

# **MOGUL** *Master* **MULTI-BLADE PLANERS**

## **OPERATOR'S MANUAL**

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*“Industrial/Recreational Over-Snow and  
All-Terrain Vehicle & Equipment Specialists”*  
Sales • Parts • Service  
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Congratulations! Your association is the proud owner of the industry's finest snowmobile trail groomer, the ***Mogul Master Multi-Blade Planer***. Your Mogul Master Multi-Blade Planer has been manufactured using only the finest in quality materials and workmanship and will provide years of trouble free use with only a minimum of maintenance.

The secret to the proven success of the Mogul Master Multi-Blade is really no secret at all. The Mogul Master Multi-Blade Planer has been carefully designed and engineered to perform a series of steps that are a must for effective trail grooming. Under most trail grooming conditions these steps are accomplished in a single pass. The steps for effective trail grooming are:

***1- Cutting Moguls:*** The most obvious step in snowmobile trail grooming, whenever conditions allow, is to remove the moguls that snowmobile traffic will cause on the trail. To simply cut off the tops of the moguls and drop the snow into the depression of the moguls will result in these same moguls returning in no time at all. The Mogul Master's combination of multiple, angled cutting blades, with the lower edge of the blade leading into the mogul, provides an extremely aggressive cutting ability. This allows the Mogul Master to completely remove the moguls, all the way down to the base, thus eliminating all "memory" of the moguls from the trail. Depending on the amount of fresh snowfall covering the moguls on the trail it is not always possible to completely remove the moguls in which case the Mogul Master is able to set up a new trail base over the existing moguls as explained below.

***2- Processing the snow:*** There are a number of steps involved in processing the snow on a trail that is achieved by the Mogul Master Multi-Blade Planer. At any given time there may be many various types of snow on a snowmobile trail... hard packed snow, soft snow, freshly fallen snow and snow that has been pounded and worked so hard that there is little consistency to it. The Mogul Master's angled blade design causes these various types of snow to be thoroughly mixed or "homogenized" by working the snow from side to side as the Mogul Master is pulled along the trail. The curved design of the cutting blades further affects this homogenizing by rolling the snow forward as it is being worked from side to side. While the snow is being mixed or homogenized it is also being de-aerated. In other words the air is being removed from the snow and at the same time this mixing is breaking down the minute sharp edges of the individual snowflakes of the fresh snow that may be present. Another very important step that is taking place is that the temperature of the snow is actually rising, be it to a very small degree, with the friction created by the Mogul Master working the snow. While the snow is being processed in this manner to provide a consistent mix of all of the snow on the trail it is also being spread evenly across the width of the Mogul Master. All of these individual steps in the processing are very important for the final step that the Mogul Master accomplishes.

***3- Compacting the snow:*** Once the Mogul Master has completed the steps as described above, the leading edge of the Rear Packing Pan of the Mogul Master Multi-Blade Planer further serves to spread the processed snow evenly across the width of the pan. Finally, the Mogul Master Multi-Blade Planer compacts the snow with the Rear Packing Pan that has been engineered to provide the ideal pressure on the processed snow and the result is a table top smooth, durable finish to the snowmobile trail.

Three basic steps that are a must to accomplish what snowmobile trail riders and groomer operators alike demand... quality, groomed trails. There is a fourth step that can add to the length of time that the finished groomed trail lasts and that is set up time. The longer the set up time,

the more durable the trail. However, with the effectiveness of the Mogul Master performing the steps described above, the set up time required is kept to a minimum.

### ***Connecting to The Tracked Vehicle***

1- By hand, raise the Front Hitch of the Mogul Master to the approximate height of the Pintle Hook of the tracked vehicle. If the connection is being done by one person only, the hitch can be held at the correct height using the length of 5/16" chain provided by connecting the chain between the grab hook which is welded on the hitch and the grab hook on the black "Floating Device" which is pinned to the front hydraulic cylinder.

