

**MEDIUM DUTY
WRECKER**

**OPERATIONS, MAINTENANCE,
AND PARTS MANUAL**

JERR-DAN

An Oshkosh Corporation Company

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Part Number 5-376-000051
Rev. 2 - 1/17

FOREWORD

This manual is intended to serve as a guide to the owner and operator in the safe operation and optimum performance of this Jerr-Dan equipment.

Establishment of good operating habits and familiarity with the equipment and its capabilities combined with good judgement are essential.

Before attempting to operate the unit carefully read all sections of this manual.

Rev. _____

Date _____

TABLE OF CONTENTS

MDL Safety (General).....	A-1
Ratings:	
MDL280/110	A-3
MDL280/110 INT	A-5
MDL320/110	A-7
MDL320/110 INT	A-9
Safety Chains	A-15
Lift Safety	A-16
Boom Safety	A-17
Safety Warning Decals.....	A-22
Reporting Safety Defects	A-25
Under Lift Operation	A-27
Spring Brackets	A-30
Frame Forks	A-34
Chain Forks (Optional)	A-36
Chain Hook Adapters (Optional)	A-39
Tire Lift (Optional)	A-42
Wheel Lift Operation	A-48
"L" Arm Grid Operation	A-53
Tie Down Straps.....	A-54
Ratchet Spool Mechanism	A-54
Installing Tie Down Straps.....	A-55
Removing Wheel Grids From Cross Bar	A-56
Pintle Hook Ball Hitch Adapter (Optional)	A-57
Rear Manual Stabilizers (Optional).....	A-60
Rear Hydraulic Stabilizers (Optional)	A-63
Integral Spades (Optional)	A-65
Wrecker Boom Operation	A-67
Dual Winch Operation	A-67
Truck Bar Operation (Optional).....	A-73
Maintenance and Lubrication	A-76
Oils and Greases	A-79
Lubrication Points	A-80
Trouble Shooting.....	A-81
Hydraulic System	A-81
P.T.O. Functioning Improperly	A-82
Hydraulic Pump	A-82
Winch Functioning Improperly	A-83

Rev. 2

Date 1/17

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Rev. 1
Date 9/14

MDL SAFETY (GENERAL)

The safe operation of your MDL is your responsibility. Read this manual and the truck manufacturer's manual and thoroughly understand them. You can be held legally responsible for injuries or damage resulting from unsafe operating practices.

The manufacturer's recommendations for operating this wrecker can help you avoid unsafe practices and their bad consequences. These recommendations are contained in this manual.

Jerr-Dan Corporation is not responsible for the results of any unsafe practice of wrecker operators or for the failure of the wrecker or its accessories resulting from improper maintenance.

The danger from a vehicle does not cease when it is disabled or wrecked. Recovering or towing vehicles can be dangerous too! The danger threatens wrecker operators and everyone else close by. As a wrecker operator you must develop an awareness of the hazards involved. You must use every safeguard within reason to prevent injuries.

For each step in operating your wrecker develop the habit of asking yourself if it is safe to proceed. Carefully check all rigging before starting a heavy lift or pull.

We cannot warn you of all the possible dangers you will encounter, but we will tell you of the most common hazards that we know about. We also recommend that you receive specialized and advanced training from a professional Towing and Recovery instructor before operating any recovery equipment.

WARNING

ONLY AUTHORIZED AND TRAINED PERSONNEL SHOULD BE PERMITTED TO OPERATE THIS WRECKER UNSUPERVISED.

IN ORDER TO BE SUFFICIENTLY TRAINED TO OPERATE THIS WRECKER, A PERSON MUST HAVE, AS A MINIMUM, THE FOLLOWING QUALIFICATIONS:

1. SATISFACTORILY PERFORMED ALL WRECKER MANEUVERS AND FUNCTIONS UNDER THE SUPERVISION OF FULLY TRAINED PERSONNEL.
2. HAVE COMPLETELY READ AND UNDERSTAND THE OPERATIONS, MAINTENANCE, AND PARTS, MANUAL(S) IN THEIR ENTIRETY FOR THIS WRECKER.
3. HAVE COMPLETELY READ ALL WARNINGS AND PRECAUTIONS ON THIS WRECKER.
4. HAVE HAD EXPLAINED TO THEM THE HAZARDS OF MOVING THE PARTICULAR MATERIALS THEY WILL BE LOADING OR UNLOADING.
5. UNDERSTAND THE HAZARDS OF OPERATING AT A PARTICULAR JOB SITE, INCLUDING
 - ... THE IMPORTANCE OF STAYING WELL CLEAR OF ALL ELECTRICAL LINES,
 - ... GIVING CONSIDERATION TO GROUND CONDITIONS SUCH AS IRREGULAR CONTOURS, ICE, WATER, OR MUD,
 - ... ANY OTHER CONDITIONS WHICH MAY INTERFERE WITH ORDINARY CAREFUL OPERATION OF THIS WRECKER.

UNTRAINED OPERATORS SUBJECT THEMSELVES AND OTHERS TO DEATH OR SERIOUS INJURY AND MAY CAUSE SERIOUS DAMAGE TO PROPERTY.

MDL280/110
DO NOT EXCEED THE FOLLOWING RATINGS:

BOOM RATING:

SAE Rating - Boom elevated at 30° Angle¹

Retracted 28,000 lbs.
Extended 14,000 lbs.

WINCH RATING:²

Each Drum 16,000 lbs.

WIRE ROPE:

Working Limit Each Line 7,600 lbs.
Nominal Breaking Strength 26,600 lbs.
Construction 6 x 37 EIPS IWRC
Diameter 1/2 inch
Standard Length 150 Feet

UNDER LIFT RATING (FORKS):

Full Retracted 11,000 lbs.³
Full Extended 8,500 lbs.³
Tow Rating 50,000 lbs.

UNDER LIFT RATING (L-ARM GRID):

Full Retracted 5,000 lbs.
Full Extended 5,000 lbs.
Tow Rating 24,500 lbs.

UNDER LIFT RATING (TIRE LIFT OPTION):

Lifting Capacity (Each Arm) 3,750 lbs.
Lifting Capacity (Total) 7,500 lbs.
Towing Capacity (Maximum)⁴ 50,000 lbs. (GCWR)

PINTLE HOOK BALL HITCH (OPTION):

Pintle Hook 16,000 lbs. (GTW)
Gross Trailer Weight 3,000 Max. Vertical Load
1-7/8 in. Ball Hitch 2,000 lbs. (GTW)
2 in. Ball Hitch 7,000 lbs. (GTW)
2-5/16 in. Ball Hitch 12,000 lbs. (GTW)
50 MM Ball Hitch 7,000 lbs. (GTW)

BALL HITCH (OPTION):

1-7/8 in. Ball	5,000 lbs. (GTW)
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- 1 SAE J2512: Surface Vehicle Recommended Practices - Towing Equipment Ratings and Practices
- 2 SAE J706: Surface Vehicle Recommended Practices - Rating of Winches
- 3 Rating Using Axle And Spring Lift Tools
- 4 THE TOWING CAPACITY SHOULD NOT EXCEED THE GROSS COMBINED WEIGHT RATING (GCWR) OF THE TOWING VEHICLE OR 42,000 LBS. (GCW) GROSS COMBINED WEIGHT OF THE TOWED VEHICLE, WHICHEVER IS LOWER.

MAXIMUM LIFTING CAPACITY - THE MAXIMUM LOAD THAT CAN BE LIFTED.

GROSS COMBINED WEIGHT RATING (GCWR) - THE VALUE SPECIFIED BY THE VEHICLE MANUFACTURER AS GCW.

GROSS TRAILER WEIGHT (GTW) - THE MAXIMUM TRAILER WEIGHT WITH LOAD

GROSS COMBINED WEIGHT (GCW) - ACTUAL WEIGHT OF THE ENTIRE VEHICLE AT THE GROUND WITH TRAILER OR TRAILERS, INCLUDING VEHICLE EQUIPMENT, DRIVER, PASSENGER, FUEL AND PAYLOAD (EVERYTHING THAT MOVES WITH THE VEHICLE).

NOTE

These ratings apply to the structural design of the MDL280/110 only and may be limited by the axle rating and gross vehicle weight rating of the truck chassis. CHECK TRUCK MANUAL FOR SPECIFIC GVW & AXLE RATINGS. ALSO REFERENCE THE CERTIFICATION DECAL AFFIXED TO DRIVER'S SIDE DOOR JAMB.

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SAE Rating - Boom elevated at 30° Angle¹

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WINCH RATING:²

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MANUFACTURED BY:

DATE OF MANUFACTURE ____ mo. ____ yr.

INCOMPLETE VEHICLE MANUFACTURED BY:

DATE INC. VEH. MFD. ____ mo. ____ yr.

GWR _____

GAWR FRONT _____ with
_____ tires,
_____ rims, @ _____ psi cold _____

GAWR INTERMEDIATE (1) _____ with
_____ tires,
_____ rims, @ _____ psi cold _____

GAWR INTERMEDIATE (2) _____ with
_____ tires,
_____ rims, @ _____ psi cold _____

GAWR REAR _____ with
_____ tires,
_____ rims, @ _____ psi cold _____

Conformity of the chassis-cab to Federal Motor Vehicle Safety Standards, which have been previously fully certified by the incomplete vehicle manufacturer or intermediate vehicle manufacture, has not been affected by final-stage manufacture. The vehicle has been completed in accordance with the prior manufacturer's instructions, where applicable. This vehicle conforms to all other applicable Federal Motor Vehicle Safety Standards in effect in:

_____ mo. ____ yr.

VEHICLE IDENTIFICATION NUMBER:

VEHICLE TYPE: _____

Certification Decal

JERR-DAN

An Oshkosh Corporation Company

A-11

Rev. _____

Date _____



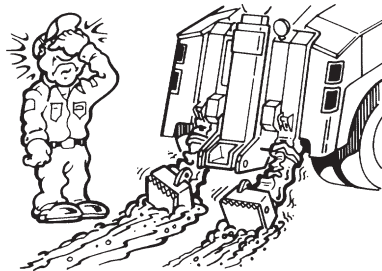
- Don't use a recovery vehicle that has not been properly maintained. Pay special attention to the mounting bolts, and lubrication of moving parts.



- Don't lower the rear hydraulic stabilizers unless the area under them is clear. Pay particular attention to keeping this area clear.



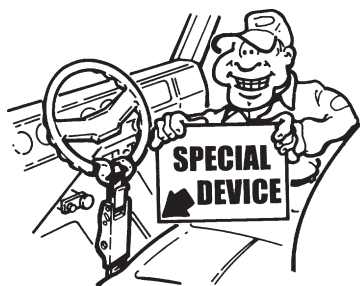
- Don't use rear spades on paved surfaces unless you are willing to accept responsibility for damage to such surfaces.



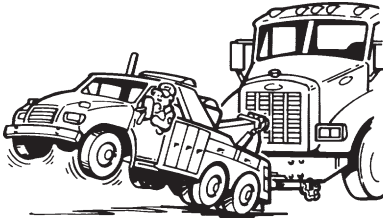
- Don't move the recovery vehicle while rear hydraulic stabilizers are extended. Damage is very likely to occur.



- Don't operate the wrecker's engine faster than recommended. Excessive speeds can damage PTO, hydraulic pumps, and winches.



- Don't rely on anti-theft steering locks to secure the steering wheel. Use a special steering wheel clamping device designed for this purpose.



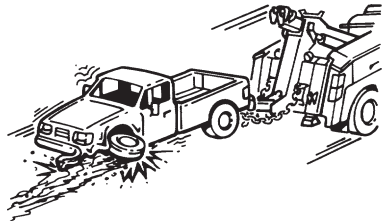
- Don't tow a vehicle that reduces the weight on the front wheels of the wrecker more than 50 percent. (SAE J2512)



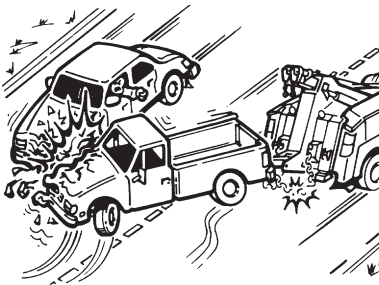
- After you have hooked up a vehicle for towing, don't start the tow until you have double checked the hook-up, installed safety chains, and released the parking brakes of the towed vehicle.



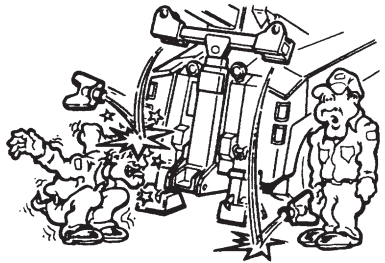
- Don't travel with the PTO engaged. Damage to the recovery vehicle's transmission and hydraulic components will occur. Engage it only while operating the controls.



- Don't tow a vehicle on its front wheels if they are damaged.



- Don't tow a vehicle on its front wheels unless the steering wheel is secured with the front wheels straight ahead.



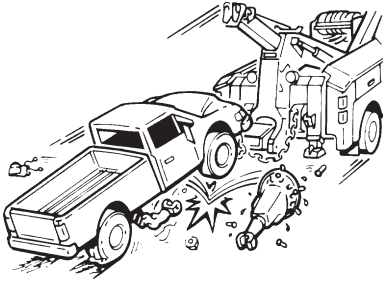
- Never fold the boom up into storage position without removing the towing adapters.



- Keep the underlift boom raised high enough off of the ground when roading to avoid dragging it over road surfaces.



- Never exceed the front and/or rear axle ratings of your towing equipment.


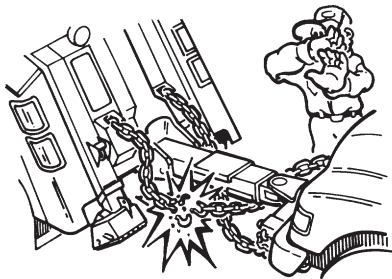




- Don't tow a vehicle on its drive wheels unless steps have been taken to protect its transmission and differential. Follow the recommendations of the vehicle manufacturer. As an alternative, use a towing dolly.

SAFETY CHAINS MUST BE USED WHEN TOWING AND TRANSPORTING

Safety chains are provided for use with your new Jerr-Dan Recovery Vehicle. Periodically inspect all chains for any signs of fatigue or damage. Don't overlook the hooks; be sure they have not been bent or deformed. If chain or hook damage is noted, they must be replaced before being used. **Do not use safety chains for recovery operations.**

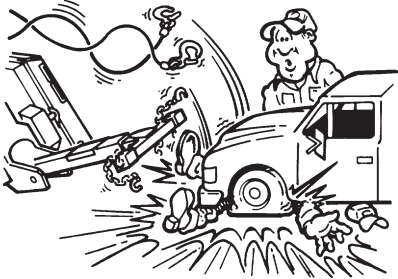
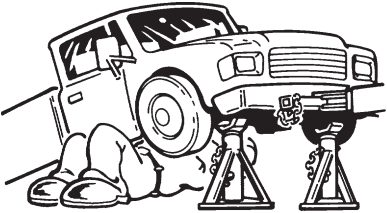

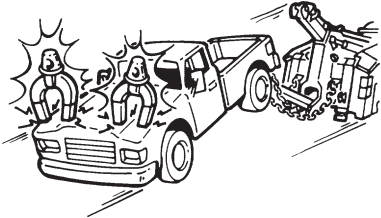
Many states require that the towed vehicle be secured to the wrecker body with safety chains. Check your local regulations and use your safety chains. Safety chains are provided for use with your new JERR-DAN.

 <ul style="list-style-type: none">• Never attach the chain hooks in such a way as to damage brake lines or other functional parts.	 <ul style="list-style-type: none">• Check that the chain does not become over tensioned when raising the towed vehicle to the towing position or during the towing operation.
 <ul style="list-style-type: none">• Keep in mind that driving over bumps and hollows and around corners will tend to tighten or loosen the chains.	 <ul style="list-style-type: none">• Always use two safety chains and two tie-down chains when towing all vehicles, regardless of distance.

LIFT SAFETY

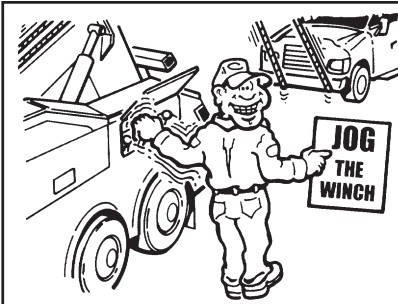
Careful consideration of the immediate surrounding conditions such as the weather, terrain, type or condition of the vehicle to be recovered and the condition and experience of the operator is foremost to the safety and success of the operation. In addition, the intent of the design of this unit should be taken before the undertaking of its use.

Your MDL is unique. It not only can make lifts from level surfaces, our boom tilt feature allows pickup of vehicles that are parked on both inclines and declines.

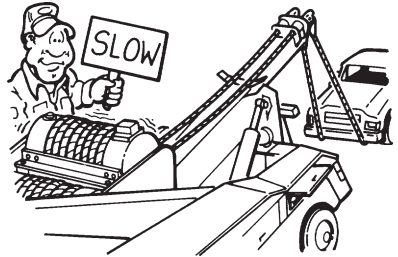
 <ul style="list-style-type: none">• You should never make a lift or movement while close to or under the vehicle being lifted!	 <ul style="list-style-type: none">• Always use jack stands to support the vehicle if it is necessary to work under it.
 <ul style="list-style-type: none">• Don't use towing forks that are not of proper size for the pickup requirements.	 <ul style="list-style-type: none">• Magnetic towing lights are required in many areas and are always recommended for safe tows.

BOOM SAFETY

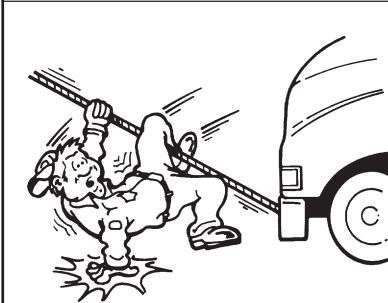
Your MDL is equipped with a wrecker boom and the following safety procedures must be observed:



- Jog the winch control lever to be sure of complete engagement of the clutch gears before making a lift or pull.



