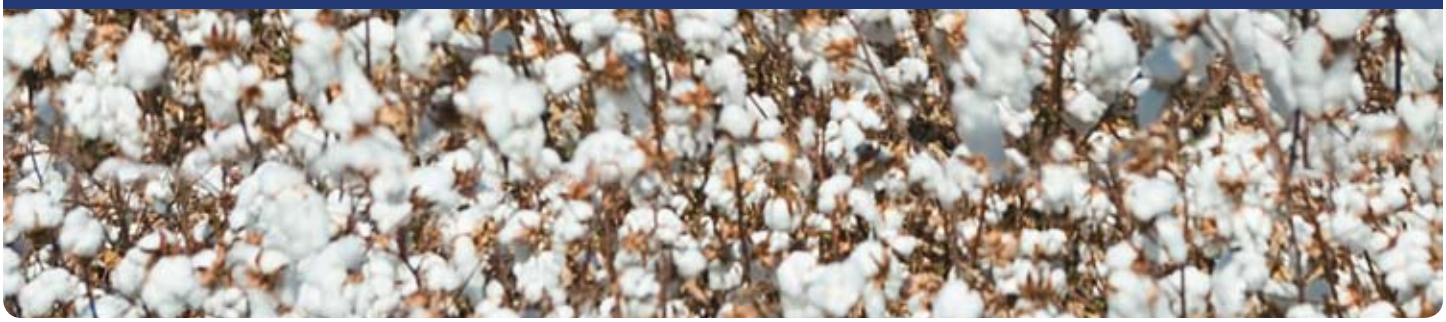
The Spindle-Type Cotton Harvester



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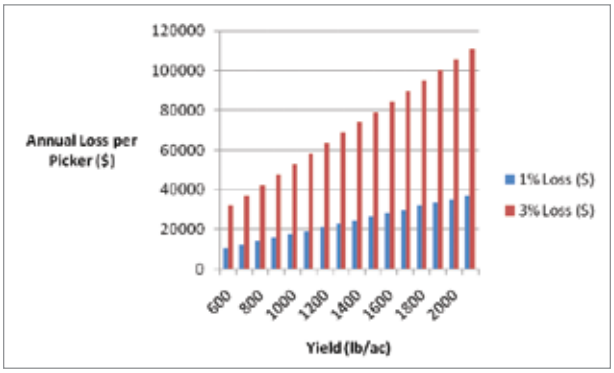
Introduction

The Need for an Expert Operator

Production of high-quality cotton lint begins with variety selection, continues with attention to all production practices, and ends with a well-planned and well-executed harvest. As harvest time nears, critical crop management decisions include scheduling defoliation, defoliating effectively, and timing harvest to get the best lint quality and yield.

Lint Quality

Lint quality is best when the cotton bolls first open and dry out. Several factors may cause you to lose yield and quality, such as weathering after boll opening, harvest delays caused by poor defoliation or timing, improper machinery adjustment, inadequate picking capacity, harvesting or storage of seed cotton with a high moisture content, storage management that allows weather to wet or damage modules before ginning, etc.



Annual loss resulting from a picker capable of harvesting 8 acres per hour during 220 hours of seasonal operation with cotton lint priced at $1 per pound.

Harvester Factors

Harvester adjustment and operation affects quality and yield. Improper adjustment will reduce quality. For example, poor doffing causes spindle twist. When you do not adjust or operate the harvester properly, you will suffer decreased harvesting efficiency or yield loss. Harvester loss level normally decreases as a percentage of total yield as the yield increases.

Picking Efficiency Losses

Spindle pickers are capable of harvesting 95-98% of the cotton produced, but some producers experience field harvest loss approaching 20%. Several problems can cause picking efficiency losses:

Good picking efficiency.

- Row units not centered on the row (driver error or row tracking adjustment)
- Picking too soon after applying defoliants (bolls not open and dried)
- Picking immature crop with bolls that did not open due to early frost or freezing conditions
- Selecting varieties with highly “storm-proof” (less open) bolls
- Compressor door tension and spindle tip clearance not adjusted correctly
- Poor doffer adjustment relative to spindle position
- Worn spindles, spindle bushings, or doffers

Poor picking efficiency due to hard locks.

- Poor spindle cleaning due to heavy plant buildup (green leaves) or inadequate moistening system adjustment
- Poor doffing (excessive doffer-to-spindle gap, bar heights not correctly adjusted)
- Losses in the handling system

Read Your Operator’s Manual

This information is intended to supplement, not replace, your operator’s manual. Based on years of research, development, and operation, the manual supplies common procedures for successful operation and adjustment. Read and understand the operator’s manual – paying close attention to the safety procedures – before operating your harvester. When you are in doubt or need further clarification, consult the dealer representative or others who are knowledgeable about your machine.

Maximizing Harvester Capacity and Productivity

Cotton budgets suggest harvesting expenses are about 16% of crop production costs in the spindle-picked regions of the U.S. In other words, harvesting will cost you about $110 per acre, which equals cost of fertilizer and seed and associated technology fees. Proper management decisions can dramatically influence these costs. Following are several steps to help you reduce harvesting costs:

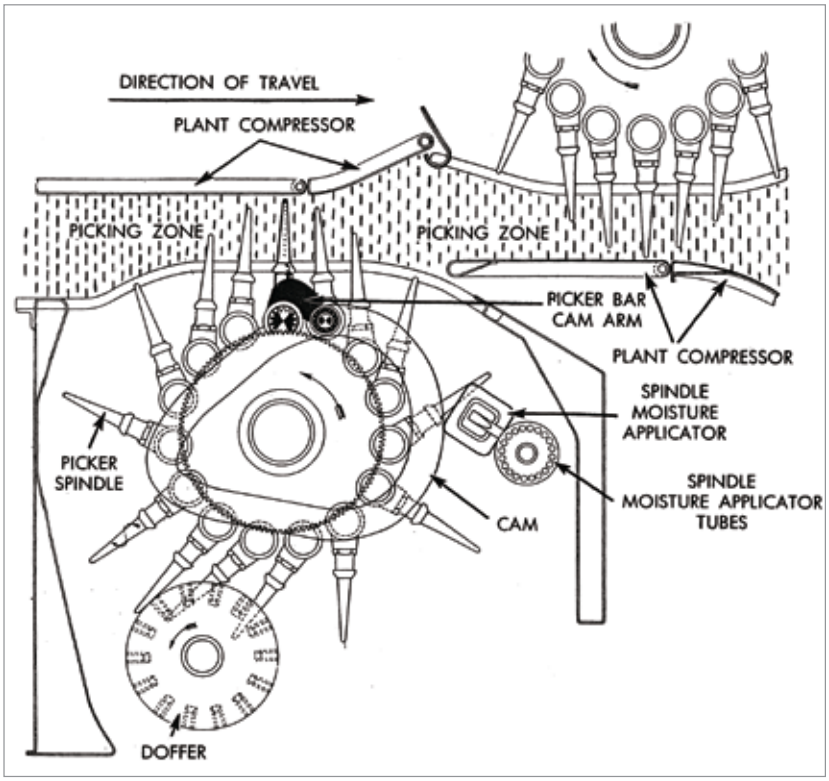
- Spread the principal and interest costs over more acres by operating more hours per season.
- Increase the capacity (field efficiency) of your harvester operation to gain more actual picking time.
- Arrange field layout to obtain longer rows.
- Arrange field layout to have row end turning distances that will allow you to resume picking quickly after turning.
- Alternatively, you can plant across row ends and then shred stalks to provide a turn space for the field harvest.
- Arrange operations so that the picker turns from longer to shorter rows where rows intersect the turn row at an angle.
- Minimize picker road travel with deliberate plans for field and crop selection and management practices.
- Minimize harvest downtime with improved service and maintenance procedures.
- Provide proper support equipment to obtain minimum unloading times.

- Improve operator skills through training programs and field “coaching.”
- Choose row patterns to obtain a wider harvester swath without lowering yields. For example, use 38-inch rows instead of 30-inch rows or use skip-row planting instead of solid planting (Buehring, et al.).