2- Back the tracked vehicle to the Mogul Master and drop the Pintle Ring on the draw bar of the Mogul Master Front Hitch into the Pintle Hook of the tracked vehicle. Fasten the lock on the tracked vehicle's Pintle Hook and install the safety pin.

3- Connect the two hoses for the front hydraulic cylinder of the Mogul Master to one circuit of the tracked vehicle and the two hoses for the rear cylinder of the Mogul Master to a second circuit on the tracked vehicle. Because the front hydraulic cylinder provides the control for the depth of cut for the Mogul Master and is used most frequently, be sure to have this front cylinder controlled by the actuator in the cab of the tracked vehicle that is in a comfortable, easy to reach location. The rear hydraulic cylinder of the Mogul Master is used to control the Rear Wheel Assembly which raises the rear of the Mogul Master for backing up and for road and railway crossings etc. and as such is used far less often.

**Note:** To remove the chain used to hold the Mogul Master Front Hitch at the correct height activate the front cylinder to raise the front of the Mogul Master (this lengthens the front hydraulic cylinder) which will provide the necessary slack. Be sure not to activate the hydraulic control to shorten the front cylinder, as this will cause the chain or the grab hooks to bend or break.

4- Activate the hydraulic controls in the cab of the tracked vehicle to raise and lower the Mogul Master 8 to 10 times to remove all air from the hydraulic hoses and cylinders on the Mogul Master. Inspect all connections for leaks.

Note: The direction of control handle movement in the cab of the tracked vehicle is very much an operator's choice, however, a pulling motion on the control to raise the Mogul Master and a pushing motion to lower is most preferred for operator comfort. Once the hydraulic connections have been made to the operators liking, to facilitate removal and reconnection of the hydraulic hoses, identify each mating hose on the tracked vehicle and Mogul Master with different colored plastic tie wraps or with some other means of identifying mating hoses. Be sure to also identify the hoses at the groomer side of the Quick-Release Couplers on the hitch if your Mogul Master is equipped with the Quick Release Couplers on the Front Hitch.

5- Once all connections have been made as described, slowly move the tracked vehicle ahead turning first one way and then the other. Carefully inspect the hydraulic hoses for binding and interference as the tracked vehicle is turned. Also check to be sure there is sufficient clearance between the rear outside of the tracks and the front outside of the Mogul Master when the tracked vehicle is fully turned.

## ***Grooming Speed***

The term for the grooming speed that provides the best all around results is the "Optimum Grooming Speed". The Optimum Grooming Speed is the speed at which the maximum number of miles of trail are groomed in the shortest length of time... while achieving the best quality trail. Do not confuse Optimum Grooming Speed with high speed!

When grooming too fast the snow does not have enough time to be processed effectively by the Mogul Master and the result is a poorer quality trail that will not stand up to traffic and in turn means more frequent grooming. Another major result of high speed grooming is the significant increase in the wear and tear and maintenance and repairs required on the tracked vehicle and Mogul Master. The operator may be able to cover more trail in a given period of time, however, this advantage is quickly lost in increased costs for more frequent grooming, higher fuel consumption, increased repair costs and down time.

Grooming too slow, although certainly not as disastrous as grooming too fast, also has its costs in wasted time and time is money in operators wages and fuel consumed.

The Optimum Grooming Speed would be somewhere between 6 to 8 miles per hour depending on conditions and should never exceed 9 to 10 miles per hour. Grooming wet snow requires a change in grooming speed as described below.

## ***Operating the Mogul Master Multi-Blade Planer***

The Mogul Master Multi-Blade Planer is an extremely user-friendly trail groomer that can be effectively operated by even the most inexperienced operators by using only two hydraulic functions activated from the cab of the tracked vehicle. The operator must, of course, be familiar with all aspects of the tracked vehicle being operated and follow all safety procedures. Before using the Mogul Master for the first time the operator should take a moment to walk around the Mogul Master Multi-Blade Planer to become familiar with the various components on the groomer. The operator should also operate the hydraulic functions from the cab of the tracked vehicle and take notice of the corresponding movements of the Mogul Master. The Mogul Master will do all of the trail preparation with only a minimum of adjustment necessary by the operator.