- Take up the wire rope cable slowly and be sure the hook is securely set.



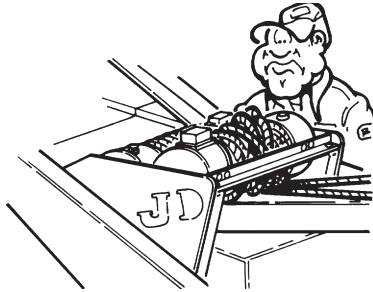
- Never stand on or straddle a working wire rope.



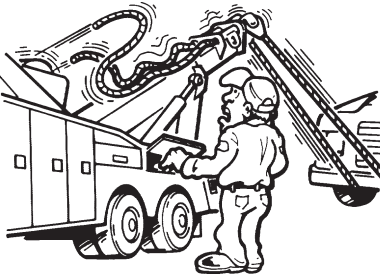
- Be sure of your lift or pull and do not exceed the working strength of the wire rope or hook. Rig to keep the estimated amount of pull well within equipment ratings. Use wire rope breaking strength ratings only for selecting replacement wire rope.



- Never lift or pull over or around a sharp obstacle.



- Never allow the wire rope to cross wrap (criss-cross) on the winch drum. Crushing of the wire rope can cause premature wire rope failure.



- Never completely unwind wire rope from a winch while loaded. Always be sure that a minimum of five (5) wraps of wire rope are on the drum at all times. (SAE J706)



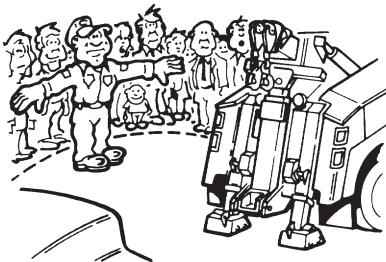
- Never make a lift or pull with the cable attached to light gauge or sheet metal parts; use the frame or major structural members.



- Never tie down the front end of your wrecker for recovery work of heavy lifts. You will likely damage the truck frame if you do.



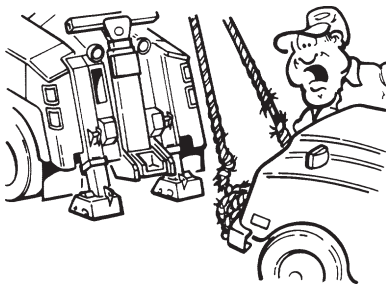
- Don't disengage the winch drum clutch while the wire rope is loaded.



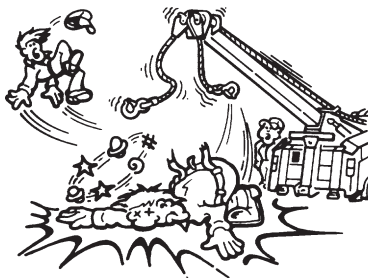
- Don't permit bystanders in the area while performing recovery work.



- Be sure all brakes and locks are properly set on the recovery vehicle.



- Never wrap the wire rope around frames or cross members. Use chains and hook the wire rope to the chains.



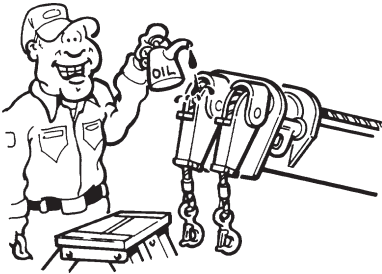
- Never under any circumstances use the winch or boom to lift people!



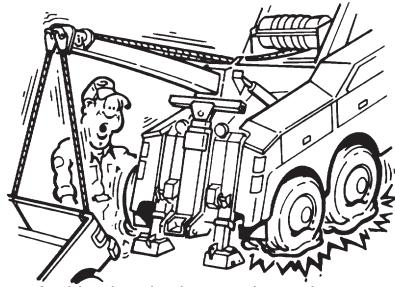
- Don't use damaged wire ropes on your wrecker. Become familiar with the various types of wire rope damage and periodically inspect the entire wire rope for wear and corrosion. **Never use wire rope menders.** Replace with similar rated wire rope and hooks.



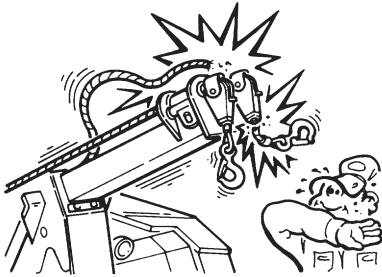
- Death or Serious Injury can occur when working near power lines. Be sure that exact locations of overhead power lines, and other obstructions or hazards are known.



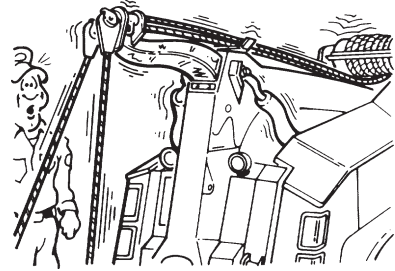
- Lubricate and maintain both the wire rope and winch on regular intervals. (See maintenance charts.) Inspect the wire rope for damage. Damaged, deformed or frayed wire rope should be replaced before use.



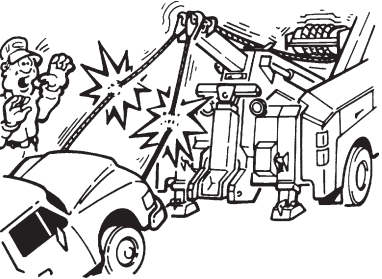
- Avoid using the boom raise or boom up control to lift a load. This can cause undue stress on the boom and winches as well as excessive loads to the rear axle. Use the winch to lift the load.



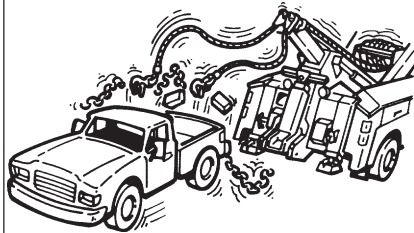
- Don't continue to wind in wire rope after the hook is against the boom end.



- Care should be taken when retracting the boom extension while under load.



- All boom placement functions should be made with the winch wire ropes set in "free spool" to avoid over tensioning or breaking the winch wire ropes.



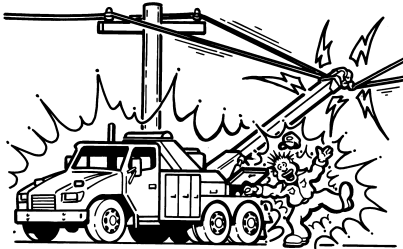
- After rigging wire ropes, don't begin pulling without rechecking connections. Make sure that all wire ropes and snatch blocks are securely attached and cannot accidentally pull loose.



- Don't expect your wrecker to tow loads equal to the wrecker ratings. Wrecker ratings apply to loads imposed during recovery with the wrecker properly stabilized.



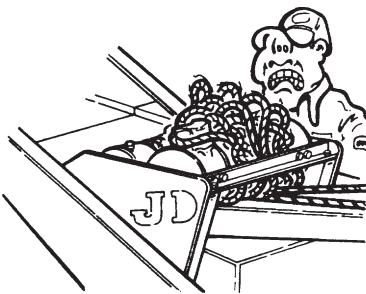
- Don't exceed ratings of booms, wire ropes, snatch blocks, or winches. Stay within nameplate ratings. Note that boom ratings decrease significantly as the boom is extended.



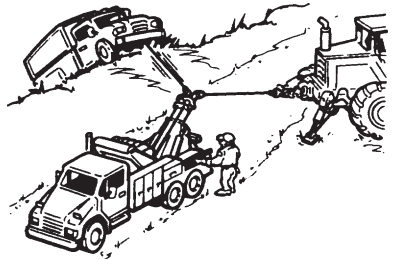
- Don't not raise, lower, or move the boom near power lines. Hazardous voltage will cause sever injury or death.



- Don't drive with the wrecker boom extended.



- To avoid birdnesting and premature failure of the wire rope, always keep tension on the wire rope when winding or unwinding.



- When making a side pull, always apply an equal load in the opposite direction of the pull to stabilize the wrecker.

SAFETY WARNING DECALS

As an extra safety precaution, your MDL has specific safety and warning decals affixed to prominent locations. These decals must not be obliterated, removed or painted over. They are there to remind and protect the operator.

SERIAL NO.
 MODEL NO.

UNDER LIFT

○ UNDER LIFT RATINGS (MAXIMUM) ○

EXTENDED LBS.
 RETRACTED LBS.

WINCH RATING (OPTIONAL)

SAE J706 RATING
 EACH DRUM LBS.

CABLE/WIRE ROPE

SIZE FT.
 TYPE
 WORKING LOAD LIMIT LBS.

WRECKER BOOM

BOOM RATING (MAXIMUM)

SAE J2512 RATING - BOOM AT 30° ANGLE

EXTENDED LBS.
 MID LBS.
 RETRACTED LBS.

○

WINCH RATING

SAE J706 RATING
 EACH DRUM LBS.

CABLE/WIRE ROPE

SIZE FT.
 TYPE
 WORKING LOAD LIMIT LBS.

WARNING

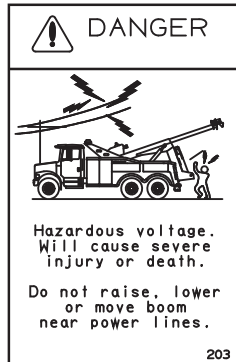
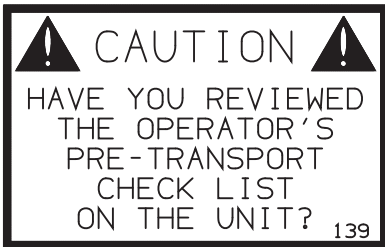
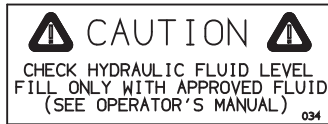
READ OPERATOR'S MANUAL AND FAMILIARIZE YOURSELF WITH THE OPERATION PRIOR TO USING THIS EQUIPMENT. KNOW THE LOADS BEING MOVED. DO NOT EXCEED RATED CAPACITIES.

WARNING

ALL RATINGS ARE BASED ON THE STRUCTURAL CAPACITY OF ABOVE MODEL. ACTUAL TOWING AND RECOVERY CAPACITY MAY BE LIMITED BY THE CAPACITY OF THE CHASSIS AND EQUIPMENT SELECTED.

MANUFACTURED BY: JLG INDUSTRIES, INC.
 FOR: **JERR-DAN**
 13224 Fountainhead Plaza
 Hagerstown, MD 21742
 Phone (717) 597-7111
 www.jerr-dan.com

1001132328-A



OPERATOR'S PRE-TRANSPORT CHECKLIST



CAUTION



REVIEW THIS CHECKLIST BEFORE EACH TOW. FAILURE TO FOLLOW CHECKLIST COULD CREATE A DANGEROUS CONDITION FOR YOU, OTHER MOTORISTS AND PEDESTRIANS, AND MIGHT RESULT IN SERIOUS INJURY OR DEATH.

VEHICLE ON UNDER LIFT - CHECKLIST:

- HEED ALL WARNINGS ON EQUIPMENT AND CONTROLS.
- DO YOU HAVE TURNING CLEARANCE FOR TOWED VEHICLE?
- ARE BOTH SAFETY CHAINS ATTACHED FROM TOWING TRUCK TO TOWED VEHICLE?
- IS THERE SUFFICIENT GROUND CLEARANCE FOR TOWED VEHICLE?
- IS THE UNDER LIFT RETRACTED AS CLOSE AS POSSIBLE TO OBTAIN MAXIMUM WEIGHT DISTRIBUTION?
- ARE CHAINS SECURED FIRMLY AROUND THE AXLE OR THE FRAME OF THE TOWED VEHICLE?
- ARE AUXILIARY TOWING LIGHTS ATTACHED TO TOWED VEHICLE?
- DO NOT OVERLOAD. STOP VEHICLE AT ONCE AND REARRANGE LOAD IF YOU NOTICE FRONT END OF TRUCK FEELS LIGHT OR BOUNCES EXCESSIVELY OR IF STEERING FEELS EXCESSIVELY LIGHT. LOSS OF VEHICLE CONTROL CAN RESULT FROM AN OVERLOAD AND CAN CAUSE A SERIOUS ACCIDENT.

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200



WARNING



ONLY AUTHORIZED AND TRAINED PERSONNEL SHOULD BE PERMITTED TO OPERATE THIS WRECKER UNSUPERVISED.

IN ORDER TO BE SUFFICIENTLY TRAINED TO OPERATE THIS WRECKER, A PERSON MUST HAVE, AS A MINIMUM, THE FOLLOWING QUALIFICATIONS:

1. SATISFACTORILY PERFORMED ALL WRECKER MANEUVERS AND FUNCTIONS UNDER THE SUPERVISION OF FULLY TRAINED PERSONNEL.
2. HAVE COMPLETELY READ AND UNDERSTAND THE OPERATIONS, MAINTENANCE, AND PARTS MANUAL(S) IN THEIR ENTIRETY FOR THIS WRECKER.
3. HAVE COMPLETELY READ ALL WARNINGS AND PRECAUTIONS ON THIS WRECKER.
4. HAVE HAD EXPLAINED TO THEM THE HAZARDS OF MOVING THE PARTICULAR MATERIALS THEY WILL BE LOADING OR UNLOADING.
5. UNDERSTAND THE HAZARDS OF OPERATING AT A PARTICULAR JOB SITE, INCLUDING:
 - ...THE IMPORTANCE OF STAYING WELL CLEAR OF ALL ELECTRICAL LINES.
 - ...GIVING CONSIDERATION TO GROUND CONDITIONS SUCH AS IRREGULAR CONTOURS, ICE, WATER, OR MUD.
 - ...ANY OTHER CONDITIONS WHICH MAY INTERFERE WITH ORDINARY CAREFUL OPERATION OF THIS WRECKER.

UNTRAINED OPERATORS SUBJECT THEMSELVES AND OTHERS TO DEATH OR SERIOUS INJURY AND MAY CAUSE SERIOUS DAMAGE TO PROPERTY

199



WARNING



A MINIMUM OF 5 WRAPS OF CABLE MUST BE LEFT ON DRUM TO ACHIEVE RATED LOAD.
NOT TO BE USED IN THE MOVING OR LIFTING OF PERSONS.



WARNING



TOWED VEHICLE MUST BE SECURED TO CROSSBAR WHEN USING FRAME FORKS AND SPRING HANGERS

211



JERR-DAN

An Oshkosh Corporation Company

A-23



Rev. _____

Date _____


CAUTION


TO AVOID BIRDNESTING AND PREMATURE
 FAILURE OF THE WIRE ROPE
 ALWAYS KEEP TENSION ON THE
 WIRE ROPE WHEN UNWINDING

253




CAUTION


THE WHEEL GRID MUST
 BE SECURED TO THE
 CROSS TUBE AT ALL
 TIMES WITH THE
 RETAINING PINS. 325

MANUFACTURED BY:
 JLG INDUSTRIES, INC.

FOR: **JERR-DAN**

MODEL NO. MDTL- XXXXXXXXXX


CAUTION


DO NOT EXCEED THE FOLLOWING RATINGS:

LIFTING CAPACITY (Each Arm).....3,750 lbs.
 LIFTING CAPACITY (Total).....7,500 lbs.
 TOWING CAPACITY (Structural Max)...24,500 lbs.

THE TOWING CAPACITY SHOULD NOT EXCEED
 THE GROSS COMBINED WEIGHT RATING (GCWR)
 OF THE TOWING VEHICLE OR THE 80,000 LB.
 STRUCTURAL CAPACITY OF THE TIRE LIFT,
 WHICHEVER IS LOWER. 1001132336-B

REPORTING SAFETY DEFECTS

If you believe that your vehicle has a defect which could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying Jerr-Dan Corporation.

If NHTSA receives similar complaints, it opens an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, or Jerr-Dan Corporation.

To contact NHTSA, you may call the Vehicle Safety Hotline toll-free at 1-888-327-4236 (TTY: 1-800-424-9153); go to <http://www.safercar.gov>; or write to:

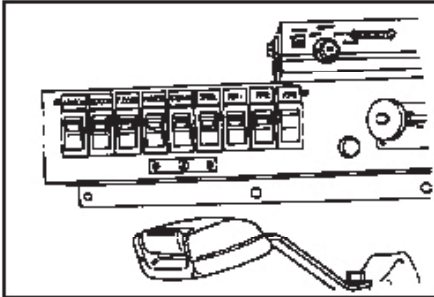
Administrator
NHTSA
400 Seventh Street S.W.
Washington, DC 20590

You can also obtain other information about motor vehicle safety from <http://www.safercar.gov>.

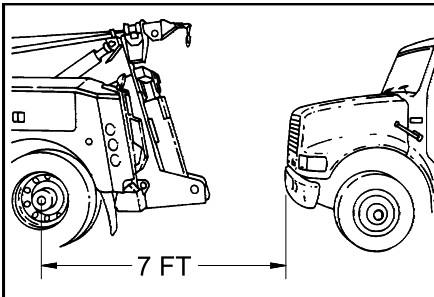
UNDER LIFT OPERATION

Your MDL is one of the most useful and efficient towing and recovery vehicles available. It is hydraulically powered and careful consideration should be given to the selection of commands. You can afford to work smart, the vehicle will do most of the work for you.

Follow these simple steps:



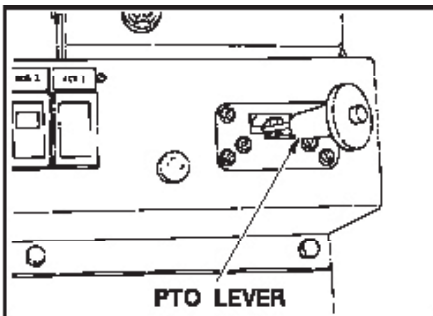
1. Turn on the safety and work lights. (Switches located on panel on the floor beside the driver's seat.) If the remote hand controller is going to be used the CONTROL switch must be turned "ON".