Picker Drum Arrangements

All pickers manufactured in the U.S. have two drums in a tandem or staggered, opposed drum arrangement. Early research during spindle-picker development compared drum positions on the same side of the row (in-line) and on opposite sides of the row (opposed drum), as well as different numbers of spindles per bar and bars per drum with a variety of plant sizes and cotton conditions. The front drum of the row unit harvests about 75% of the cotton. Current production pickers have a top-to-bottom spindle contact area of about 30 inches using 18 or 20 spindles per bar. Spindles are spaced 1.625 inches along the bar. Bar cams and cam tracks cause spindles to enter a cotton row pointed slightly toward the rear of the picker and quickly swing to aim slightly forward as they retreat from a row. Bar travel must synchronize with ground speed, causing the spindles’ motion relative to the stalk to be “into” and “out of” the row. When bars are not synchronized with ground travel, spindles typically cause damage on the front or rear of the stalks. Incorrect picker tire size, belt slippage of belt-driven picker units, improper picker

Spindle damage to stalks is about equal, indicating good synchronization of ground speed and the bars/ spindles.



A 1946 diagram used to explain how an opposed-drum cotton picker works.

adjustment, and incorrectly assembled row-unit drive components are some reasons bars do not synchronize. These situations will result in harvest of trashy seed cotton and excessive power and wear to the row units.

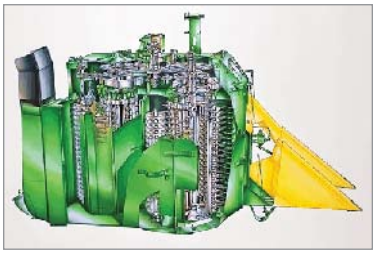
Opposed Drums

The first cotton pickers introduced had row units with two drums – one on each side of the row. Cotton production at that time had been standardized to 38- to 40-inch rows. So the row units were designed without much consideration of width, other than to prevent the sides from interfering with adjacent rows. The rear drum was generally located just behind the front drum so that the bars of spindles did not interfere. However, length (weight) of the row unit was as short as possible (close to the tractor or carrier).

In the current design, row units are lengthened to allow them to nest and provide a minimum row spacing of about 28-30 inches. These machines have left- and right-handed bars, cam tracks, spindles, and spindle nuts, which increases the number of different parts required to repair a row unit. This design can also cause confusion, leading to spindles being placed in the wrong spindle nut and bar. Such a mistake would cause the spindle to turn in the wrong direction to wrap cotton and then be doffed. Wrong-handed spindles installed in a row unit will wear out doffer and moistening pads and will not pick cotton. The advantage of opposed drum-row units is that they pick from both sides of the plant and will pick a slightly greater percentage of the cotton from the stalk in some field conditions.

In-Line Drums

In-line drum arrangements have both drums on the right side of the row and only pick from that side of the plant. These units have all right-handed bars, spindles, spindle nuts, and cam tracks for front and rear drums. This arrangement is an advantage for the manufacturer and the producer in parts stocking and assembly.



In-line row unit with both drums on the same side of the row.

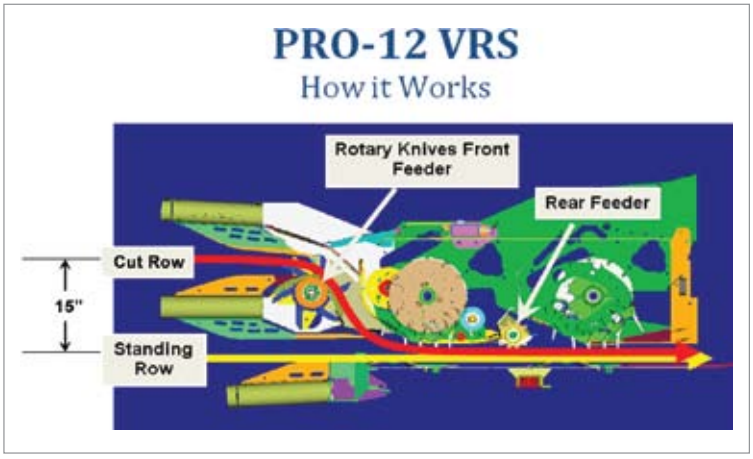
VRS Row Units

Variable-Row-Spacing (VRS) pickers have the capability to harvest narrower rows (15-inch rows and skip-row planting patterns). A cutter mechanism ahead and to the right of the front picker drum

cuts and feeds unpicked stalks into the uncut adjacent row. Plants in the left row remain uncut and are picked in the normal fashion with in-line drums. When skips occur in the uncut row, modified ribs on these front drums and feeder fingers between the drums help move cut stalks through this row unit.

This VRS design is a picker option for cotton growers with lower-yielding soils where narrow-row production is more economical or for growers who use certain skip-row patterns with 15-inch row spacing. This design allows the row units to be spaced wider apart and achieve a 45-inch (two planted, one skipped 15-inch drills) or 60-inch (two planted, two skipped 15-inch drills) effective picking width per row unit. Research has shown that these row patterns yield about the same amount of cotton as conventionally planted 15-inch, 30-inch, and 38- to 40-inch plantings. (See Buehring, et al., “Nonirrigated Spindle Picker 15-Inch and Wide-Row Cotton Production Systems Analysis.”)

15-inch dual row units in a modified skip-row pattern.



Seed Cotton Handling Systems

Three methods of handling picked cotton are available, each requiring unique procedures, equipment, and harvest personnel. Each harvesting system has comparative advantages and limitations.

Basket-Based (Conventional) System

Pickers with simple basket systems typically unload into a boll buggy, which then unloads into a module builder. Under good management, these pickers can spend approximately 70% of their operational time actually picking. This process requires good communications between picker and boll buggy operators. They can communicate verbally, by signaling with vehicle lights, or by routine unloading patterns to signal the boll buggy operator where the picker will need to be unloaded.

Picking Patterns

Stopping the picker on the row and pulling the boll buggy beside it within a few seconds is most efficient. The basket is then raised, unloaded and lowered, and then the picker resumes harvesting. Operators should develop picking patterns based on unloading near row ends – even if baskets are only partially full – in order to minimize field compaction from the boll buggy and tractor or making ruts when the soil is wet. Unload the basket into the wind to minimize scattering of the seed cotton on windy days.

Conventional basket picker stops on the row and unloads into a boll buggy for greatest field efficiency (about 70% of time actively harvesting).

Half-Module System

Case IH manufactures one of two available onboard packaging systems that offer near-nonstop harvesting potential. The systems eliminate module builders and boll buggies, along with their operators and tractors. This onboard rectangular module-forming (OBRMF) harvester forms modules that are 8 feet high (maximum), 8 feet wide, and 16 feet long. Each module requires a cover (fitted tarp) to prevent wind-related losses. These modules typically contain 6 to 7.5 bales of seed cotton, depending on yield, row length and operator decisions (manufacturer's specifications indicate 4,000-12,000 pounds of seed cotton).

When operating this picker, be careful to minimize shearing of cotton from the module as it is ejected. Two modules are usually loaded for transport. When loading, carefully align the truck with each module. Always space modules at least 2 feet apart on the turn row for temporary storage; space them farther apart if necessary to meet fire insurance policy criteria. Loose cotton that is raked or piled at the base of a module will not be covered by the tarp, so it becomes wet when it rains and can wick water into the adjacent module. Also be careful loading loose cotton between two modules on the module truck. If this loose cotton is not separated at an intermediate storage site to await ginning, rainfall will soak into both modules and cause the cotton to rot.

Case IH onboard module building picker unloading sequence.

Round Module System

The John Deere On-Board, Round-Module-Building Picker rolls a cylinder of cotton 7.5 feet wide and 7.5 feet in diameter. This picker wraps each cylinder with three layers of plastic film around its circumference just before discharging the module. The wrap practically eliminates losses from wind and movement of the modules. Each module typically holds about 3.75 bales of seed cotton. Do not place the modules closer than 4-8 inches apart to avoid interference during loading and weather damage during storage. This picker has a "surge hopper" that allows harvesting to

John Deere round-module-building picker carries a module before unloading while picking to the end of the row.

continue while the finished module is being wrapped. Currently, each roll of plastic film will wrap 22-24 round modules (depending on manufacturer's supply and criteria). Thus, reloading requires stopping to rethread the wrap after picking 80 or more bales of seed cotton. If the plastic wrap is damaged, you need to repair it quickly.

Stop immediately if a rain shower occurs during harvesting – stop in mid-row if necessary – and wrap or discharge and cover all cotton in the harvester. There is less mixing of seed cotton with onboard module pickers. Thus, wet seed cotton concentrates in a layer on top of or around the module, likely causing quality to degrade. Flag any modules made during rainfall and stage them for immediate ginning; ask gin personnel to gin these modules as soon as possible.

