OPERATION, PREVENTIVE MAINTENANCE, TROUBLESHOOTING AND SERVICE GUIDE

MODELS 488L and 488-6

NOTICE

THIS GUIDE CONTAINS IMPORTANT OPERATION AND SAFETY INFORMATION AND SHOULD BE KEPT AVAILABLE TO THOSE PERSONNEL INSTALLING AND OPERATING THIS EQUIPMENT.

P/N A6474X210
Revision 4, February / 07

SAFETY PRECAUTIONS AND GUIDELINES

OVERVIEW

Before you operate, maintain or in any other way, use this unit -

READ and STUDY this guide. KNOW how to safely use the unit's controls and what you must do for safe maintenance.

ALWAYS wear or use the proper safety items required for your personal protection.

If you have ANY QUESTIONS about the safe use or maintenance of this unit:
ASK YOUR SUPERVISOR - NEVER GUESS - ALWAYS CHECK

PRE-START INSPECTION

Read this entire guide BEFORE attempting to operate this unit. You should be familiar with the controls and their functions before the unit is energized.

INSPECT your machine by doing a pre-operational inspection. Have any malfunctioning, broken or missing parts corrected or replaced before use.

VERIFY that all maintenance has been performed.

VERIFY that all the instruction and safety labels are in place and readable. These are as important as any other equipment on the machine.

CLEAN any foreign material from the operator's compartment.

THIS Model 488 Series UN-A-TRAC® was shipped from the factory equipped with a protective canopy. This canopy MUST be securely in place before operating the unit.

STARTING

DO NOT operate any levers or pedals from outside the operator's compartment to keep the machine from hitting you or other personnel.

FOLLOW the instructions in the STARTING PROCEDURES section of this guide (page 23).

DO NOT operate any levers or pedals if anyone is in the Hazard Zone (page 21).

BE familiar with the operation of the tape switches and be prepared for the sudden stop when the tape switches are struck.

OPERATING

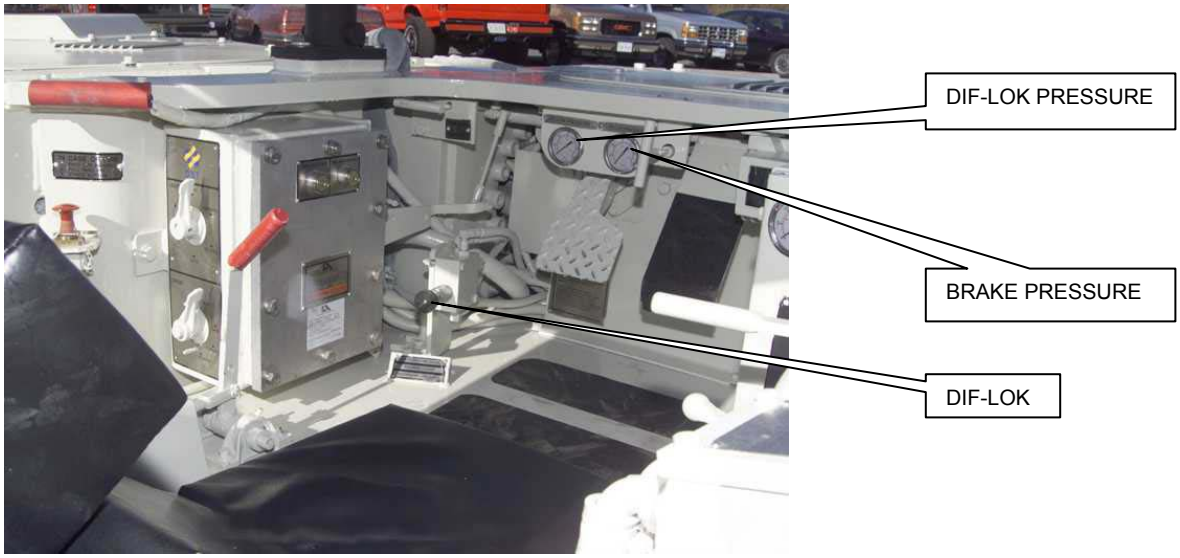
ALWAYS make sure that no person or obstruction is in your line of travel BEFORE starting the unit into motion or in the articulation area when steering the unit.

NEVER climb onto, or climb out of the machine while it is in motion.

DO NOT operate the machine with any part of your body outside of the operator's compartment in order to prevent body parts from being crushed between the machine and objects outside.

USE extreme caution and be observant when working in close quarters or in congested or blind-travel areas. The warning gong should be sounded to alert personnel of your movement.

FIGURE 10 – GAUGE PANEL AND DIF-LOK (OPTIONAL)



DIF-LOK (OPTIONAL)

The operator controlled “DIF-LOK” actuator (Figure 10) is located to the operator’s left and on the floor. When actuated, pushed in, the differential locks are engaged in both the front and rear axles. To release the differential lock, pull out on the push button.

GENERAL HYDRAULIC CONTROL SYSTEM INFORMATION

In the operator's compartment located to the right of the operator’s seat is a group of control levers and gauges (Figure 11). These levers control the steering, bucket position, ejector blade position, winch operation and battery changer system by means of a hydraulic valve bank located behind the panel to the operator's right. The gauges include emergency brake, accumulator, and system pressure. The hydraulic system pressure relief valve is set at the factory at 2000 psi (138 bar), and should not be changed. Should the "SYSTEM PRESSURE" gauge (Figure 11) read more than 2250 psi (155 bar), SHUTDOWN the Model 488-6 and call a maintenance person (see page 29 for Shutdown Procedure).