2. Using the rear axle as a guide, position the recovery vehicle within seven (7) ft. of the subject casualty vehicle and as close to the direction of the pull as possible.

3. Place the recovery vehicle's transmission gear selector into neutral and set the parking brakes.

4. Engage the power take-off (PTO) by moving the control lever. See PTO operator's manual. **NEVER TRAVEL WITH THE POWER TAKE-OFF CONTROL ENGAGED.** This could result in damage to the PTO unit and the recovery vehicle's transmission.

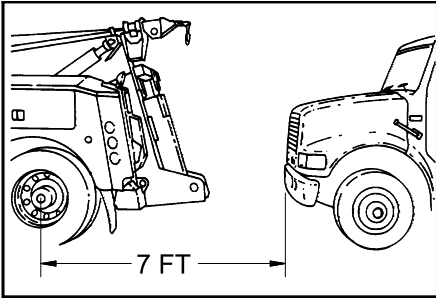


- Adjust the electronic or manual throttle control to elevate the engine speed to approximately 1000-1200 R.P.M. of P.T.O. output shaft speed for optimum performance.

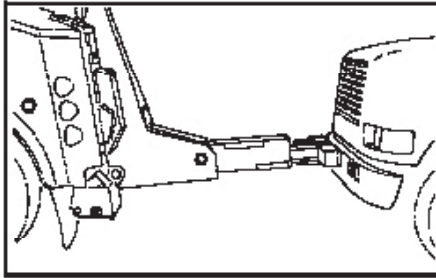


CAUTION:

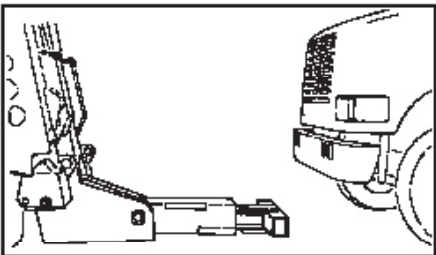
Never exceed 1200 R.P.M. When your hook up is complete, reset the engine idle to normal.



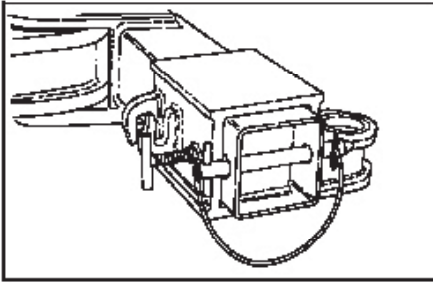
- Confirm the recovery vehicle's position in relation to the casualty vehicle to be towed. Seven (7) ft. is recommended. Reposition the MDL if necessary. **Be sure the casualty vehicle is not in gear or park. Keep the brake set and block the wheels not being lifted.**



- Unfold and tilt the under lift boom down until it is in the horizontal position.



- Lower the under lift boom to about one (1) in. from the ground and swing the crossbar parallel to the casualty vehicle.

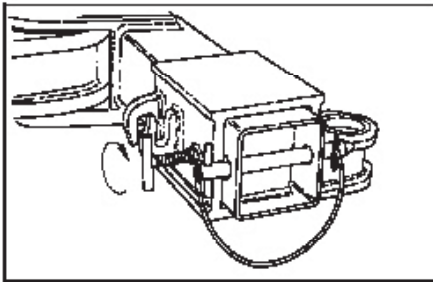


9. Attach the lift receivers to the crossbar by sliding them over the ends of the crossbar. Install the retaining pin into the end of the crossbar and secure with the safety pin.

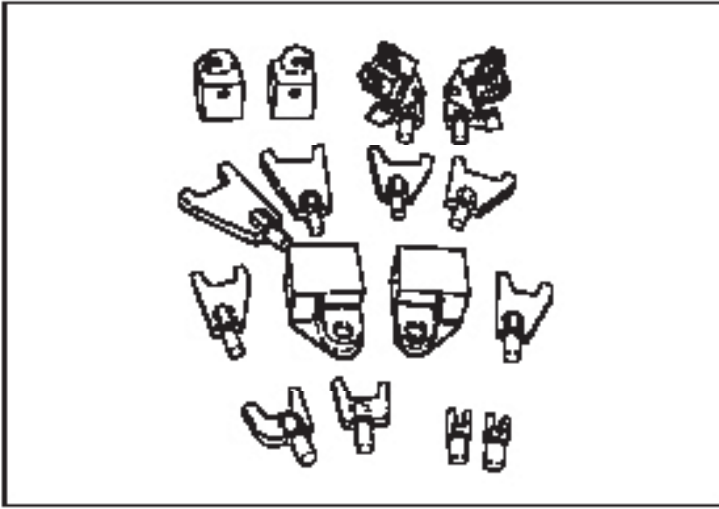


CAUTION:

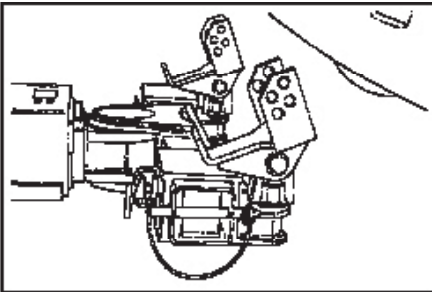
The retaining pins must be in place during all towing applications.



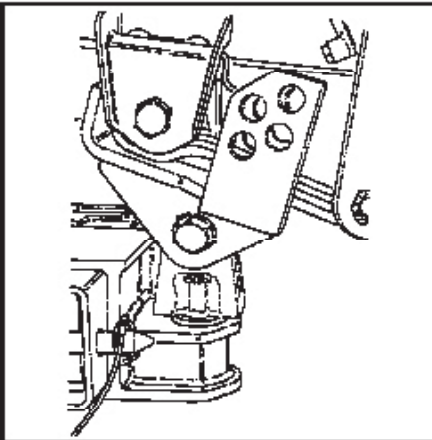
10. Adjust the lift receivers on the crossbar to the desired position and tighten the “T” handles to secure the receivers on the crossbar.



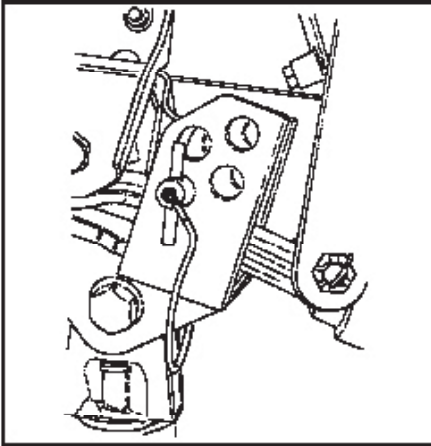
SPRING BRACKETS



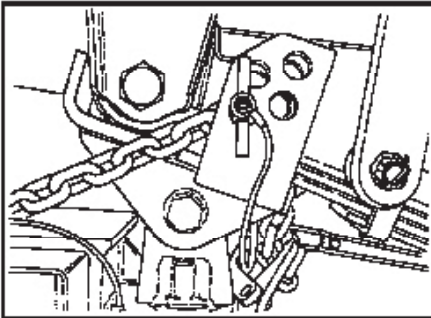
1. Insert the spring brackets into the receivers that you put onto the crossbar.
2. Extend the under lift boom under the casualty vehicle so that the spring brackets are in the proper position for lifting. Make sure that the spring brackets are against the front part of the spring hanger as shown. **At the same time make sure you are not attaching the spring brackets to any steering components.**



3. Raise the boom to lift the casualty vehicle slightly, still leaving the tires on the ground.



4. Secure the casualty vehicle to the spring brackets with the retaining pins and safety pins.

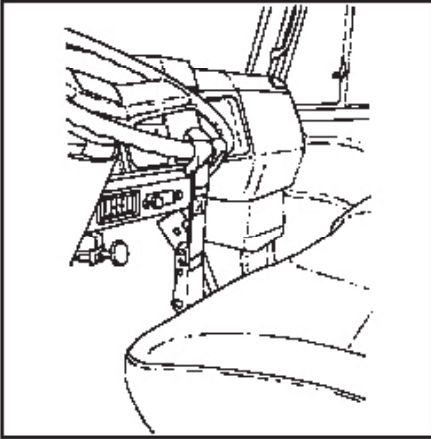


5. Secure the casualty vehicle to the crossbar with chains. A chain binder can be used to tighten the chains.
6. After securing the casualty vehicle and before making the final lift, check to be sure that the casualty's parking brake is released, the transmission is in neutral, and the wheels are straight.

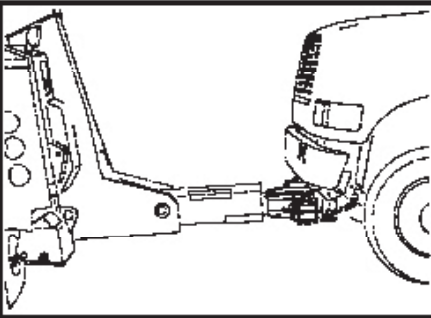


CAUTION:

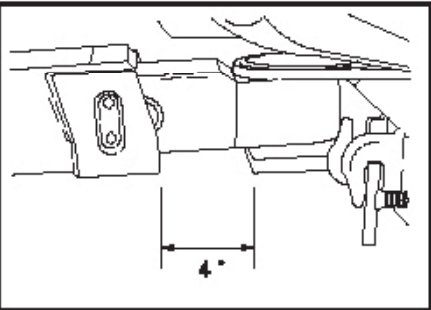
If vehicle to be towed is on a slope, do not release the brake until the load is secured.



7. It is recommended that the steering wheel be secured by a steering wheel strap for any front or rear tow.
8. With the vehicle in neutral and the parking brake released, you can move the vehicle safely up, down, in or out. All of these movements are hydraulically controlled.



9. Power retract the under lift until the casualty vehicle is about three (3) to four (4) feet from the back of the recovery vehicle. Leave enough room to maneuver around corners without corner binding or causing contact between the two (2) vehicles. **Be sure that the fly boom is extended at least four (4) in. to ensure unobstructed cross-bar pivoting.**



10. Raise the casualty vehicle into the final towing position observing the far end for sufficient ground clearance. It is possible to set the rear of a front lifted vehicle completely onto the ground, causing damage. Take irregular road surfaces into consideration. Observe the lift function from the side and away from both vehicles if possible.

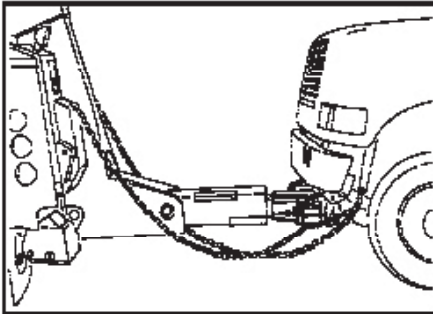
NOTE:

When towing, the Underlift boom should be as close to horizontal as possible. You will have better turning and maneuvering capabilities and it will prolong the life of your underlift and pivot pin.



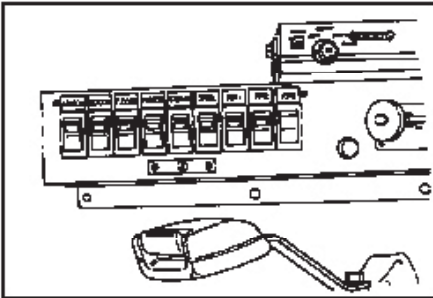
WARNING:

Always follow the chassis manufacturer's recommended procedures for towing. Remove drive lines and drive shafts as directed. Many vehicles can be severely damaged unless these components are removed prior to towing.



11. Be sure to maintain sufficient ground clearances with the bottom of the casualty vehicle.

12. Attach the safety chains and magnetic towing lights. **Safety chains should be crossed under the towbar from one side of the recovery vehicle to the opposite side of the casualty vehicle.**



13. If the wired remote hand controller was used, turn the CONTROL switch "OFF". (Switch is located on panel on the floor.)



WARNING:

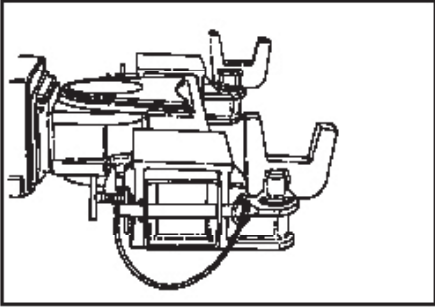
Never fold the boom up into the storage position without removing the towing adapters from the crossbar receivers.



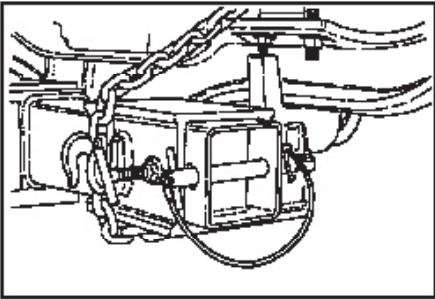
CAUTION:

The use of secondary tie-down chains is recommended. Install the tie-down chains between the axle or substantial chassis component and the towbar.

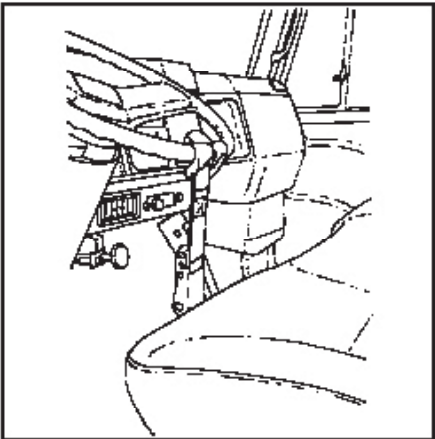
FRAME FORKS



1. Choose the frame forks that are best suited to your needs and insert them into the receivers on the crossbar.
2. Extend the under lift boom under the vehicle so that the frame forks are in the proper position for lifting. **At the same time make sure you are not attaching the frame forks to any steering components.**
3. Raise the boom to lift the casualty slightly, still leaving the tires on the ground.



4. Secure the casualty vehicle to the crossbar with chains. A chain binder can be used to tighten the chains.
5. After securing the casualty vehicle and before making the final lift, check to be sure that the casualty's parking brake is released, the transmission is in neutral, and the wheels are straight.

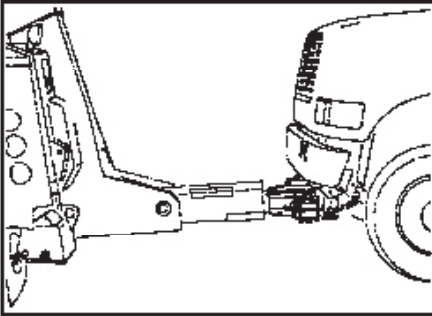


CAUTION:

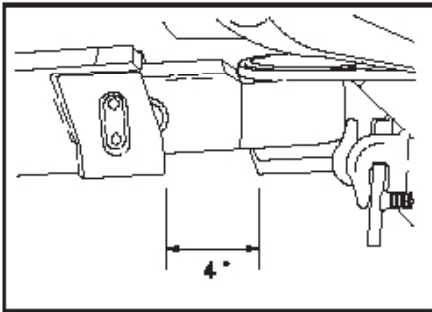
If vehicle to be towed is on a slope, do not release the brake until the load is secured.

6. It is recommended that the steering wheel be secured by a steering wheel strap for any front or rear tow.

7. With the vehicle in neutral and the parking brake released, you can move the vehicle safely up, down, in or out. All of these movements are hydraulically controlled.



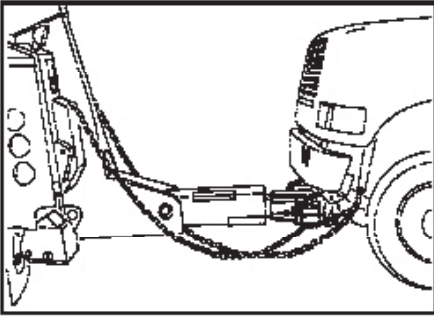
8. Power retract the under lift until the casualty vehicle is about three (3) to four (4) feet from the back of the recovery vehicle. Leave enough room to maneuver around corners without corner binding or causing contact between the two (2) vehicles. **Be sure that the fly boom is extended at least four (4) in. to ensure unobstructed cross-bar pivoting.**



9. Raise the casualty vehicle into towing position observing the far end for sufficient ground clearance. It is possible to set the rear of a front lifted vehicle completely onto the ground, causing damage. Take irregular road surfaces into consideration. Observe the lift function from the side and away from both vehicles if possible.
10. Be sure to maintain sufficient ground clearances with the bottom of the casualty vehicle.

NOTE:

When towing, the Underlift boom should be as close to horizontal as possible. You will have better turning and maneuvering capabilities and it will prolong the life of your underlift and pivot pin.



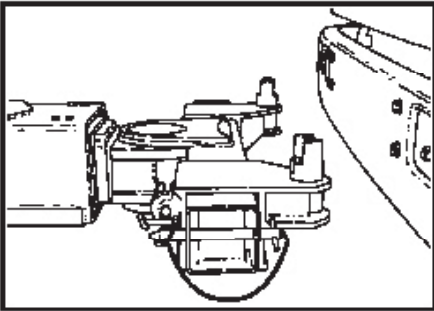
11. Attach the safety chains and magnetic towing lights. **Safety chains should be crossed under the towbar from one side of the recovery vehicle to the opposite side of the casualty vehicle.**
12. If the remote hand controller was used, turn the CONTROL switch "OFF". (Switch is located on panel on the floor.)



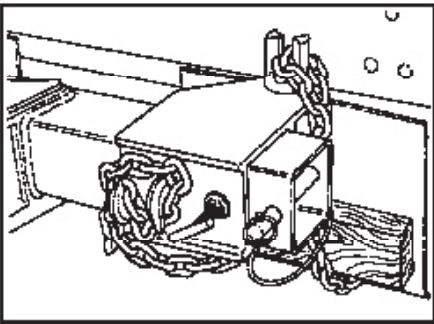
WARNING:

Never fold the boom up into the storage position without removing the towing adapters from the crossbar receivers.