Basic Safety Precautions

Cotton pickers are very large, costly, complex machines that create blind spots for an operator. Take these steps before starting or operating any cotton picker:

Basic Procedures

- Read and understand the operator's manual and the basic safety and operating procedures provided with the harvester.
- Establish procedures and then train and retrain all personnel on how row units will be serviced; how they are to be locked when raised for maintenance; how baskets, chambers, and trampers will be operated during service; and when and how the picker transmission, brakes, etc., are to be positioned if the operator leaves the picker seat.
- Keep windows and mirrors clean for good visibility.
- Keep all lighting and alarms in proper working order.
- Scrape mud from shoes before climbing on the picker.
- When climbing or descending a ladder, face the ladder with both hands on the handrails.
- Be sure that other personnel in the area are free and clear of the picker by loudly calling "Clear," and wait to hear a response before starting the engine or moving the picker.
- Always engage controls gently and smoothly.

Avoid Potential Hazards

- Block or lock any raised component so it cannot be accidentally lowered when working around or under the component.
- Get assistance to back the picker when it must be reversed to ensure avoiding all personnel, parked vehicles and equipment, and other obstacles.
- Always be alert for and avoid contact with overhead obstacles such as overhanging trees, power lines, cables, etc.
- Never raise a basket or module chamber near overhead power lines.
- Never position a module where the retrieving truck will be forced to raise under wires or obstacles.

- Always lower baskets or module trampers and chambers to their lowest positions before travel to and from the field.
- Travel at safe speeds on the road and field/turn row for conditions.
- Use an escort and turn on all (flashing) lights when traveling on public roads.
- Never attempt to clear a choke from a machine while it is powered.

Fire Precautions

- Never park an idling picker or other support equipment where the exhaust is released toward a nearby module.
- Pickers should have at least one 10-pound ABC fire extinguisher located near the exterior of the cab door and one 20-pound ABC fire extinguisher located on the left side near the engine compartment, accessible from the ground. Plan, train employees, and practice how to use fire extinguishers, the spindle solution, and any other practices to control fire on the picker. Inspect and service fire extinguishers before each harvest season begins and replace any extinguisher that was used.
- Never enter a basket or chamber suspected of containing fire. Upon first indication of fire, move the picker to a nearby area free of combustible material that can provide fuel or allow the fire to spread. Unload the seed cotton immediately. Identify the location and extent of the fire. Extinguish the fire with the correct procedure and extinguisher. See the operator's manual for specific recommendations for your picker.

Operator Safety

- Wash hands and immediately treat any cuts or scrapes that break the skin. Many bacteria living on plant materials or in the trash in a row unit may cause serious infections when cuts are left uncleaned and untreated. Spindle solution is a quick, convenient hand-cleansing option. However, you need better cleansing and antiseptic supplies to curb potentially serious infection.
- Ensure that everyone is safely out of harm's way before unloading or moving any picker.
- Get assistance and establish a procedure both of you understand if it is necessary to power row units while washing or blowing trash from cabinets. Never wedge the tether behind steps or otherwise run row units in a "constant on" condition when servicing or cleaning.
- Find a secure location away from traffic and potential sources of fire and clear of grass and weeds. Lower all raised components to their lowest positions. Turn off all power, remove the key, and lock the cab when leaving the picker for extended periods of time.

Preseason Procedures

Spindle pickers are complex, close-tolerance machines, requiring skilled training to operate. They also require precision shop equipment for repairs and adjustments, especially to the row units. Many producers rely on a dealer or specialty shop with trained service technicians for major repairs and adjustments. Pickers must be properly prepared to make sure they are capable of minimizing harvest losses.

Study and use the operator's manual provided for your picker; it is the best source of information concerning adjustments. This reference gives insight into most common problems faced by picker operators, and it offers solutions to these problems. Preparation can begin with a thorough cleaning and inspection of all row units. Tighten or replace loose or missing or damaged fasteners.

Tire Condition and Pressure

Check and inflate tires to the pressure specified for that tire and picker load before making other adjustments. Low pressure in picker tires on one side can cause that side's row unit height to be several inches lower. Low tire pressure can also promote a springing or bouncing effect of the row unit height control system. Low pressure eventually damages the tire. A damaged tire may burst and cause the picker operator to lose control during high-speed travel or cause a serious harvest delay during prime picking.

Row Unit Tilt

Row units of a cotton picker are tilted somewhat to cause the lowest spindles in the bars to enter the plants at the lowest possible height, maintaining the bottom of the row units about 1 inch above the soil. Proper tilt gives spindles a very slight vertical motion relative to the plant from entry to exit of the picking zone. Proper row unit tilt positions the front and rear spindles at slightly different heights within each plant. This arrangement leaves very little gap between spindles moving through the plants and provides greater harvesting efficiency. Tilt also provides relief at the rear of

the cabinets to shed trash easier, thus reducing accumulation and dragging of shed leaves and plant debris. Faster clearing of debris reduces wear on the bottom of the cabinets.

Tilt Adjustments

Row units should attach to the toolbar with the front of the cabinet or front drum about 1-1.5 inches lower than the rear of the cabinet when positioned at picking height. Raising and operating row units higher may change the tilt slightly. Manufacturers (within the operator's manual) typically specify a "pin-to-pin center" adjustment on the turnbuckle or adjustment link to obtain the specified tilt. Consider their specification a guide for average conditions – a starting point. Cotton fruiting very low, such as a crop planted "no-till" with little or no row bed, may retrieve much better with reduced tilt that puts the entire picking head closer to the ground. A greater amount of tilt may pick a higher percentage of larger plants with higher fruit set.

Spindles and Spindle Bushings

Picker spindles should be sharp at the front of the barb in order to grasp, hold, and pull seed cotton from the bur. Spindles tend to wear at the heights both where more cotton is picked and where more soil splashes onto the cotton before picking. Thus, wear occurs at different heights on the bars in different crop conditions. Usually, the bottom one-half to two-thirds of the spindles in a bar wear faster. Spindle wear can cause rust during picker storage, reducing aggressiveness and harvesting efficiency. Bushing wear is more rapid in the same height zones due to greater side force on spindles passing beneath the doffers.

Be sure that spindle assemblies are the correct left- or right-hand spindles to match both the nut thread and the drum where they are to be installed. The tips of the barbs should rotate into the cotton and point in the direction that the nut is turned when screwed into the bar. Immediately replace any broken or damaged spindles to prevent further damage to doffers, spindle moistening pads, and supports. Remove and identify the cause of any non-rotating or "dead" spindles – even if the bar needs removal and disassembly – to correct the problem.

Spindle Adjustments

A spindle assembly should have about 0.003- to.017-inch end play before insertion into the bar. Once it is in the bar, you should feel some slack between the drive gear in the bar and the spindle gear when rotating the spindle back and forth between your thumb and forefinger. If the spindle binds or has no slack between the gears, remove it, add shims, and retighten it until you can feel the slack. You can use a dial indicator to measure bushing wear when gauging the bar heights. Center the probe directly over the spindle between the dust collar and the start of taper on each spindle. Observe variations in the reading when forcing the spindle fully up to fully down vertically. Vertical movement in excess of 0.006 inch signals a need to replace the spindle bushings. Excess end play here may also be caused by wear of the thrust flange bushing on the base of the spindle nut.

Replacing Worn Parts

Worn thrust flanges prevent spindle gears from meshing correctly with the drive gear; this problem accelerates the wear of the drive gear. Usually, spindle bushings are replaced when new spindles are installed. Several factors can shorten spindle life, such as weather, yield, crop and soil conditions, and the amount of leaf, sand, and trash in the cotton. However, spindle and bushing life should typically be approximately 600 hours of picking (fan hours).

Bar Height and Condition

A uniform picker bar height is critical in maintaining the correct gap between the spindles and the doffers and moistening system. A low bar may not doff cotton from the spindles well; a high bar may gouge or dig into the doffers and moistening pads. Certainly, check the bar height each year before the start of the harvest season. You should also take the following steps:

- Thoroughly clean all row units, paying special attention to cleaning the base of each bar.
- Raise or remove the doffers and moisture system columns to provide clearance and easy rotation of the drums.
- Number each bar and its position in the drum with a permanent marker or steel stamp.