HYDRAULIC CONTROL PANEL GAUGES	
GAUGE	**PRESSURE READING**
Emergency Brake	1500 – 1800 psi (103 –124 bar)
Accumulator	1500 – 1875 psi (103 – 129 bar)
System Pressure	2250 psi (155 bar)

WARNING

SHOULD EITHER GAUGE SHOW ABOVE OR BELOW THE PRESSURES LISTED ABOVE, SHUTDOWN THE UN-A-TRAC® AND CALL A MAINTENANCE PERSON (SEE PAGE 29 FOR SHUTDOWN PROCEDURE).

TOWING A DISABLED MACHINE

IT IS NOT POSSIBLE, WITHIN THE SCOPE OF THIS GUIDE, TO ANTICIPATE ALL POSSIBLE ARRANGEMENTS FOR TOWING A DISABLED UNIT. BEFORE ATTEMPTING TO TOW ANY VEHICLE, YOU MUST TAKE ALL POSSIBLE PRECAUTIONS TO PROTECT THE OPERATORS AND ANY ONE AROUND BOTH VEHICLES FROM BEING INJURED BY EITHER THE TOWING VEHICLE, THE TOWING DEVICES OR THE VEHICLE BEING TOWED. THE PRIMARY TOWING DEVICE USED (CABLES, BARS, ETC.) AND THE TOWING VEHICLE (SCOOP, TRACTOR, ETC.) MUST BE STRONG AND HEAVY ENOUGH TO MAINTAIN CONTROL OF BOTH VEHICLES THROUGH ALL BOTTOM CONDITIONS TO BE ENCOUNTERED AT ALL TIMES. SAFETY CHAINS OR OTHER SAFETY DEVICES MUST BE USED IN CASE OF FAILURE OF THE PRIMARY TOWING DEVICE. ALL OPERATORS MUST BE ALERT AT ALL TIMES TO PREVENT EITHER UNIT FROM "RUNNING AWAY" OR RUNNING OUT OF CONTROL DURING TOWING. THE VEHICLE TO BE TOWED MUST BE SECURELY COUPLED TO THE TOWING VEHICLE BEFORE THE BRAKES ARE RELEASED ON THE DISABLED UNIT. THE OPERATOR OF THE TOWING VEHICLE MUST BE IN PLACE IN THE TOWING VEHICLE WITH THE BRAKES APPLIED BEFORE THE BRAKES OF THE DISABLED VEHICLE ARE RELEASED.

1. Couple the towing vehicle securely to the disabled vehicle.

2. Close the valve to tank circuit that is on the hand pump. This isolates the park brake solenoid from the circuit.

3. Begin pumping the hand pump. The building pressure moves the shuttle valve and allows the Automatic (Park) Brake system to be pressurized.

4. The Automatic (Park) Brake is "released" as indicated by the Brake Release gauge.

AT NO TIME DURING TOWING SHOULD ANYONE RIDE IN OR ON THE VEHICLE BEING TOWED OR STAND IN BETWEEN THE TOWING VEHICLE AND THE DISABLED VEHICLE.

5. Begin towing the vehicle.

6. Once the destination is reached, stop both vehicles and set the parking brake on the disabled vehicle before removing the towing devices. The disabled vehicle should be choked in both directions at all four wheels for additional stability. The brake is "set' by opening the valve on the hand-pump.

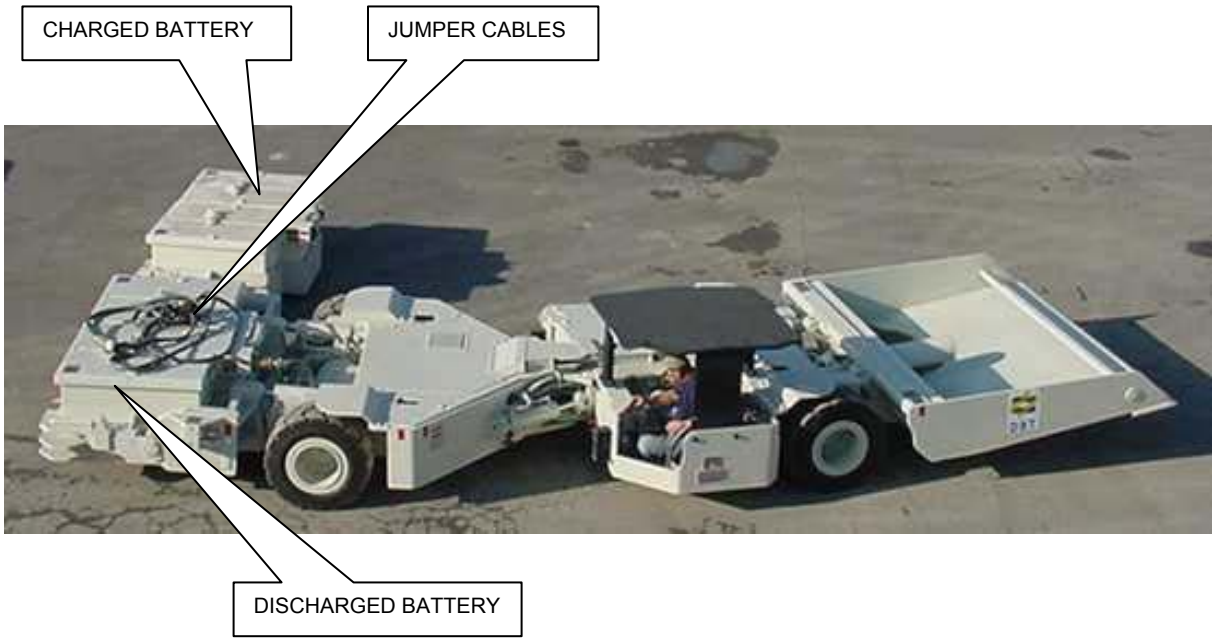
FAILURE TO SET THE PARKING BRAKE ON THE DISABLED VEHICLE BEFORE REMOVING THE TOWING DEVICE COULD ALLOW THE DISABLED VEHICLE TO ROLL AWAY UNCONTROLLED.

