John Deere RTK Radio 450

OPERATOR'S MANUAL

John Deere RTK Radio 450

OMPFP10922 ISSUE J1 (ENGLISH)

CALIFORNIA

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

If this product contains a gasoline engine:

⚠ WARNING

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

The State of California requires the above two warnings.

Additional Proposition 65 Warnings can be found in this manual.

John Deere Werke Zweibrücken

Worldwide Version

PRINTED IN U.S.A.

DCY

OMPFP10922

Introduction

www.StellarSupport.com

NOTE: Product functionality may not be fully represented in this document due to product changes occurring after the time of printing. Read the latest Operator's Manual and Quick Reference Guide prior to operation. To obtain a copy, see your dealer or visit www.StellarSupport.com

OUO6050,0000FB1 -19-10AUG10-1/1

Contents

Original Instructions. All information, illustrations and specifications in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

Recognize Safety Information

This is a safety-alert symbol. When you see this symbol on your machine or in this manual, be alert to the potential for personal injury.

Follow recommended precautions and safe operating practices.

T81389 —UN—07DEC88

DX,ALERT -19-29SEP98-1/1

Understand Signal Words

A signal word—DANGER, WARNING, or CAUTION—is used with the safety-alert symbol. DANGER identifies the most serious hazards.

DANGER or WARNING safety signs are located near specific hazards. General precautions are listed on CAUTION safety signs. CAUTION also calls attention to safety messages in this manual.

TS187 —19—30SEP88

DX,SIGNAL -19-03MAR93-1/1

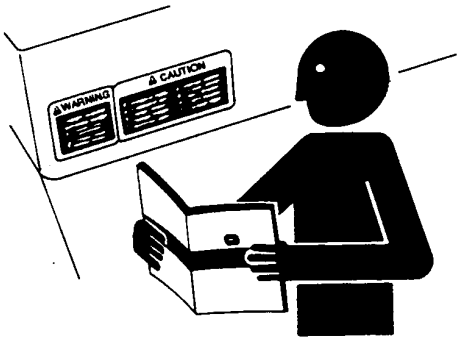
Follow Safety Instructions

Carefully read all safety messages in this manual and on your machine safety signs. Keep safety signs in good condition. Replace missing or damaged safety signs. Be sure new equipment components and repair parts include the current safety signs. Replacement safety signs are available from your John Deere dealer.

There can be additional safety information contained on parts and components sourced from suppliers that is not reproduced in this operator's manual.

Learn how to operate the machine and how to use controls properly. Do not let anyone operate without instruction.

Keep your machine in proper working condition. Unauthorized modifications to the machine may impair the function and/or safety and affect machine life.



TS201 —UN—23AUG88

If you do not understand any part of this manual and need assistance, contact your John Deere dealer.

DX,READ -19-16JUN09-1/1

Practice Safe Maintenance

Understand service procedure before doing work. Keep area clean and dry.

Never lubricate, service, or adjust machine while it is moving. Keep hands, feet , and clothing from power-driven parts. Disengage all power and operate controls to relieve pressure. Lower equipment to the ground. Stop the engine. Remove the key. Allow machine to cool.

Securely support any machine elements that must be raised for service work.

Keep all parts in good condition and properly installed. Fix damage immediately. Replace worn or broken parts. Remove any buildup of grease, oil, or debris.

On self-propelled equipment, disconnect battery ground cable (-) before making adjustments on electrical systems or welding on machine.

On towed implements, disconnect wiring harnesses from tractor before servicing electrical system components or welding on machine.

TS218 —UN—23AUG88

DX,SERV -19-17FEB99-1/1

Handle Electronic Components and Brackets Safely

Falling while installing or removing electronic components mounted on equipment can cause serious injury. Use a ladder or platform to easily reach each mounting location. Use sturdy and secure footholds and handholds. Do not install or remove components in wet or icy conditions.

If installing or servicing a RTK base station on a tower or other tall structure, use a certified climber.

If installing or servicing a global positioning receiver mast used on an implement, use proper lifting techniques and wear proper protective equipment. The mast is heavy and can be awkward to handle. Two people are required when mounting locations are not accessible from the ground or from a service platform.

TS249 —UN—23AUG88

DX,WW,RECEIVER -19-24AUG10-1/1

Prevent Electrical Shock and Fires

To prevent injury from electrical shock, always disconnect power to the receiver, antenna, and amplifier before installing or servicing.

If installing with the power amplifier option, prevent electrical shock or fire by using a 14 AWG heavy-duty electrical cord with 15 amp rating suitable for outdoor use.

Understand and follow all local codes and regulations when installing electrical equipment.

PC12631 —UN—04JUN10

JS56696,0000A47 -19-27JUL11-1/1

Avoid Exposure to High Radio Frequency Fields

Prevent injury from exposure to high radio frequency fields at an RTK base station. Do not touch the antenna while the system is transmitting. Always disconnect power to the receiver, radio, and amplifier before installing or servicing.

While the RTK base station amplifier and radio are operating together, stay at least 3.6 m (12 ft.) away from the base antenna.

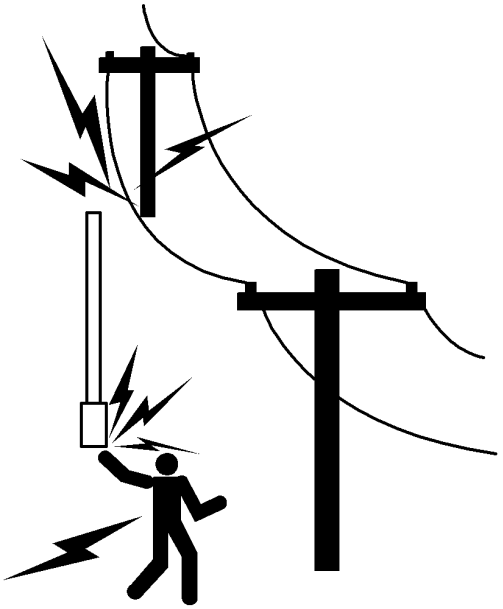
While using the base station radio without the amplifier option, stay at least 40 cm (16 in.) away from the radio antenna.

PC12632 —UN—04JUN10

JS56696,0000A46 -19-27JUL11-1/1

Avoid Electrical Power Lines

Watch for wires. Do not install the base antenna near power lines. It may come into contact with low-hanging electrical cables. This would result in the installer suffering serious injury or death from electrocution.

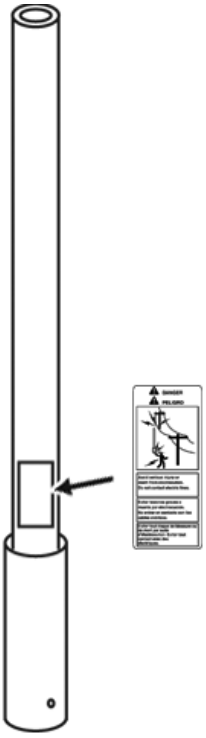


PUPC000036 —UN—09DEC09

JS56696,00008AC -19-03JUN10-1/1

Antenna Front View Decal

CAUTION: To avoid serious injury or death from electrocution. Do not come into contact with electrical lines.



Antenna Front View Decal Location

PUPC000037 —UN—10DEC09

USA, Canada, Australia and New Zealand Antenna Decal

PC13795 —UN—25MAY11

General Antenna Decal (except for US, CA, NZ and AU)

DK01672,000014B -19-26JUL11-1/1

FCC NOTIFICATIONS TO USER

FCC NOTIFICATION

These devices comply with Part 15 of the FCC Rules Operation subject to the following two conditions.

1. These devices may not cause harmful interference.
2. These devices must accept any interference received, including interference that may cause undesired operation.

These devices must be operated as supplied by John Deere Ag Management Solutions. Any changes or modifications made to these devices without the express written approval of John Deere Ag Management Solutions may void the user's authority to operate these devices.

DK01672,0000136 -19-22JUL11-1/1

450 MHz RTK

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at the user's expense.

DK01672,0000137 -19-22JUL11-1/1

COUNTRY USE RESTRICTIONS

The John Deere RTK Radio 450 is designed to operate on frequency ranges, the exact use of which differs from one region and/or country to another. The user of the radio modem must take care that the said device is not operated without permission of the local authorities on frequencies other than those specifically reserved and intended for use without a specific permit. Refer to table **Radio Power Setting to Meet Licensed ERP** in this OM.

IMPORTANT: Please contact your local radio authorities for country specific regulations and licensing

DK01672,0000108 -19-15JUL11-1/1

Licensing of John Deere RTK Radio 450

The standard (869MHz, 900MHz) RTK product sold by John Deere uses ISM band radios. These radios do not require licensing by the end user. The radios are limited to a specific frequency range and 1W/ 0.5W maximum output power. While this system works for the majority of applications, the reliability of the RTK link may become limited when passing through trees and dense foliage.