- Replace the bottom row of spindle nut assemblies in both drums with new or renewed spindle nut assemblies.
- Position the dial indicator probe on the bottom plate of the row unit to strike the top of the bottom spindle of each bar between the dust collar and the start of taper on each spindle to indicate a depression of the dial probe for each bar.
- Rotate the drum by hand, recording the bar position and the dial indicator reading (at the maximum point for the spindle) to the nearest 0.001 inch for each bar.
- After you measure all bars, scan the readings for the bar with the greatest reading (highest bar).
- Calculate the shim thickness (amount of shims) needed to bring each bar to the height of the highest bar.
- Loosen the pivot pads for each low bar, add the proper amount of shims, and retighten.
- Measure the bar heights again, and repeat the process until all bars are within 0.003- to 0.008-inch of each other.
- Reinstall/adjust the doffer and moisture system columns to within 0.003-inch of the closest spindles.

Note: Doffers should barely touch the spindles in the highest bar. If a feeler gauge is not available, a crisp dollar bill should slide with slight drag between the doffer lugs centered over the high point on the spindles.

Doffers

Doffers remove the seed cotton from the spindles with an unwinding, wiping, and stripping motion toward the end of the spindle. The surface speed of the doffer is many times faster than the surface rotation of the spindle. Follow these tips to maintain the doffers:

- Doffer lugs should operate within about 0.003 inch from the spindle surface.
- When crop conditions are very good, doffer-to-spindle clearances of as much as 0.020 inch may doff very well.
- Do not lower a doffer column first before determining the cause of poor doffing. At times, this action only accelerates the wear of the doffers, spindles, and bushings without improving doffing appreciably.
- The doffer material must be flexible enough to allow seed cotton, trash, and other material to pass between the lug and the spindle without damage. Weather, sunlight, and other factors may age and harden doffers.
- Severely worn doffer lugs have reduced clearance for seed cotton to pass between the plate and the spindle. This problem can increase cracked seed, which is particularly important when

cotton is harvested for planting seed.

- Polyurethane (beige colored) doffers have reduced wear or “shavings” that are less prone to contaminate lint.
- Doffer lugs with leading edges that become rounded from wear are less effective and should be reground or replaced with doffers with sharp leading edges. One cause of wear and rounding of the doffer lug leading edge is poorly shimmed bar height. It may also cause frequent spindle wrap and twist on low bars.
- Replace doffer columns that have broken, torn, or rounded-edge doffer lugs with a properly ground doffer column. Adjust the height correctly.
- See your operator’s manual for a recommended doffer adjustment procedure.
- Here is one effective doffer height adjustment method: Power the row unit slowly using your tether. Lower the doffer column slowly while listening for a regular “thump, thump, thump” as the bars pass beneath the doffer column (use a stethoscope or a screwdriver from the doffer column bearing area to your ear). Then, slowly raise the adjustment until the thumping sound becomes faint to undetectable. This method also confirms that bar height is nearly correct when the thumps occur at regularly spaced intervals. Bar height needs to be serviced when the thumps you hear are random or at irregular intervals.

Some row units are adjusted at the bottom of the doffer column to assure that the column is correctly positioned in relation to the bar. Follow your operator’s manual for alignment instructions. Inspect daily and ensure that all mounting hardware for doffer and moisture pad columns are tight. Routinely remove trash, dirt, and grease accumulation from the doffer column enclosure. Removing this buildup may prevent conveying chokes.

Spindle Moistening System

The purpose of the spindle moistening system is to constantly supply cleaning solution onto the spindles to remove plant gums and resins. This cleansing helps keep the spindles aggressive and easier to doff. The solution removes plant residue while seed cotton wipes the spindle, much like a dish cloth washing flatware. A cleaning solution mixed to the correct concentration is essential

for proper function. Follow these recommendations to properly maintain and use the moistening system:

- Clean any “gummy” or hardened residue from the bottom of the tank and flush the tank before the start of the picking season.
- Clean the strainers and sediment bowl daily before picking.
- Fill the tank to approximately 80% of capacity with clean water and add the proper amount of spindle cleaning solution to the tank (approximately 2 ounces per gallon of water or 1.6 gallons per 100 gallons of water). Finish filling the tank with water.
- Bulk premixing of the spindle-cleaning solution decreases the time needed for filling the tank if you have a solution trailer.
- Both picker manufacturers offer their own spindle-cleaning agents. Refer to your operator’s manual and the dealer for the best spindle cleaner for your crop conditions. A mild dishwashing detergent may do the same job once the correct solution ratio for your crop conditions is identified.
- Operate the fan system powering the spindle moistening system pump. Check the pump pressure, remove the spray nozzle at the top of the moisture pad column, and see if the spray pattern is full and uniform. Remove the nozzle from its body, clean or replace the nozzle, and then check each moisture pad in both columns of each row unit to verify that sufficient solution is going to each spindle.
- Adjust the moisture pad column so that the fins on the pads just touch the spindles as they pass beneath the pad.
- During the day, routinely remove trash (especially cockleburs) and dirty seed cotton from the moisture pad zone. However, limited lint residue on the pads may help distribute cleaning solution to the spindles.

Picker Ribs

Picker row units clean, in addition to removing the seed cotton from the plant. The rotating spindle slings locks of seed cotton against the ribs as they leave the row, knocking burs and sticks off before cotton enters the doffer and air conveyor. Spindles work with the ribs to perform centrifugal cleaning much like a cotton gin. These tips will help you maintain the picker ribs:

- Poorly spaced, damaged, or loose ribs may contact bars and/or spindles. This problem causes unusual wear and could potentially spark a fire in the row unit. The spindles, spindle nuts, and bars should not contact the ribs as they rotate.

- Missing ribs will fail to clean burs, sticks, and leaf trash from the seed cotton as it is picked from the stalk.
- Inspect the mountings and fasteners at the ends of the ribs for wear, and replace missing fasteners or damage as needed.
- All ribs should be similar to a new rib. They should not be misshapen or have free movement within the mountings.

Compressor Door Considerations

Compressor doors should press the plant and open cotton bolls against the spindles. They should have the capability of moving away from and protecting the picking mechanism from damage by large plant volumes, large-diameter stalks, or chunks and rocks passing through each row unit. Doors are hinged and supported by adjustable springs. Rotating or tightening the shaft retaining the springs increases the pressure applied by the compressor door. Ribbed “scrapping” inserts are often fastened to the row side of the compressor door to promote a more aggressive contact with bolls toward the entry and plant exit. These steps will help you maintain compressor doors:

- If the compressor door hinges are worn excessively, the door fails to move smoothly as the volume of stalks varies along a row. The door may drag on the frame of the row unit. Tension springs may break and thus apply less tension to the compressor doors. Inspect and repair or replace worn or damaged hinge pins, mounting holes, scrapping inserts, and tension springs as needed.
- Reinstall compressor doors upon completion of row unit maintenance and check for smooth movement without drag. Shim if necessary.
- Adjust the tension springs to approximately 10-15 foot-pounds on the front doors and 30 foot-pounds on the rear doors (starting point) using a torque wrench.
- Gap the spindle tip from the pressure door from 1/8- to 1/4-inch clearance on all doors.
- If dropped cotton lies to the left side of the base of the stalks, check spindle-tip-to-pressure-door clearance and adjust the gap if needed. Increase spring pressure in approximately 5 foot-pound increments (one hole). Begin with the rear doors and then alternate to the front doors, “tweaking” spring tension. Evaluate each adjustment by any improvement or reduction of unpicked seed cotton. Adjust, pick, and check behind the picker before making additional changes.
- Install scrapping inserts, tighten compressor door springs, and adjust spindle-tip-to-pressure-door clearance to clean the stalks of seed cotton if picking once over when few green bolls remain on the stalk.
- Always check that spindle tips do not contact the compressor door assemblies before operating the picker.

Cotton crop conditions are considerably different in more arid regions where crops are irrigated than in the rain-belt regions. Cotton plants grown in dry conditions tend to be short, wide, and “bushy” with the bulk of the yield concentrated in the lower 20 inches. Sometimes, passage of the large concentrated crop volume through row units causes field loss. General recommendations are to initially set pressure doors quite loose, and then tighten them as needed to improve picking efficiency. Do not use scrapping plates for front or rear drums if limbs are brittle as a result of a freeze.

Plant Lifters

Plant lifters must float with the contour of the soil surface, gently guiding the open bolls into the row unit. They need to operate within 1 inch of the surface without plowing soil or dragging leaves. These guidelines will help you maintain the lifters:

Plant lifters should be adjusted to gently lift lower bolls into the lowest and second lowest spindles of the front drum. This may require heating and bending in extreme situations.