BATTERY CHANGE PROCEDURE (GROUND LEVEL)

Two people are needed to change the battery in the UN-A-TRAC®. Since one person may step into the Hazard Zone, the other person (operating the UN-A-TRAC®) must be very careful and look each time before moving any levers or pedals. Take time now to refamiliarize yourself with the Hazard Zone (page 21).

1. Line up the battery end of the UN-A-TRAC® with the place where the battery is to be deposited (Figure 24) (see Starting Procedure, page 23).

FIGURE 24 – BATTERY CHANGE PROCEDURE (GROUND LEVEL)



WARNING

THE "BATTERY" CHANGE CONTROL LEVER SHOULD NEVER BE OPERATED EXCEPT AT A BATTERY CHANGE STATION OR WHEN ITS NECESSARY TO ADJUST THE BATTERY'S TERRAIN CLEARANCE. IF THE "BATTERY" CHANGE CONTROL LEVER IS OPERATED IN A LOW ROOF AREA, THE BATTERY MAY BE DAMAGED.

2. Unlatch both battery latch pins before placing the battery on the ground (Figure 25). If difficulty is encountered in unlatching the latch pins, it may be necessary to gently shake the battery up and down by using the battery "LIFT" control lever.

CRITICAL TORQUE VALUES

Torque values are expressed in lubricated and dry thread values. Lubricated thread torque values should be used any time the bolt threads are covered with oil, grease, anti-seize or thread-locking compounds. Dry thread torque values should be used when threads are completely clean and dry.

CRITICAL BOLT TORQUE VALUES (ft./lbs.) (m-n)				
LOCATION	**BOLT SIZE**	**GRADE**	**DRY**	**LUBRICATED**
Steering Cylinder Pins	7/8 NC	Grade 8	N/A	460
Tire-Wheel Mounting Bolts (John Deere Axle)	3/4-16UNF X 2-1/2”	Grade 8	390 (529 m-n)	300 (407 m-n)
Tire-Wheel Mounting Bolts (Meritor Axle)	9/16 NC X 2-1/4”	Grade 8	160 (217 m-n)	120 (163 m-n)
Tire-Wheel Mounting Bolts (Kessler)	M16 X 1.5 X 60	Class 10.9	232	217
Drive Motor-to-Gearbox Mounting Bolts	3/4NC X 2-3/4”	Grade 5	285 (387 m-n)	170 (231 m-n)

LUBRICANTS, FLUIDS AND CAPACITIES

LOCATION	**TYPE OF LUBRICANT**	**APPROXIMATE CAPACITY**	**NOTES**
Hydraulic Oil	Spec. 100-1 (John Deere or Meritor) Spec. 100-12 (Kessler)	40 Gallons (151.5 l)	1
Speed Reducer (Gearbox)	Spec. 100-6	As Required	
Axle Housing (Meritor) (Kessler)	Spec. 100-6	As Required	2
Planetary Wheel Ends (Meritor) (Kessler)	Spec. 100-6	As Required Each Wheel end	2
Wet Disc Brakes (Meritor) (Kessler)	Spec. 100-12	As Required For Each Brake	2
John Deere Axle	John Deere Hy-Gard Oil	20 Qt. (18.9 l)	5
Winch	API GL-4 or (140) Worm Gear Oil Peragma Grade 8	5 pints (2.36 l)	
SROIB Park Brake	SROIB Oil	2 Qt. (1.89 l)	4
Wet Disc Brake (PT Tech)	Spec. 100-1	As Required	
Multi-Purpose Grease	Spec. 100-3	As Required	3

Notes:

1. With ejector blade completely retracted.
2. The axle housing, brake cooling sumps, and planetary wheel end assemblies do not have a common oil source. Each assembly must be filled separately.

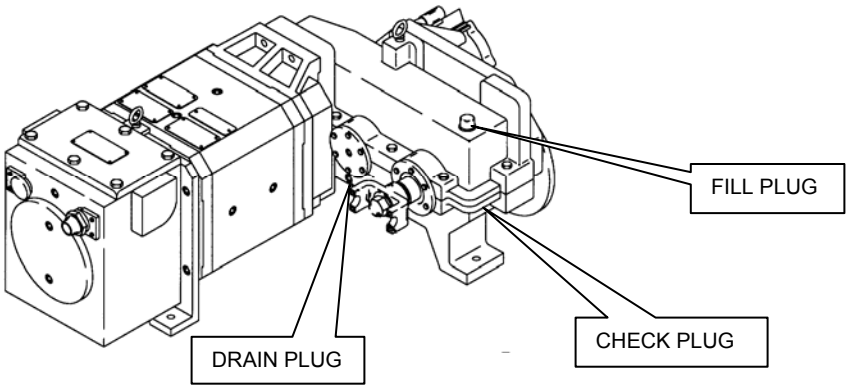
   Make sure the level and fill hole in the planetary wheel end cover is in the proper position. Rotate the wheel end as required to bring the fill hole to either the 3 o'clock or 9 o'clock position.