The intent of RTK Radio 450 is to increase the range and reliability of the RTK link. To overcome the attenuation of adverse field conditions, transmission power greater than standard (869MHz, 900MHz) RTK is needed. While there is some added benefit from using a radio with lower frequency and longer wavelength, the signal strength is the dominant factor in the radio link reliability. To legally transmit at a higher power, RTK Radio 450 uses a licensed band radio. The end user of the licensed band transmitting radio is responsible for obtaining and maintaining a valid site license from the local spectrum authorities. In RTK Radio 450 system, this requires a license for each base station and repeater.

Vehicle radios in RTK Radio 450 system are not transmitters. Since they only receive corrections from the base or repeater, RTK Radio 450 vehicle radios do not require a site license.

An end user can apply for the license by applying directly to the local spectrum authority:

NOTE: Visit www.StellarSupport.com for license request examples and links to Authority for different countries.

An end user can also apply with the aid of a frequency coordinator. A frequency coordinator is a private company that has been certified by the local frequency spectrum authority to recommend and aid in the application for a licenses. For a fee, these third party coordinators will reduce the complexity and confusion of the application process. However, the final responsibility of the license still resides with the end user.

Check **www.StellarSupport.com** for country specific instructions on how to obtain a site license.

IMPORTANT: Please contact your local radio authorities or partnering frequency coordinator for region specific regulations and licensing.

License Renewal Scams

After being granted a license for RTK Radio 450 radio, base station operators should be aware of license renewal scams. Spectrum licenses are public record. Other companies could retrieve licensee information and then mail current license holders offers to prepare applications for license renewal. The letters contain warnings that there will be monetary penalties if the licensee does not comply. These companies are not affiliated with government spectrum authorities. They are taking advantage of the public record and the licensee's desire to comply with the law. Their intention is to charge a "processing" fee on top of the actual amount that a licensee would pay for renewal. While it is important to not let your license expire, licensees should work directly with their local spectrum authority or a certified frequency coordinator. Internet searches of the companies involved usually identify if the company is relevant.

DK01672,0000140 -19-25JUL11-1/1

John Deere RTK Radio 450 Compatability

Base Station	**Vehicle** StarFire iTC	**Vehicle** StarFire 3000
StarFire iTC	**YES**	**YES**
StarFire 3000 + Glonass	**YES**	**YES**
StarFire 3000 + Glonass + Repeaters	**NO**	**YES**

IMPORTANT: If a Repeater is used in the John Deere RTK Radio 450 network it's recommended to use StarFire 3000 receivers only for Base Station and Vehicles. Also uncheck the "Repeater in Network" function in the StarFire setup - Configure RTK Network menu if a StarFire iTC is in the network.

DK01672,0000141 -19-25JUL11-1/1

RTK Base Station Setup

System Overview

The John Deere RTK Radio 450 system consists of a local base station permanently mounted on a structure that transmits high accuracy corrections to the vehicle's StarFire™ receiver using RTK Radio 450 and an optional amplifier (only available in USA and Canada). The StarFire™ receiver on the RTK equipped vehicle must have a direct line of sight with the base station in order to receive the RTK signal. While the higher transmission power and longer wavelength of RTK Radio 450 aids in the transmission through trees and foliage, it will not penetrate through earth in hilly terrains.

Performance of the RTK correction is related to the operating distance from the base station. When operating beyond 20 km (12 mi.), degraded accuracy will occur and it may take longer to initially acquire the RTK signal.

IMPORTANT: The standard (869MHz, 900MHz) RTK system and RTK Radio 450 systems are not compatible. Vehicles with RTK Radio 450 must receive corrections from a RTK Radio 450 attached to the base. Likewise, vehicles with standard (869MHz, 900MHz) radios installed must receive there corrections from a base with a standard (869MHz, 900MHz) radio installed. Different radio models can not communicate with each other since they transmit on different frequencies.

BA31779,00001CE -19-23MAY11-1/1

Vehicle Receiver

RTK Receiver on Top of Cab

Wire Bracket on Top of Cab

Position receiver with integrated RTK radio module is located on top of machine.

Position receiver combines the global positioning signals it receives with the RTK differential correction via the radio link to provide accurate position information to the GreenStar™ system.

The receiver has a dedicated operating mode (Vehicle Mode). Refer to *Operating Mode—RTK* in Section *StarFire 3000* for setup of the receiver on vehicle.

IMPORTANT: The antenna must be installed before the radio module is powered ON.

Avoid water intrusion by keeping the antenna attached whenever possible.

Removing the antenna while powered may damage the radio module.

Mannheim Tractor Conversion Bracket

The RTK Radio 450 system is only compatible with the deluxe shroud. This may require a conversion bracket for installation.

GreenStar is a trademark of Deere & Company

DK01672,000012E -19-21JUL11-1/1

Base Station Setup

The base station is the most critical part of RTK system. During installation, care must be taken to ensure the base has problem-free operation. There are two issues that are responsible for most problems with a base station: Shading and Multipathing. If a base station experiences one of these problems, it could be detrimental to your RTK operation. These issues are shared with the standard (869MHz, 900MHz) RTK system. Mitigation techniques have already been documented in the standard StarFire 3000 – RTK manual that came with the StarFire receiver. This manual provides detailed recommendations to minimizing these errors.

Base station operating mode can be either Absolute Survey Base Mode or Quick Survey Base Mode.

NOTE: Quick Survey Base Mode is for testing purposes only. this mode can be used to test the functionality without doing the 24h measurement with Absolute Survey Base Mode.

Once you have installed the base station receiver, installing the radio in a location to best maximize the output, can be a challenge. Below are several options currently available through John Deere.

- Leave the RTK radio in its original configuration attached directly behind the base station receiver.
- Use PF80821 extension harness [92 m (300 ft.) in length], or PFP10549 MRTK and iGuide harness (5 m), or PFP10540 MRTK and iGuide harness (10 m), or PFP10541 MRTK and iGuide harness (20 m), moving the radio from the back of the base station receiver to an elevated position, and running the harness in between.

  NOTE: It is important to use the PF80821 harness and grounding wire properly according to the installation instructions. This harness has built in protection for both your radio and receiver for unwanted electrical transients developed on the harness.The Maximum recommended harness length is 92m (300ft).

  IMPORTANT: The antenna must be installed before the radio module is powered ON.

  Avoid water intrusion by keeping the antenna attached whenever possible. Removing the antenna while transmitting may damage the radio module.

  IMPORTANT: If using coaxial cable between the radio and the antenna, you need to use the lowest-loss cable available or you may suffer RTK radio link range issues.

- Attach the RTK radio in a secured location and run low-loss coaxial cable between the radio and the antenna.

NOTE: When using this option, it may be necessary to install a higher-gain antenna and/or the optional amplifier (USA and Canada only) to compensate for loss.

John Deere RTK Radio 450 Specifications

Model Number	PFA10094	PFA10095	PFA10096	PFA10097
Country	Russia	Ukraine	EU, BY, KZ, NZ	USA, AU, Canada
Frequency Range	435-447 MHz	440-450 MHz	435-470 MHz	435-470 MHz
Bandwidth Options	12.5 kHz			
Modulation	level 2 GFSK			
RF Baud, 12.5 kHz BW	9.6 kbps at L2			
Frequency Channels	2800 at 12.5 kHz			
Output Power	0.2-2 W			
Sensitivity	-108 dBm at BER 10^-3; -106 dBm at BER 10^-6			
In/Out Impedance	50 ohm			
Operating Voltage	9-15 V DC			
Operating Temperature	-30 to 60° C			
Out RF Connectors	Female TNC			
Control Connector	4-pin Deutsch			

Every RTK Radio 450 radio comes standard with whip antenna that has a TNC connection.

John Deere RTK Radio 450 Whip Antenna Specifications

Model Number	PF81464
Gain	2 dBi
Frequency Range	450-470 MHz
Impedance	50 ohm
VSWR	< 2:1
RF Connector	Female N-Type
Length	13.2 in. (33.5 cm)

Model Number	PFP10612
Gain	1 dBi
Frequency Range	435-450 MHz
Impedance	50 ohm
VSWR	< 2:1
RF Connector	Female N-Type
Length	13.2 in. (33.5 cm)

Continued on next page

John Deere RTK Radio 450 High Gain Antenna

Model Number	PF81452
Gain	7 dBi
Frequency Range	435-470 MHz
Max Power	200 W (UHF)
Impedance	50 OHMS
VSWR	< 1.7:1
RF Connector	N-FEMALE
Length	81 in (2 m).
Fiberglass Tube dia	2 in (5 cm)
Base Pipe	11 in (28 cm) long, 2 3/8 in (6 cm) dia
Wind Survival	100 MPH (161 km/h)

Always mount the radio antenna vertically to make sure that the RTK signal is radiating outwards. If the antenna is at an angle, it may cause the data received at the vehicle to be lower than expected.