- The plant lifters’ height should be only low enough to guide the lowest bolls into the bottom spindles.
- Adjust spring tension so only a few pounds of force are required to raise the plant lifters.
- Plant lifters should not continue to bounce after the row unit height sensors raise or lower the row units at full picking speed.
- Operating plant lifters too close to the ground when the lowest bolls are several inches higher on the stalk causes undue wear. This mistake also provides potential for unwarranted damage that might occur if lifters drag on or plow into soil or obstructions.
- Set the front tip of a plant lifter approximately 1 inch above the front lower edge of the cabinet. This placement will help the bottom of the lifter to slide rather than plow when it contacts the soil.
- Raise the height adjustment to minimize dragging leaves and plant debris.
- Use the stalk lifter guides to raise the lower bolls up to the level of the second from the bottom spindle when bolls are set close to the ground. These settings may need to be adjusted for different row bed shapes.
- If you know that large rocks, bricks, chunks, and debris are present, consider removing the stalk guides to minimize the risk of damage to row units. However, this action will likely increase seed cotton losses.

Row Unit Operating Height and Height Sensing

The best operating height for row units may be a compromise due to plant size, soil type, soil surface, shed leaves, plant debris, other obstacles, ground speed, and field terrain. Ideally, the bottom spindle on the front drum enters the row just below the bottom bolls. Where bolls have set 5-8 inches above the soil and cotton has grown on a relatively smooth row, this goal is easy to reach. Operating the row units at fairly high setting provides several benefits:

- Less contact with obstacles
- Less dragging of leaves and debris
- Reduced wear and damage of the row units
- Greater ground speed – higher productivity

Lower Boll Set Factors

Lower boll set, rows with no or slight beds, or fields rutted by erosion or containing obstacles usually cause some yield sacrifices due to higher stalk and ground seed cotton losses. A lower picking unit reduces speed and the capacity of the picker, and it increases potential for damage and wear of the row units. For low-visibility night operations, choose fields or areas within fields where the cotton fruits higher and the likelihood of obstructions is lower. Simply raising row units as little as 1/2 inch can reduce dragging of shed leaves.

"Hunting" Procedures

Constant raising and lowering of the row units ("hunting") by the automatic height-sensing system will cause more seed cotton losses along the row and greater wear of the row unit mechanisms. Height-sensing shoes should be set for the average of the row units controlled by that sensor shoe at the chosen field speed of the picker. If a picker height sensor cycles – "begins to hunt" – as the picker moves along the rows, take these steps:

- Check the tires for proper inflation pressure.

- Check the ground speed.
- Check the oil flow and electronic settings to the sensors.
- Try reducing or increasing picking speed by as little as 1/10 mph. Sometimes, a small speed change may reduce or eliminate the cycling.

Inspect the tracks left by the sensing shoe to find out if a system is adjusted properly. A smooth, even track along the row indicates fairly constant height positioning. A heavy track followed by little or no track several yards down the row may suggest excessive cycling.

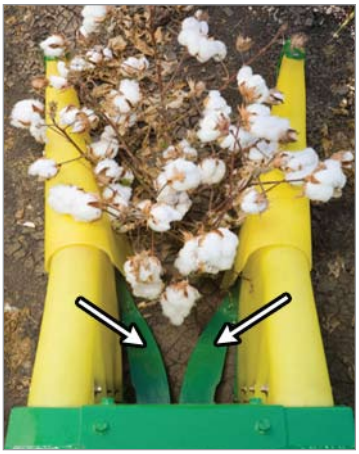
Air Conveyance System

Reliable seed cotton conveyance from each picking unit is essential. Consistent seed cotton movement depends upon adequate air volume delivery by the fan to the cotton conveyor duct. All air ducts must be free of holes, duct connections must be tight, and the air system must be free of sharp edges where lint collects (roping) or debris accumulates. Follow these rules to maintain air conveyance systems:

- Inspect and correct all air piping to ensure that there are no holes, kinks, or sharp turns in the air ducts and that all ducts are connected and secured with clamps and have no air leaks.
- Set the engine throttle and fan speed to the manufacturer's recommendations.
- Duct air velocity should be approximately 5,000 feet per minute, measured in the straight duct's midsection between the row unit and the cotton discharge. A flow rate equal to 20 cubic feet per minute per pound of seed cotton conveyed is recommended for air conveyor systems. Have a service technician measure this rate if conveyance problems persist. Manufacturer-specific airflow requirements may be suggested in dealer service publications.
- Inspect and clean the door/transition, discharge, and air separation areas several times each day, depending upon these operating conditions:
- Picking in green or less mature cotton
- Air humidity is high during morning and late-evening operation
- After greasing the row units

Row Tracking and Correction

Row unit spacing must match the planter spacing for the row pattern being picked. Attempting to pick row patterns that are not simple subsets of the planter will result in an odd row or rows that have varying spaces as you progress down the row. For example, if you try to pick cotton planted with a 10-row planter using a



Guidance system sensor shoes.

6-row picker, there will always be one pass of the picker on well-spaced rows, followed by one or more passes on poorly spaced rows. This problem will result in much higher picker losses at places where the drills from two planter passes diverge.

Row Guidance Systems

Automatic row guidance provides more uniform row spacing between planter passes than a skilled, unaided operator can obtain at planting. Guidance systems with sensors to detect and correct the position of the row unit relative to the stalks in a row reduce operator fatigue and hold the picker on the row at faster picking speeds. They are capable of reducing field losses when the row units would otherwise vary off the row under manual control.

Guidance System Adjustments

Poor plant stands in rows where the stand was damaged by standing water, weed infestations, inadequate moisture at planting, or other problems renders the guidance system less effective and may require temporary manual control. Set the guidance system sensors so the stalks enter the row unit halfway between the ribs and compressor door of the front drums.

Newer guidance systems have electronic adjustment from the cab. Setting the sensors on older guidance systems and checking the new systems require starting the picker down the row with the guidance system in operation and then stopping the picker with the hydrostat lever. After stopping, determine the positions of the ribs and spindles relative to the stalks being picked and adjust the unit to drive left or right as needed. You may need to repeat this procedure several times while making adjustments. However, once the system is set, it should not require additional adjustments unless the sensors become bent or damaged.

In-Season Procedures

Cotton Picker Fires

A fire that starts on a cotton picker may be minor if the operator reacts correctly. However, poor decisions and reactions may result in a total loss of the picker and any cotton in the machine or surrounding areas. A picker fire that begins as a smoldering mass of trash and lint can become uncontrollable in as few as 3 minutes. In as few as 15 minutes, a cotton picker can become almost unrecognizable – tires burned off and bars melted into puddles under the row unit cabinets. Large amounts of grease in row units, high-pressure hydraulic oil, and diesel fuel accelerate a fire once lines and tanks rupture.

Preventing Hazardous Conditions

You may be forced to make snap decisions regarding risk of personal injury or saving the picker from a total loss. The best course of prevention is due diligence in recognizing and eliminating or minimizing conditions that often result in a fire on the picker:

- Dry and windy conditions (humidity in the range of 10-30%) for several days, resulting in seed cotton, trash, and lint with 4-6% moisture content and high potential for static electricity (a condition made worse by light winds and lack of dew formation at night)
- A malfunction of the picker row unit that results in metal-to-metal contact, such as a loose rib that is struck by spindles
- Scrap metal, rocks, or bricks (near old house sites) that enter the row unit while picking
- A row-unit choke or trash accumulation that is undetected, allowing doffers to rub for extended periods on the material
- Trash and lint accumulation on or near components that can be very hot, such as the transmission, belt drive, hydraulic components, engine manifold, and exhaust system
- Poorly serviced and cleaned chassis and row units
- Lint and trash accumulations on hydraulic valve banks
- Operator carelessness or ignorance in dealing with a fire

Operator Fire-Prevention Training

Operator training and practice are vital in fire prevention and control. Operators must learn how to react to a fire on a cotton picker before it happens, as well as how to use fire extinguishers and

other fire-control resources. Read and understand the operator's manual section for fires for the cotton picker to be operated. The following steps are suggested as ways of reducing fire losses:

- Keep a full water trailer and pump in the field whenever possible.
- Be especially cautious of conditions that are likely to result in a fire. Bluebird skies with a slight dry wind after a passing dry front can result in very low relative humidity and dry cotton. Fire dangers are increased and may reach a critical point in mid- to late afternoon.
- Be alert to any unusual noise, odors, or visible signs of a picker malfunction.
- Be cautious if more frequent row-unit chokes are occurring.
- Remove large accumulations of trash and lint more frequently.