The Rear Wheel Assembly of the Mogul Master is raised or lowered by a hydraulic control in the cab and is used to raise the rear of the groomer at any time the Mogul Master is backed up or to allow for road crossing and railway crossing and to load the Mogul Master and tracked vehicle on and off trailers etc. When trail grooming the Rear Wheel Assembly is in the raised position and the Rear Packing Pan is always on the snow.

The amount that the Mogul Master cuts is adjusted by moving the control in the cab that activates the front hydraulic cylinder on the groomer. The main frame of the Mogul Master is raised or lowered at the front to vary the amount of cut as necessary with the Rear Packing Pan in constant contact with the snow as mentioned above. The cutting depth of the Mogul Master must be adjusted by the operator as varying trail conditions demand.

When operating the Mogul Master, if the visibility from the cab of the tracked vehicle permits, watch the snow in the groomer as it is being processed and/or the finished trail that the Mogul Master leaves. Until the operator is familiar with the results that the Mogul Master is producing, occasionally stop the tracked vehicle and get out and walk back to the rear of the Mogul Master and check the trail that is being produced.

Varying snow and trail conditions will mean varying the grooming procedures somewhat. When operating, the Mogul Master is at all times in a "Nose Up Attitude" to a greater or lesser degree depending on the trail and snow conditions. The procedures described below are a general guideline to follow and are assuming that the tracked vehicle has adequate pulling power and tractive ability. With a tracked vehicle that has sufficient tractive ability and pulling power, in a single pass, the Mogul Master can in most cases easily remove moguls that are up to 18" in height. With a good front blade on the tracked vehicle, moguls of 24" or more in height can be removed in a single pass. By following the general guidelines described below, the operator will soon be getting maximum results from the Mogul Master.

***Trail Condition: Little to moderate amounts of freshly fallen snow; hard packed, low to moderate to severe moguls; temperature below freezing:***

Because the Mogul Master is extremely aggressive and is able to remove moguls with ease, when grooming a trail with little fresh snow cover, care must be taken not to have the Mogul Master adjusted too low which would unnecessarily process the hard packed trail base. The snowmobile trail should be groomed no lower than to the bottom of the moguls only to reprocess the moguls and any new fallen snow that may be present. By following this method the hard packed base of the trail is constantly being raised as the season progresses.

Adjust the cutting depth to a point where the moguls are being removed. On a trail with low to moderate moguls, when the Mogul Master is correctly adjusted, the front blades of the Mogul Master will only skim the tops of the moguls and the middle and rear blades will finish the removal of the moguls. The snow can be seen working back and forth and rolling in the Mogul Master. On a trail with more severe moguls the Mogul Master cutting depth will have to be adjusted so the front blades will be cutting a larger portion of the moguls. The snow will be approximately half way up the front blades and it can be seen rising and falling as the front blades meet the moguls. The deeper the cutting depth of the Mogul Master and the more fresh snow on the trail, the more snow that will be carried. When the snow that has built up in front of the pan cannot be seen to be working or flowing the groomer is carrying too much snow and not working effectively. Raise the Mogul Master slightly to reduce the amount of snow being carried and watch the snow to ensure it starts to flow effectively. In most cases, depending on the track vehicle's hydraulic system, a "tap" of the control lever up or down is all it takes to make a significant change in the amount the Mogul Master cuts and in the amount of snow being carried.

The important points to watch for are:

1- The Mogul Master cutting height should be adjusted so the snow can be seen working in the groomer. When the amount of snow at the rear of the Mogul Master builds up to a point where the snow does not appear to be flowing effectively, raising the Mogul Master slightly will reduce the amount of snow being carried and allow the snow to begin flowing.