NOTE: The RTK Radio 450 whip antenna, PF81464 (450-470 MHz) and PFP10612 (435-450 MHz), looks similar to 900 MHz and 869 MHz RTK whip antennas. To differentiate, it has a white or green stripe near its tip. The white stripe labels the 450 - 470 MHz antenna and the green stripe labels the 435 - 450 MHz antenna.

DK01672,0000145 -19-25JUL11-2/2

Base Station Setup—Amplifier Option (USA and Canada only)

CAUTION: Install and operate the amplifier safely. Read and follow PREVENT ELECTRICAL SHOCK AND FIRES and AVOID EXPOSURE TO HIGH RADIO FREQUENCY FIELDS in the SAFETY section.

The primary reason for RTK Radio 450 is to provide a more robust RTK data link. Signal strength is the dominant factor in the link reliability and range. For areas where there are trees and other foliage, John Deere offers an optional in-line amplifier.

The PF81443 amplifier is a UHF RF power amplifier intended for use in RTK Radio 450 system. It is not intended to be used with standard (869MHz, 900MHz) RTK or any other applications. The amplifier can deliver RF power from 0 to 50 W proportional to the 0 to 2 W input from RTK Radio 450. It covers a frequency range from 450 MHz to 470 MHz. This higher signal strength provides greater range from the base and increased coverage in areas with dense foliage and trees.

This amplifier is inserted between the radio and the base antenna. The amplifier has been designed to function outdoors attached to its mounting plate with sun shade. Mount the amplifier in an area where air can freely circulate around it. If possible, mount in a location shaded from direct sunlight.

Operation of the amplifier inside an enclosure is not recommended. Poor ventilation within the box can cause the amplifier to overheat. While this would not permanently damage the amplifier, it would cause it to stop amplification. The output signal would no longer be strong enough for the vehicles in the field to receive.

Amplifier Assembly

PUPC000027 —UN—06DEC09

Continued on next page

DK01672,0000139 -19-22JUL11-1/2

450 MHz Amplifier Specifications (USA and Canada only)

Model Number	PF81443
Frequency Range	450-470 MHz
Input Power	0-2 W
Output Power	0-50 W
Current During Transmission	8 amp
Nominal Voltage	13.8 V DC
Internal fuse	15 amp
In/Out Impedance	50 ohm
Operating Voltage	11-15 V DC
Max Duty Cycle	100%
Operating Temperature	-30 to 60° C
In RF Connector	Female TNC
Out RF Connectors	Female N-Type
Power Connector	Amphenol (EcoMate C016 20D003 110 12)

There are 3 connections located at the bottom of the power amplifier:

1. 12 VDC power input
2. RF input via TNC connector
3. RF output via N-Type connector

The connectors should only be finger-tight. Using tools can over tighten and damage the RF and power connectors.

A 13.8 V power supply capable of providing a constant 10 amp to the amplifier is required. Amplifier operation with insufficient voltage can lead to higher amplifier operating temperatures. Insufficient current can cause the amplifier to not amplify or only partially amplify the RF signal. These conditions result in incomplete or no RTK transmissions being received by the vehicle.

IMPORTANT: Make sure the antenna and coax are attached before the amplifier module is powered ON or damage to the amplifier could occur. Do not remove the coax or antenna while the amplifier is powered ON. Avoid water intrusion by keeping the connections attached whenever possible.

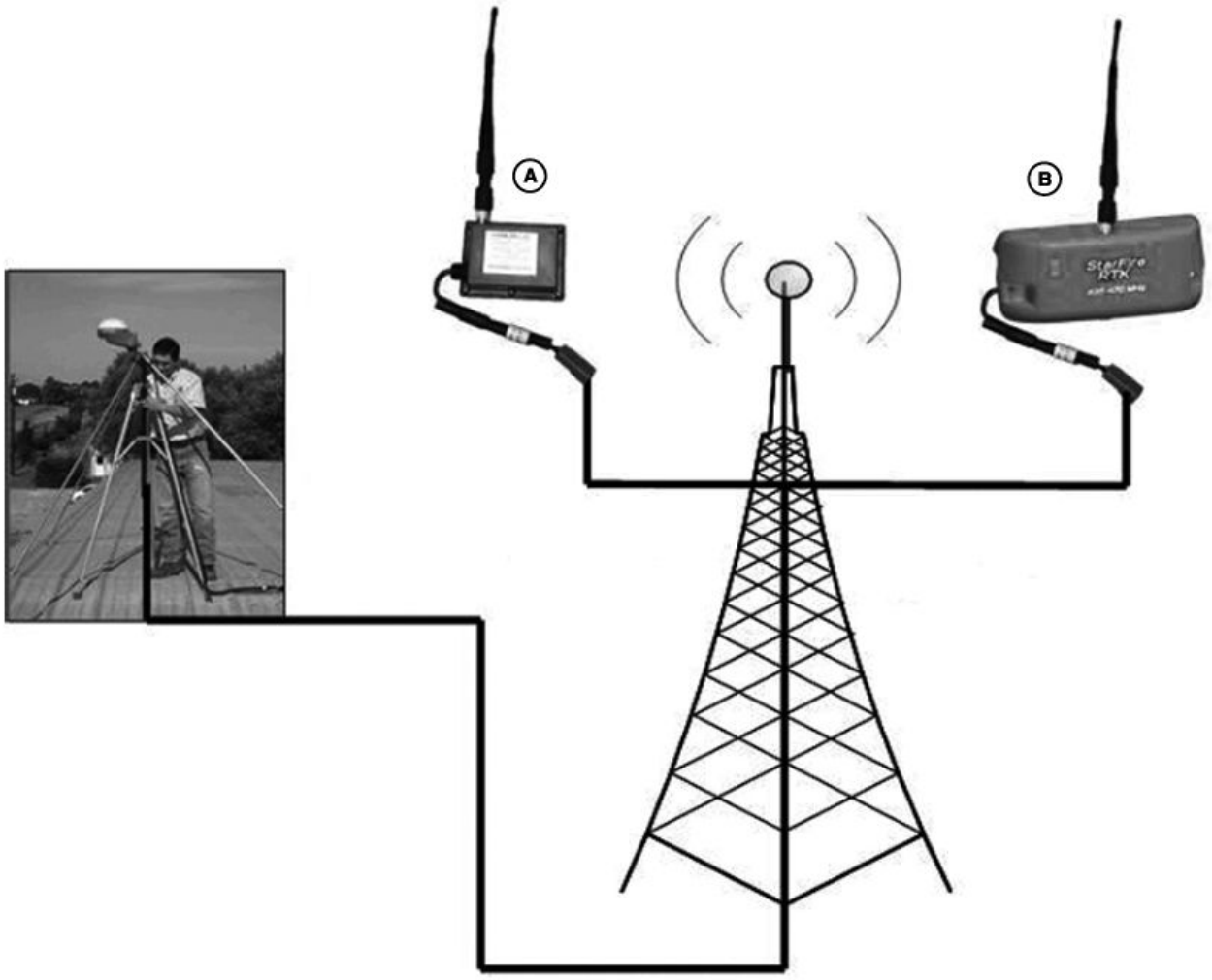
Make sure the power connector is attached and unpowered when handling the RF IN and RF OUT connectors. The ground provided by the power connector protects the amplifier against possible electrostatic discharge.

Amplifier Connection Ports

PUPC000028 —UN—06DEC09

DK01672,0000139 -19-22JUL11-2/2

Base Station Setup—Dual Radio (USA and Canada only)



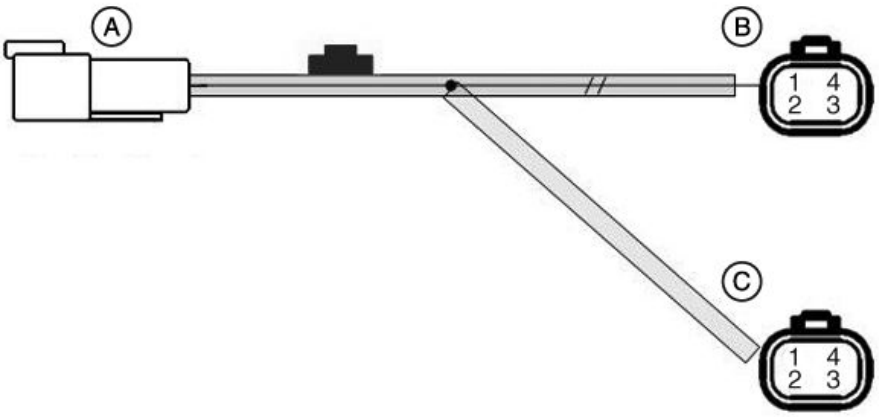
Dual Base Radio Cartoon

A—900MHz RTK Radio **B—RTK Radio 450 with Amplifier**

A single base station receiver can be used to support both the standard 900MHz RTK and the RTK Radio 450 concurrently. An additional harness is required that splits the RS232 correction stream from the StarFire™ receiver into two.