   When filling the axle housing and planetary wheel ends, allow enough time for the lubricant to fill the various cavities and around component parts in each assembly. Continue adding oil into each assembly until the required oil level is reached
3. Pump grease into fitting until old grease can be observed coming out of component.
4. If the SROIB brake is used as a service brake, sump oil capacity is 4 qt (3.78 l).
5. When bleeding brakes, bleed both ports at the same time.

9. Check the oil level in the speed reducer (gearbox).

A. Remove the check plug from the speed reducer (gearbox) (Figure 42). The oil level should be kept at the level of the check plug.
B. Should it be necessary to add oil, add the oil through the fill plug hole slowly until oil flows from the check plug hole. Do not overfill the speed reducer.
C. Replace the check and fill plug.

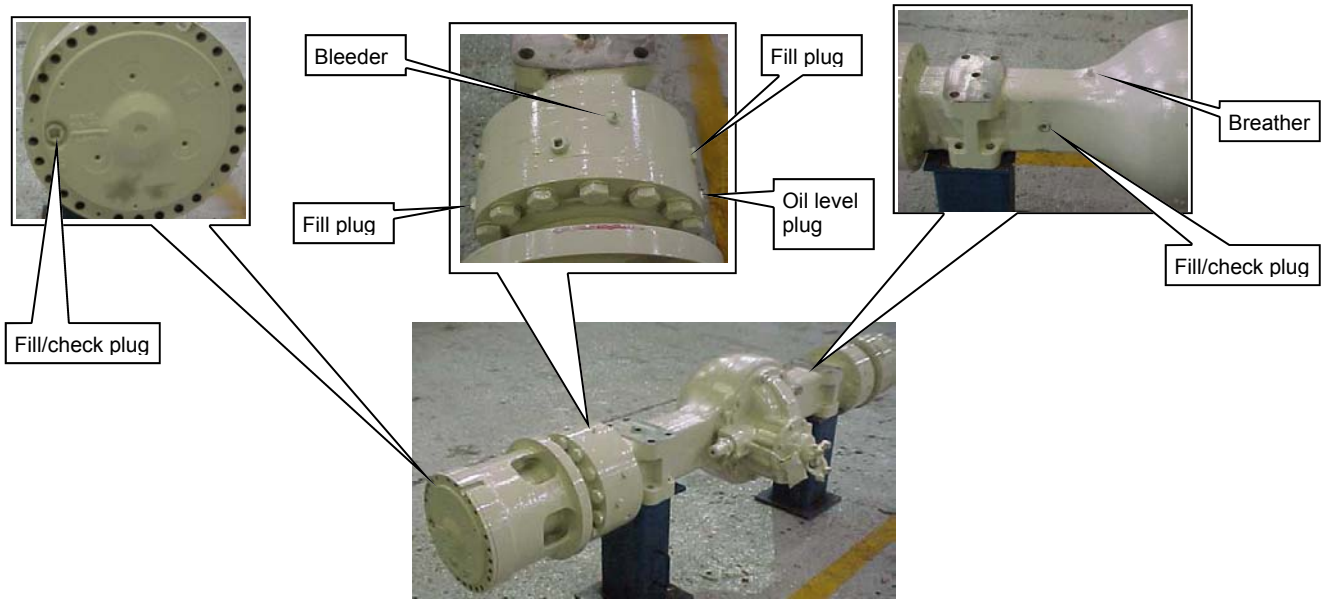
FIGURE 42 – SPEED REDUCER (GEARBOX) OIL LEVEL



10. Check the oil levels of both drive axles. (If equipped with John Deere axles, see Figure 45).

A. Park the UN-A-TRAC® on solid level ground and remove the oil level/fill plugs (Figure 43),
B. Make sure the level and fill hole in the planetary wheel end cover is in the proper position. Rotate the wheel end as required to bring the hole to either the 3 o'clock or 9 o'clock position.
B. The oil should just barely flow out from these holes when full.
C. Should it be necessary to add oil, add the oil through the level/fill plug hole slowly, just until it starts to run back out. Allow time for the oil to travel throughout the axle when filling.

FIGURE 43 – AXLE AND WET DISC BRAKEFILL POINTS (Meritor)



The following lubricants are recommended for use in the UN-A-TRAC®. Other lubricants with equivalent specifications may be used.

	Recommended Lubricant	Specification
Hydraulic Oil (John Deere or Meritor)	Texaco Rando HD68	Spec 100-1
Hydraulic Oil (Kessler)	Mobilfluid 424	Spec 100-12
Heavy-Duty, Multi-Purpose Grease	Texaco EP 1	Spec 100-3
Speed Reducer (Gearbox) Oil	Texaco EP-90 Gear Oil	Spec 100-6
Axle Oil (Meritor or Kessler)	Texaco EP-90 Gear Oil	Spec 100-6
Axle Oil (John Deere)	John Deere Hy-Gard Oil	--------
Wet Disc Brakes (Meritor or Kessler)	Mobilfluid 424	Spec 100-12
SROIB Park Brake	SROIB Oil	--------

LUBRICATION CHART

CLEAN ALL EXCESS OIL AND GREASE FROM THE UN-A-TRAC® AFTER COMPLETING MAINTENANCE PROCEDURES.

ONCE PER WEEK

The following points should be lubricated at the grease fittings with heavy-duty, multi purpose grease.