Engine compartment type ABC fire extinguisher.

Platform water-based fire extinguisher.

- Inspect and clean the row units and conveyor doors more frequently.
- Slightly increase the spindle cleaner solution application rate, but not to the point that more trash accumulates in the row unit.
- Be aware of any defoliation practices that are more likely to accelerate a fire (use of sodium chlorate and other desiccant materials).

Fire-Prevention Procedures

Customize the following procedures for the picker you are operating and practice it as part of fire-prevention training:

- Cotton, oil, belts, and electrical components have very distinct odors when burning. At the first whiff of smoke or indication of fire, stop harvesting, stop the fans immediately, and investigate to identify what might be burning or smoldering.
- If you have a cell phone or radio, alert an emergency contact that a fire is indicated/probable and request help.
- Raise the row units and drive onto the closest turn row or back the picker 20-50 yards into a previously picked part of the field (whichever is nearest and quickest).
- Unload any cotton in the basket, module chamber, or surge hopper, even if you must unload onto the ground. Unload even if you do not see an indication of fire in the basket or module chamber. Delaying this step with a fire burning near a hydraulic hose or fuel line may result in the lines rupturing, fueling the fire with a mist of hot oil or fuel. The seed cotton on the picker only serves as additional fuel for the fire, which would guarantee a complete burn at this point.
- Leave the picker basket or module chamber in the unload position and move the picker the length of the machine away from the seed cotton that was unloaded.
- Stop the picker, place the transmission in park, set the brakes, stop the engine, put on a pair of leather gloves, exit the cab, and look for the fire.
- Inspect the platform area, looking between the duct area and the accumulator, basket, or module chamber. Also look on the tops of the row units. Take a quick look at the top of the picker as you dismount.
- Unless trash or lint is visibly burning or smoldering near the point of catching fire in the basket, surge hopper, or module chamber, you can wait to extinguish it after finishing your overall inspection of the machine. Fires that ignite on the top of the picker rarely result in a total loss.
- Use water-based fire extinguishers and the spindle cleaner solution emergency hose for flash lint and seed cotton fires on the platform and on top of the picker.
- Inspect the chassis as you dismount, looking for indications of fire in the engine compartment area.
- Remove the Type ABC fire extinguisher mounted in the engine compartment and take it with you for the remainder of the inspection.
- If there are signs of a fire in the engine compartment, open doors and remove panels slowly and cautiously, observing the hotter engine components first. Inspect the exhaust system.
- Remove any smoldering lint or trash with a wire hook or stick.

- Do not rake smoldering trash with a bare hand. Doing so may fan the smoldering ember and cause it to flame up. Not only would this action further ignite a flash fire, burning trash and grease may stick to your hand.
- Direct the Type ABC fire extinguisher nozzle to the base of any flame and release in short bursts. Do not use long blasts of the extinguisher as this could spread the fire.
- Begin inspecting each row unit with close attention to doors, doffer areas, and lower conveyor ducts. Open doors cautiously.
- Inspect the gear compartment for the drum and doffer drives in the top of the row unit.
- Inspect hydraulic components, paying close attention to valve banks and reservoirs.
- Once all fire is removed or extinguished from the lower portion of the machine, return to the top of the picker and begin removing and extinguishing any smoldering trash.
- Thoroughly clean the picker, inspecting and repairing any hydraulic, fuel, or grease lines as needed. It is best to clean with water after a fire.
- Identify the origin of the fire and correct any deficiencies as needed.
- Service or replace the fire extinguisher before further picking. If you missed a smoldering fire and go back to work without a functioning extinguisher, it may be the last for that picker.

Cleaning and Servicing the Picker

Properly cleaning and servicing the cotton picker each night or morning will result in better performance and lower potential of fire throughout the day. Most producers do a thorough cleaning from top to bottom before greasing, adding fluids, and inspecting and repairing. There are several cleaning methods, each with advantages and disadvantages.

Cleaning Procedures

Check engine oil and coolant levels before starting the picker's engine for the first time in the morning, but be mindful of the following safety rules:

- Always raise handrails when working on top of picker baskets or bale chambers.
- Always climb and descend ladders facing the ladder and holding onto handrails.

- Never try to climb to the top of a picker with a hand- or armful of tools or hose. Have someone hand you what you need on top of the picker.
- Always engage proper safety locks for baskets and bale chambers before cleaning or servicing in or near those components.
- Never defeat operator-presence switches or wedge tether switches in order to rotate the row unit drums without a hand on the switch.

Use a broom or your hands to remove large accumulations of lint and trash in the basket or bale chambers. Do this chore any time during the day when waste buildup becomes a fire hazard or if a sensor indicates a false condition. Although it is time-consuming, it can be very effective to go ahead and clean the whole basket/chassis area.

Inspect all sensors and remove any lint tags to prevent false indications. One advantage of hand cleaning is that wiring components are less likely to be harmed by mechanical damage, water from high-pressure washing, or compressed-air removal techniques.

Low-Pressure Water Washing

Many producers use low-pressure water from home or commercial water systems to wash trash from the row units. This method is effective, but it requires an extreme amount of time on larger multiple-row pickers. It also wets the ground around the picker, increasing the chance of slip and fall injuries. Some producers use a water trailer with a portable pump to clean the picker, add spindle-cleaning solution, and extinguish fires. These units spray a lot of water at low pressure, so plan to clean more with volume than pressure.

High-Pressure Water Washing

High-pressure washing is effective at removing trash and grease in row units and is much faster than hand or low-pressure washing. Unfortunately, the water stream can damage seals, wet the ground around the picker, break or unplug wiring harnesses, and force dirt and water into some bearings and grease in gear cases. Always wear adequate personal protective gear – hat, gloves, rain suit, protective eyewear, and boots with slip-resistant soles – when pressure washing a picker. Never direct a flow from a pressure washer towards humans or animals. High-pressure washing is particularly effective at removing grease and trash accumulations inside the row-unit cabinets. It is usually best to wash the tops of the row units last and then move the picker to a dry area before further servicing.

High-Pressure Air Cleaning

High-volume, high-pressure air (150-250 cfm and 125 psi from an industrial air compressor) is very effective at removing trash and lint buildup from a picker. Lower volume compressors can be effective with their airflow magnified and pressure kept at a safe level (not more than 30 psi at the discharge) with a venture type of nozzle. Volume is directly proportional to cleaning power. A heavy air hose (about 3/4 to 1 inch) with a stiff wand (pipe nozzle) is used to direct air where it is needed.

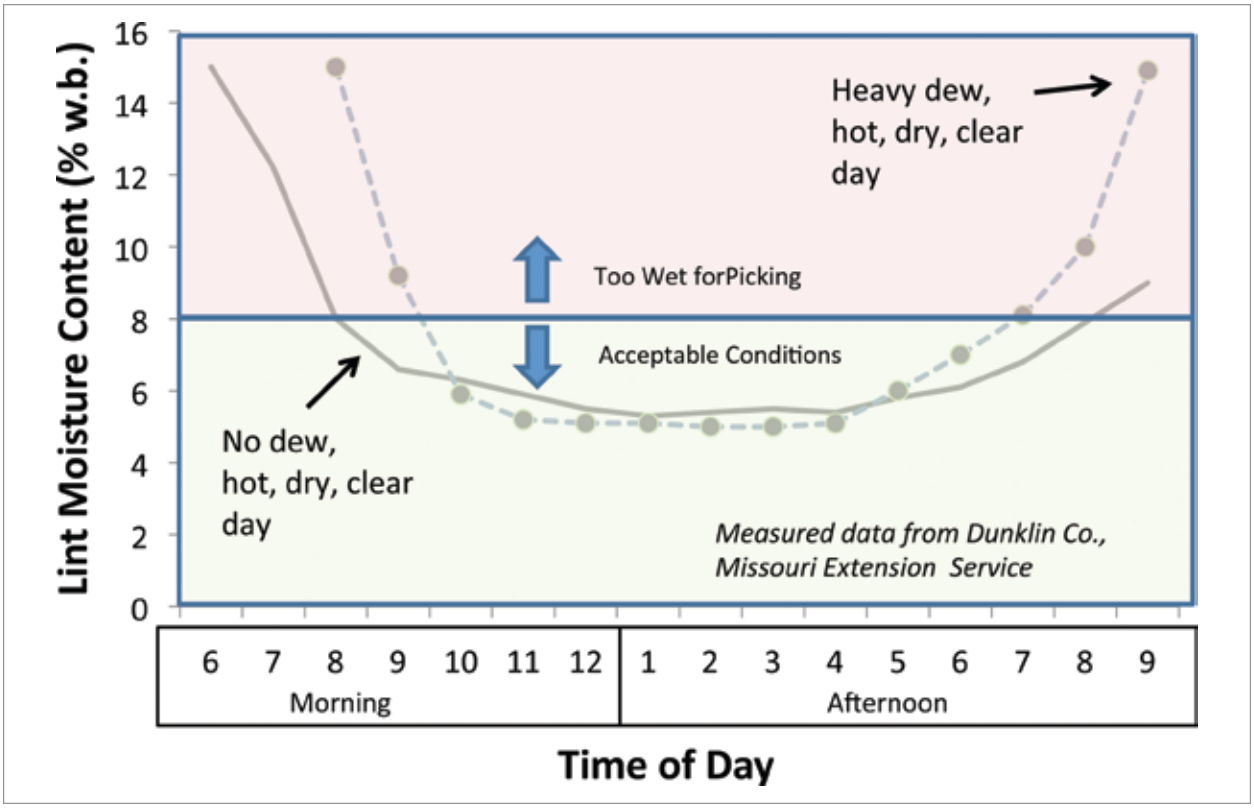
This equipment can be very heavy for anyone using it on top of the picker. A dead-man valve should be attached to the nozzle to prevent the air hose from whipping around if you drop it.