StarFire is a trademark of Deere & Company

Continued on next page



PUPC000030 —UN—07DEC09

Dual Base RTK Harness Schematic

A—StarFire™ Receiver **B—RTK Radio 450 Receiver and Configure** **C—900MHz Radio Receiver Only**

A - StarFire™ Receiver	
Terminal	**Detail**
1	12 V Power
2	Tx (From SF)
3	Rx (To SF)
4	Gnd

B - RTK Radio 450 Receiver and Configure	
Terminal	**Detail**
1	12 V Power
2	Tx (From SF)
3	Rx (To SF)
4	Gnd

C - 900 MHz Radio Receiver Only	
Terminal	**Detail**
1	12 V Power
2	Tx (From SF)
3	None
4	Gnd

Continued on next page

DK01672,00000E7 -19-12JUL11-2/3

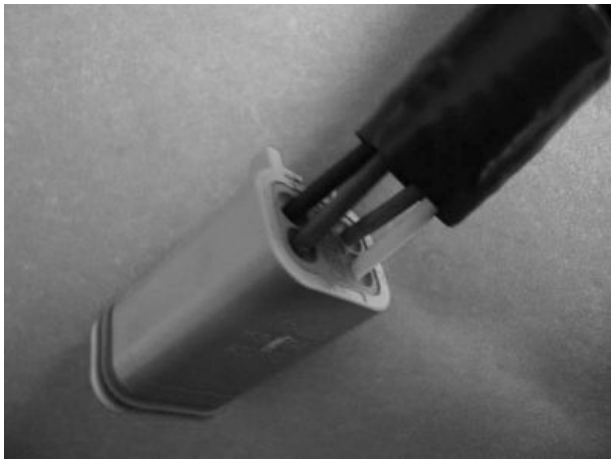
The ability to use a single base station is a substantial reduction in cost and maintenance. The drawback to this method is that only one radio can be configured at a time. A single RS232 port is used by the StarFire™ receiver to communicate with an RTK radio. Two radios can simultaneously receive RTK corrections from the receiver. Unfortunately, the receiver can not process simultaneous messages sent from the radios. The two radios send different messages and interfere. To ensure that this interference does not occur, the dual radio harness has the radio send wire in only one branch.

To prevent network connection errors, a specific procedure must be followed when configuring a base station supporting two radios:

1. Connect the Dual Radio Harness to the StarFire™ Receiver.
2. Power the base station StarFire™ Receiver with only standard 900MHz RTK radio connected to 4-wire Deutsch connector. The receiver must have clear view of the sky.
3. Once the receiver determines its position, configure standard RTK radio Network ID and Radio Channel.
4. Power down the base station StarFire™ Receiver.
5. Disconnect standard 900MHz RTK radio and then connect RTK Radio 450 to the 4-wire Deutsch connector.
6. Once the receiver determines its position and recognizes the radio, configure RTK Radio 450 to comply with the site license.
7. Power down the receiver.
8. With RTK Radio 450 still attached to the 4-Wire Deutsch connector, connect the standard 900MHz RTK radio to the 3-wire Deutsch connector.
9. Power the base station.

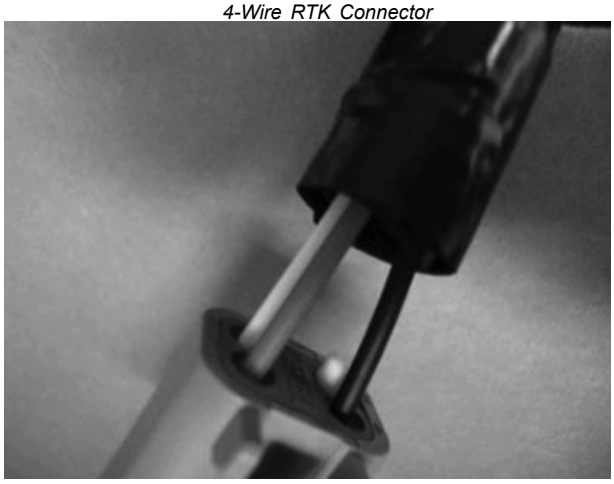
IMPORTANT: Do not attempt to change the radio parameters while both radios are attached. This can corrupt the configuration of 900 MHz radio and may cause problems with rovers liking to it. If this does occur, reconfigure the radios with the process given above.

During normal operation, ensure that RTK Radio 450 is connected to the 4-wire connector and that standard 900MHz RTK radio is connected to the 3-wire connector. If the receiver detects a standard 900MHz RTK radio, RTK Radio 450 link may be compromised. At its lowest data speed, the RTK Radio 450 does not have the capacity to transmit corrections at the Standard 900MHz RTK radio.



PUPC000007 —UN—03DEC09

4-Wire RTK Connector



PC13762 —UN—17MAY11

3-Wire RTK connector

The mandatory narrow bandwidth of the licensed band radio results in a slower over-the-air baud rate because Vehicles using 900Mhz will see fewer messages received when using a dual radio base station as their correction source. In a network with repeaters enabled the RTK message rate will be further reduced.

DK01672,00000E7 -19-12JUL11-3/3

Radio Power Setting to Meet Licensed ERP

The RTK Radio 450 system has been designed to meet a wide range of possible configurations. This gives the end user the ability to optimize the system for their specific location and application. The end user must obtain a site license from the local spectrum authorities. It is the end user's responsibility to ensure that RTK Radio 450 system parameters are configured correctly. Frequency, bandwidth, output power and antenna height must all conform to the granted license.

The frequency and output power of the RTK Radio 450 are programmable by the StarFire™ receiver. The available ranges are:

Frequency	435 – 470 MHz
Frequency Resolution	6.25 kHz
Bandwidth	12.5 kHz
Radio Output Power	0.2 to 2.0 W
Amplifier Output Power	5.0 to 50.0 W

When installing a base station, the total output power of the system must be adjusted to comply with the granted license. Cable losses, connection losses and the antenna gain must be considered when calculating the total system output power. The radio output power is configured using GreenStar 3 System™ Display. Equivalent Radiated Power (ERP) of the radio should be adjusted to ensure that the total RTK Radio 450 system output power complies with the license granted by the local spectrum authority. The following tables can be used to determine the appropriate setting.

NOTE: Cable loss measured on LMR400 Cable.

0.3 dB connector loss estimate included for cables.

0.1 dB connector loss estimate for direct connection of the antenna.

NOTE: The use of an Amplifier is only permitted in the USA and Canada.

Radio Only Power Output

	No Coax			15 ft. (4.6 m)			100 ft. (30.5 m)			200 ft. (61 m)		
Radio Output Power Watts	1dBi Whip	2 dBi Whip	7 dBi Base	1dBi Whip	2 dBi Whip	7 dBi Base	1 dBi Whip	2 dBi Whip	7 dBi Base	1dBi Whip	2 dBi Whip	7 dBi Base
2.0	2.5	3.1	—	2.1	2.6	8.3	1.4	1.8	5.8	0.9	1.2	3.6
1.6	2.0	2.5	—	1.7	2.1	6.6	1.2	1.4	4.6	0.7	0.9	2.9
1.3	1.6	2.0	—	1.3	1.7	5.3	0.9	1.2	3.6	0.6	0.7	2.3
1.0	1.2	1.6	—	1.0	1.3	4.2	0.7	0.9	2.9	0.5	0.6	1.8
0.8	1.0	1.2	—	0.8	1.0	3.3	0.6	0.7	2.3	0.4	0.5	1.4
0.6	0.8	1.0	—	0.7	0.8	2.6	0.5	0.6	1.8	0.3	0.4	1.2
0.5	0.6	0.8	—	0.5	0.7	2.1	0.4	0.5	1.4	0.2	0.3	0.9
0.4	0.5	0.6	—	0.4	0.5	1.7	0.3	0.4	1.2	0.2	0.2	0.7
0.3	0.4	0.5	—	0.3	0.4	1.3	0.2	0.3	0.9	0.1	0.2	0.6
0.3	0.3	0.4	—	0.3	0.3	1.0	0.2	0.2	0.7	0.1	0.1	0.5
0.2	0.2	0.3	—	0.2	0.3	0.8	0.1	0.2	0.6	0.1	0.1	0.4