- 2- Watch the front blades of the Mogul Master to have them just skimming the moguls on a moderately rough trail and on a rougher trail have the snow half way up the front blades.
- 3- The snow should not be allowed to build up in front of the rear pan to a point where it is spilling over the sides.
- 4- Constantly watch the snow in the Mogul Master to make sure it is flowing and working and make slight adjustments as necessary.

***Trail Condition: Lots of freshly fallen snow; temperature below freezing:***

When grooming on trails with a lot of new snow the Mogul Master should be adjusted to be as high as necessary to keep the rear pan area of the Mogul Master full of snow without having the snow spill over the sides. With a great amount of snow on the trail some spillage may occur. Grooming speed may have to be reduced somewhat. Moguls under a deep snowfall cannot in all cases be completely removed, however, the Mogul Master is able to process the fresh snow and compact it to a smooth finish which sets up a new base over the existing moguls. In this case a longer set up time becomes more important. In the case of extremely deep snow falls two passes may be required. The first pass will pack the trail and the second pass will more effectively groom the trail.

***Trail Condition: Wet, heavy snow; temperature above freezing:***

Processing wet heavy snow is more difficult and requires more operator finesse in that it is sticky and will not flow as well as cold, dry snow. To groom in wet snow adjust the Mogul Master somewhat higher than you would in below freezing conditions and pick up the speed slightly. The operator must watch the snow in the Mogul Master very closely in wet conditions to ensure the snow is flowing freely. Should the wet snow begin to collect in the Mogul Master and not flow freely, raise the drag high enough to clear the snow and then lower it again. With a bit of experience, the operator will be able to groom quite effectively in wet snow.

***Overlapping Passes***

With the ability of the Mogul Master to contain the snow within the main frame of the groomer, the operator is able to groom side by side passes on a trail leaving virtually no burm between the passes. Simply overlap the first pass somewhat to ensure the packing pan is at the same level as the first pass and follow the procedures above.

***Backing Up***

Extreme care must be taken when backing up. When backing up off the groomed portion of the trail ensure the area you are backing into is free of any obstacles that may be hidden under the snow and that the rear of the Mogul Master may run into. The Mogul Master can be backed up with the rear wheels in either the raised or lowered position depending on the situation the operator finds himself in. The High Lip Packing Pan has been designed with a high, radiused rear leading edge to allow the Mogul Master to float on top of the snow when backing up. Keep the front of the Mogul Master as low as possible and back up very slowly. Always watch the Mogul Master when backing up. With the design of the Mogul Master the Front Hitch is

attached to the main frame with a Floating Device which reduces hill top scalping when cresting hills. This Floating Device will allow the front of the Mogul Master to lift if the rear of the groomer meets an obstacle when backing up. If the operator does not notice the groomer lifting and continues to back up, serious damage to the Pintle Hook of the tracked vehicle and to the Draw Bar or Hitch of the Mogul Master can result.

### ***Grooming at Night***

Grooming at night in most cases will produce the best quality trail because the temperatures are generally colder and the snow will flow better and set up harder. Grooming at night is also safer because the groomer operator is able to see the lights of oncoming snowmobile traffic and the snowmobilers are able to see the lights and strobe beacon of the tracked vehicle as well as the reflective striping and Slow Vehicle Caution Sign that are visible on the Mogul Master.

### ***Grooming on the Wrong Side of the Trail***

There are advocates of trail grooming that advise grooming against the traffic flow on the left side of a trail with the justification that you are able to groom against the moguls and therefore are better able to cut the moguls. This practice is very dangerous and must be avoided! With the great physical size of snowmobile trail grooming equipment there is in many cases very little room for oncoming traffic to get around grooming equipment operating on the right side of the trail let alone the left side. The aggressive nature of the Mogul Master will cut the moguls very effectively on the proper side of the trail and the Mogul Master has actually been designed to operate on the right side of the trail by having the last blade of the groomer pull the snow from the outside of the trail towards the center.