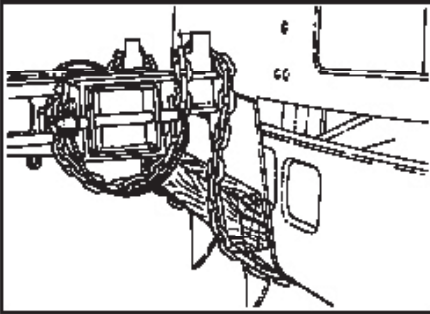
CHAIN FORKS (OPTIONAL)



1. Insert the chain forks into the receivers on the crossbar.
2. Extend the under lift boom up to the casualty vehicle so that the chain forks are in the proper position for lifting.



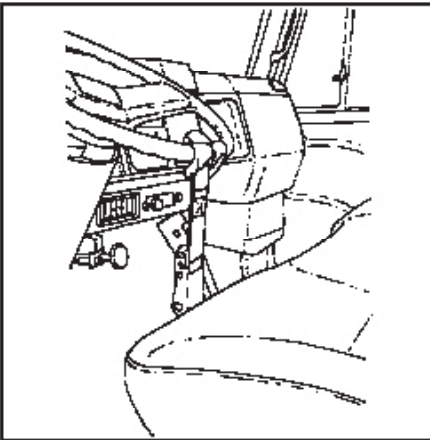
3. Attach the hook-up chains to the casualty vehicle. Hook the chains through the chain forks and secure any extra chain to the hooks on the lift receivers. The use of wood blocks and rubber mats may be required to protect the casualty vehicle.



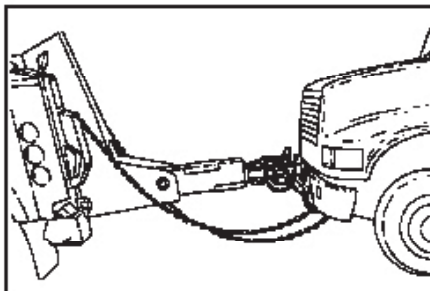
4. Raise the boom to lift the casualty vehicle slightly. At the same time make sure that you are not going to damage any components.
5. Before making the final lift, check to be sure that the casualty's parking brake is released, the transmission is in neutral, and the wheels are straight.

! **CAUTION:**

If vehicle to be towed is on a slope, do not release the brake until the load is secured.

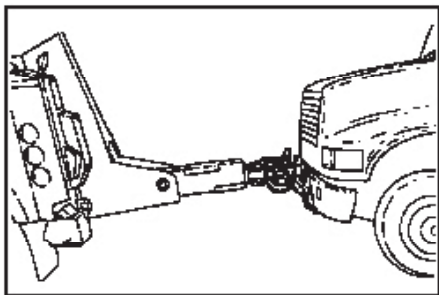


6. It is recommended that the steering wheel be secured by a steering wheel strap for any front or rear tow.
7. With the vehicle in neutral and the parking brake released, you can move the vehicle safely up, down, in or out. All of these movements are hydraulically controlled.



8. Power retract the under lift until the casualty vehicle is about three (3) to four (4) feet from the back of the recovery vehicle. Leave enough room to maneuver around corners without corner binding or causing contact between the two (2) vehicles. **Be sure that the fly boom is extended at least four (4) in. to ensure unobstructed cross-bar pivoting.**

9. Raise the casualty vehicle into towing position observing the far end for sufficient ground clearance. It is possible to set the rear of a front lifted vehicle completely onto the ground, causing damage. Take irregular road surfaces into consideration.

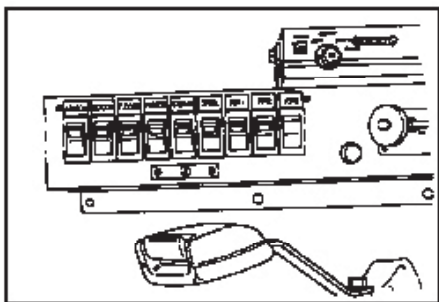


NOTE:

When towing, the Underlift boom should be as close to horizontal as possible. You will have better turning and maneuvering capabilities and it will prolong the life of your underlift and pivot pin.

10. Be sure to maintain sufficient ground clearances with the bottom of the casualty vehicle.

11. Attach the safety chains and magnetic towing lights. **Safety chains should be crossed under the towbar from one side of the recovery vehicle to the opposite side of the casualty vehicle.**



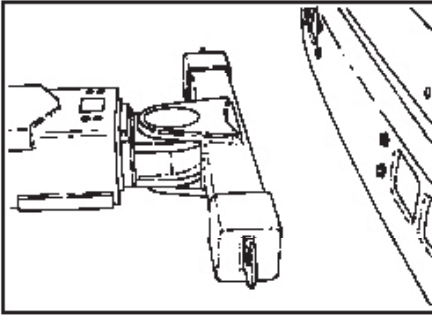
12. If the remote hand controller was used, turn the CONTROL switch "OFF". (Switch is located on panel on the floor.)



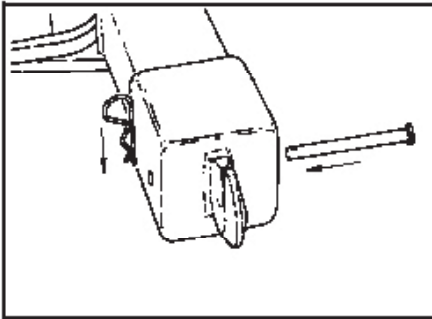
WARNING:

Never fold the boom up into the storage position without removing the towing adapters from the crossbar receivers.

CHAIN HOOK ADAPTERS (OPTIONAL)

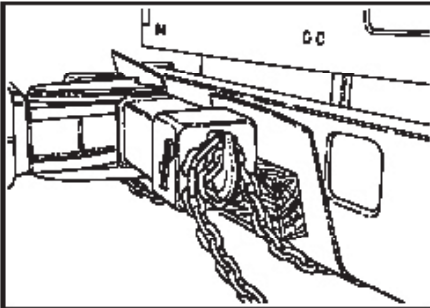


1. Slide the chain hook adapters onto the crossbar.



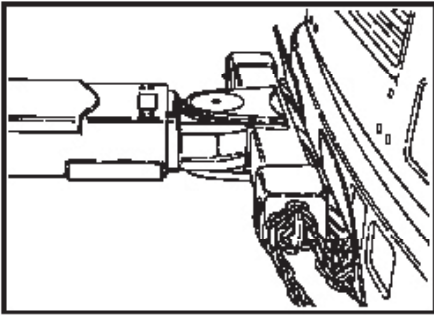
2. Install the retaining pin from the back side of the crossbar through the adapter and crossbar and install the hair pin.

3. Extend the under lift boom up to the casualty vehicle so that the chain hook adapters are in the proper position for lifting.



4. Attach hook-up chains to the casualty vehicle. Fasten the chains in the hooks on the end of the adapters and wrap the chain around the bottom of the hook. Secure the remaining chain.

5. Raise the boom to lift the casualty vehicle slightly. At the same time make sure that you are not going to damage any components.

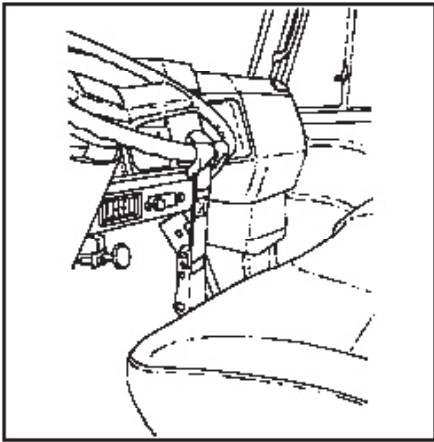


6. Before making the final lift, check to be sure that the casualty's parking brake is released, the transmission is in neutral, and the wheels are straight.

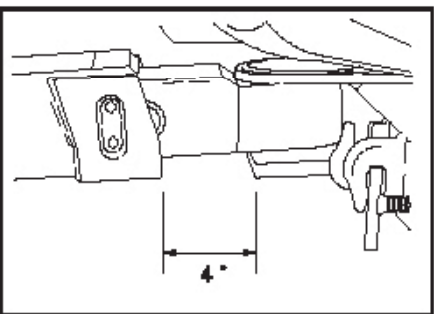


CAUTION:

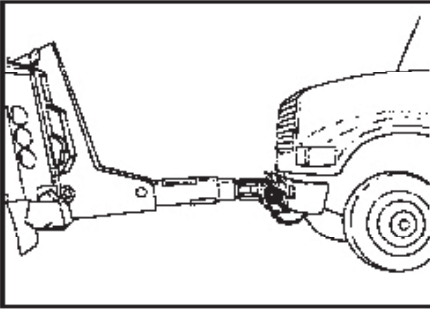
If vehicle to be towed is on a slope, do not release the brake until the load is secured.



7. It is recommended that the steering wheel be secured by a steering wheel strap for any front or rear tow.
8. With the vehicle in neutral and the parking brake released, you can move the vehicle safely up, down, in or out. All of these movements are hydraulically controlled.



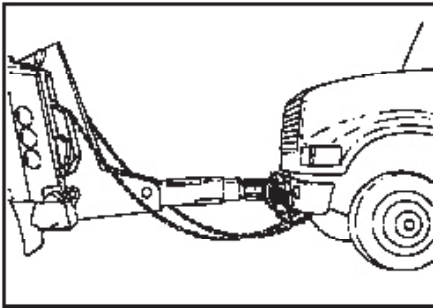
9. Power retract the under lift until the casualty vehicle is about three (3) to four (4) feet from the back of the recovery vehicle. Leave enough room to maneuver around corners without corner binding or causing contact between the two (2) vehicles. **Be sure that the fly boom is extended at least four (4) in. to ensure unobstructed cross-bar pivoting.**



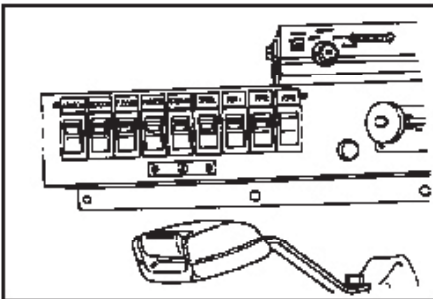
10. Raise the casualty vehicle into towing position observing the far end for sufficient ground clearance. It is possible to set the rear of a front lifted vehicle completely onto the ground, causing damage. Take irregular road surfaces into consideration.

NOTE:

When towing, the Underlift boom should be as close to horizontal as possible. You will have better turning and maneuvering capabilities and it will prolong the life of your underlift and pivot pin.



11. Be sure to maintain sufficient ground clearances with the bottom of the casualty vehicle.
12. Attach the safety chains and magnetic towing lights. **Safety chains should be crossed under the towbar from one side of the recovery vehicle to the opposite side of the casualty vehicle.**



13. If the remote hand controller was used, turn the CONTROL switch "OFF". (Switch is located on panel on the floor.)

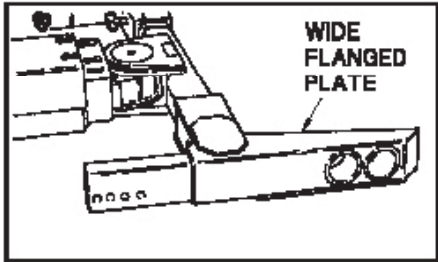
TIRE LIFT (OPTIONAL)

DO NOT EXCEED THE FOLLOWING RATINGS:

- Lifting Capacity (Each Arm)..... 3,750 lbs.
- Lifting Capacity (Total) ²..... 7,500 lbs.
- Towing Capacity (Maximum)¹ 24,500 lbs.

¹ THE TOWING CAPACITY SHOULD NOT EXCEED THE GROSS COMBINED WEIGHT RATING (GCWR) OF THE TOWING VEHICLE OR 42,000 LBS. (GCW) GROSS COMBINED WEIGHT OF THE TOW VEHICLE, WHICHEVER IS LOWER.

² **MAXIMUM LIFTING CAPACITY** - THE MAXIMUM LOAD THAT CAN BE LIFTED.

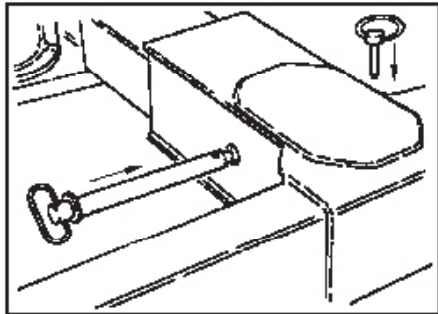


1. Slide the bus bar grid onto the crossbar.

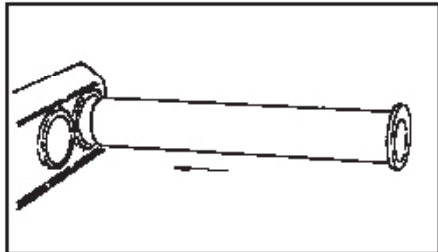


CAUTION:

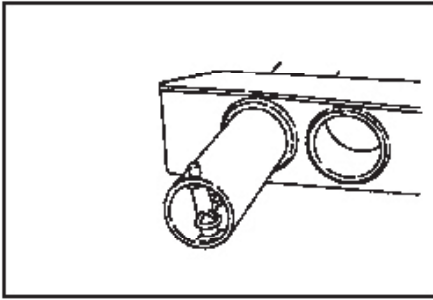
Make sure that the Tire Lift Grid is installed as shown with the wide flanged plate on top.



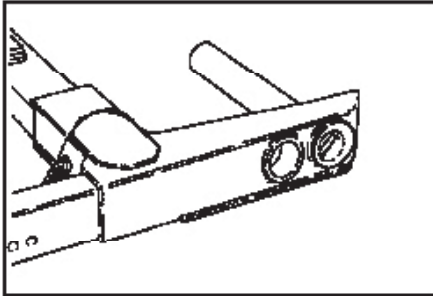
2. Install the retaining pin from the back side of the crossbar through the grid and crossbar and secure with the pin.



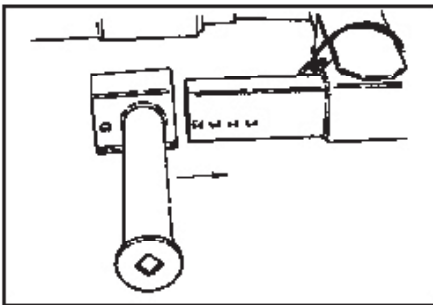
3. Insert the round tube into the desired position in the grid.



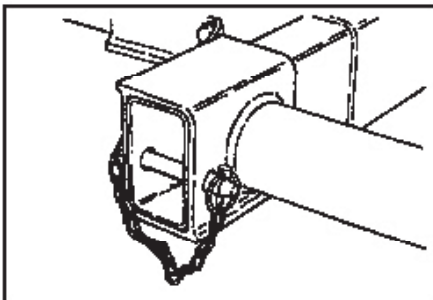
4. Install the retaining pin and hairpin.



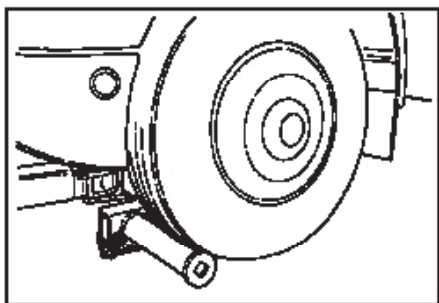
5. Retract the tube inward to the loading position.



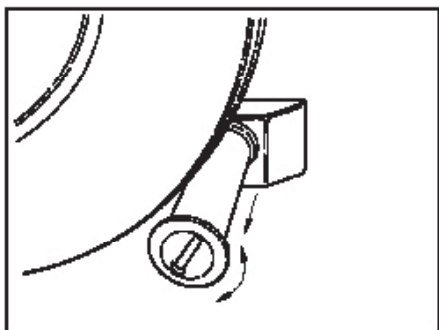
6. Slide the arm weldment over the end of the grid and adjust to the desired position for loading.



7. Install the retaining pin through the grid and arm weldment and secure with the hairpin.



8. Extend the under lift under the casualty vehicle so that the arm makes contact with the front of the tires. **At the same time make sure that you are not going to damage any under body components.**

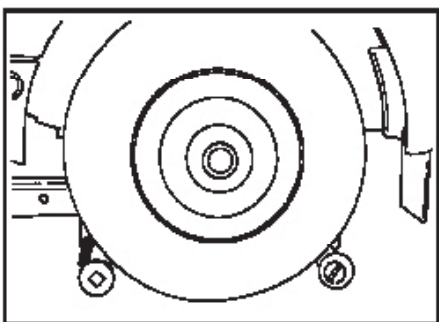


9. Using the pulling tool, extend the round tube to capture the back of the tire. After extending the tube, make sure that the flanged edge of the tube is turned up to prevent the tire from sliding off the end of the tube.

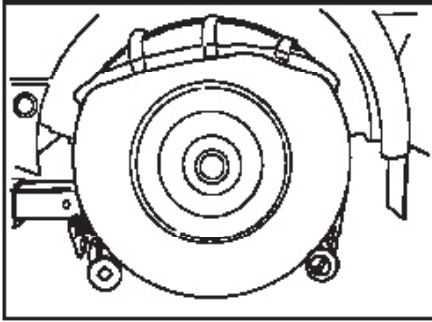


CAUTION:

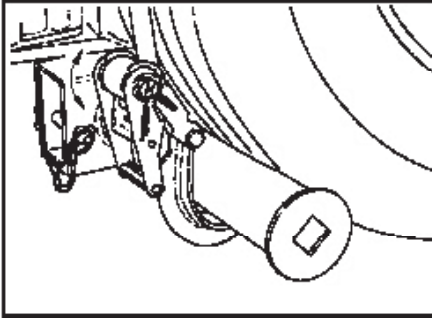
When lifting a vehicle that has dual tires from the rear, only extend the round tube out to capture the inside tire. The flanged edge of the tube must be between the tires and turned up to prevent the tire from sliding off the end of the tube.



10. Raise the boom to lift the casualty vehicle slightly. At the same time make sure that you are not going to damage any components.