SYMBOL	LOCATION
•	1. Bucket Pivot Pins (2 Places)
•	2. Bucket Lift Cylinders (Rod End)
•	3. Bucket Lift Cylinders (Base End)
•	4. Steering Cylinders (Rod End)
•	5. Steering Cylinders (Base End)
•	6. Automatic (Park) brake Caliper
•	7. Drive Line Universal Joints
•	8. Drive Line Slip Joints
•	9. Control Levers
•	10. Foot Pedals
•	11. Central Lubrication Fitting Block
•	12. Center Section Assembly
•	13. Winch

MAJOR MAINTENANCE PROCEDURES

CONTACTOR TIP REPLACEMENT

1. Insure electrical power is off and allow a minimum of one minute for capacitors to discharge (see page 69).
2. Change the stationary contactor tips (Figure 53):

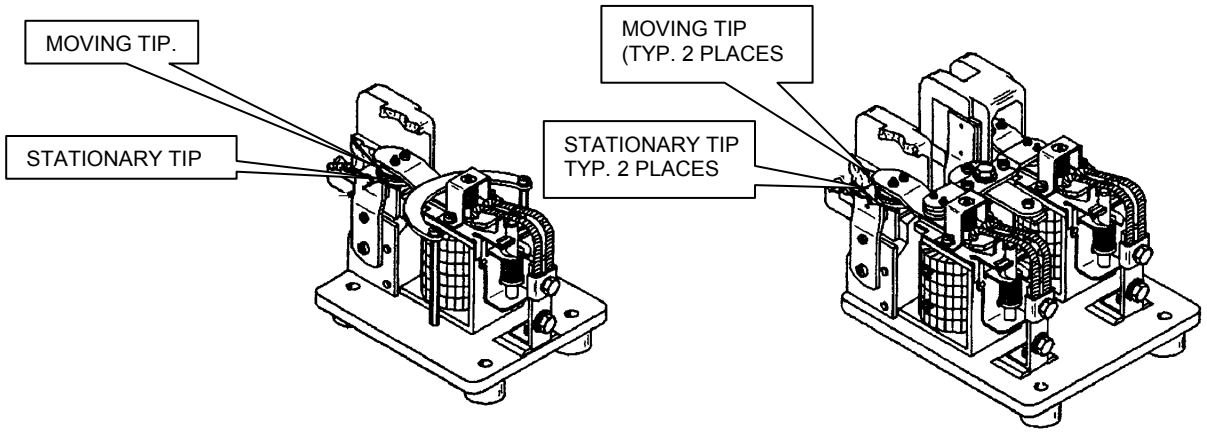
   A. Remove the bolt that holds the old tip in place and remove the old tip.
   B. Position the new tip in place and replace the bolt. Check the placement of the tip to insure that it is correctly positioned and the bolt is tight.
   C. Repeat for all stationary tips.

THE BOLTS USED TO FASTEN THE STATIONARY CONTACTOR TIPS IN PLACE ARE SPECIALLY SIZED TO PREVENT THE CONTACTOR TIP FROM GROUNDING TO THE CONTACTOR COIL. IF REPLACEMENT BECOMES NECESSARY, IT IS IMPORTANT TO USE BOLTS AND WASHERS IDENTICAL TO THE ORIGINAL ONES. ALL CONNECTIONS MUST BE TIGHT BEFORE THE UNIT IS PUT BACK INTO SERVICE.

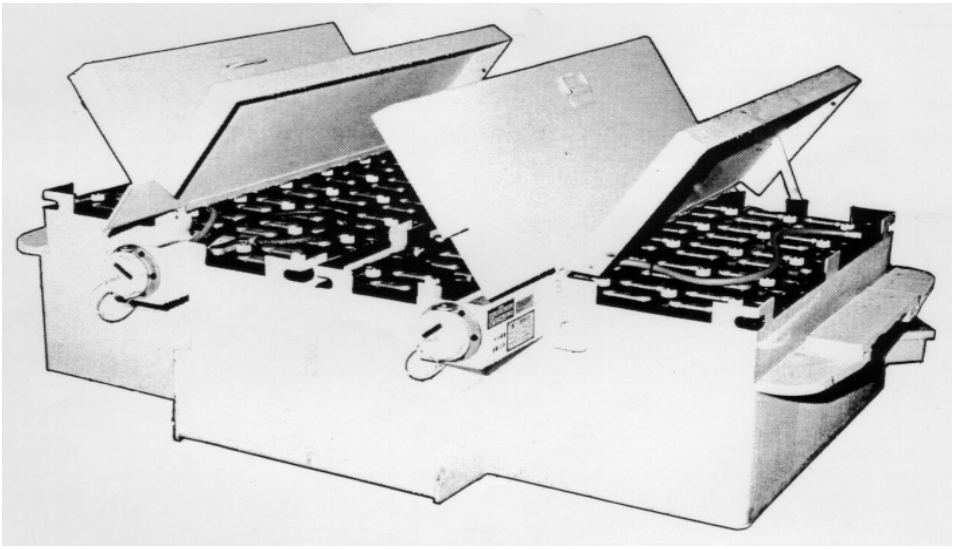
3. Check for grounding between the stationary tips and either terminal of the contactor coil by using a volt/ohm meter set on R x 1. Correct any shorts if found.
4. Change the moving contactor tips (Figure 53).

   A. Remove the two (2) nuts that secure the tip and remove the old tip.
   B. Position the new tip and secure with new nuts. Check the placement of the tip to insure that it is correctly positioned and the nuts are tight.
   C. Repeat for all moving tips.

FIGURE 53 – CONTACTOR TIP INSPECTION AND REPLACEMENT



INSTALLATION, USE MAINTENANCE, AND REPAIR OF MINE POWER STORAGE BATTERIES



NOTICE

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P/N A6474X26
Revision 9, February / 05

SAFETY PRECAUTIONS AND GUIDELINES

OVERVIEW

Before you install, maintain or repair a mine service battery -

READ and STUDY this guide. KNOW how to safely use the battery and what you must do for safe maintenance.

