TECHNICAL BULLETIN

COTTON INCORPORATED

6399 Weston Parkway, Cary, North Carolina, 27513 • Telephone (919) 678-2220

TRI 1008

QUALITY CARDING

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INTRODUCTION

Cotton Incorporated presents in this bulletin recommendations for good card maintenance procedures, quality standards, and troubleshooting guidelines for the production of a quality end product. The purpose of this bulletin is to present a concise reference on the carding process to maximize efficiency, performance, and profit.

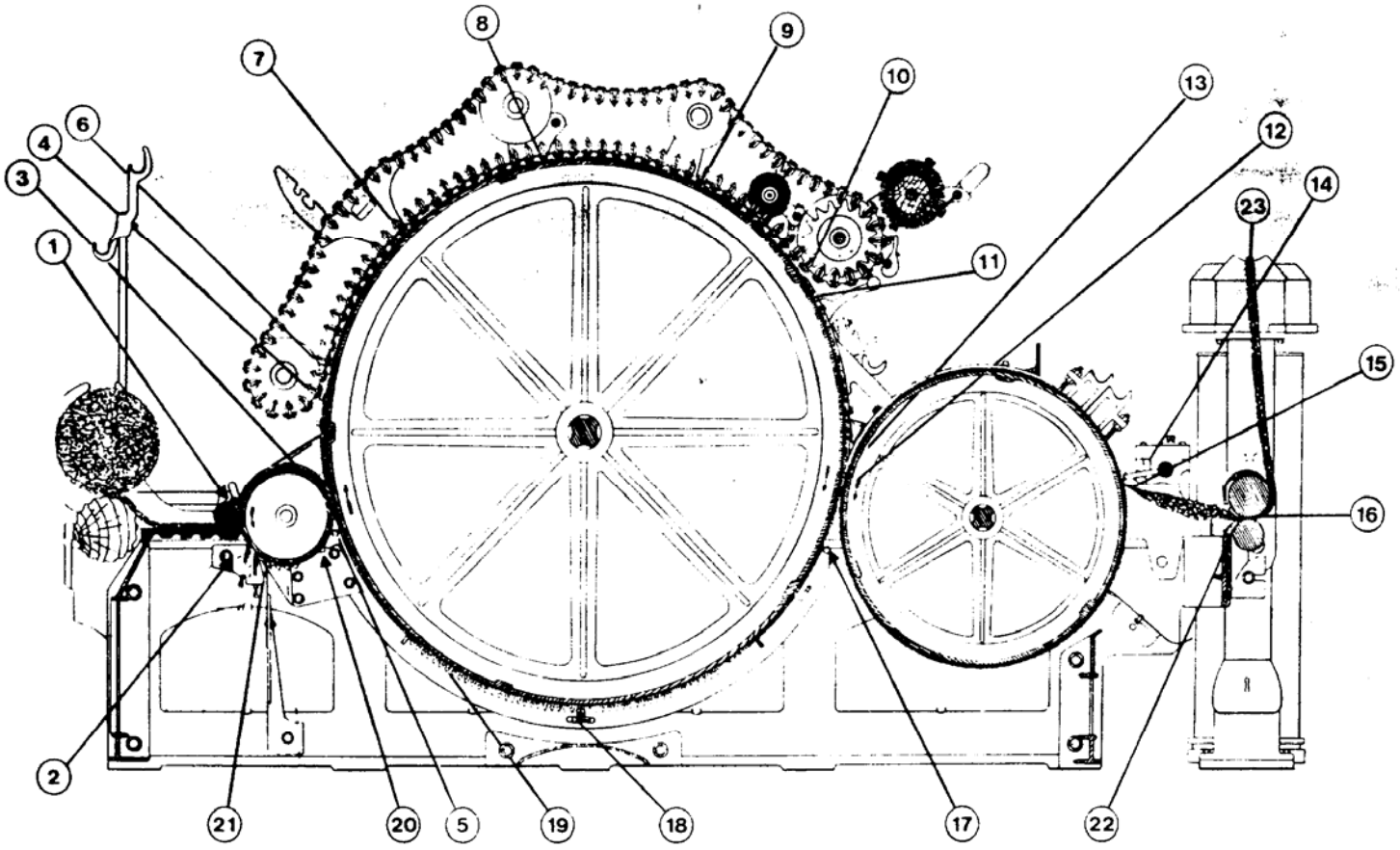
This information represents card settings for a large number of cards in use today. More recently, cards with long and short term leveling devices have been introduced to the industry and are now being used in commercial production. Manufacturers of these units should be contacted for set-up and continuing maintenance recommendations.