11. Attach the hook end of the tie-down strap to the round tube behind the tire. Pull the strap up and cover the tire and attach the hook on the ratchet end of the strap to the arm in front of the tire. **Make sure that the hook is seated into one of the slots on the underside of the ramp plate.**

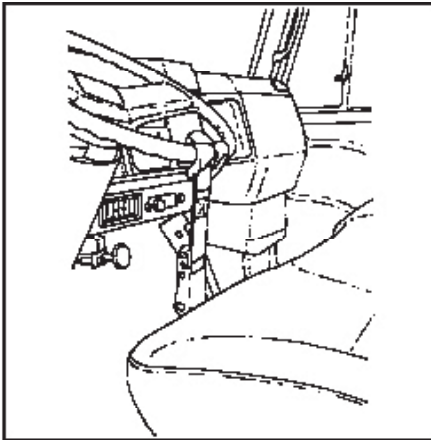


12. Take up the slack in the strap by ratcheting the takeup spool arm. Continue until the tires show some compression.

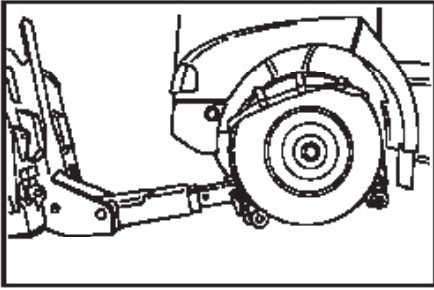


CAUTION:

If vehicle to be towed is on a slope, do not release the brake until the load is secured.



13. Always secure the steering wheel with a steering wheel strap for any front or rear tow.
14. With the vehicle in neutral and the parking brake released, you can move the vehicle safely up, down, in or out. All of these movements are hydraulically controlled.

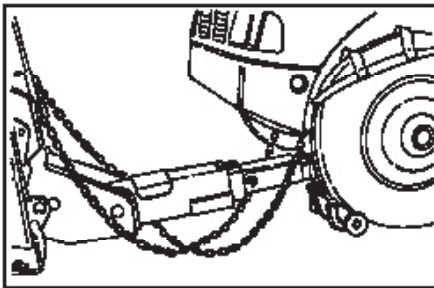


15. Power retract the under lift until the casualty vehicle is about three (3) to four (4) feet from the back of the recovery vehicle. Leave enough room to maneuver around corners without corner binding or causing contact between the two (2) vehicles. **Be sure that the fly boom is extended at least four (4) in. from the middle boom section to ensure unobstructed cross-bar pivoting.**

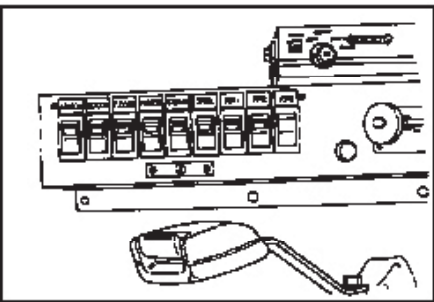
16. Raise the casualty vehicle into towing position observing the far end for sufficient ground clearance. It is possible to set the rear of a front lifted vehicle completely onto the ground, causing damage. Take irregular road surfaces into consideration.

NOTE:

When towing, the Underlift boom should be as close to horizontal as possible. You will have better turning and maneuvering capabilities and it will prolong the life of your underlift and pivot pin.



17. Be sure to maintain sufficient ground clearances with the bottom of the casualty vehicle.
18. Attach the safety chains and magnetic towing lights. **Safety chains should be crossed under the towbar from one side of the recovery vehicle to the opposite side of the casualty vehicle.**



19. If the remote hand controller was used, turn the CONTROL switch "OFF". (Switch is located on panel on the floor.)



WARNING:

Do not use the Tire Lift if the tire(s) of the casualty vehicle are flat or if there is damage to the wheels or suspension.



CAUTION:

Retighten the tie-down straps periodically during a tow as the tires settle into the grid from towing.



CAUTION:

The use of trailer brakes or secondary braking devices is recommended.



CAUTION:

The tire lift and grid tubes must be in their outermost positions for storage on the under lift when folded up in the travel position to avoid damage to the body.



CAUTION:

The use of secondary tie-down chains is recommended. Fit the secondary tie-down chains to the axle (not to any part of the suspension or body which will rise and fall with the suspension) arranged so as to hold the wheel down in the grid and prevent it from jumping up, forwards, or backwards. Use load binders as required.



CAUTION:

Do not tow any vehicle without safety chains being installed.



CAUTION:

Always follow the chassis manufacturer's recommended procedures for towing. Remove drive lines and drive shafts as directed. Many vehicles can be severely damaged unless these components are removed prior to towing.

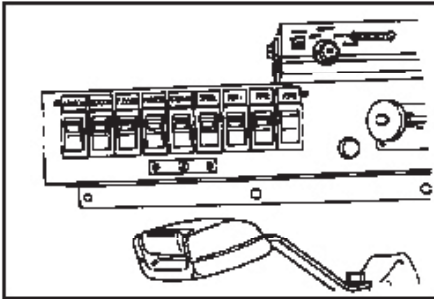


CAUTION:

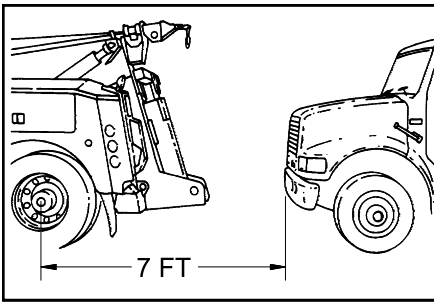
All products are subject to age, wear and deterioration, all of which cause a reduction in the products breaking strength capacity. It is recommended that all products be regularly inspected. Any worn, deformed, misused or overloaded products should be replaced immediately.

WHEEL-LIFT OPERATION

Follow these simple steps:

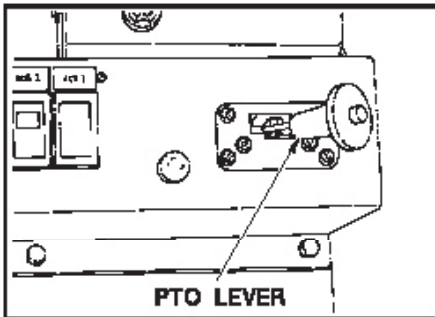


1. Turn on the safety and work lights. (Switches located on the floor beside the driver's seat.) If the remote hand controller is going to be used the CONTROL switch must be turned "ON".



2. Using the rear axle as a guide, position the recovery vehicle within 7 ft. of the subject vehicle and as close to the direction of the pull as possible.

3. Place the recovery vehicle's transmission gear selector into neutral and set the parking brakes.



4. Engage the power take-off (PTO) by pulling on the control lever. See PTO operator's manual. **NEVER TRAVEL WITH THE POWER TAKE-OFF CONTROL ENGAGED.** This could result in damage to the PTO unit and the truck transmission.

Rev. _____

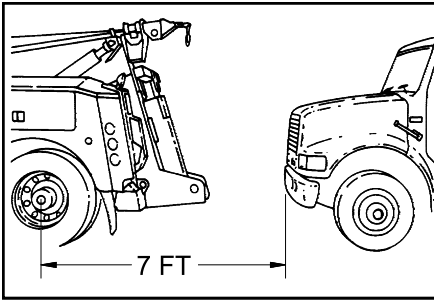
Date _____

- Adjust the electronic or manual throttle control to elevate the engine speed to approximately 1000-1200 R.P.M. for optimum performance.

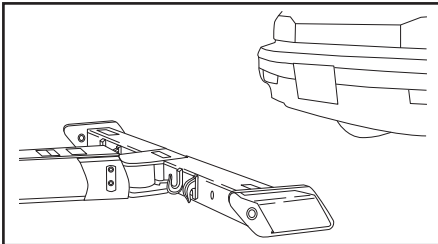


CAUTION:

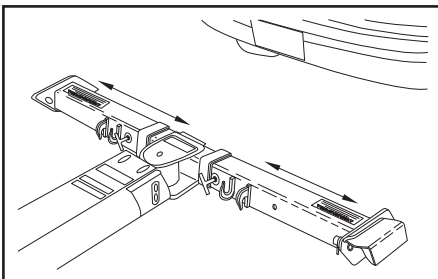
Never exceed 1,200 R.P.M. When your hook up is complete, reset the engine idle to normal.



- Confirm the recovery vehicle's position in relation to the vehicle to be towed. Seven (7) feet is recommended. Reposition the MDL if necessary. **Be sure the towed vehicle is not in gear or park. Keep the brake set.**



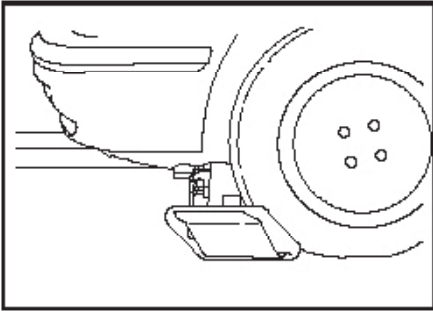
- Unfold and lower the lift arm to about 1-1/2" from the ground and swing the cross bar parallel to the tires.



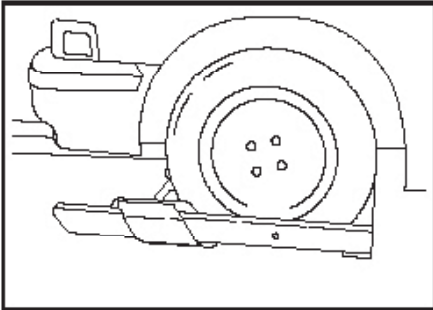
- Set the grid width as required for the vehicle to be towed. Be sure both grids are as close to the center of the boom as possible. (See your particular grid option instructions).

Rev. 1

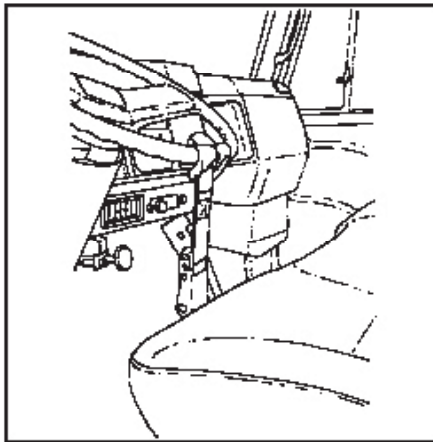
Date 9/14



9. Extend the lift arm under the vehicle being sure that all under carriage parts are cleared and that the front portion of the grid is in contact with both tires. Lower the grid fully to the ground. **There is no reason for the operator to get under the vehicle.**



10. Visually inspect the tire to grid contact before proceeding.
11. Secure the grid arm around the towed vehicle's tires following the instructions given for your particular grid option.



12. After securing the grid arms around the towed vehicles tires and before making the actual lift, check to be sure the towed vehicle's parking brake is re-leased, the transmission is in neutral, and the wheels are straight.

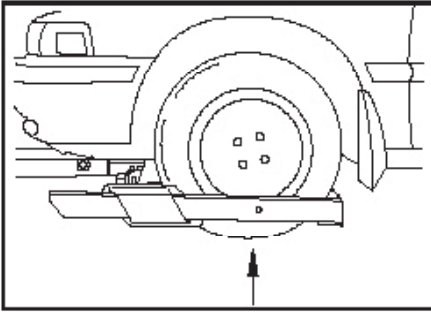
NOTE:

If vehicle to be towed is on a slope, do not release the brake until the tie-down straps are installed. Observe the wheels in the grid for any slippage.

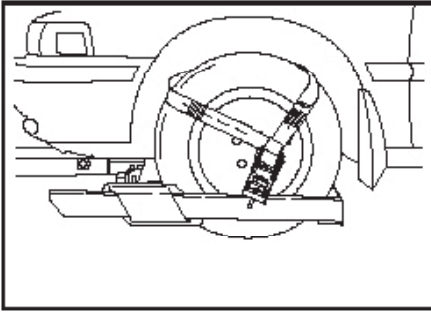
13. It is recommended that the steering wheel be secured by a steering wheel strap for any tow.

Rev. _____

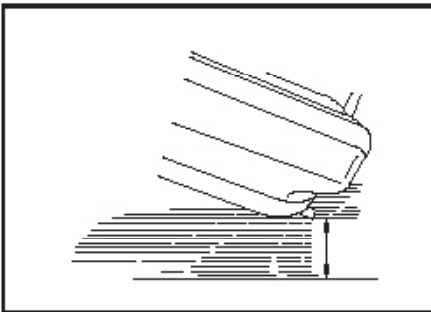
Date _____



14. Lift the vehicle high enough to allow tires to clear ground. Make sure that the grid is not in contact with any engine or body components.



15. Remove the tie down straps from tool boxes and attach the tie down straps. (**See your particular grid option instructions**).



16. With the straps in place, the vehicle in neutral and the parking brake released, you can move the vehicle safely up, down, in or out. All of these movements are hydraulically controlled.

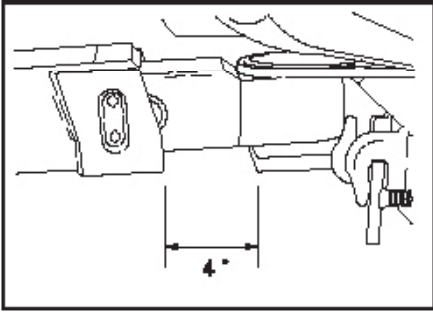
17. Raise the vehicle into the final towing position observing the far end for sufficient ground clearance. It is possible to set the rear of a front lifted vehicle completely onto the ground, causing damage. Take irregular roadsurfaces into consideration. Observe the lift function from the side and away from both vehicles if possible.

NOTE:

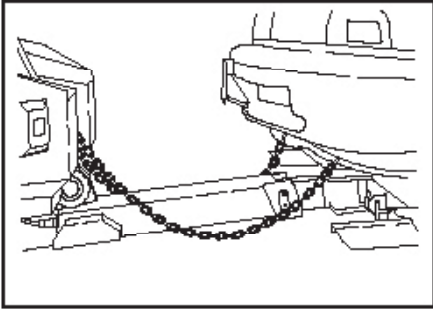
When towing, the Underlift boom should be as close to horizontal as possible. You will have better turning and maneuvering capabilities and it will prolong the life of your underlift and pivot pin.

Rev. _____

Date _____



18. Power retract the grid boom until the towed vehicle is about 3 to 4 feet from the back of the truck. Leave enough room to maneuver around corners without corner binding or causing contact between the two (2) vehicles. **Be sure that the boom is extended at least 4" to ensure unobstructed cross-bar pivoting.**



19. Be sure to maintain sufficient clearances with the bottom of the towed vehicle.

20. Attach the safety chains and magnetic towing lights. **Safety chains should be crossed from one side of the recovery vehicle to the opposite side of the casualty vehicle.**



CAUTION:

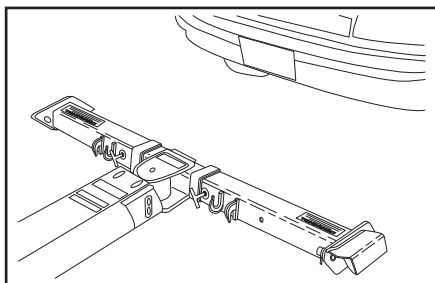
Retighten the tie-down straps periodically during a tow as the tires settle into the grid from towing.



CAUTION:

Do not tow any vehicle without safety chains being installed.

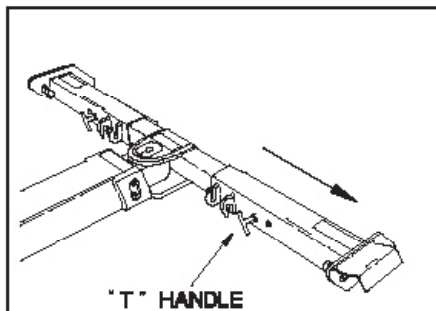
“L”-ARM GRID OPERATION



1. Remove the “L” arms from their storage in the toolbox.

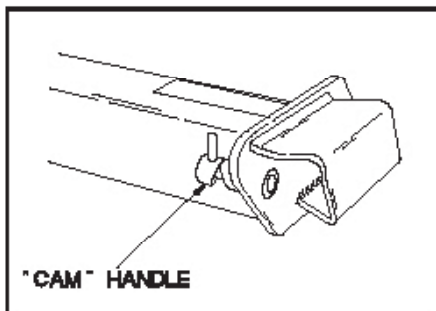
2. Set the grid width as required for the vehicle to be towed.

3. To set the grid width, loosen the “T” handles on the front of the grid arms and pull the grids out. Be sure both grids are as close to the center of the boom as possible, and wide enough to allow the “L” arms to slide into their channels. Tighten the “T” handles to secure the grids.

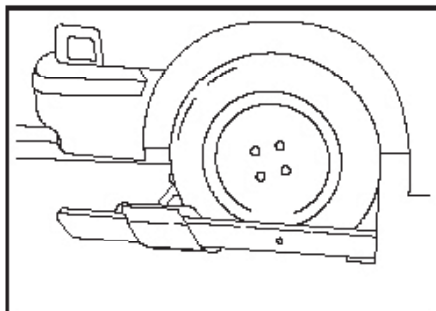


4. Retract the “Cam” handle locking pin on the grid by turning it a half turn. It should remain in the open position.

5. Lower the lift arm to the ground and extend under the vehicle to be towed as described in the Wheel Lift Operation section.



6. Take the “L” arms and slide them into the channels on the side of the grid. Insure that they are resting snugly against the tires. With the “L” arms in close contact with the tires, reset the locking pin by turning the “Cam” handle back to the original position. **Be sure that the pin seats in one of the holes.** The tires are now confined front and back.