### ***Shear Pin Hitch***

Two systems have been designed into the Mogul Master to reduce undue stress to both the Mogul Master and the tracked vehicle. First, each individual cutting blade is spring loaded and is able to pivot or trip when striking rocks or stumps that may be present on the trail. Secondly, the Draw Bar in the Front Pintle Hitch is held in place with a 1/2" x 4 1/2" Grade 2 bolt which acts as a safety shear bolt. This allows the Mogul Master to break away from the tracked vehicle in the event that the Mogul Master strikes an immovable object. The hydraulic hoses on the Mogul Master incorporate Quick Release Couplers attached to the Front Hitch which will uncouple when the shear bolt shears. This shear bolt feature is not incorporated into the optional Extended Reinforced Pintle Hitch or the Goose Neck Hitch.

To reconnect the Mogul Master if the shear bolt shears, remove the Draw Bar from the tracked vehicle Pintle Hook and reinstall it into the Mogul Master Hitch. Install a new shear bolt of the exact same size and grade. Carefully back the tracked vehicle close to the Mogul Master lining up the Pintle Hook with the Pintle Ring and stop just short of the Pintle Ring. Reconnect the hydraulic hoses to each ones correct mate. If difficulty in reconnecting the Quick Couplers is experienced it is generally because there is pressure in the lines that must be released. You may have to cycle the hydraulic control levers back and forth with the vehicle shut off in the case of a manual hydraulic system and in the case of an electric/hydraulic system cycle the controls with the engine shut off and the key on. On some electric/hydraulic systems with lock out valves in the hydraulics the engine should be left running and the hydraulic controls cycled. In extremely

cold temperatures, carefully warming the O-Rings of the female Quick Coupler with a pocket soldering torch will help to soften the O-Rings and ease the reconnection.

With the hydraulics reconnected, shorten the front hydraulic cylinder with the control in the cab, manually lift the Front Hitch and back into the Pintle Ring. If you are alone, connect the length of 5/16 chain provided between the grab hook on the Front Hitch and the grab hook on the Floating Device and use the hydraulic control to raise the Front Hitch to the proper height. Back into the Pintle Ring, then using the hydraulic control, lower the Front Hitch to drop the Pintle Ring into the Pintle Hook and remove the chain.

This entire procedure can be done in less than 10 minutes, even by one person. The shear bolt is a very important feature designed for safety and to reduce damage that may be caused and should not be replaced with a harder bolt under any circumstances. Always be sure to carry additional shear bolts in the cab of the tracked vehicle as well as the tools necessary to replace the shear bolt. The shear bolt should be removed at the start of each grooming shift and inspected for wear which may cause the bolt to shear prematurely.

### ***Maintenance***

The Mogul Master Multi-Blade Planer is an extremely rugged unit and although the maintenance requirements are much lower than other types of equipment such as tracked vehicles there are procedures that should be followed to ensure the Mogul Master will provide many years of reliable, trouble free service. See the attached maintenance sheet for required service.

### ***Warranty***

All Mogul Master Multi-Blade Planer snowmobile trail groomers carry a one season parts and labour warranty. In the unlikely event of a component failure, simply contact the selling dealer or The Shop Industrial for warranty approval prior to performing the repair or replacement of a failed component.

The warranty will not apply to any failure resulting from normal wear and tear, operator neglect or abuse, or the modification or alteration outside of original factory design of any component.