The process of cotton spinning begins at the card. The opening, blending, and cleaning processes are preparatory operations which clean and separate the cotton fiber to allow the card to perform its objectives. The carding objectives are to open the fiber from small tufts to individual fibers, remove foreign matter and neps, partial parallelization of fibers, and combining these fibers into a sliver. The quality of the sliver produced at carding is a major factor, ultimately determining the quality of yarn and fabric.

With the evolution of high speed carding, an ever-increasing need for rigorous maintenance procedures and careful monitoring of the quality produced at each individual card becomes apparent. Each individual mill must select the quality standards to satisfy the customer's needs. With thorough inspection and problem detection, quality standards are maintained, thus ensuring the consistent production of the best product at the lowest cost.

CARD SETTING

RECOMMENDATIONS



SETTING POINTS FOR REVOLVING FLAT CARD

	Setting Points		Max.	Min.	Recom-mended	Comments
1	Feed Roll to Plate		.005	.003		
2	Feed Plate to Lickerin		.029	.010		
3	Lickerin to Cylinder		.010	.007		
4	Back Plate	Top	.034	.022		
5		Bottom	.034	.022		
6	Flats	Back	.034	.007		
7		Intermediate	.034	.007		
8		Intermediate	.034	.007		
9		Intermediate	.034	.007		
10		Front	.034	.007		
11	Front Plate	Top	.064	.022		
12		Bottom	.064	.022		
13	Doffer to Cylinder		.007	.003		
14	Take Off Roll	Top	.080	.034		
15	To Doffer	Bottom	.100	.054		
16	Calender Roll		.015	.003		
17	Screen	Front	.250	.125		
18		Middle	.062	.029		
19		Back	.029	.017		
20		Basket to Lickerin	.034	.017		
21		Nose to Lickerin	.125	.034		
22	Trumpet	Card	.250	.150		
23	Hole Diameter Coiler		.250	.150		
24	Arches to Cylinder (Not Shown)		.034	.015		

Note: Setting expressed in inches

The Trumpet

1. The bore of the trumpet controls the amount of condensation of the sliver. For every weight of sliver, there is a corresponding bore for the trumpet.

2. The coiler trumpet should be larger by 1.12 times the trumpet diameter.

3. Certain long staple, low micronaire cotton may require an even larger hole than recommended because of coring (the tendency to form core/sheath geometry).

4. Sizing of the trumpet should be done with a tapered reamer. Check with standard trumpet gauge from discharge end of trumpet.

GRAIN SLIVER	DIAMETER TRUMPET HOLE	
	Recommended	Minimum
40	0.160	0.140
45	0.175	0.150
50	0.185	0.160
55	0.190	0.167
60	0.200	0.175
65	0.210	0.182
70	0.220	0.190

Note: The above does not apply to cards equipped with auto-leveling device.

MAINTENANCE RECOMMENDATIONS

A. LUBRICATION SCHEDULE

The following points of a high production card should be lubricated with a good grade of low detergent oil every eight hours, as applicable, or according to manufacturer's recommendations:

1. Doffer drive
2. Web tension gears driving calender section
3. Roller chain

The following points should be greased each maintenance cycle or according to manufacturer's recommendations:

1. Web tension and drive gears
2. Coiler drive gears
3. Calender roll gears

Units equipped with central lubrication systems are to be cycled once every eight hours of operation. Note:

1. **Caution:** Keep oil clean when filling reservoir.
2. Check oil flow each time maintenance requires tubing disconnection. Bleed air from line if needed.

Doffer, cylinder, and lickerin bearings should be lubricated according to manufacturer's recommendations.