7. Remove the tie down straps from toolboxes and attach the tie down straps.

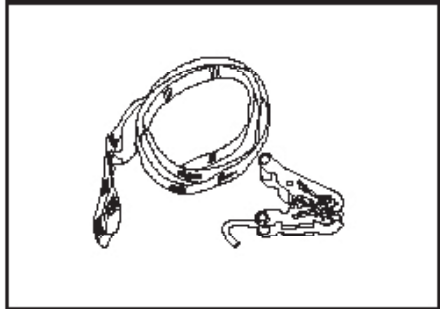
Rev. _____

TIE DOWN STRAPS

The MDL is supplied with a set of high strength polyester web tie down straps. They are to be used to secure wheels of the towed vehicle to the wheel lift grid. **NEVER TOW A VEHICLE WITHOUT THE TIE DOWN STRAPS INSTALLED.**

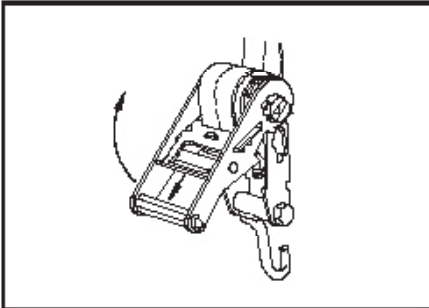
The tie down strap assembly is comprised of 2 basic components:

1. The Strap
2. The Ratchet Spool Mechanism

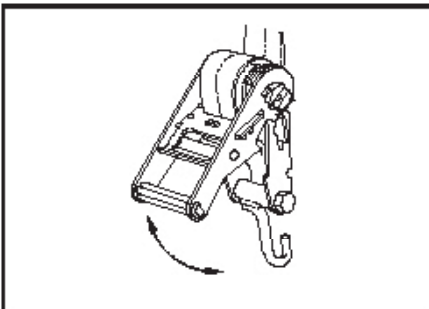


The following steps should be followed to properly install the tie down straps:

USING THE RATCHET SPOOL MECHANISM



1. First the spool must be set into "free spool". This is done by pulling the lock bar out and swinging the handle upward until it rests in the free spool notch and then simply pulling out the amount of strap required to fit over the tire.

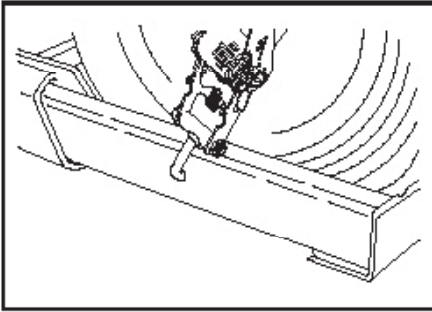


2. Now pull on the lock bar and move it downward until it engages the ratchet teeth on the take up spool. By pushing and pulling the handle up and down, the strap will be wound onto the spool.
3. To release the ratchet, simply pull on the locking bar, disengaging the teeth and raise the handle to the "free spool" position.

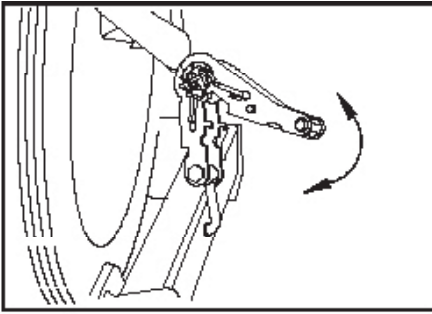
Rev. _____

Date _____

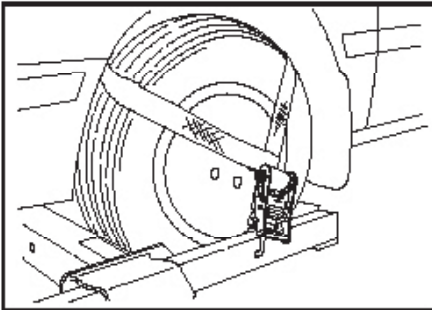
INSTALLING THE TIE DOWN STRAP



1. With the vehicle lifted just barely off the ground, attach the strap to the wheel grid.



2. Set the ratchet spool in “free spool” position and pull the webbed strap out and form a loop which will wrap around the tire. Be sure the loop is over approximately 1/3 of the tire.



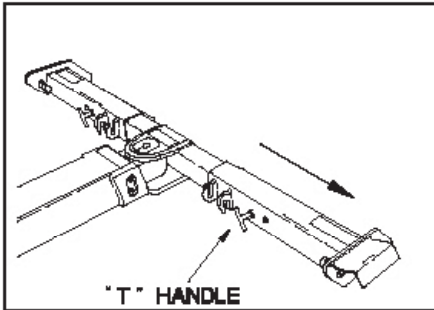
3. Take up the slack in the strap by ratcheting the takeup spool arm. Continue until the tires show some compression.

4. Raise the wheel grid to the towing position. **RE-TIGHTEN THE RATCHET PERIODICALLY AS TIRE SETTLES IN GRID FROM TOWING.**

Rev. _____

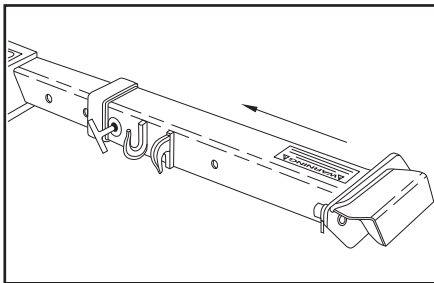
Date _____

REMOVING THE WHEEL GRIDS FROM THE CROSS BAR

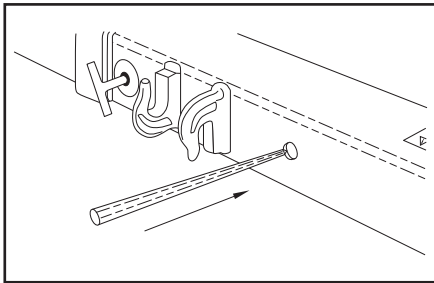


1. Unfold and position the wheel grid and cross bar to about 3 ft. from the ground.

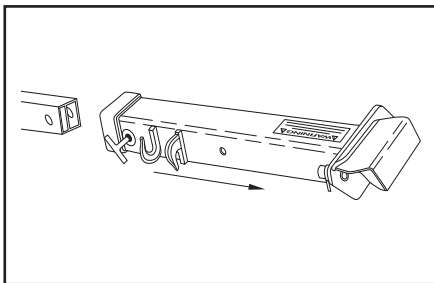
2. Loosen the "T" handles on the front of the grid arms and pull the grid arms out until they hit the built in stops.



3. After the grid arms hit the stops, push the grid arms back in about 1 inch to allow the internal catch to disengage the built in stop.



4. Insert a screw driver or other long and narrow object into the hole on the front side of the grid arm.



5. Gently, push in on the catch and pull the grid arm off the end of the cross bar. Store the grid arms in the tool boxes.

PINTLE HOOK BALL HITCH (OPTIONAL)

DO NOT EXCEED THE FOLLOWING RATINGS:

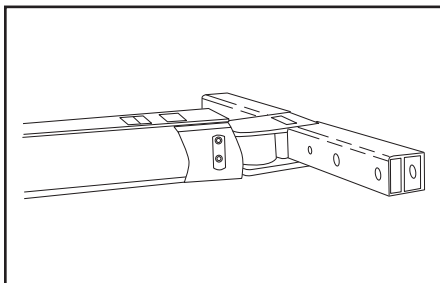
PINTLE HOOK BALL HITCH

Pintle Hook	16,000 lb (GTW)
Gross Trailer Weight.....	3,000 Max. Vertical Load
1-7/8 in. Ball Hitch.....	2,000 lbs. (GTW)
2 in. Ball Hitch.....	7,000 lbs. (GTW)
2 in. Ball Hitch.....	12,000 lbs. (GTW)
50 MM Ball Hitch	7,000 lbs. (GTW)

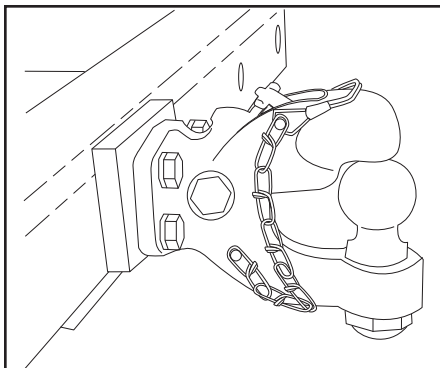
BALL HITCH:

1-7/8 in. Ball.....	5,000 lbs. (GTW)
2 in. Ball	5,000 lbs. (GTW)
2-5/16 in. Ball.....	7,500 lbs. (GTW)
50 MM Ball.....	5,000 lbs. (GTW)

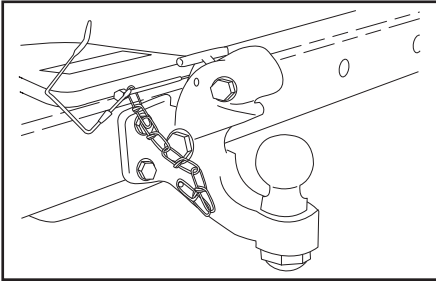
PINTLE HOOK:



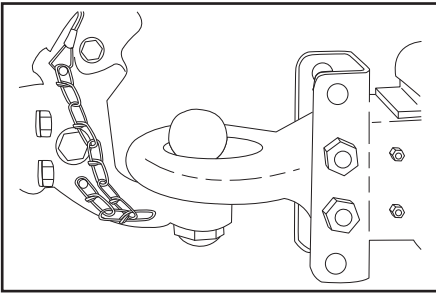
1. Unfold and tilt the under lift boom down until it is in the horizontal position.



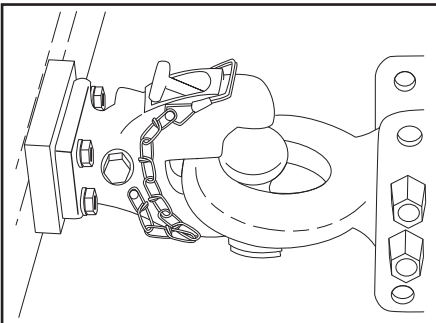
2. Install the pintle hook to the cross bar using the four bolts supplied. **Torque the bolts to 100 lb.-ft.**



3. Open the latch by removing the safety pin and lifting the lock.



4. Position the drawbar eye over the horn of the pintle and lower into place.

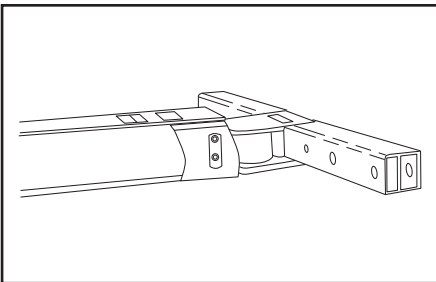


5. Push the latch closed and insert the safety pin. Connect the trailer lights and attach safety chains.



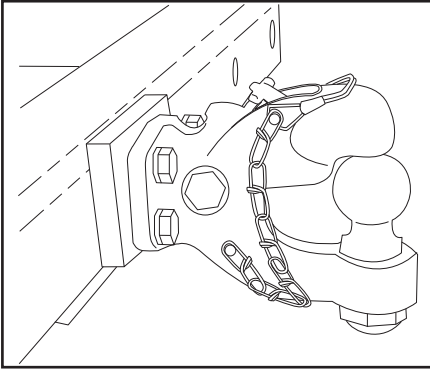
CAUTION:

If the trailer to be towed is on a slope, do not release the brakes until the load is secured.

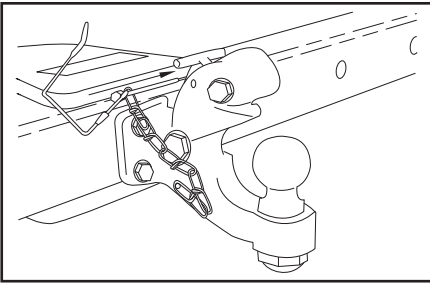


BALL HITCH:

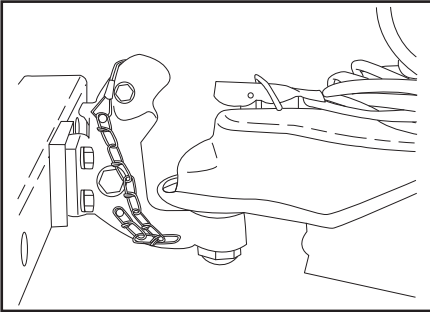
1. Unfold and tilt the under lift boom down until it is in the horizontal position.



2. Install the pintle hook to the cross bar using the four bolts supplied. **Torque the bolts to 100 lb.-ft.**



3. Open the latch by removing the safety pin and lifting up on the lock. Replace the safety pin into the hole to secure the latch in the open position.



4. Position the ball coupler over the ball and lock into place. Connect the trailer lights and attach safety chains.



CAUTION:

Make sure that the ball and coupler are of the same matched size.



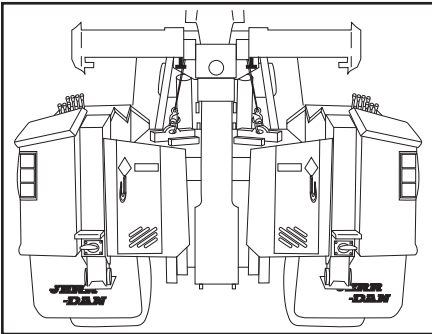
CAUTION:

If the trailer to be towed is on a slope, do not release the brake until the load is secured.

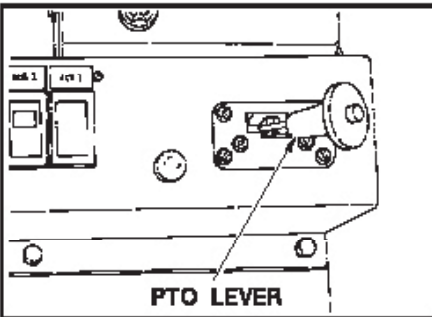
REAR MANUAL STABILIZERS (OPTIONAL)

Your MDL is equipped with rear stabilizers. The stabilizers serve two purposes. First, they may be used as a chassis support when lifting heavy loads which would otherwise cause the front axle of the vehicle to lift off the ground. Second, they can be used to provide a resistance to winching forces. **USE CAUTION AND GOOD JUDGEMENT!**

Follow these simple steps:

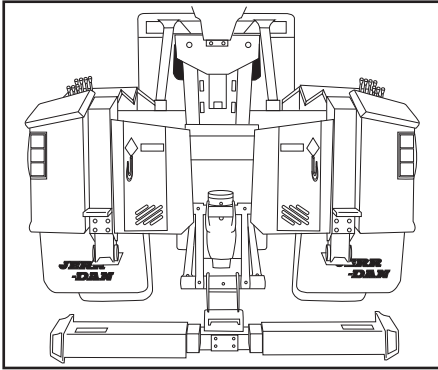


1. Position the recovery vehicle as close as possible to the work and set the parking brakes and place the transmission in neutral.
2. Engage the power take-off (PTO). See PTO operator's instruction manual.
3. Adjust the electronic or manual throttle control to elevate the engine speed to approximately 1000-1200 R.P.M. of P.T.O. output shaft speed for optimum performance.

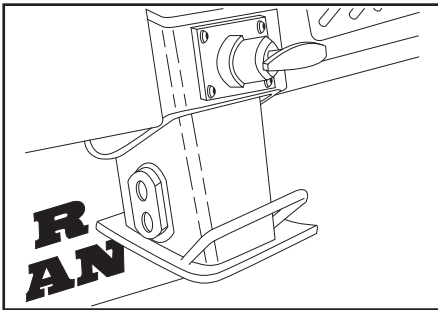


CAUTION:

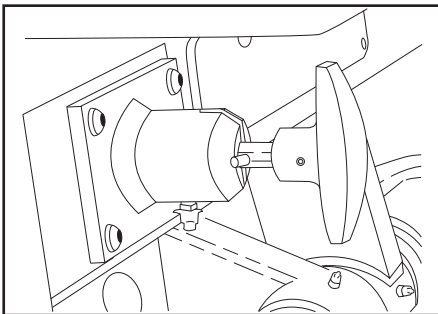
Never exceed 1200 R.P.M. When your hook up is complete, reset the engine idle to normal.



- Using the control levers, lower the under lift boom to the ground.



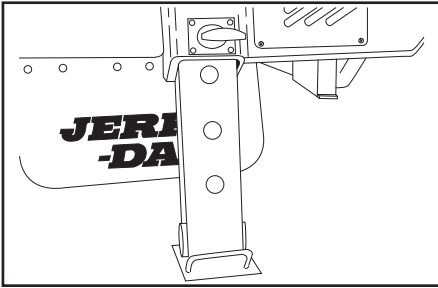
- Slightly raise the rear of the recovery vehicle.



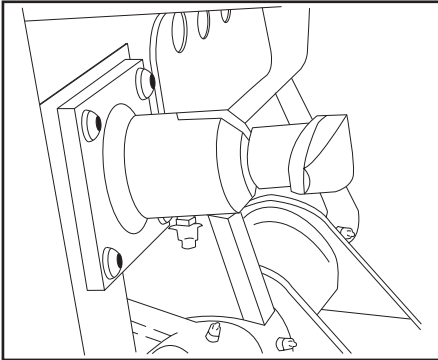
- While holding onto the handle of the inner stabilizer tube, pull out on the locking pin handle and rotate 90° to the "out" position.

! WARNING:

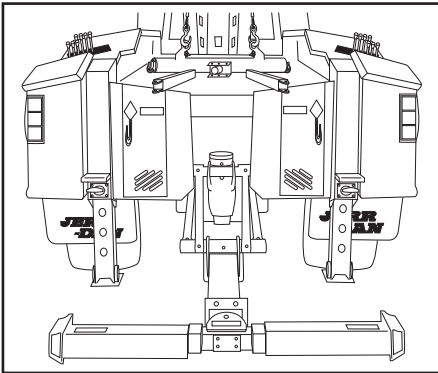
Area should be clear of feet when lowering the rear stabilizers.



7. Lower the stabilizer tube to the ground.



8. Rotate the locking pin handle back 90° to the original position making sure that the pin engages one of the holes in the stabilizer tube. *If the pin does not engage one of the holes, raise the back end of the recovery vehicle allowing the stabilizer tube to drop until the pin engages in one of the holes.*



9. Using the control levers, raise the under lift boom and allow the recovery to rest on the rear stabilizer tubes.



CAUTION:

Do not attempt to use the stabilizers to level the recovery vehicle chassis or raise the rear of the recovery vehicle off of the ground. Damage to the chassis can occur.