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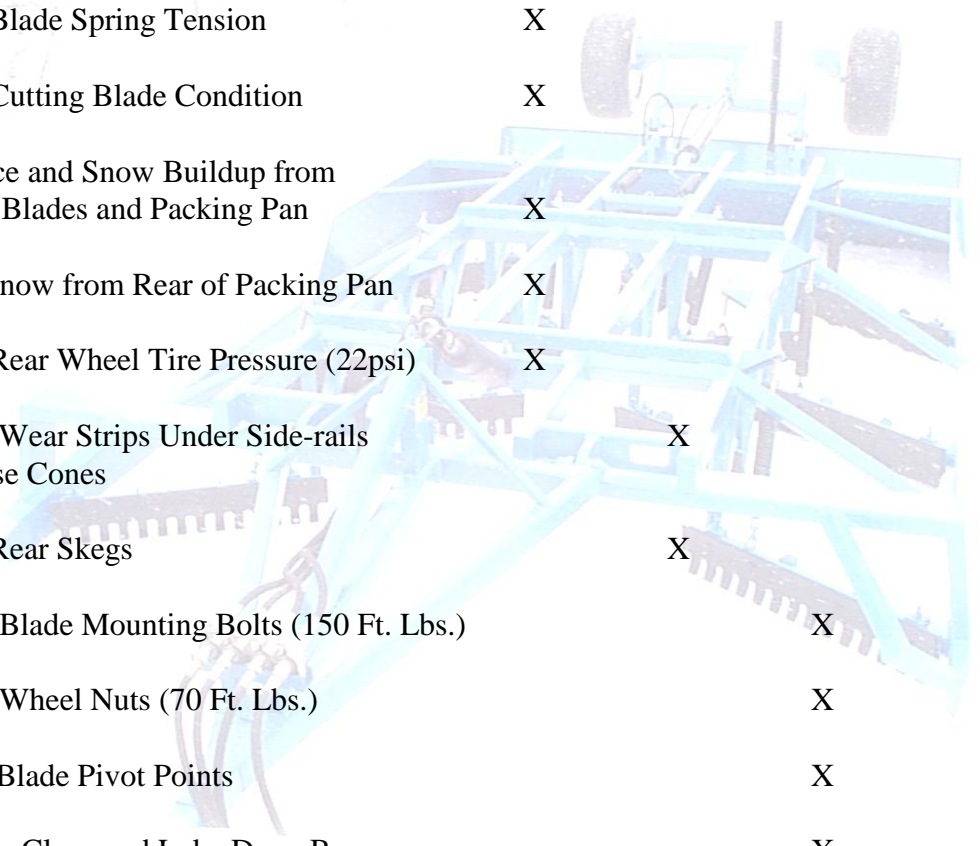
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### ***Mogul Master Maintenance Schedule***



<i><b>Required Service</b></i>	<i><b>Daily</b></i>	<i><b>Weekly</b></i>	<i><b>Monthly</b></i>	<i><b>Yearly</b></i>
Walk Around Inspection	X			
Remove and Inspect Shear Bolt	X			
Inspect Hydraulic System for Leaks	X			
Check Blade Spring Tension	X			
Check Cutting Blade Condition	X			
Clean Ice and Snow Buildup from Face of Blades and Packing Pan	X			
Clean Snow from Rear of Packing Pan	X			
Check Rear Wheel Tire Pressure (22psi)	X			
Inspect Wear Strips Under Side-rails and Nose Cones		X		
Check Rear Skegs		X		
Torque Blade Mounting Bolts (150 Ft. Lbs.)			X	
Torque Wheel Nuts (70 Ft. Lbs.)			X	
Grease Blade Pivot Points			X	
Remove. Clean and Lube Draw Bar			X	
Check and Re-pack Rear Wheel Bearings				X
Check and Repair Damage, Cracked Welds Etc.				X
Touch Up Paint as Necessary				X
Check Blade Height Adjustment (see attached)				X

### ***Mogul Master Blade Adjustment Procedure***

Over a period of time, as the cutting blades wear, the operator may find that, particularly in hard snow conditions, the performance of the Mogul Master has been reduced and to maintain a reasonable amount of snow in the Mogul Master, the front of the groomer will have to be set to a lower position than normal by retracting the front hydraulic cylinder. This reduction in performance indicates a need to adjust the existing blades of the Mogul Master to the correct depth or to replace and adjust any blades that are worn  $5/8''$  to  $3/4''$  or more. A new blade measures  $6''$  in overall height, therefore, the blade(s) should be replaced when the overall height measures  $5\ 3/8''$  to  $5\ 1/4''$  or less. To adjust the blades to the correct cutting depth, follow the instructions below. Note that the blades are adjusted in relation to the four extreme corners of the lower Side-rails and not to the length of the lower Side-rails. This is due to the fact that during manufacture, the Side-rails are somewhat higher in the center than at the front and rear.