B. CLEANING PROCEDURES FOR HIGH PRODUCTION CARDING EQUIPMENT

The following procedures should be completed once every 24 hours:

1. Cut feed out, lock stop motion in place, and leave the doffer running on 4 to 5 cards.
2. Pull motes and undercard fly if not equipped with automatic cleaning.
3. Remove or open the following:
    - Back door
    - Side doors
    - Front door
    - Release pressure on scraper blades
    - Flat strip roll
4. Blow the following points in approximate order listed:
    - Four arch points where chokes sometime form
    - Each end of doffer shaft between shrouds and doffer ends
    - Under cards, from front to back
    - Screens, dislodging any fly accumulation on ribs
    - If possible, remove top clearer on calender roll and blow accumulation between rolls and trumpet

- Open coiler cover and clean
- Outside of card, blowing the four arch points last

5. Replace all covers, etc., reapply pressure to scraper blades, and put card back into production.

In addition to the above, the cards should be mopped or wiped on the outside once a shift.

600-HOUR MAINTENANCE SCHEDULE

The following maintenance items should be performed every 600 operating hours:

1. Run cotton out of card.
2. Clean card completely.
3. Run flats out -- strip cylinder and doffer.
4. Stop card.
5. Remove guard and covers.
6. Clean gears, sprockets, chain, and pulleys.
7. Check gears for wear and proper mesh.
8. Check sprockets for wear and proper alignment.
9. Check chain for wear and proper tension.
10. Check web roll scraper blades for wear or damage.
11. Check condition of wire, cylinder, doffer, lickerin and flats.
12. Check all set points on card (see listing and schematic).
13. Grease or oil all lubricating points.
14. Clean all air cleaning equipment.
15. Tighten all adjustment screws.
16. Clean and replace all guards and covers.
17. Start card without cotton -- check for any rubbing.
18. Check card drive for alignment.
19. Put cotton in card.
20. Check seating of scraper blade on web rolls.
21. Check card stop motions.

TROUBLESHOOTING

CARDING PROBLEMS

A. Cylinder Loading

Probable Cause	Solution
1. Contaminated stock. 2. Flats set too close to cylinder. 3. Doffer not set close enough to cylinder. 4. Back plate too close to cylinder. 5. Damaged clothing. 6. Lickerin jerk in.	1. Check opening and picking for contamination. 2. Try more open flat setting. 3. Set doffer to cylinder on 0.005" to 0.007". 4. Try more open plate setting. 5. Grind, brush, or recloth. 6. Check feed roll setting to feed plate. This setting should not exceed 0.005".

B. Lickerin Loading

1. Damaged lickerin wire. 2. Contaminated stock. 3. Lickerin wire not suited for type of stock being run. 4. Lickerin not set close enough to cylinder.	1. Replace lickerin. 2. Check opening and picking for contamination. 3. Consult wire manufacturer. 4. Reset lickerin on 0.007" to cylinder.

C. Doffer Loading

1. Damaged wire. 2. Take-off unit improperly set. 3. Lickerin jerk in. 4. Improper procedure for putting end up on card.	1. Grind, brush, or recloth, depending on degree of damage. 2. Adjust take-off unit to manufacturer's specifications. 3. Check feed roll to feed plate. 4. Moisten crush roll as soon as stock starts through the card.