ALWAYS wear or use the proper safety items required for your personal protection.

If you have ANY QUESTIONS about the safe use or maintenance of this unit:
ASK YOUR SUPERVISOR - NEVER GUESS - ALWAYS CHECK

MAINTENANCE

AVOID, whenever possible, servicing, cleaning or examining the battery in congested areas.

ALWAYS replace damaged or lost decals or metal instruction plates. Refer to the Parts Manual for the proper location and part number of decals and plates.

DISCONNECT the battery when servicing or when welding on the battery.

BE SURE the battery area is well ventilated (clear of fumes) when it is necessary to connect battery charger. Fumes from the battery could ignite by a spark and explode.

It is important that any procedure not specifically recommended in this guide be thoroughly evaluated from the standpoint of safety before it is implemented.

Chapter 4 of this guide is dedicated to safety procedures that MUST be followed when using or servicing lead-acid batteries. It is important that you read and understand the procedures outlined in this guide, particularly those in Chapter 4.

3. Check to make sure that all cells are properly connected and that terminal connections are tight. If there are irregularities in the electrolyte levels or specific gravity readings, or if the battery has been in storage for more than 30 days, it should be given a freshening charge (see Paragraph 2-10d).

4. Recheck electrolyte levels after charging and after gassing has stopped. Again take and record specific gravity readings and electrolyte temperatures. If irregularities in electrolyte specific gravity readings still exist, they should be adjusted as described in Paragraph 3-12.

2-5. General

Economical and dependable performance from a storage battery depends, to a great extent, upon proper charging. Faulty charging causes a decrease in battery service life and dissatisfaction with its performance. The selection of suitable charging equipment and methods is as important as the application of the correct battery. A mine battery installation is completely satisfactory only when the unit, battery, and charger operate as a smoothly functioning team. **This text on chargers is for general information and guidance only.** If specific data is required on a particular type of charger, contact the nearest sales representative.

When preparing a battery to be charged, make certain that all points of contact between the charger and the battery are clean to assure good conductivity. Also make certain that the positive terminal of the battery is connected to the positive terminal of the charger and, correspondingly, negative of battery to negative of charger.

PERMANENT DAMAGE TO THE BATTERY OR CHARGER MAY RESULT IF THE BATTERY IS CONNECTED INCORRECTLY.

2-6. Charging Principles

Charging, as applied to a storage battery, is the conversion of electrical energy into chemical energy within the cell or battery. This restores the active materials and is accomplished by maintaining a unidirectional current to the battery in the opposite direction to that during discharge. When a cell or battery is said to be charged it is understood to mean fully charged. The type of battery, service condition, time available for charging, and the variation in battery voltages will strongly influence which charging method is best for a particular situation. Normally lead-acid batteries are recharged in 8 hours following a full discharge. However, they can be recharged within other time periods when desirable. A deeply discharged battery will absorb high current rates when the voltage is low. As the charge progresses, the voltage steadily increases until it reaches gassing voltage, approximately 2.37 volts per cell at 77 degrees F. At this point, battery chargers normally reduce charging rates automatically and taper to finishing rates which are used to complete the charge. The battery is fully charged when nearly all of the active material has been converted and when the specific gravity of the electrolyte and cell voltage have reached their maximum or constant values (corrected for temperature), as indicated by similar readings over a two or three hour period.

Batteries used in mine power applications are cycled - they are either being charged or discharged. In most circumstances, batteries are charged after each shift of use, so they are cycled many times during their lifetime. Incorrect charging for only a few cycles will do little harm, but if repeated day after day, the battery's service life will be seriously shortened.

2-7. Charging Rates

Proper charging means charging the battery sufficiently without overcharging, overheating, or excessive gassing. The charge is usually started at high amperage which is known as the starting rate. Later during the charge, this rate of current flow is reduced to what is called the finishing rate. It is

TABLE 5 (Continued)		
STORAGE BATTERY TROUBLESHOOTING CHART		
SYMPTOMS	**PROBABLE CAUSE**	**POSSIBLE REMEDY**
BATTERY NOT COMPLETING FULL WORK SHIFT	1. Battery not fully charged before placed into operation.	1. See that battery has reached full charge specific gravity before placing into operation.
	2. Weak, leaking, or defective cell(s) in battery.	2. Repair or replace cell(s) or battery.
	3. Grounds or shorts in the battery.	3. Remove grounds or shorts.
	4. Battery worn out and beyond economical repair.	4. Replace battery with equal or higher capacity battery.
	5. Battery too small for job.	5. a. Replace battery with one having higher capacity. b. Purchase extra batteries (with higher capacity if possible) and change them more frequently.
	6. Electrical or mechanical problem.	6. Troubleshoot vehicle and repair.
LOW ELECTROLYTE	1. Cracked or broken jar(s).	1. Replace jar(s) and adjust gravity.
	2. Cell missed when watered.	2. More careful attention when watering.
	3. Defective or weak cell(s).	3. Repair or replace cell(s)
	4. Frequent overcharge.	4. See items 1 and 2 in “Battery Overheats During Charge.”
	5. Battery not regularly watered.	5. Water battery regularly.

CHAPTER 5 – STORAGE AND SHIPMEMT

5-1. General

Follow these guidelines for those occasions when batteries must be stored, in either a wet or dry state, and for possible reshipment to other areas.