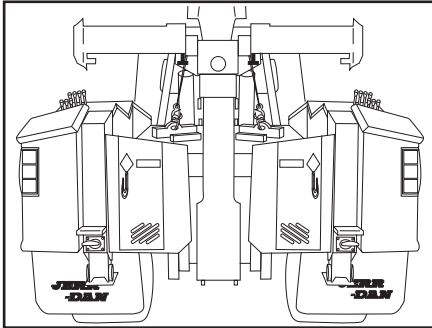
CAUTION:

Do not allow the recovery vehicle to move with the stabilizers on the ground or damage to the chassis or stabilizers can occur.

REAR HYDRAULIC STABILIZERS (OPTIONAL)

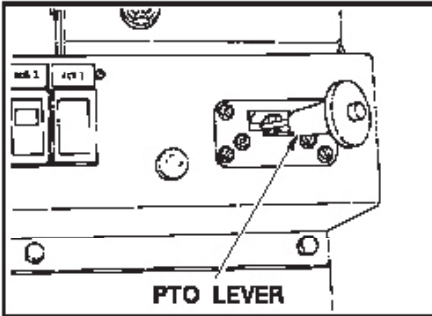
Your MDL is equipped with rear hydraulic stabilizers. The stabilizers serve two purposes. First, they may be used as a chassis support when lifting heavy loads which would otherwise cause the front axle of the vehicle to lift off the ground. Second, they can be used to provide a resistance to winching forces. **USE CAUTION AND GOOD JUDGEMENT!**

Follow these simple steps:



1. Position the recovery vehicle as close as possible to the work and set the parking brakes and place the transmission in neutral.

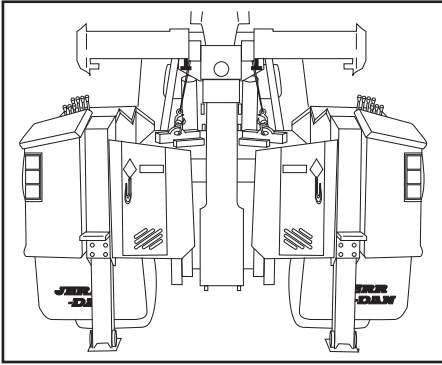
2. Engage the power take-off (PTO). See PTO operator's instruction manual.



3. Adjust the electronic or manual throttle control to elevate the engine speed to approximately 1000-1200 R.P.M. of P.T.O. output shaft speed for optimum performance.

CAUTION:

Never exceed 1200 R.P.M. When your hook up is complete, reset the engine idle to normal.



- Using the control levers, lower the stabilizers to the ground. The stabilizers work independently from each so that they can be used on uneven ground.



CAUTION:

Do not attempt to use the stabilizers to level the recovery vehicle chassis or raise the rear of the recovery vehicle off of the ground. Damage to the chassis can occur.



WARNING:

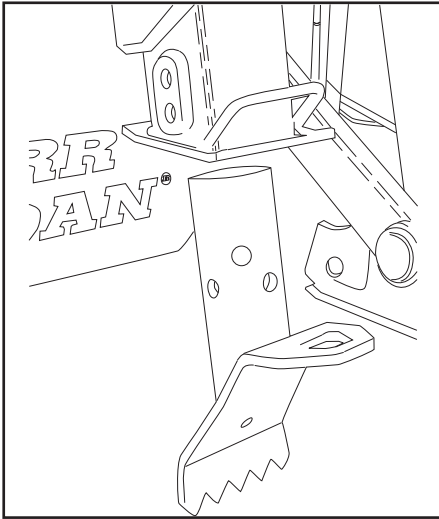
Area should be clear of feet when lowering the rear stabilizers.



CAUTION:

Do not allow the recovery vehicle to move with the stabilizers on the ground or damage to the chassis or stabilizers can occur.

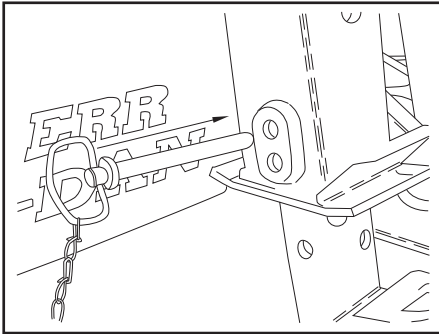
MULTI-POSITION SPADES (OPTIONAL)



1. With the stabilizer in the up position, insert the spade into the bottom of the stabilizer tube.

NOTE:

If needed, lower the under lift to the boom to the ground to raise the rear of the recovery vehicle. A wood block can be used under the under lift boom if needed to raise the rear of the recovery higher.

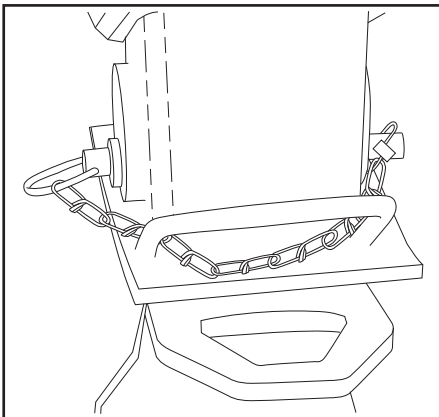


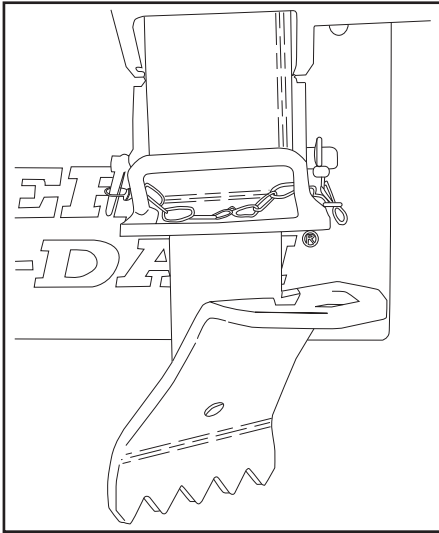
2. Find the desired position of the spade that best suits your needs and secure the spade in the stabilizer using the retaining pin and safety pin. *The spades can be positioned at two different heights and rotated 45° and 90° left or right.*



CAUTION:

Do not attempt to use the stabilizers to level the recovery vehicle chassis or raise the rear of the recovery vehicle off of the ground. Damage to the chassis can occur.





NOTE:

The eye plate on the back side of the spades can be used for the attachment of snatch blocks or to terminate the wire rope hook during winching operations.



WARNING:

Area should be clear of feet when lowering the rear stabilizers.



CAUTION:

Do not move the recovery vehicle with the stabilizers on the ground or damage to the chassis can occur.



CAUTION:

Do not use spades on pavement or concrete. Damage to the pavement or concrete may result.

WRECKER BOOM OPERATION

The wrecker boom is probably one of the most useful accessories on your MDL. It allows the operator to perform lifting and retrieval tasks that cannot be performed in any other way. Safe operation of the wrecker boom demands knowledge of the controls and the boom functions. Review the boom safety section of this manual and USE CAUTION AND GOOD JUDGEMENT!

Position the recovery vehicle to best take advantage of the leverage the boom affords. A vertical lift is the best and most efficient, so attempt to place the boom over the work. This reduces the chance of the work breaking free and swinging during the lift. Place the recovery vehicle as close as possible to the work. A shorter boom extension will result in less rear axle loading. When pulling, align the recovery vehicle with the work so that the direction of pull is in line with the length of the truck. If the front wheels of the recovery vehicle raise completely from the ground,

Stop! And Re-Rig.

DUAL WINCH OPERATION

Your MDL is equipped with a dual winch wrecker boom that has one of the following ratings:

MDL280/110 and MDL280/110 INT

BOOM RATING: (SAE J2512)

SAE Rating - Boom elevated at 30° Angle

Retracted 28,000 lbs.
Extended 14,000 lbs.

WINCH RATING: (SAE J706)

Each Drum 15,000 lbs.

WIRE ROPE:

Working Limit Each Line 5,828 lbs.
Nominal Breaking Strength 20,400 lbs.
Construction 6 x 37 EIP IWRC
Diameter 7/16 inch
Standard Length 150 Feet

MDL320/110 and MDL320/110 INT

BOOM RATING: (SAE J2512)

SAE Rating - Boom elevated at 30° Angle

- Retracted 32,000 lbs.
- Extended 14,000 lbs.

WINCH RATING: (SAE J706)

- Each Drum..... 15,000 lbs.

WIRE ROPE:

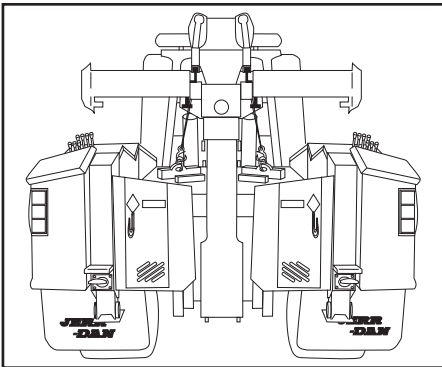
- Working Limit Each Line 7,600 lbs.
- Nominal Breaking Strength..... 26,600 lbs.
- Construction 6 x 37 EIP IWRC
- Diameter 1/2 inch
- Standard Length 150 Feet

WARNING:

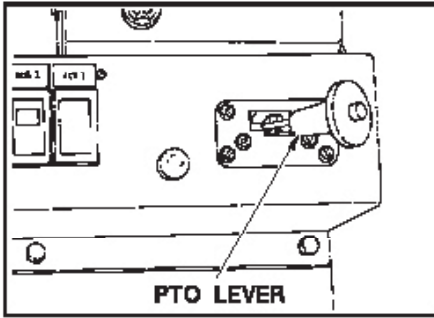
Do not exceed the working limit of the wire rope. Use snatch blocks and multiple lines to reduce the load on the wire rope. Always apply an equal load in the opposite direction of the pull to stabilize the load.

These ratings are supplied for day to day reference. See rating placard affixed to the under lift boom tower for the ratings of your particular wrecker boom. The operator must be sure he knows and understands this information before placing the boom into service.

When making a heavy lift or pull with the wrecker boom, the following steps should be taken:



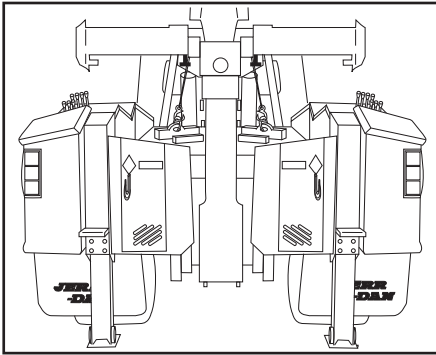
1. Position the recovery vehicle as close as possible to the work and set the parking brakes and place the transmission in neutral.
2. Turn "ON" the CONTROL switch if the remote hand controller is going to be used.



- Engage the power take-off (PTO). See PTO operator's instruction manual. Adjust the electronic or manual throttle control to elevate the engine speed to approximately 1000-1200 rpm of P.T.O. output shaft speed for optimum performance.

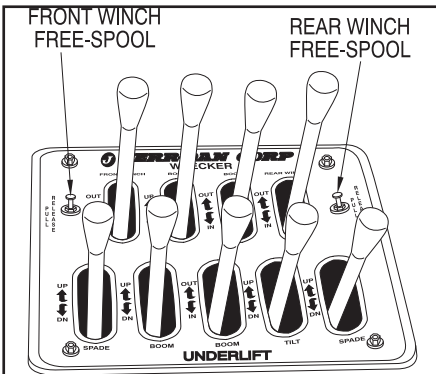
! CAUTION:

Never exceed 1200 R.P.M. When your hook up is complete, reset the engine idle to normal.

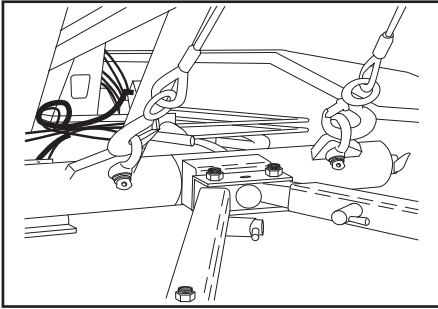


- Confirm that the recovery vehicle is positioned properly and rests on firm ground. The stabilizers or spades can be lowered to provide additional support if necessary.

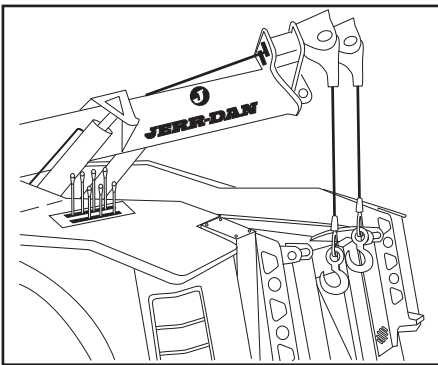
- Using the winch control levers, unwind some wire rope from the winches to relieve the pressure on the winch free-spool device.



- Pull the winch free-spool knobs to the "out" position to set both boom winches into the "free spool" mode.



7. Wearing gloves, unhook the wire ropes from their stored position. Moving the boom head with the wire rope locked can result in damage to both the wire ropes and the boom. Carefully observe the winch drums when beginning to extend the boom to be sure both winches are free-spooling.



8. Position the boom head by using the boom up and down lever and the boom in and out lever.
9. Manually, "free-spool" enough wire rope to make the hook-up being sure that a minimum of five (5) wraps remains on the cable drums.



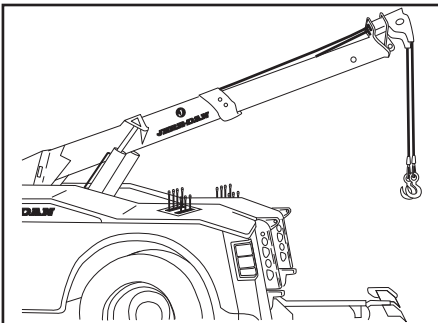
WARNING:

Wear gloves to protect hands from wire ropes.

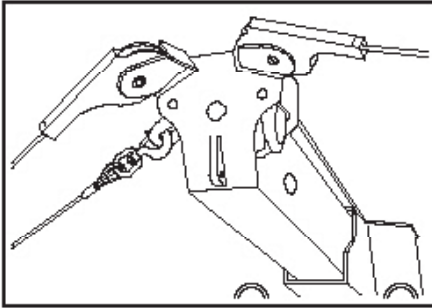


CAUTION:

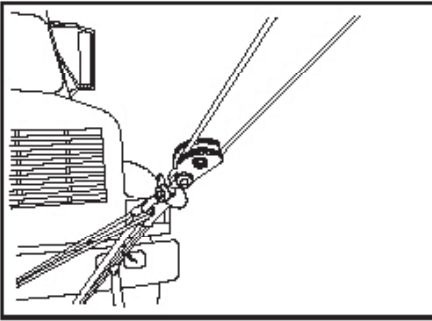
To avoid birdnesting and premature failure of the wire rope, always keep tension on the wire rope when winding or unwinding.



10. Make the hook-up in such a way as to afford an even pull on both wire ropes. Over stressing one wire rope can happen if care isn't taken in hook placement.

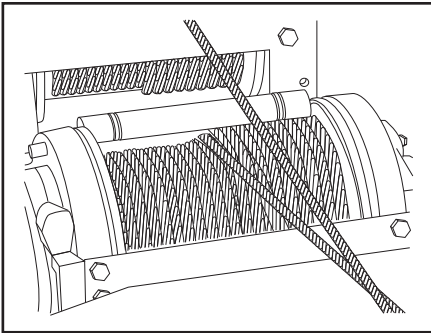


11. If a heavy lift or pull is to be made additional cable lines may be necessary. **Always use more stabilizing lines than pull lines. RIG FOR SAFETY.**



12. **DO NOT EXCEED THE WORKING LIMIT OF THE WIRE ROPE.** When making a recovery and pulling to the side, always apply an equal or lesser load in the opposite direction of the pull to stabilize the load.

13. The use of snatch blocks and multiple lines will allow you to pull, stabilize the recovery vehicle, and minimize deflection of the wrecker boom.



14. Push the winch free-spool knobs to the "in" position to re-engage the winch. Slowly take up the slack in the wire ropes. Inspect the hook-up points for slippage before continuing the lift or pull. Manually control each winch to ensure wire ropes are stressed evenly. As the wire rope is retrieved, be sure it doesn't criss-cross on the spool.

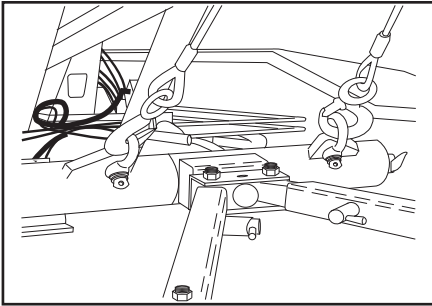


15. Complete the lift or pull being sure the work is placed in a stable location where it won't slip or roll. If there is any question about stability, use blocks or tie the work down before removing wire rope and chains.

16. Using the winch controls, unwind enough wire rope to remove the hooks or chains and remove them carefully. Avoid straddling the wire rope.

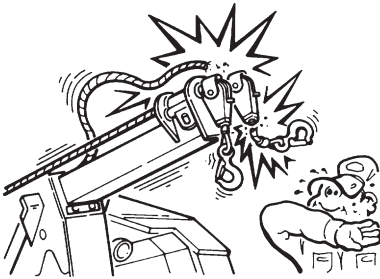
17. Respool both wire ropes and take this opportunity to inspect them for damage.

18. Retract and lower the boom to normal horizontal position and carefully snug up any loose wire rope.



CAUTION:

Don't stress the wire rope by over retrieving or tightening and exceeding the working limit. Over stressing the wire rope beyond its working limit can cause damage resulting in premature wire rope failure.