D. Flats Loading

1. Damaged wire. 2. Improper setting of flat comb.	1. Grind, brush, or replace clothing. 2. Make proper comb setting.

CARDING PROBLEMS (continued)	
E. Losing Fiber Off the Doffer to the Main Cylinder	
Probable Cause	**Solution**
1. Nose of front cylinder screen too long for staple length stock being run. 2. Nose of front screen set too close to cylinder. 3. Dull doffer wire.	1. Replace with proper length front screen. 2. Try more open setting on front of screen. 3. Grind doffer.
F. Heater Controls Overloaded. Drive Kicking Out on Start-Up.	
1. Belt too tight. 2. Cylinder rubbing arches.	1. Adjust motor. 2. Adjust arches to cylinder on 0.022" when possible.
G. Heater Controls Overload on Drive, Kicking Out After Running for 1 Hour.	
1. Cylinder loaded with fiber. 2. Heater in control box too low.	1. Cut feed out. Let cylinder clean out. Brush cylinder if necessary. 2. Install correct heaters.
H. Drive Belt Not Slipping on Start-Up	
1. Drive belt too tight. 2. Belt dressing on belt.	1. Adjust drive motor. 2. Clean belt with cleaning fluid. (Belt should slip on cylinder pulley for 50 to 120 seconds during starting up of card.)
I. Drive Belt Running Off Main Cylinder. Pulley on Start-Up.	
1. Motor mounting bracket not adjusted properly. 2. Timing pulley out of adjustment. 3. Main cylinder pulley out of round.	1. Line and level motor bracket. 2. Adjust timing pulley and main cylinder pulley. 3. Replace main cylinder pulley or turn pulley in lathe until pulley is round and true. (It is not necessary to crown the pulley.)

CARDING PROBLEMS (continued)	
J. Drive Pulley Slipping in Timing Belt	
Probable Cause	**Solution**
1. Drive belt too loose.	1. Adjust belt tension. (Belt should slip on large cylinder pulley for 50 to 120 seconds during start-up of card.
K. Doffer Bearing Getting Hot	
1. Doffer bearings not aligned. 2. Bad bearing.	1. Remove bearing caps and realign bearings. 2. Replace bearing.
L. Crush Roll Fusing Synthetic Fiber in Blends	
1. Too much pressure on crush rolls.	1. Pressure should be adjusted to a lower degree until the problem is eliminated.
M. Rolls Not Crushing Trash in Card Web	
1. Not enough pressure between crush rolls. 2. Pressure on crush rolls not being distributed evenly.	1. Adjust roll pressure according to manufacturer's specifications. 2. Align crush rolls according to manufacturer's specifications.
N. End Down	
1. Scraper blade tagging. 2. Take-off rolls and crush rolls not set properly. 3. Draft gear not deep enough in mesh. 4. Web tension not correct. 5. Sliver tension from calender roll to coiler. 6. Trumpet bore too small. 7. Doffer or cylinder loading. 8. Fiber build-up on nose of front screen. 9. Tagging under doffer cleaning hood. 10. Improper front bottom plate setting.	1. Inspect scraper blade for proper setting. Replace worn blades. 2. Set take-off rolls and crush rolls to manufacturer's specifications. 3. Set draft gear properly. 4. Change web tension gear to desired tension. 5. Change sliver tension gear or sprocket for best results. 6. Ream trumpet at calender rolls and in coiler according to sliver weight. 7. Refer to problems A and C. 8. Remove screen from card, clean, deburr, or replace if damaged. Install and reset. 9. Remove hood, clean, inspect for burrs and replace. 10. Set front bottom plate to manufacturer's specifications.

CARDING PROBLEMS (continued)	
N. End Down (Cont'd)	
Probable Cause	**Solution**
11. Card not properly cleaned.	11. Card should be cleaned as instructed by manufacturer.
12. Bad lap or batt selvage.	12. Check pickers or card feeders.
13. Lap or batt guides not set properly.	13. Re-set lap or batt guides.
14. Feed roll not set properly to feed plate.	14. Check feed roll bearings for wear and set feed roll to feed plate on 0.005".
15. Split lap on lap-fed cards.	15. Correct lap on card and check pickers.
16. Calender rolls set too open.	16. Set calender rolls according to sliver weight being produced.
17. Temperature and humidity.	17. Maintain proper temperature (75° to 85°F) and humidity (40% to 60%).
18. Feeder and lap weight variation.	18. Check feeder and pickers.
O. Neps	
1. Dull or damaged doffer, cylinder, lickerin and flat wire.	1. Grind or replace wire.
2. Cylinder loading.	2. Refer to problem A.
3. Flats loading.	3. Refer to problem D.
4. Plates and screens not set properly.	4. Reset plates and screens to manufacturer's specifications.
5. Lickerin to cylinder improperly set.	5. Set lickerin to cylinder on 0.007".
6. Flats to cylinder improperly set.	6. Set flats to cylinder to manufacturer's specifications. (For 100% cotton, set flats to cylinder on 0.010" from front to rear.)
7. Doffer to cylinder improperly set.	7. Set doffer to cylinder from 0.005" to 0.007".
8. Feed plate to lickerin improperly set.	8. Set feed plate to lickerin to mill's standards.
9. Too much reworkable waste being processed.	9. Blend minimum amount of reworkable waste with stock.
10. Improper speeds on cylinder, lickerin and flats.	10. Adjust speeds according to production and stock being processed.