#### ***Blade Adjustment Procedure "A"***

Procedure "A" assumes that a flat floor space of adequate size is available for the Mogul Master to rest on. The floor space must be flat with no variations from front to rear or side to side within the width and length of the Mogul Master.

1/ Remove the Skegs that are attached to the Rear Packing Pan. Ensure that the wear strips under the Side-rails are not excessively worn. Replace wear strips or sections of the wear strips as necessary.

2/ With the Mogul Master on the flat floor area, raise the front of the Mogul Master slightly and place a suitable spacer  $5/8''$  thick onto the floor under the front of the left Side-rail and a second  $5/8''$  spacer on the floor under the front of the right Side-rail. Lower the Mogul Master onto the front spacers.

3/ Raise the rear of the Mogul Master slightly and place two suitable spacers  $13/16''$  thick onto the floor under the rear of both the left and right Side-rails. Lower the Mogul Master onto the rear spacers. The Mogul Master is now sitting on the flat floor, raised  $5/8''$  at the front and  $13/16''$  at the rear, ready for the blade adjustment.

4/ Loosen all of the nuts that attach the blade to the Mold Board and allow the blade to drop to the floor. The blade is now set to the correct cutting depth. If the blade will not reach the floor, the blade is worn beyond adjustment and must be replaced.

5/ Torque the attaching nuts to 150 Ft. Lbs., replacing nuts and bolts and washers as necessary.

6/ On the outside and inside of each blade you will find a blade stopper with a  $7/16''$  Dog Point Bolt and jamb nut which stops the blade from being forced upward when grooming. After the blade attaching nuts have been torqued, loosen the jamb nut and adjust the Dog Point Bolt so it just contacts the thick flat bar spacer and tighten the jamb nut. Ensure that the flat bar spacer had

been positioned horizontally when the blade attaching bolts were torqued to ensure good contact between the Dog Point Bolt and spacer.

7/ Repeat for all blades as required.

### ***Blade Adjustment Procedure “B”***

Procedure “B” assumes that a flat floor space of sufficient size is not available.

1/ Ensure that the wear strips under the Side-rails are not excessively worn. Replace wear strips or sections of wear strips as necessary.

2/ Place the Mogul Master on four jack stands positioned approximately one foot rearward of the front of the left and right Side-rails and one foot forward of the rear of the left and right Side-rails.

3/ Place a suitable, rigid flat bar across the front width of the bottom of the Mogul Master Side-rails, forward of the two front jack stands. The flat bar must be rigid to ensure that it will not sag when clamped to the Side-rails. Place a suitable 5/8” spacer between the flat bar and the bottom of the Side-rail on the left side and a second 5/8” spacer between the flat bar and the bottom of the Side-rail on the right side. Using two “C” clamps, clamp the flat bar to the Side-rails with the spacers “sandwiched” between the flat bar and the bottom of the Side-rails.

4/ Place a second flat bar across the rear width of the bottom of the Mogul Master Side-rails rearward of the two rear jack stands. Place two suitable 13/16” spacers between the flat bar and the bottom of the left and right Side-rails and clamp as described above.

5/ Run 6 to 8 lengths of binding twine or strong string along the length of the Mogul Master from the top of the front flat bar clamped to the underside of the Mogul Master to the top of the rear flat bar clamped to the underside of the Mogul Master. The twine or string must be tied so it is very taught with no sag and each string must be positioned across the width of the Mogul Master to ensure that there is a string in line with the outside of each blade.

6/ Repeat steps 4 to 7 under Procedure “A” on the preceding page except that each blade is lowered to the level of the twine or string rather than to the floor. Care must be taken that the blades are not lowered too far, thereby deflecting the string and not achieving correct adjustment. The easiest way to ensure the string is not deflected is to loosen the blade mounting nuts only slightly and use the Dog Point Bolts to push the blade down into the correct position at each side.

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