cable connections to the other instruments. Route the cables away from all sharp edges to prevent control wires from being pulled hard or damaged.

Using the “MDU-G5 Torque Connection Diagram” on page 12 as a guide, connect the cables included in your kit (main cable, ECU-S1 cable, power switch cable) to the appropriate parts.

When routing and connecting cables:

- Stow cabling under carpets and at the edges of the cab.
- Store excess cable lengths with a minimum six-inch bend radius.
- Avoid high-temperature exposure (for example the exhaust, exhaust manifold).
- Hand tighten cables only—do not use tools.

Post-Installation Procedures and Information

Powering the MDU-G5 Torque On and Off

The MDU-G5 Torque power on/off button is located on the front left of the unit.



- To power on the unit: Press the power button once (a green LED along the outer edge of the power button turns on).
- To power off the unit: Press the power button (green LED turns off).

Note: For instructions on powering on/off additional MDU-G5 Torque system components, refer to the documentation for those components.

Care and Maintenance

Adhere to the following for care and maintenance for your MDU-G5 Torque system.

Note: Should you require repair service, spare parts, or warranty information, contact your MDU-G5 Torque dealer. Only the factory or an authorized service center has the correct parts and training necessary to service your MDU-G5 Torque system.

- Always wear appropriate personal protection equipment when cleaning or maintaining the MDU-G5 Torque.
- Make sure the anti-rotation brackets are always secured to the steering column. Check the brackets every 250 hours of operation or every six months, whichever occurs first, and verify they are secured to the steering column and all fasteners are tight. Tighten as necessary.
- Check all cables and electrical connectors every six months. Secure any loose cables using cable ties.
- Clean the outside surfaces of the MDU-G5 Torque using a damp cloth. Do not apply spray cleaners, spray waxes, liquids, or lubricants. The use of any liquid cleaning agent or lubricant may damage the internal components of the MDU-G5 Torque and will void the factory warranty.
- Power off the MDU-G5 Torque and make sure it is free of any electrical currents before cleaning or performing maintenance on the MDU-G5 Torque.