CARDING PROBLEMS (continued)	
P. Unevenness	
Probable Cause	**Solution**
1. Web and sliver tension. 2. Gears and chains not set properly. 3. Uneven feeder batt or picker lap. 4. Feed roll not set properly. 5. Damaged clothing.	1. Change web and sliver tension for best results. 2. Reset gears and chains to proper adjustment; replace if worn. 3. Check card feeder and picker. 4. Refer to problem N-14. 5. Refer to problems A, B, C, and D.
Q. Improper % of Flat Strip	
1. Top front plate out of adjustment. 2. Flexible bends out of adjustment. 3. Flat speed incorrect.	1. Set top front plate to proper setting. 2. Set flexible bends to flat pulleys to standard setting. 3. Change flat drive pulley to desired speed.
R. Improper % of Undercard Mote or Fly Waste	
1. Screen not set properly. 2. Fiber retriever or mote knife not set properly. 3. Lickerin plenum or pipe plugged. 4. Plenum improperly set to feed roll.	1. Reset screen. 2. Reset fiber retriever or mote knife. 3. Clean out plenum and pipe. 4. Reset plenum to feed roll to manufacturer's specifications.
S. Coring of Sliver	
1. Trumpet bore too small. 2. Too much pressure on calender rolls.	1. Ream trumpet according to grain weight of sliver. Refer to trumpet hole chart. 2. Adjust calender roll pressure to manufacturer's specifications. **NOTE:** Coiler trumpet should be 0.010" larger than calender roll trumpet.
T. Uneven Selvage on Card Web	
1. Choke on the nose of the front screen. 2. Lap or batt guides improperly set. 3. Bad picker lap or feeder batt selvage.	1. Clean and reset front screen. 2. Reset lap or batt guides. 3. Check pickers or feeders.

CARDING PROBLEMS (Continued)	
U. Stop Motion Failure to Operate	
Probable Cause	**Solution**
1. Stop motion not set properly.	1. Set stop motion as instructed by manufacturer.
2. Sliver wand fails to fall.	2. Clean and lubricate bearing. Reset balance weight.
3. Sliver wand fails to latch.	3. Reset the latch assembly as instructed by manufacturer.
V. Improper Web Tension	
1. Improper web tension gear or sprocket.	1. Install proper tension gear or sprocket.
2. Improper calender roll pressure.	2. Adjust calender roll pressure to manufacturer's specifications.
3. Improper bore in calender roll trumpet.	3. Ream calender roll trumpet according to the grain weight of sliver. (Refer to trumpet hole chart).
4. Humidity or temperature.	4. Adjust temperature to minimum 75°, maximum 85°F. Adjust humidity to minimum 40%, maximum 60%.
W. Improper Sliver Tension	
1. Improper coiler tension gear or sprocket.	1. Refer to solution P-1.
X. Holes in Web	
1. Doffer wire loaded with trash.	1. Clean doffer wire.
2. Damaged wire on doffer or cylinder.	2. Recloth as needed.
Y. Lap Jerking in at Feed Roll	
1. Feed roll not set properly.	1. Set feed roll to feed plate on 0.005".
2. Feed roll bearings worn, allowing feed roll to raise up.	2. Install new feed roll bearing.
Z. Belts Slipping from Cylinder to Lickerin and from Lickerin to Doffer	
1. Belt too loose.	1. Replace belt and maintain 2% tension.
2. Bad bearing on lickerin, doffer, calender roll or coiler.	2. Locate bad bearing and replace.
3. Lickerin choked.	3. Unchoke lickerin.