Precautions

Always wear personal protective equipment, including eyewear, gloves, boots, long pants, long-sleeve shirt, hearing protection, and respirator or dust mask. Air is less likely than water to break wiring and otherwise damage the picker, but it is still a danger. Do not direct high-volume/high-pressure airflow at radiator fins, hydraulic oil coolers, bearings and seals, electrical and glass components, and air-conditioning lines and condensers. The blast of air can force grit into bearings and grease seals and can break glass, damage seals, and puncture or bend thin components. You can better clean out grease and trash inside row-unit cabinets by operating the unit in a slow idle tethered mode and flushing the moistening system periodically. The ground stays relatively dry, reducing mud and slipping injuries. Never use high-pressure air systems to blow dust and dirt from personnel. After overall cleaning of the picker chassis is done, clean the lights and cab glass inside and out with a good glass cleaner and a cloth or towel. Inspect all lights for proper function, and repair or replace as needed. Follow the manufacturer's recommended procedures closely for cleaning your particular make and model of picker. John Deere provides a DVD entitled "7760 Cotton Picker Cleaning & Operation # N382998" for specific instructions on cleaning, servicing, and operating the round-module picker. Service the picker as needed for greasing (see operator's manual), and add fuel, coolant, engine oil, spindle grease, and spindle solution as needed. Round-module picker owners usually replenish the supply of plastic wrap when servicing is complete.

Timing Field Operations/Moisture Considerations

After the bolls open, dry, and fluff, the moisture of seed cotton during harvest has the greatest potential impact on fiber quality until it is ginned. Deciding when to start harvesting is sometimes complex, especially with weather forecasts uncertain beyond a few days. The main things to consider in this decision are the factors that affect lint quality and your revenues. Most growers will schedule harvest 10-14 days after the first application of defoliants.



Lint moisture content vs. time of day for typical conditions in a Mississippi delta environment.

Daily temperatures, soil moisture, defoliant selection, and boll maturity and plant condition when defoliants are applied may shift harvest a few days earlier or later. Several moisture sources impact storage and quality:

- Rainfall after cotton opens and before harvesting
- Applying excessive spindle-cleaning solution
- Excessive dew and high humidity, causing damp seed cotton to be harvested
- Green leaf from poor defoliation and regrowth
- Partially or poorly opened bolls
- Immature seed
- Field areas with later crop maturity

Humidity Concerns

Most of these factors will also reduce picking efficiency. Unless extreme conditions occur – such as delayed harvest late in the season – do not operate pickers when relative humidity is above 70% (lint moisture of 8% or greater). Do not pick until all free moisture from dew or rain has dried from the lint. Heavy morning dews extend the time required for seed cotton to become sufficiently dry.

The “seed cotton moisture vs. relative humidity” figure shown on the previous page suggests a relative humidity pattern a grower might expect for a typical late-September fall day. Note that by 8:00 p.m. most nights the relative humidity exceeds 70%. Relative humidity patterns vary from this chart for atypical days, daylight saving time, and earlier or later days in the harvest season. Non-Rain-Belt regions will have dramatically lower night humidity, enabling early-morning, late-evening, or night picking to be successful.

Assessing Moisture Content

Seed cotton containing 12% or less total moisture will usually store for extended periods without quality loss. Green leaf and damp seed usually raise seed cotton moisture above 12%.

Assess the moisture content of lint and seed before starting harvest each morning:

- Handheld moisture meters are usually within ± 1% percent accuracy.
- A sharp crack when you bite a seed indicates a brittle seed coat and seed moisture below 12%.
- One simple test of when harvest may begin is to pick several bolls by hand, ball them into a tight fist, and then release the fist. If the seed cotton springs back to or near the original volume, it is time for harvest.

Excessive green plant material in the harvested seed cotton is another reason to delay harvest, usually several days. Green vegetation stains the seed cotton in storage and requires ginners to increase heat, which may damage fiber quality. Harvesting clean and dry seed cotton reduces drying and cleaning at the gin and attains the highest possible fiber quality considering varietal characteristics and seasonal weather.

Preventing and Freeing Row Unit Chokes

Row-unit chokes can become very expensive. Frequent chokes may reduce field efficiency by more than 10%, increasing seed cotton losses and costs to the grower and/or picker owner. Several factors affect the frequency of chokes: crop conditions, picking high-moisture seed cotton, the picker’s air system capability, and keeping the row units and conveyance system cleared of dirt, trash, grease, and sticks.

Row-unit chokes can occur while picking in high-humidity conditions, in early morning and late evening, and within the first hour after greasing row units. Higher moisture seed cotton is heavier, requiring a higher air-conveying velocity. Excess spindle-cleaner solution collects on the surfaces

of the row-unit cabinet, causing seed cotton to stick. Excess grease can seep out of the spindle nuts and accumulate where seed cotton is conveyed; this buildup collects trash and seed cotton, causing resistance to rapid cotton movement.

Techniques for reducing or eliminating chokes include beginning the day with clean row-unit cabinets, lowering spindle cleaner application rates, using a slower ground speed, and using smaller and more frequent grease applications. Dry, brittle crop conditions, possibly resulting from a freeze, may cause limbs and stalks to break off and plug row units. Slower harvest speeds and delaying harvesting until temperatures exceed 32°F may solve, or at least reduce, this problem.

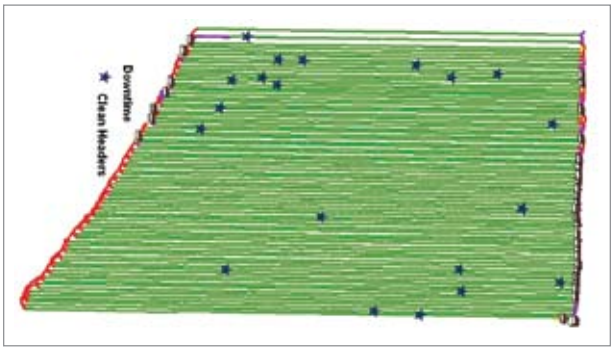
NOTE: The recommended procedure (see your operator's manual) is to stop the picker, lower row units completely, switch fans off, place the hydrostat control in park, set the brake, allow the engine to idle to cool for a few minutes, stop the engine, exit, lock and remove the key from the door, dismount the picker, and remove the choke, leaving the seed cotton in the row middle.

No amount of seed cotton and time saved is worth death or injury while trying to clear a choke. Picker row units can fall and trap you, and a picker left in gear can crush or roll over you. Be careful opening row-unit doors. Be alert to the possibilities that the choke may have started a fire or that an animal may be entangled but still capable of biting or scratching. Only an operator properly trained and shown how to clear chokes should practice the following procedure:

- Identify the row unit with the choke from the monitor.
- Raise the row units, disengage the picking-unit drive, and back the picker 5-10 feet from cotton remaining to be picked.
- Lower the row units completely, disengage power to the picking units, place the ground travel lever in park, and set the parking brake.
- Allow the engine to idle to cool and the turbocharger to slow before stopping it.
- Dismount the picker, and close and lock the cab with a key (to prevent a coworker from moving controls while you are under the machine).
- Locate the choke, open the appropriate door about halfway, and observe the cause of the choke.
- Pull the cotton from the door and duct area.
- Remove dirt/trash/grease buildup, sticks, limbs, or other obstructions.
- Close and secure the doors.
- Make a record of row-unit choke.
- Resume picking operations.
- Never attempt to clear a row unit with the drums in operation.
- Never allow or instruct a coworker to crawl under the machine to clean or service it unless you locate that person before restarting the engine.