Radio and Amplifier Power Output (USA and Canada only)

	No Coax			15 ft. (4.6 m)			100 ft. (30.5 m)			200 ft. (61 m)		
Radio Output Power Watts	1 dBi Whip	2 dBi Whip	7 dBi Base	1dBi Whip	2 dBi Whip	7 dBi Base	1dBi Whip	2 dBi Whip	7 dBi Base	1 dBi Whip	2 dBi Whip	7 dBi Base
2.0	61.5	77.4	—	52.4	65.9	208.4	36.2	45.6	144.2	22.9	28.8	91.0
1.6	48.9	61.5	—	41.6	52.4	165.6	28.8	36.2	114.5	18.2	22.9	72.3
1.3	38.8	48.9	—	33.0	41.6	131.5	22.9	28.8	91.0	14.4	18.2	57.4
1.0	30.8	38.8	—	26.2	33.0	104.5	18.2	22.9	72.3	11.5	14.4	45.6
0.8	24.5	30.8	—	20.8	26.2	83.0	14.4	18.2	57.4	9.1	11.5	36.2
0.6	19.5	24.5	—	16.6	20.8	65.9	11.5	14.4	45.6	7.2	9.1	28.8
0.5	15.5	19.5	—	13.2	16.6	52.4	9.1	11.5	36.2	5.7	7.2	22.9
0.4	12.3	15.5	—	10.4	13.2	41.6	7.2	9.1	28.8	4.6	5.7	18.2
0.3	9.7	12.3	—	8.3	10.4	33.0	5.7	7.2	22.9	3.6	4.6	14.4
0.3	7.7	9.7	—	6.6	8.3	26.2	4.6	5.7	18.2	2.9	3.6	11.5
0.2	6.1	7.7	—	5.2	6.6	20.8	3.6	4.5	14.4	2.3	2.9	9.1

RTK SoftKey

RTK Radio 450 is supported by VI displays. These include GreenStar™ 3 2630 Display, GreenStar™ 2 2600 Display and SDUA. Configuration with the original GreenStar™ Display is not supported.

Allows for setup and display of both standard (869MHz, 900MHz) RTK and RTK Radio 450 information:

- Operating Mode
- RTK Network Configuration
- Base Station Data
- Radio Data

The RTK Radio 450 shares the same activation as standard (869MHz, 900MHz) RTK. The receiver automatically detects which radio is connected at start-up and adjusts its screens for the appropriate radio when the softkey is pressed.

RTK Radio 450 can be operated in three modes:

- Vehicle
- Quick Survey Base (for testing purposes only)
- Absolute Base

IMPORTANT: Any time the radio is reconfigured or changed, power must be cycled at the GPS receiver before continuing.

Vehicle Mode Select this mode if the receiver is on a vehicle.

Quick Survey Base Mode Select for testing purposes only. This mode can be used to test the functionality without doing the 24h measurement with Absolute Survey Base Mode. Regarding your licence for each base station, the usage of the “Quick Survey” setup is only permitted at the dedicated location as per licence agreement stated.

Absolute Survey Base Mode Select if exact location of guidance tracks need to be stored for future guidance applications without relying on visual reference for track position to align using Shift Track feature. Track 0 must be stored using Current Track 0 in Guidance Setup – Set Track 0 in order to follow previously used tracks. Absolute Base Mode requires 24 hour self survey to be conducted on location before first use. After survey is completed, base station will then transmit corrections. If base station is moved to another position and then returned to original surveyed position, it is very important that base station is mounted in exact same position. Any difference between original surveyed position and mounted position will result in offset of corrected position. For this reason, it is important to mount receiver to a fixed position like a building or post mounted in concrete.

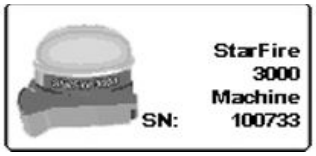
OFF Mode This mode disables all RTK functionality in receiver. RTK Operating Mode must be OFF for normal SF1 or SF2 operation on SF2 licensed receiver.

GreenStar is a trademark of Deere & Company

PC8663 —UN—05AUG05

MENU Button

PC13006 —UN—08NOV10



StarFire iTC Button

PC8681 —UN—05AUG05

RTK Softkey

DK01672,000014C -19-26JUL11-1/1

Screens Common to Standard (869MHz, 900MHz) and RTK Radio 450

When RTK is in the OFF mode, the main pages are common between the two systems. The details of these particular pages are provided in the *StarFire 3000* and *RTK* Operator's Manual. This manual was provided with the purchase on an SF3000 receiver. When in VEHICLE or BASE mode, the pages for RTK Radio 450 system vary slightly from the pages for standard (869MHz, 900MHz) RTK system.

There is single RTK activation that provides access to both standard (869MHz, 900MHz) RTK and RTK Radio 450. The difference between the two systems is the radio hardware. After power is supplied, the receiver links up to the attached radio and shows the relevant screens.

The Rover Access List currently used for standard (869MHz, 900MHz) RTK is unchanged. When upgrading to RTK Radio 450, previous lists remained stored in the receiver. The methods of adding, editing and deleting Rover receiver serial numbers remains unchanged.

Several other features in standard (869MHz, 900MHz) RTK are also provided unchanged in the RTK Radio 450:

- RTK-x
- Optimized shading
- Radio self test page
- Absolute Base Coordinate Setup
- TCM Calibration

NOTE: The John Deere RTK Radio 450 is accessible for configuration when the StarFire has GPS reception.

DK01672,00000EA -19-12JUL11-1/1

RTK Main Page

IMPORTANT: Base station receiver and vehicle receiver must be setup before operating RTK. See *RTK Base Station Setup* Section.

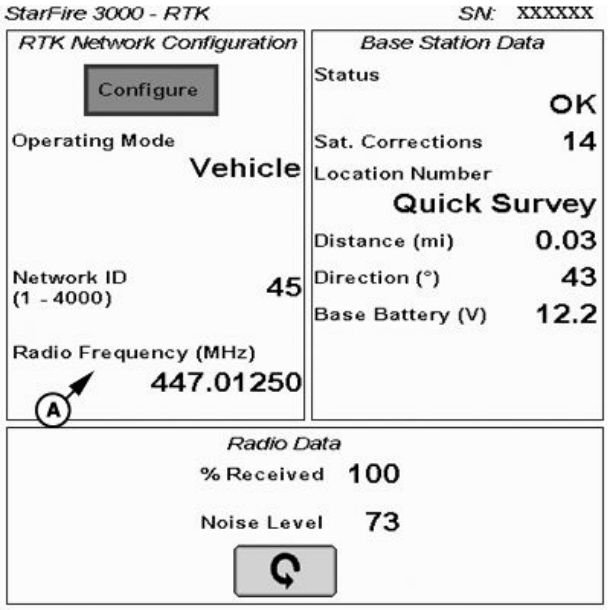
NOTE: Check that base station and vehicle have same Frequency, and Network ID.

RTK Main—Vehicle

The majority of the diagnostics and controls are the same as standard (869MHz, 900MHz) RTK on the RTK Main – vehicle screen. Three items have been modified on the RTK Main Page for RTK Radio 450.