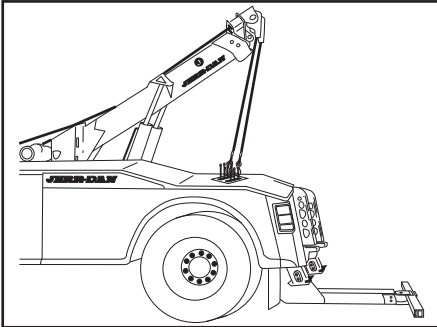


TRUCK BAR OPERATION (OPTIONAL)

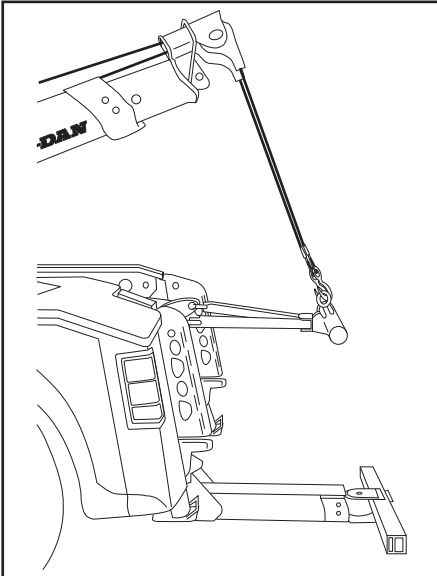
DO NOT EXCEED THE FOLLOWING RATINGS:

TRUCK HITCH:

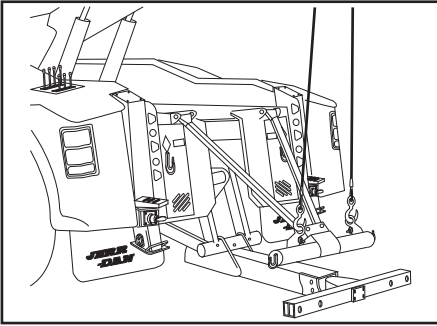
Lifting Capacity 8,000 lbs.
Towing Capacity 50,000 lbs.
Max. Towing Speed.....50 m.p.h.



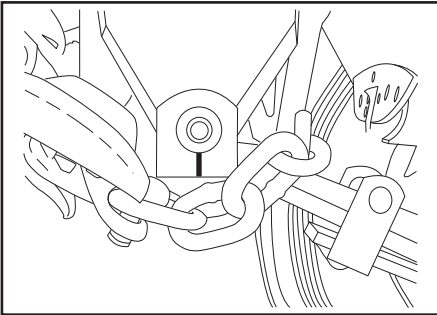
1. Raise the wrecker boom to approximately 45° and telescope out to allow for working clearance.
2. Lower the under lift cross bar to about 1-1/2" from the ground.



3. Lower the truck bar assembly to horizontal using the winches. Rotate the "Cam" handles on the hold back bars 180° to the open position. Pull the hold back bars to their full extension. Rotate the "Cam" handles back to the closed position.

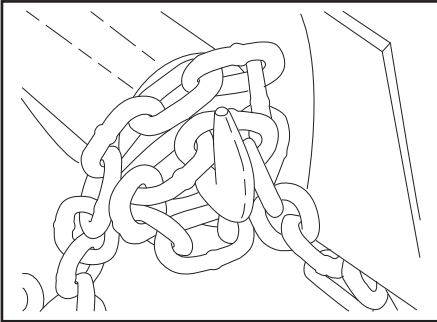


- Center and position the truck bar at the height necessary to connect the truck bar to the casualty vehicle.

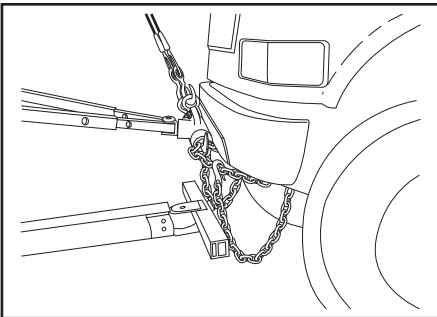


- Set the parking brake and use wheel chocks to prevent the casualty vehicle being towed from moving during hookup.

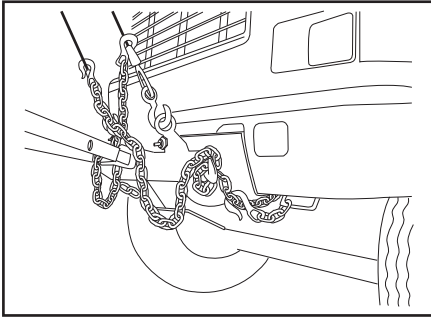
- Connect the tow chains to the casualty vehicle. The chains must be secured firmly around the axle or the frame of the vehicle. Be sure that you do not damage any brake lines or other functional parts of the casualty vehicle.



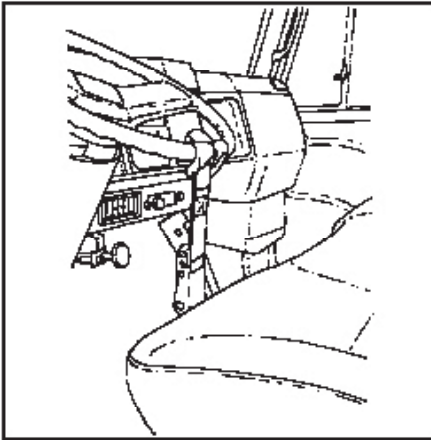
- Connect the tow chains to the hooks on the truck bar. Put a safety wrap of chain around the truck bar and secure any loose chain. The use of wood blocks or rubber mats may be required to protect the casualty vehicle.



- Raise the vehicle into the final towing position. **The bottom anchor bar must never be higher than the attachment point on the rear of the towing vehicle. The hold back bar assembly acts as a pivot in the event of a sudden stop. This will assure that the towed vehicle will not catapult forward onto the rear of the towing vehicle.**



9. Retract the wrecker boom slowly drawing the vehicle forward until the hold back bars are fully retracted and the "Cam" handles snap into the locked position.

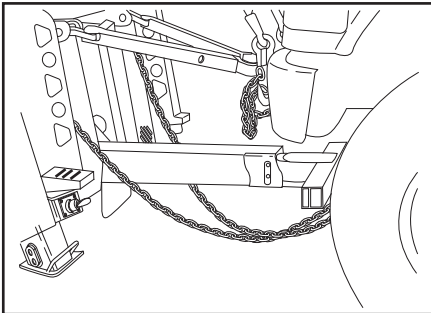


10. Before making the final lift, check that the casualty's parking brake is released, the transmission is in neutral, and the wheels are straight.



CAUTION:

If the vehicle to be towed is on a slope, do not release the brake until the load is secured.



11. It is recommended that the steering wheel be secured by a steering wheel strap for any tow.

12. Attach the safety chains and towing lights. **Safety chains should be crossed from one side of the recovery vehicle to the opposite side of the casualty vehicle.**

13. Raise the under lift crossbar.

MAINTENANCE AND LUBRICATION

Your MDL has been designed to give you excellent service and long life but like all equipment, it requires proper and periodic maintenance. The truck chassis itself is on a maintenance schedule recommended by the manufacturer. Follow these guidelines and protect your vehicle warranty. There are a number of different lubricants used on your MDL and the following chart details the proper lubricant and the most common brands and specification which meet the requirements.

Use only safe practices when maintaining this equipment. Always shut off the engine and block load before reaching into pinch areas.

Inspect the vehicle and under lift system periodically for damage or evidence of pending failure. Damaged or broken parts should be replaced immediately. Never operate a machine which is known to be defective or operating improperly. The cause of any binding or leakage should be determined immediately and the problem promptly fixed.

Critical wear points on your MDL must be lubricated at regular intervals. The wear pads on the sliding surfaces of the booms are self lubricating. Sliding surfaces are to be cleaned of grease periodically. Heavy grease will hold grit and sand that can cause premature wear of your equipment. Cleaning every month is recommended for normal highway operations, but this frequency will vary appreciably with the type of service. Fittings on linkage pivots should be greased every two (2) months, again depending upon usage. The following chart and diagram shows the location of these points, and when and what type of lubricant to use.

Check the hydraulic oil level bi-monthly or after any leakage. A sight glass has been provided on the hydraulic tank. The proper oil level is best checked with all cylinders fully retracted. Use 5W20 Dual Range hydraulic oil. (Automatic transmission fluid may be used in the hydraulic system if necessary.)

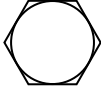


The hydraulic filters located on the sides of the hydraulic tank come equipped with restriction indicator gauges. The gauges show the operator the condition of the filter elements. When the needle reaches the red band (25 psi), the filter is starting to bypass and the element needs to be changed. Failure to change the element will result in premature wear and/or failure of any or all of the hydraulic components. **Only check gauges with hydraulic fluid at operating temperatures. Cold oil is more dense and will give a false indicator gauge reading.**

If a cylinder seal leaks, disassemble the cylinder and ascertain the cause of the leak. Small scores caused by chips or contaminated fluid can usually be worked out with fine emery cloth to avoid repetition of the trouble. Whenever any seal replacement is necessary, it is always advisable to replace all seals in that component. These seals are available in kits. Also, thoroughly clean all components before reassembly.

The body of your Jerr-Dan has been built from high strength aluminum and composite material which has been carefully assembled in our factory. To keep it clean and free of dirt use any non-abrasive soap or detergent recommended for automotive finishes. Use a soft cloth or sponge and finish with a thorough rinsing. Drying with a soft cloth or chamois will prevent spotting or streaking. A coat of automotive wax is recommended.

The MDL is mounted to the truck chassis by bolts. These bolts are torqued at the factory to 180 ft. lbs. We recommend inspection and retightening of these bolts after the first month of service and periodic inspection and retightening of the bolts thereafter. Replace any broken or damaged bolts immediately.

TIGHTENING TORQUES (FOOT-POUNDS) FOR SCREWS AND NUTS

SIZE INCHES (MM)	 GRADE 2	 GRADE 5	 GRADE 8
1/4 (6.350)	6	8	10
5/16 (7.938)	10	14	19
3/8 (9.525)	17	27	33
7/16 (11.112)	28	45	60
1/2 (12.700)	45	68	90
9/16 (14.288)	63	100	120
5/8 (15.875)	90	135	180
3/4 (19.050)	145	230	310
7/8 (22.225)	145	380	500
1 (25.400)	220	570	760

- All torque values shown are for bolts (cap screws) and nuts that are either zinc-plated or lubricated.
- Torques shown above apply to screws and nuts used for assembly and installation of all wrecker components.
- Different torque values may be given in instructions for certain components due to short thread engagement or low-strength internal threads.
- When nuts are used, tighten nuts to torques shown (screws or bolts should be held but not turned).
- Retighten nuts of all mounting screws that secure the wrecker and wrecker-body within two weeks after they are first installed on the vehicle. Thereafter, inspect such screws and nuts visually once every month and after each job imposing extremely heavy loads on the equipment. Periodically recheck all accessible screws and nuts for proper tightness.
- Converting ft/lbs to Nm (Newton metres) can be accomplished by using the following:

Multiply: by: to get:
 ft/lbs x 1.3558 = Nm (Newton metres)

Rev. _____

Date _____

OILS AND GREASES

The following oils and greases are suitable for use with your Jerr-Dan.

Company

Product

HYDRAULIC OILS

- | | |
|-----------------------------|----------------------|
| 1. Drydene Dual Range | Hydraulic Fluid 5w20 |
| 2. Sun Refining & Marketing | 2105 Hydraulic |
| 3. D.A. Lubricants | 5w20 HiVi |
| 4. Texaco | Rando HD AZ |
| 5. Mobil Oil Corp. | DTE 15 |
| 6. Amoco Oil Co. | Rykon MV |
| 7. Citgo | A/W All Temp |

GREASES

- | | |
|------------|----------------|
| 1. Drydene | HD Lithium EP2 |
| 2. Gulf | Crown EP2 |
| 3. Amoco | Amolith EP2 |
| 4. Shell | Alvania EP2 |
| 5. Texaco | Marfax EP2 |
| 6. Mobil | Mobilux EP2 |
| 7. Sunoco | Prestige EP2 |

WINCH AND GEAR LUBE

- | | |
|-------------|--|
| 1. Phillips | 140 wt. EP Gear Lube 93301
(or approved equivalent) |
|-------------|--|

LUBRICATION POINTS

The following lubrication charts are located inside the tool box lid on the driver's side of the MDL body.

335

LUBRICATION CHART

JERR-DAN

INTERVAL (HOURS)	REF NO.	IDENTIFICATION	SERVICE	LUBRICANT	NO. OF POINTS
WEEKLY	B	WIRE ROPE	OIL	WIRE LUBE	2
50 OR MONTHLY	H	WINCH CASE BREATHERS	CHECK		4
	I	WINCH GEAR BOX	CHECK		2
	K	NYLATRON PADS	COAT	MPG	3
100 OR BI-MONTHLY	A	BOOM EXTEND CYLINDER	LUBE	MPG	1
	C	BOOM LIFT CYLINDER	LUBE	MPG	4
	D	TOW BAR (OPTIONAL)	LUBE	MPG	2
	E	PIVOT ARMS	LUBE	MPG	4
	F	BOOM SHEAVE HEAD	LUBE	MPG	2
	G	BOOM PIVOT	LUBE	MPG	1
	J	UNDERLIFT LIFT CYLINDER	LUBE	MPG	2
	L	TILT CYLINDER	LUBE	MPG	2
	M	UNDERLIFT EXTEND CYLINDER	LUBE	MPG	2
	N	PIVOT PINS	LUBE	MPG	2
250 OR SEMI-ANNUALLY	Q	HYDRAULIC FILTER	CHANGE		2
	I	WINCH GEAR BOX	DRAIN AND FILL	GL 5 #140	2

The diagram shows a side view of the boom and underlift mechanism. Various components are labeled with letters A through Q, corresponding to the lubrication chart. A 'BREATHER CAP' is also indicated. The boom is shown in a raised position, and the underlift is shown in a lowered position.

TROUBLE SHOOTING

You probably won't require anything but preventive maintenance to keep your MDL running, however, the following chart should help you isolate and correct minor problems if they occur with use. Any service work on the hydraulic system should be performed by qualified mechanics.

HYDRAULIC SYSTEM

Problem	Cause	Solution
Slow operation	<ul style="list-style-type: none"> a. Low engine RPM b. Low oil level c. Blocked or restricted hoses d. Dirty hydraulic oil e. Hydraulic pump worn f. Frozen hydraulic lines 	<ul style="list-style-type: none"> a. Speed up engine b. Check level and fill with the specified oil c. Inspect: remove blockage d. Drain, flush and refill with clean oil, replace filter e. Rebuild or replace f. Thaw and remove water
Valve handle sticks tight or frozen	<ul style="list-style-type: none"> a. Insufficient lubrication b. Broken centering spring or clogged with foreign material 	<ul style="list-style-type: none"> a. Lubricate per lube chart b. Inspect, clean or replace
Valve leaks	<ul style="list-style-type: none"> a. Defective seals 	<ul style="list-style-type: none"> a. Inspect and replace
Cylinder leaks	<ul style="list-style-type: none"> a. Defective seals or rods 	<ul style="list-style-type: none"> a. Inspect and replace
Erratic cylinder function	<ul style="list-style-type: none"> a. Air in the system b. Defective pump (pulsating) 	<ul style="list-style-type: none"> a. Cycle hydraulic system 10 to 15 times to remove air b. Replace if necessary
Remote hand controller fails to respond	<ul style="list-style-type: none"> a. Electric power turned off 	<ul style="list-style-type: none"> a. Turn on CONTROL power switch in cab

P.T.O. FUNCTIONING IMPROPERLY

Problem	Cause	Solution
Cable tight or frozen	<ul style="list-style-type: none"> a. Cable kinked or bent b. Cable and P.T.O. connection not adjusted properly c. Mounting bracket nuts are over tightened at P.T.O. 	<ul style="list-style-type: none"> a. Straighten or replace b. Inspect and adjust c. Loosen if necessary
Rattling noise in P.T.O.	<ul style="list-style-type: none"> a. P.T.O. backlash too loose (Consult P.T.O. Manual) 	<ul style="list-style-type: none"> a. Shims must be removed

TROUBLESHOOTING

P.T.O. FUNCTIONING IMPROPERLY

Problem	Cause	Solution
Howling noise in P.T.O.	a. P.T.O. backlash too tight (Consult P.T.O. Manual)	a. Shims must be added
Gear oil leak between P.T.O. and pump	a. Defective shaft seal	a. Remove and replace
P.T.O. will not engage or disengage	a. Cable and P.T.O. connection not adjusted properly b. Defective shifter cover plate	a. Inspect and adjust b. Inspect and replace

HYDRAULIC PUMP

Problem	Cause	Solution
Pump noisy (Cavitation)	a. Low oil supply b. Heavy oil c. Dirty oil filter d. Restriction in suction line e. Pump worn	a. Fill to proper level b. Fill with proper oil (See chart) c. Replace filter d. Clean out and remove e. Repair or replace
Pump slow or fails to respond	a. Low oil supply	a. Fill to proper level
Oil heating up	a. Foreign material lodged in relief valve b. Using too light oil c. Dirty oil d. Oil level too low e. Pump worn (slippage)	a. Inspect and remove/replace filter b. Drain and refill with clean oil c. Drain, flush and refill with clean oil/replace filter d. Fill to proper level e. Repair or replace
Oil foaming	a. Air leaking into suction line b. Wrong kind of oil c. Oil level too low	a. Tighten all connections b. Drain and refill with non-foaming type of hydraulic oil (See lube chart) Replace filter c. Refill to proper level
Hydraulic oil leak between P.T.O. and pump	a. Defective shaft seal	a. Replace shaft seal
Pump leaks at front and rear covers	a. Defective seals	a. Replace seals

TROUBLESHOOTING

WINCH FUNCTIONING IMPROPERLY

Problem	Cause	Solution
Winch screeches during operation	a. Insufficient lubrication	a. Lubricate per lube chart
Winch will not pull load or take in wire rope	a. Free-spooling device not engaged b. Sheared keys or broken coupling c. Hydraulic pump worn	a. Engage b. Inspect or replace c. Inspect and replace
Free-spool device	a. No air pressure b. Insufficient air pressure c. Defective pressure switch d. Leaking air line	a. Turn truck on b. Allow truck to run c. Inspect and replace d. Inspect and replace

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