Consistent Choke Problems

If you observe a consistent problem of chokes over several days of picking within a particular row unit, you might solve the problem with an inspection of the fans, fan drives, air-delivery ducts, cabinet obstructions, and conveying ducts. Row-unit chokes are common when moisture accumulates on the doors as a result of high spindle moistener application rates, too frequent moistener system flush operation, and/or over-greasing the bars (if grease and trash accumulates inside the cabinet). Picking rows from the opposite direction when second picking or picking extremely dry or brittle plants affected by a freeze may prompt excessive chokes due to broken limbs lodging in the doors or air-duct entries.



Row-unit chokes (represented by stars) were more frequent early in the morning (picking began at 9:30 a.m., lower part of the figure), after greasing in late afternoon, and during evening operation in this field. Harvest was completed at the top end by 10:00 p.m.

Recordkeeping

A record of breakdowns, chokes, and possibly the remedies can be extremely valuable in improving later operations. At a minimum, records should include the following:

- Dates and times of routine maintenance
- Any difficulties, including chokes and the extent of spindle wrap, making notes specific to the row unit and bar(s)
- Weather and other conditions that may have contributed to chokes
- Time spent waiting for a boll buggy or module builder
- Modules containing unusual green leaf, green weeds, or wet cotton (for example) from uniquely different areas of the field

Use these notes to expedite ginning of certain modules. Review the notes before initiating repairs, focusing on identifying and correcting the most frequent problems.

Appendix: Harvest Loss Calculations

As the price of cotton rises, the value of "fine-tuning" picker operation and adjustment can easily exceed $1,000 per day. Estimating stalk and ground losses of seed cotton after the picker has passed can help determine what additional adjustments should be made. Two methods of estimating losses are (1) gleaning and weighing replicated plots (greatest accuracy) and (2) counting seed.

Seed Count Method of Estimating Picker Loss

1. Measure and mark several 10-foot sections of representative rows within the field to be harvested.
2. Count the open bolls on every plant within each 10-foot section of row.
3. Glean any seed cotton from the ground that fell from the sample row. Count and record the number of seeds in this cotton (preharvest loss).
4. Randomly select 20 open bolls, cut the stems, and save the bolls from at least five random but representative plants within the 10-foot section. Bolls should be representative selections, considering fruiting positions and relative yield contribution.
5. Count the number of locks in each of the 20 bolls and then record and determine an average number of locks per boll. If boll rot is significant, estimate the percentage of locks that are hard locks.
6. Pull one lock of seed cotton from each boll, and count the number of seeds within the locks to estimate an average number of seeds per lock.
7. Calculate the base seed count for yield by multiplying the number of bolls per 10-foot sample by the average number of locks per boll and then by the average number of seeds per lock.
8. Harvest the field and again select several 10-foot row sections to glean for composite postharvest, stalk, and ground loss. Maintain a separate count of stalk loss. If you determined hard locks in step 5, count the hard locks still on the stalk and those on the ground (loss due to hard lock).
9. Count all the seed contained in the cotton gleaned from the post-harvest, stalk, and ground loss samples; record and determine a total seed count.

10. Divide the number of seeds in each gleaned portion by the total base seed count (step 6) and multiply this number by 100 to obtain the percent loss in each category.

11. To estimate yield, divide the number of bolls counted per 10-foot section in step 2 by 120 bolls (equals approximately 1 bale per acre). However, this is a very preliminary estimate, which is sensitive to variety and weather.

These are estimates for yield and losses. Boll position on the plant affects boll size, yield from that boll, and picking efficiency. Smaller bolls from the top of the plant may not pick as well as big, open, fluffy bolls from the middle of the plant. Lower bolls, exposed to more weathering, may have locks that have dropped and lost before picking. Improve your estimate precision by increasing the number of sections, length of row, or number of bolls used for the base seed count and the loss sample.

Weight Method of Estimating Loss:
(More applicable to researchers)

1. From the "Row Length Table" on page 36, for the appropriate row spacing determine or calculate the equivalent row length to represent 1/1,000 acre or 1/100 acre to be gleaned (43,560 square feet per acre; 1/1,000 acre = 43.56 square feet). For a field with a uniform 38-inch row spacing: 43.56 square feet/38-inch row/12 inches per foot = 13.75 feet of row to equal 1/1,000 acre.

2. Harvest the field with the picker keeping accurate records of lint per acre.

3. Locate six representative plots within the field to be sampled. Glean the seed cotton from the row length determined in step 1, separating cotton gleaned from the stalks and from the ground in different containers. If preharvest losses are significant, keep weathered seed cotton distinct from ground losses while gleaning. Glean from all rows to be harvested with different row units on the picker. However, gleaning in middles where the tires have been generally results in a lowered amount of ground losses because the tires bury some locks.

4. Note appearance and condition of the stalks and losses. Noting this may help explain what seem to be irregularities in loss calculations later.

5. Remove the gleaned seed cotton from the field containers and spread it on a table to dry at standard room temperature (72°F) and humidity for 24-48 hours.

6. Clean large sticks and burs from the gleaned seed cotton by hand. If a seed cotton fractionation device is available, establish a standard "run time" and clean each of the samples to remove leaves and dirt during the standard run time.

7. Weigh the seed cotton in grams. Convert grams to pounds (454 grams = 1 pound) and multiply by 1,000 (or 100 if using 1/100-acre plots) to obtain the seed cotton loss per acre.

8. Estimate the turnout (ratio of lint to seed cotton harvested from ginning or assume 38% of the total weight is lint). If a small sample gin is available, the loss samples can be combined and ginned to estimate turnout for the samples. Use this ratio only for the sample turnout, since it may not be representative of the picked seed cotton sent to the gin.

9. Divide the lint yield per acre by the gin turnout (converted to a decimal) to obtain the seed cotton yield per acre. Add this to the losses in pounds per acre for a total seed cotton yield per acre. Divide the harvested seed cotton by the total seed cotton yield for harvester efficiency. Divide the losses by the total seed cotton yield for picker losses. Multiply these by 100 to obtain the percent loss within each category. Add the losses for a total loss per acre.

Note: 1 gram from 1/1,000 acre is equivalent to 2.2 pounds of seed cotton per acre; 1 gram from 1/100 acre is equivalent to 0.22 pound per acre. Therefore, it is extremely important to glean and clean the samples very carefully. Increasing the number of rows or the multiple lengths of 1/1,000 acre or choosing the 1/100-acre row length in a sample increases the precision of the measurements, if you can justify the increased cost (i.e., time and labor for sample gleaning and preparation). Weather loss is a function of conditions before harvest and is largely an unavoidable loss with the exception of a more timely harvest. Stalk and ground loss from the picker indicate the composite of the picker's mechanical condition and adjustment and the operator's proficiency.

Row Length Table:

Row length in feet required to glean for 1/1,000 and 1/100 acre to represent each row unit.

Effective Row Spacing	Row Spacing (inches)	Row Length (feet) to Glean for:	
Row Unit Coverage (inches)	Regularly Spaced Row Patterns	1/1,000 acre	1/100 acre
30	15	17.4	174.2
30	30	17.4	174.2
36	36	14.5	145.2
38	38	13.8	137.6
40	40	13.1	130.7
	Alternating Skip-Row Patterns		
45	15 with one row skipped for every two planted	11.6	116.2
60	15 with two rows skipped for every two planted	8.7	87.1
45	30 with one row skipped for every two planted	11.6	116.2
54	36 with one row skipped for every two planted	9.7	96.8
72	36 with two rows skipped for every two planted	7.3	72.6
57	38 with one row skipped for every two planted	9.2	91.7
76	38 with two rows skipped for every two planted	6.9	68.8
60	40 with one row skipped for every two planted	8.7	87.1
80	40 with two rows skipped for every two planted	6.5	65.3
50	40 with a 60-inch skip for every two rows planted	10.5	104.5

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