Select: MENU Button >> StarFire 3000™ Button >> RTK Softkey >> OPERATING MODE drop-down box >> VEHICLE

A—The Radio ID control has been replaced with the Radio Frequency (MHz)



RTK Main--Vehicle

StarFire iTC is a trademark of Deere & Company

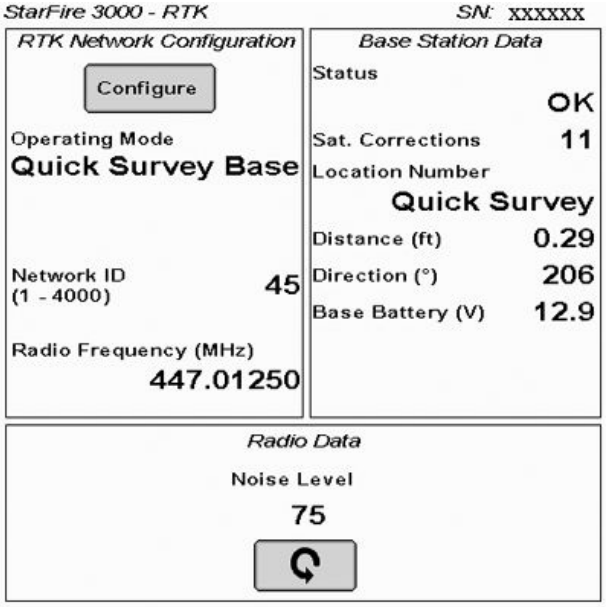
Continued on next page

DK01672,000013B -19-22JUL11-1/2

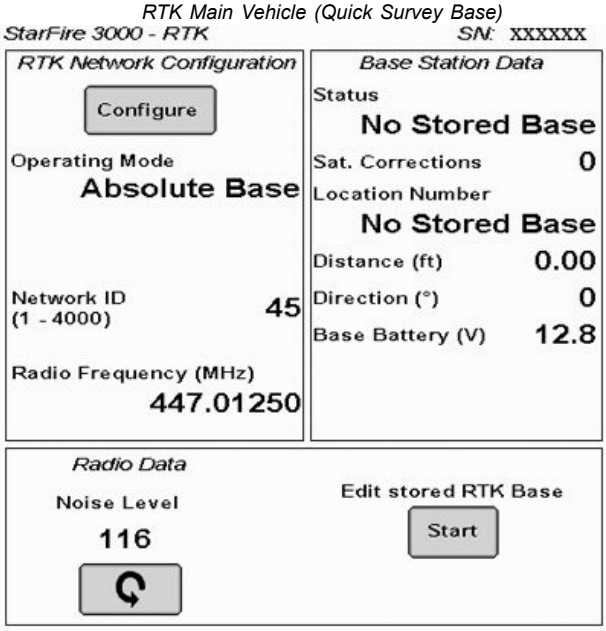
RTK Main—Base Station

The Quick Survey Base and Absolute Base versions of the RTK Main screens also display the frequency of the radio link.

NOTE: The Quick Survey Base Mode is for testing purposes only. This mode can be used to test the functionality without doing the 24h measurement with Absolute Survey Base Mode. Regarding your licence for each base station, the usage of the "Quick Survey" setup is only permitted at the dedicated location as per licence agreement stated.



RTK Main Vehicle (Quick Survey Base)



RTK Main Vehicle (Absolute Base)

DK01672,000013B -19-22JUL11-2/2

RTK Configure Page

The frequency and power settings for standard (869MHz, 900MHz) RTK are fixed to comply with ISM band requirements. For RTK Radio 450, these settings can be controlled and are the responsibility of the end user. Besides the Network ID on the RTK Main screen, there are four parameters that manage the radio link between the vehicle and Base: Radio Frequency, Bandwidth, Data Rate and Power.
The **Operation Mode** provides the setup for Absolute Base, Quick Survey Base, Vehicle or to shut RTK off.

The **Radio Frequency** is the center frequency of the link shared between the Base and Rover.

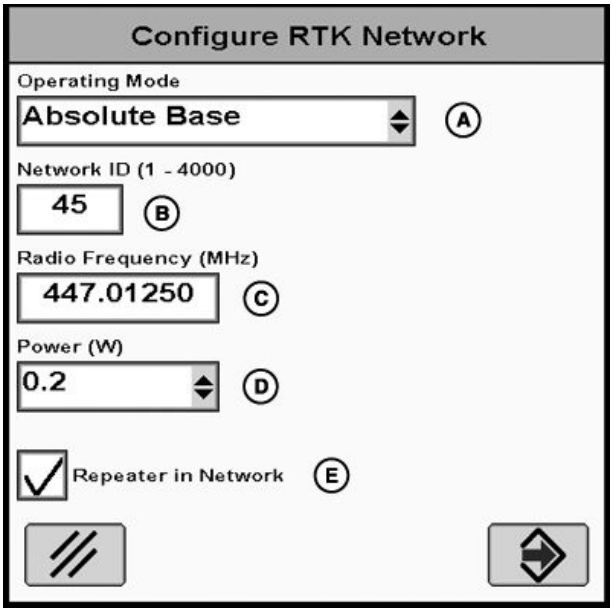
The **Network ID** for base station and vehicle receiver must match. If more than one base station with the same Network ID numbers are within range, vehicle may lock on to either one of the base stations. to prevent this from happening, be sure to use unique network ID.

The **Repeater in Network** check box needs to be checked if a repeater is in the network setup.

Press: MENU Button >> StarFire3000™ Button >> RTK Softkey >> Radio Configure Button

The output power control is only displayed when the receiver is set to Quick Survey Base or Absolute base Operating Modes. When the receiver is set as a Vehicle, the radio output power is not visible since it is a receiver only.

StarFire iTC is a trademark of Deere & Company



Configure Radio Screen

A—Operation Mode
B—Network ID
C—Radio Frequency
D—Power
E—Repeater in Network

The cancel button disregards any input to the Radio Configure screen and returns the user to the RTK Main page.

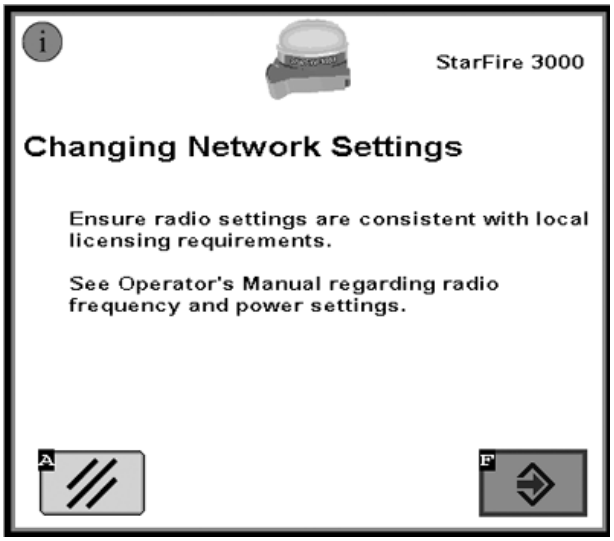
DK01672,000013C -19-22JUL11-1/3

When a valid set of parameters is entered, a confirmation screen will pop-up reminding the user not to vary from the parameters designated in the license.

The RTK Radio 450 system is capable of operating over a wide range of frequency and power settings. Since the final license parameters granted to the customer is unknown to the manufacturer, this system flexibility exists to enable use by a large range of customers and markets. The end user has the responsibility of configuring the system parameters to meet the license granted them by the local spectrum authority. Frequency, and output power (if a base or repeater) will be designated by the local license, and the base must be set to comply with these specifications.

NOTE: See Operator's manual regarding radio frequency and power settings. Ensure radio settings are consistent with local licensing requirements.

See users manual regarding radio frequency and power settings.

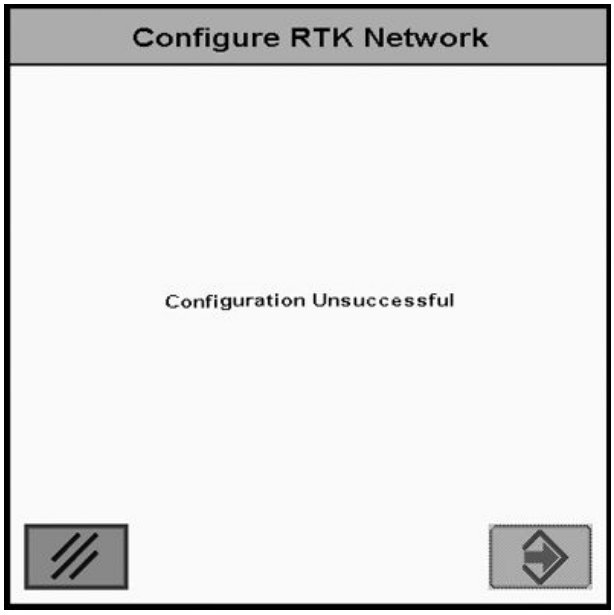


Continued on next page

DK01672,000013C -19-22JUL11-2/3

When the return button is pressed, verification is made on the input radio parameters. If the combination inputs are invalid, a pop-up screen will appear to communicate this.

NOTE: Configuration Unsuccessful.



PC13861 —UN—13JUL11

Configuration Unsuccessful

DK01672,000013C -19-22JUL11-3/3

Diagnostic LEDs

A key aid to gain insight into the working state of the RTK Radio 450 system are the LEDs on both the RTK radio and the in-line amplifier (USA and Canada only). These diagnostic lights can be used during setup, maintenance and troubleshooting.

DK01672,00000F2 -19-13JUL11-1/1

RTK Radio 450 LEDs

There are three radio LEDs. They can be seen after the radio has been powered. They are viewed through a small window on the front of the radio.