PRODUCTION CALCULATIONS

$$\text{Production (in lbs./hr.)} = \frac{\text{rev.}}{\text{min.}} \times \frac{\text{in.}}{\text{rev.}} \times \frac{\text{yd.}}{\text{in.}} \times \frac{\text{min.}}{\text{hr.}} \times \frac{\text{grains}}{\text{yd.}} \times \frac{\text{lbs.}}{\text{grains}}$$

$$= \text{RPM} \times \pi D \times \frac{1}{36} \times \frac{60}{1} \times \frac{\text{grains}}{\text{yd.}} \times \frac{1}{7000}$$

$$= \frac{\text{RPM} \times \pi D \times \text{GRAIN WT.}}{4200}$$

$$\text{Production (for 2" roller)} = \frac{\text{RPM} \times \text{GRAIN WT.} \times 6.2832}{4200}$$

$$= \frac{\text{RPM} \times \text{GRAIN WT.}}{668.45}$$

$$= \text{RPM} \times \text{GRAIN WT.} \times 0.0015$$

$$\text{Production (for 2 ½" roller)} = \frac{\text{RPM} \times \text{GRAIN WT.} \times 7.854}{4200}$$

$$= \frac{\text{RPM} \times \text{GRAIN WT.}}{534.75}$$

$$= \text{RPM} \times \text{GRAIN WT.} \times 0.00137$$

$$\text{Production (for 3" roller)} = \frac{\text{RPM} \times \text{GRAIN WT.} \times 9.4298}{4200}$$

$$= \frac{\text{RPM} \times \text{GRAIN WT.}}{445.6}$$

$$= \text{RPM} \times \text{GRAIN WT.} \times 0.0024$$

Note:
1. $\pi = 3.14$
2. Production at Card
   3" Calender Roll = RPM x GRAIN WT. x 0.0024 x 1.1
3. Production at Card
   4" Calender Roll = RPM x GRAIN WT. x 0.003 x 1.1

RESEARCH AND TECHNICAL SERVICES

Cotton Incorporated is a research and promotion company representing cotton worldwide. Through research and technical services, our company has the capability to develop, evaluate, and then commercialize the latest technology to benefit cotton.

- Agricultural research leads to improved agronomic practices, pest control, and fiber variants with properties required by the most modern textile processes and consumer preferences. Ginning development provides efficient and effective machines for preservation of fiber characteristics. Cottonseed value is enhanced with biotechnology research to improve nutritional qualities and expand the animal food market.

- Research in fiber quality leads to improved fiber testing methodology and seasonal fiber analyses to bring better value both to growers and then mill customers.

- Computerized fiber management techniques result from in-depth fiber processing research.

- Product Development and Implementation operates programs leading to the commercialization of new finishes and improved energy and water conserving dyeing and finishing systems. New cotton fabrics are engineered -- wovens, circular knits, warp knits, and nonwovens -- that meet today's standards for performance.

- Technology Implementation provides comprehensive and customized professional assistance to the cotton industry and its customers -- textile mills and manufacturers.

- A fiber-to-yarn pilot spinning center allows full exploration of new and existing fiber processing and spinning technologies from specific cotton fiber profiles for various products.

- The Company operates its own dyeing and finishing laboratory, knitting laboratory, and a laboratory for physical testing of yarn, fabric, and fiber properties including High Volume Instrument testing capable of measuring micronaire, staple length, strength, uniformity, color, and trash content.

For further information contact:

COTTON INCORPORATED
WORLD HEADQUARTERS
6399 WESTON PARKWAY
CARY, NC 27513
PHONE: 919-678-2220
FAX: 919-678-2230

COTTON INCORPORATED
CONSUMER MARKETING HEADQUARTERS
488 MADISON AVENUE
NEW YORK, NY 10022-5702
PHONE: 212-413-8300
FAX: 212-413-8377

Other Locations
• Los Angeles • Mexico City • Osaka • Shanghai • Singapore •

Visit our website at: www.cottoninc.com

COTTON INCORPORATED