5-2. Storage Methods

a. Charged and Wet Batteries - Lead acid batteries may be stored in a charged and wet (filled with electrolyte) condition when necessary for periods of up to several months. During such periods they should be stored in a clean, cool, dry, and well ventilated location away from radiators, hot air ducts, or other sources of heat, and protected from exposure to direct sunlight. Before being stored, the battery should be fully charged and the electrolyte brought to the proper level. Any leads should be disconnected or insulated to prevent accidental discharge. The top of the battery should be protected from dust, foreign matter, and moisture. **Do not attempt to dismantle the battery.**

If the average storage temperature is 80 degrees F. or higher, the specific gravity of the electrolyte should be checked at least monthly. If below 80 degrees F., check gravities at least every two months. Whenever the specific gravity, corrected to 80 degrees F., falls to 1.240 or below, the battery should be given a freshening charge as described in Paragraph 2-10d. A freshening charge is also recommended just before returning a battery to service.

b. Charged and Dry Batteries - New batteries are often supplied charged and dry (without electrolyte). Batteries in this condition can remain in storage, unattended, for a period of at least two years. They should be stored in a cool, dry place with vent caps tightly closed. Average temperatures should not exceed 80 degrees F. Batteries should not be stored near radiators, hot air ducts, or other sources of heat, and should be protected from exposure to direct sunlight. The top of the battery should be protected from dust, foreign matter, and moisture. Charged and dry batteries when removed from storage should be activated as described in Paragraph 2-4a.

5-3. Shipment

a. Charged and Wet Batteries - Depots or using organizations may make shipments of motive power batteries in a charged and wet condition if intended for use within a period of 90 days. The battery service weight is usually stamped into the steel tray near one of the lifting holes.

Before crating a wet battery for shipment, it should be given a freshening charge as described in Paragraph 2-10d. A tag should be attached to both the battery and the crate showing the date of the last charge and the specific gravity of the electrolyte at the completion of the charge. Make certain that the battery is properly protected when crated. The receiving organization should be alerted also to the need for a freshening charge before the battery is put into service.

b. Charged and Dry Batteries - Depots will normally make domestic and export shipments of new batteries which usually will be in a charged and dry condition. Batteries, and the accompanying electrolyte in separate carboys, which are intended for export shipment must be packaged in accordance with approved methods.

WHENEVER BATTERIES ARE SHIPPED BY COMMON CARRIER, ICC REGULATIONS WILL APPLY.

MAJOR HAZARDS

AREA WHERE HAZARD CAN OCCUR	HAZARD WHAT CAN HAPPEN IF PRECAUTIONS AND SAFEGUARDS ARE NOT OBEYED	SAFEGUARDS HOW TO AVOID THE HAZARD
ELECTRICAL (A.C. Input, Charger, Battery)	Electrical shock could cause irreparable injury or death.	All electrical systems should be maintained by certified electricians. The a.c. input and charger plug should be disconnected before servicing the charger.
	Charging a battery of a size different than that shown on the charger nameplate could cause the battery to burst, or cause damage to the battery or charger.	Chargers should be matched to the size batteries in use at each particular mine.
BATTERY	The battery produces lethal amounts of power whether connected to the machine or charger, or not.	The battery should be maintained by qualified personnel. (Refer to DBT America Inc. "INSTALLATION, USE, MAINTENANCE, AND REPAIR OF MINE POWER STORAGE BATTERIES," PART NUMBER A6474X26, for complete instructions).
	Battery covers could fall crushing hands or arms.	Be sure cover supports are in place when working on battery.
	Battery hold-down clamps could crush fingers.	Keep fingers away from hold-down clamps.
	Batteries produce explosive gases that could be ignited causing burns or explosions.	Batteries should be well vented before servicing particularly if welding or burning on the battery. Batteries should be maintained by qualified personnel.
	Batteries contain strong acid that could cause severe burns if spilled or splashed on body parts or in the eyes.	Protective clothing, gloves, and eyewear must be worn when working on batteries. Batteries should be maintained by qualified personnel.

INSTALLATION INFORMATION

Minimum Wire Sizes

Table 2 lists the a.c. input and the d.c. output minimum wire size requirements. At distances exceeding 10 ft., the d.c. wire size should be chosen to keep the voltage difference between the units d.c. output terminals and the battery at less than 1/2 volt when the unit is fully loaded.

FUSE SIZE	WIRE SIZE REQUIREMENT CUSTOMER CONNECTION	EQUIPMENT GROUNDING CONDUCTOR MINIMUM	FUSE SIZE	WIRE SIZE REQUIREMENT CUSTOMER CONNECTION	EQUIPMENT GROUNDING CONDUCTOR MINIMUM
1	#14	#14	150	#1	#6
3	#14	#14	175	#1/0	#6
4	#14	#14	200	#2/0	#6
5	#14	#14	225	#2/0	#4
6	#14	#14	250	#4/0	#4
10	#14	#14	300	250-MCM	#4
15	#12	#12	350	350-MCM	#2
20	#12	#12	400	400-MCM	#2
25	#10	#12	450	500-MCM	#2
30	#10	#10	500	600-MCM	#2
35	#8	#10	600	900-MCM	#1
40	#8	#10	700	1500-MCM	1/0
45	#8	#10	800	2/500-MCM	1/0
50	#8	#10	1000	2/800-MCM	4/0
60	#6	#10	1200	2/1000-MCM	4/0
70	#6	#8	1600	2/2000-MCM	4/0
80	#4	#8	2000		250-MCM
90	#4	#8	2500		350-MCM
100	#4	#8	3000		400-MCM
110	#2	#6	4000		500-MCM
125	#2	#6	5000		700-MCM
130	#2	#6	6000		800-MCM

TABLE 2

Electrical Connections & Field Wiring

Terminal blocks are provided for connecting the a.c. input and d.c. output. A ground wire must be connected to the unit's case ground.