The LEDs can be used to determine
- ☐ Is the radio powered?
- ☐ Is the radio configured as a Base Station or a vehicle?
- ☐ Is the radio searching or linked?
- ☐ Is the radio in configuration mode?

The radio enters configuration mode when parameters are being read/set or when diagnostics are being retrieved. While in configure mode, the radio does not transmit or receive communications.

The meanings of the radio LED states are provided in the table below.

PC13863 —UN—13JUL11

LED Window

A—LED Window

DK01672,0000174 -19-09AUG11-1/2

RTK Radio 450	Base Station (TX)	Vehicle (RX)	Repeater (RX/TX)
Searching	Master does not search. See Linked and Master Transmitting	Solid Red Off Slow Blinking Red	Solid Red Off Slow Blinking Red
Linked and Master Transmitting	Solid Red Fast Blinking Red Off	Solid Green Off Solid Red	Solid Green Fast Blinking Red Solid Red
Configuring	Solid Green Solid Green Solid Green	Solid Green Solid Green Solid Green	Solid Green Solid Green Solid Green

PC13864 —UN—13JUL11

Radio LEDs Table

DK01672,0000174 -19-09AUG11-2/2

Amplifier LEDs (USA and Canada only)

There are four amplifier LEDs. They are located on the side of the amplifier.

The LEDs can be used to determine
- ☐ Is the amplifier powered?
- ☐ Is there an internal failure?
- ☐ Is the radio signal being amplified?
- ☐ Is the amplifier setup causing it to overheat?
- ☐ Is the antenna or its connection path faulty?

The LEDs operate in two states: *Start Up* and *Operation*.

After the amplifier is initially powered, the amplifier strobes through each LED sequentially. This rapid flashing sequence indicates that the internal firmware test sequence is initiated. It checks the power to the unit and the integrity of internal components.

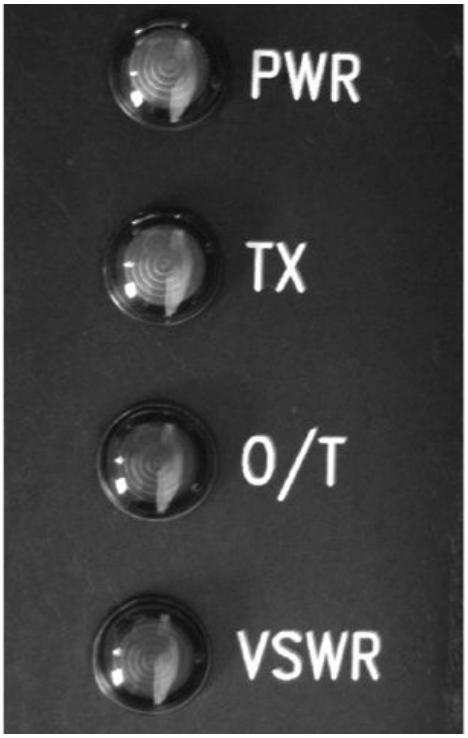
The outcome of a successful startup test sequence results in only the PWR LED on. The outcome of an unsuccessful startup sequence results in the PWR LED and any of the red LEDs on. These red LEDs indicate a failure.

During normal operation after a successful startup, each amplifier LED has a specific meaning.

Power LED Indicates that the amplifier has DC power.

TX LED Indicates that an RF signal is being actively amplified and transmitted. This light blinking indicates normal function.

O/T LED Indicates that the unit has exceeded its internal temperature limits. When this light is on, the unit will cease amplification. This allows the unit to cool and prevents permanent damage.



PUPC000031 —UN—07DEC09

Amplifier LED

VSWR LED Indicates that the antenna path is faulty. When this light is on, the unit will cease amplification. This prevents the output power from being reflected back into the amplifier and causing permanent damage.

DK01672,000010A -19-15JUL11-1/1

RTK Radio 450 Performance

RTK Radio 450 Accuracy

The accuracy of RTK Radio 450 is the same as standard (869MHz, 900MHz) RTK. The UHF link is more robust, but the content sent by the StarFire RTK™ base to the vehicle is identical.

StarFire RTK™ delivers 1 in. repeatable accuracy. RTK accuracy is expressed as an absolute value (without +/-) because RTK performance is not subject to GPS drift over time. RTK accuracy levels are described on a static basis measured at the vehicle receiver, 68 percent of the time, within 12 mi. (20 km) line of sight with the base station, assuming unobstructed view of the sky, favorable PDOP, and correct base station setup.

StarFire RTK is a trademark of Deere & Company

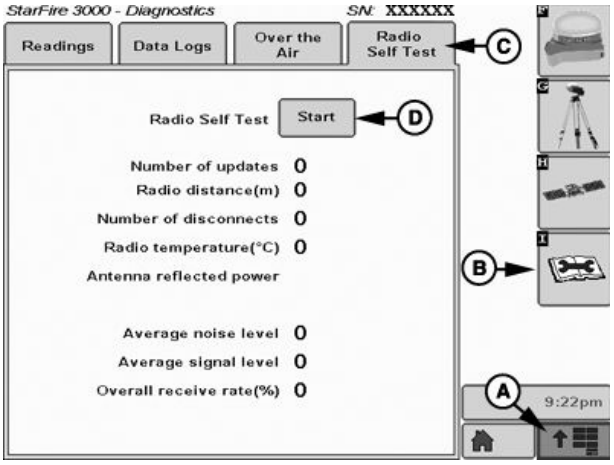
DK01672,00000F7 -19-13JUL11-1/1

Radio Self Test

A Radio Self Test can be performed in the StarFire 3000 Diagnostics menu.

Select: MENU Button (A)>> StarFire 3000™ Button>> Diagnostics Softkey (B) >> Radio Softkey (C) >> Start Button (D).

A—Menu Button
B—Diagnostics Softkey
C—Radio Selftest tab
D—Start



PC13865 —UN—13JUL11

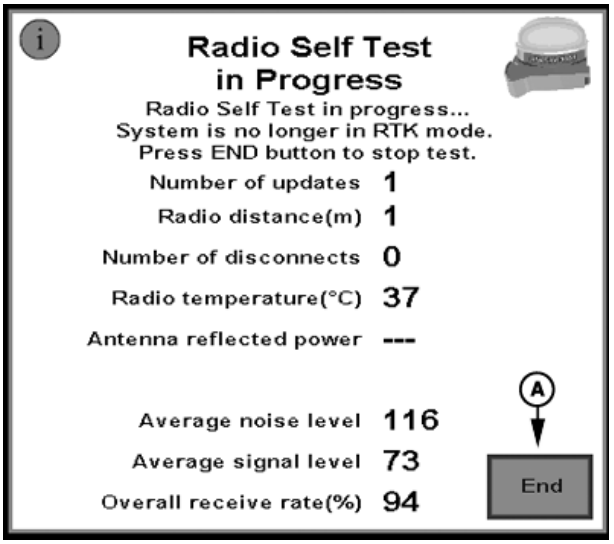
StarFire is a trademark of Deere & Company

DK01672,000014D -19-26JUL11-1/3

When the test is running the screen changes. Number of updates shows how many times the test is performing. The other values show the distance from the radio to the base or repeater station where it's receiving the signal, the number of disconnects, radio temperature, antenna reflected power, average noise and signal level and the overall receive rate.

In order to stop the Radio Self Test press the End button (A).

A—End Button



PC13866 —UN—13JUL11

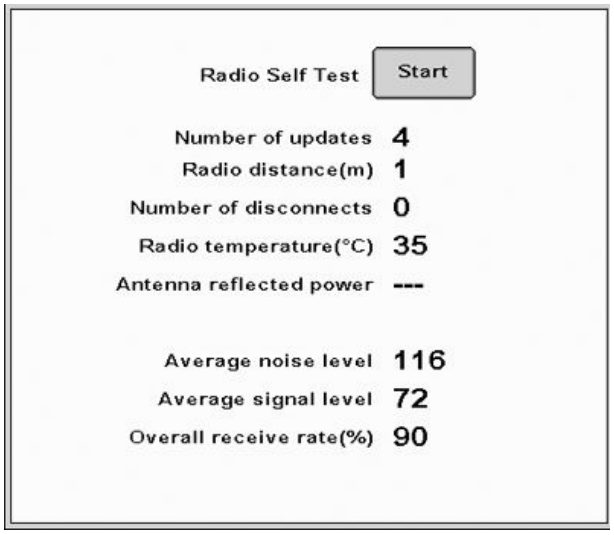
Radio Self Test

Continued on next page

DK01672,000014D -19-26JUL11-2/3

The result of the last performed test is shown on the Radio Self Test main screen.

- **Number of Updates:**
  Indicates how many times the Radio Self Test was performed.
- **Radio Distance:**
  Indicates the distance in meters between the selected radio (vehicle) and the radio to which the selected radio is directly linked (Base/Repeater). It is typically accurate to within 30 meters for distances over one Km (0.6 miles). This calculation is performed by the radios independent of the GPS receivers.
- **Number of Disconnects:**
  Indicates how many times a disconnect occurred during this test.
- **Radio Temperature:**
  Shows the radio temperature.
- **Antenna Reflected Power:**
  A measurement of the transmitted power reflected back into the transceiver from mismatched antennas or cables, or loose connections between the transceiver and antenna.
- **Average Noise Level:**
  The average noise level indicates the average power of background noise and interference at the transceiver. Ideally, noise level value should be greater than 120 and the difference between the average signal level and average noise level should be 26 dB or more. Noise levels significantly higher than this are in indication of a high level of interference that may degrade the performance of the link.



PC13867 —UN—13JUL11

Radio Self Test Main

- **Average Signal Level:**
  The average signal level indicates the average power of the received signal for the attached radio. For a reliable link, the average signal level should be between 35 and 106. The difference between the average signal level and the average noise level should also be at least 26 dB.

DK01672,000014D -19-26JUL11-3/3

Line of Sight

Line of sight is the direct path between two points, free of obstacles. For the RTK application, this is the line between the base and vehicle antennas. Typical obstructions include:

- Trees and foliage
- Buildings or other man-made objects
- Terrain variation, such as hills or valleys
- Curvature of the Earth

The higher RF power of RTK Radio 450 will reduce attenuation due to plants and small variations in terrain.

Blockage due to man-made objects can be reduced through planning of the base antenna location. Similar to analysis performed to locate the StarFire™ receiver installation, the transmitting antenna should be located away from nearby obstructions.

To deal with obstructions away from the base, small terrain variations and the curvature of the Earth, the antenna should be placed as high as possible. The local spectrum authority will limit the range and potential interference of the base station signal by setting a maximum power and maximum antenna height. End users should install their base antenna to the maximum height allowed for best performance.

StarFire RTK™ retains its published accuracy to 12 mi. (20 km). If consistent with the granted site license, it is recommended that antennas are mounted ≥ 30 m (100 ft.) to ensure the full range of coverage. The table below relates the base antenna height to the line-of-sight to the base radio horizon.

Base Height	Base Station Radio Horizon	Base Height	Base Station Radio Horizon	Line of Sight
ft.	*mi.*	*m*	*km*	
148	16.3	45	26.3	Strong
131	15.4	40	24.8	
125	15.0	38	24.2	
115	14.4	35	23.2	
98	13.4	30	21.5	Good
82	12.2	25	19.6	
66	10.9	20	17.6	Marginal
49	9.4	15	15.2	
33	7.7	10	12.4	Poor
20	6.0	6	9.6	
10	4.2	3	6.8	
5	3.0	1.5	4.8	

PC9393 —UN—23OCT06

In order to maintain a good RTK Radio link, the antenna must be mounted high enough to radiate over the earth's curvature and any obstacles. As shown in the figure, the curve of the earth can block the signal from the RTK link. If the radiating base station radio antenna is mounted too low, the broadcasting range will be drastically reduced.

Antenna Height

RTK Shared Base Station: Antenna Height

Continued on next page

Operation of Vehicle Next to Base

Depending on the base station setup, operation of vehicles directly under or next to the base may be limited. The RTK Radio 450 system has both higher power and higher signal sensitivity than standard (869MHz, 900MHz) RTK. A consequence of this is that radio signals in the immediate vicinity of the transmitter may be too strong for the receiving radios. For base stations that serve vehicles at both ≥20 km and ≤ 1 km from the base, it may be necessary to add inline RF attenuators to the rovers operating directly under the base. Attenuator specifications: RF load of 15 dBm, capable of 2W, inline female TNC to male TNC.

BA31779,00001D7 -19-23MAY11-1/1

EC Declaration of Conformity

Deere & Company
Moline, Illinois U.S.A.

The undersigned hereby declares that:

Product: John Deere RTK Radio 450

Part Number: PFA10096

fulfills all relevant provisions and essential requirements of the following directive(s):

Directive	Number	Certification Method
Radio and Telecommunications Terminal Equipment Directive (R&TTE)	1999/5/EC	Annex IV (Notified body)

The product is in conformity with the following standards and/or other normative documents:

EN 60950-1: 2006
EN 60950-22: 2006
ETSI EN 301 489-1: 2008 (v.1.8.1)
ETSI EN 300 113-1: 2009 (v.1.6.2)
ETSI EN 300 113-2: 2009 (v.1.4.2)

Notified body involved:

Nemko AS
Gåsevikveien 8
2027 Kjeller, Norway
Identification mark: 0470

Name and address of the person in the European Community authorized to compile the technical construction file:

Brigitte Birk
Deere & Company European Office
John Deere Strasse 70
Mannheim, Germany D-68163
EUConformity@JohnDeere.com

Place of declaration: Kaiserslautern, Germany

Date of declaration: 18 May 2011

Manufacturing unit: John Deere Intelligent Solutions Group

Name: Aaron M. Senneff

Title: Engineering Manager, John Deere Intelligent Solutions Group

CE 0470

PC14001 —UN—24AUG11

JS56696,0000A51 -19-24AUG11-1/1

Index

John Deere Service Literature Available

Technical Information

Technical information can be purchased from John Deere. Some of this information is available in electronic media, such as CD-ROM disks, and in printed form. There are many ways to order. Contact your John Deere dealer. Call **1-800-522-7448** to order using a credit card. Search online from http://www.JohnDeere.com. Please have available the model number, serial number, and name of the product.

Available information includes:

- PARTS CATALOGS list service parts available for your machine with exploded view illustrations to help you identify the correct parts. It is also useful in assembling and disassembling.
- OPERATOR'S MANUALS providing safety, operating, maintenance, and service information. These manuals and safety signs on your machine may also be available in other languages.
- OPERATOR'S VIDEO TAPES showing highlights of safety, operating, maintenance, and service information. These tapes may be available in multiple languages and formats.
- TECHNICAL MANUALS outlining service information for your machine. Included are specifications, illustrated assembly and disassembly procedures, hydraulic oil flow diagrams, and wiring diagrams. Some products have separate manuals for repair and diagnostic information. Some components, such as engines, are available in separate component technical manuals
- FUNDAMENTAL MANUALS detailing basic information regardless of manufacturer:
  - Agricultural Primer series covers technology in farming and ranching, featuring subjects like computers, the Internet, and precision farming.
  - Farm Business Management series examines "real-world" problems and offers practical solutions in the areas of marketing, financing, equipment selection, and compliance.
  - Fundamentals of Services manuals show you how to repair and maintain off-road equipment.
  - Fundamentals of Machine Operation manuals explain machine capacities and adjustments, how to improve machine performance, and how to eliminate unnecessary field operations.

TS189 —UN—17JAN89

TS191 —UN—02DEC88

TS224 —UN—17JAN89

TS1663 —UN—10OCT97

DX,SERVLIT -19-31JUL03-1/1

John Deere Service Keeps You On The Job

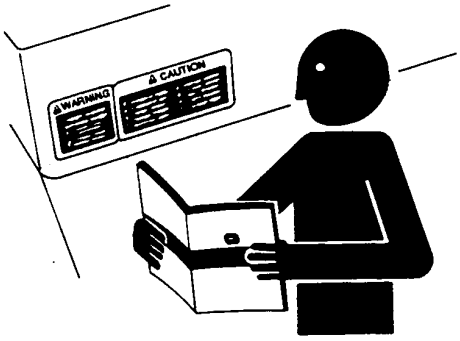
John Deere Is At Your Service

CUSTOMER SATISFACTION is important to John Deere.

Our dealers strive to provide you with prompt, efficient parts and service:

–Maintenance and service parts to support your equipment.

–Trained service technicians and the necessary diagnostic and repair tools to service your equipment.



TS201—UN—23AUG88

CUSTOMER SATISFACTION PROBLEM RESOLUTION PROCESS

Your John Deere dealer is dedicated to supporting your equipment and resolving any problem you may experience.

1. When contacting your dealer, be prepared with the following information:

–Machine model and product identification number

–Date of purchase

–Nature of problem

2. Discuss problem with dealer service manager.

3. If unable to resolve, explain problem to dealership manager and request assistance.

4. If you have a persistent problem your dealership is unable to resolve, ask your dealer to contact John Deere for assistance. Or contact the Ag Customer Assistance Center at 1-866-99DEERE (866-993-3373) or e-mail us at www.deere.com/en_US/ag/contactus/.

DX,IBC,2 -19-02APR02-1/1