A.C. Input

Make sure that the input source is the same voltage and frequency as that which is marked on the nameplate of the rectifier.

The a.c. input current, specified on the nameplate, is for (nominal) output. A.C. line fuses or breakers must be sized for the overload or current limit point of the charger which is 130% of the nameplate value.

An adequate earth ground lead should be connected to the terminal marked "GROUND" or "GND" on the rectifier terminal board or case.

Be sure the transformer taps are set for the correct a.c. input.

(see Figure 1, page 15).

SYMBOLS AND SPECIAL NOTATIONS

Throughout this manual there are specific notations that are either **UPPERCASE BOLD**, UNDERLINED or *ITALICIZED* for the primary purpose of emphasis. Please pay special attention to such statements as they regard safety or critical maintenance installation information.

You will also see the following:

NOTICE: *THIS NOTATION DENOTES A REFERENCE TO PREVIOUSLY STATED INSTRUCTIONS.*

IMPORTANT: *THIS SYMBOL DENOTES THAT SPECIAL ATTENTION MUST BE ADHERED TO IN THE ATTACHED STATEMENT.*

CAUTION: *THIS SYMBOL DENOTES THAT FAILURE TO COMPLY WITH THE ATTACHED STATEMENT COULD RESULT IN A CUT, BRUISE OR ABRASION.*

WARNING: *THIS SYMBOL DENOTES THAT FAILURE TO COMPLY WITH THE ATTACHED STATEMENT COULD RESULT IN A LOST TIME ACCIDENT.*

DANGER: *THIS SYMBOL DENOTES THAT FAILURE TO COMPLY WITH THE* POINTS IN THE TEXT MARKED WITH THIS SYMBOL DRAW YOUR ATTENTION TO IMMEDIATELY IMPENDING DANGER INCLUDING ELECTRICAL DANGERS. POSSIBLE CONSEQUENCES ARE: VERY SERIOUS INJURY, DEATH OR DEATH BY ELECTROCUTION.

DESCRIPTION OF FEATURES

The LA 2000 Solid State Controller incorporates a variety of independent protection systems. These improve reliability, shield the motors and controller from overload, protect the machine from inadvertent abuse by the operator, and help to protect workers from potential harm from malfunctioning equipment.

LA 2000 Motor Controller Consist of:

- Dual Motor IGBT Panel or single motor IGBT Panel or 2-single motor IGBT panels
- Microprocessor Based Logic Card
- Optional Dashboard Display
- Optional Hand held Diagnostics/Calibrator Unit
- "Y" connecting harness (used only with 2-single motor panel systems)

LA 2000 Motor IGBT Panel (Power Connections)

- Battery positive
- Battery negative
- 4 motor connections for each motor (S1, S2, A1 and A2)

(For Power Circuit Layout see Machine Wiring diagram and schematic)

Microprocessor Based Logic Card (Control Inputs)

- Input applies battery voltage to logic card (Pin 16)
- Proportional control accelerator, 5000 OHMS (Pins 1 and 2)
- Tram direction select (Pin 7)
- Tram direction select (Pin 8)
- Park brake condition (set / release) (Pin 14)
- Circuit breaker driver (Pin 6)
- Circuit breaker condition (Pin 11)
- Current limit default setting (Pin 12)
- Accelerator (FS1) input switch (Pin 4)
- CAN Communication Input Port for optional hand held diagnostics/calibrator unit
- CAN Communication Input Port for optional dashboard display
- Analog Input for connection to pump motor shunt to allow pump motor current measurement

The LA 2000 Microprocessor-Based Logic Card will control dual two-quadrant IGBT devices, controlled by PWM (PULSE WIDTH MODULATED) switching, providing forward and reverse direction control.

Traction Status Display (Continued)

Plugging Current Stored Duration Mid Bytes (S. M.) Left Channel Plugging Current Stored Duration Mid Bytes (S. M.)		ALL	N / A
Plugging Current Stored Duration Low Bytes (S. M.) Left Channel Plugging Current Stored Duration Low Bytes (S. M.)		ALL	N / A
SM FWD IGBT High Temperature		ALL	N / A
SM REV IGBT High Temperature		ALL	N / A
DM RIGHT IGBT High Temp.		ALL	N / A
DM LEFT IGBT High Temp.		ALL	N / A
SM FWD IGBT Low Temperature		ALL	N / A
SM REV IGBT Low Temperature		ALL	N / A
DM RIGHT IGBT Low Temp.		ALL	N / A
DM LEFT IGBT Low Temp.		ALL	N / A
Battery Voltage High		ALL	N / A
Battery Voltage Low		ALL	N / A

Traction Test Display

Display Name	Range / Notes	Security Level Displayed	Security Level Adjustable
Accel. Voltage	0.0 V - 5.0 V	ALL	N / A
Accel. Percent Demand	0 - 100%	ALL	N / A
Forward Switch	OPEN / CLOSED	ALL	N / A
Reverse Switch	OPEN / CLOSED	ALL	N / A
FS1 Switch	OPEN / CLOSED	ALL	N / A
Configuration Jumper 1	OPEN / CLOSED	ALL	N / A
Configuration Jumper 2	OPEN / CLOSED	ALL	N / A
Brake Input	OPEN / CLOSED	ALL	N / A
Circuit Breaker Input	OPEN / CLOSED	ALL	N / A
Oil Temperature	OK / HOT	ALL	N / A
Oil Level	OK / LOW	ALL	N / A
Software Version	VX.XXX	ALL	N / A

IGBT PANELS

FOR REPLACEMENT PARTS AND MACHINE WIRING DIAGRAMS, PLEASE REFER TO YOUR SPARE PARTS MANUAL.