

INSTALLATION OF EVP (WITH LIGHT WEIGHT MOTOR) AND BATTERY

- **PAGE 1:** VACUUM PUMP DESCRIPTION AND OPERATION
- **PAGE 2 :** OVERALL DIMENSIONS OF VACUUM PUMP
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The Star Machine Electric Vacuum Pump (EVP) is representative of our continued efforts to provide racers with the latest vacuum pump technology. The EVP is a DC electric, reciprocating piston vacuum pump. It incorporates two dynamic seal pistons, coupled to a common yoke that is eccentrically driven in a common bore. The EVP offers the distinct advantage of ALL the HP gains, thru increased crank case vacuum, with ZERO HP lost to driving a mechanical vacuum pump.

Originally designed for Pro Stock Motorcycle to comply with the one pump rule it is also currently used in Pro Stock Car as a vacuum assist pump. In PSB applications it is equal to 5 times the capacity of the most commonly used pump to produce crank case vacuum. In PSB it is producing vacuum levels of 25" Hg.(wire to wire). In PS Car applications it has shown a 15 - 20% increase over existing crank case vacuum readings.

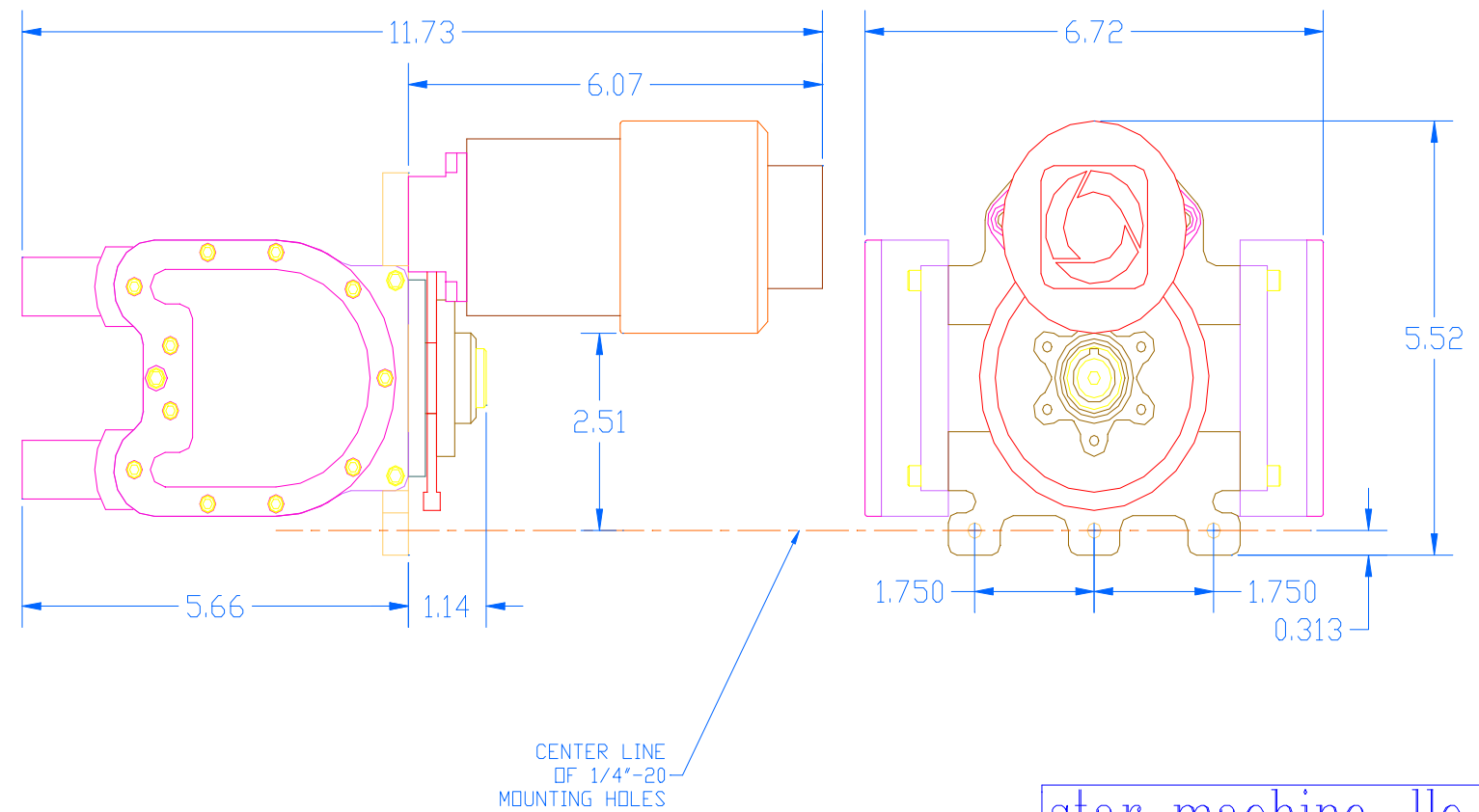
At Star Machine we realize that you don't get something for nothing. The electric motor driven EVP adds the requirement of between round battery maintenance (recharging). This will be considered, by some racers as a burden (one more between round headache). Other racers, looking for that last .01 second advantage, will view the additional maintenance as part of the game.

The EVP is sold (complete) with two 24 VDC (DEWALT Power Tool) rechargeable batteries, DEWALT Charger, quick change (battery) holder, wiring harness and vacuum hose. The EVP operates (completely) separate from your existing (12/16 VDC) electrical system. To complete the EVP installation one 12V-20A normally open switch (and 12ga. wire) are required to operate the pump.

Activating the pump is presently (and recommended) done when the vehicle is pre-staged. In most cases at the same time the data recorder is switched on. This will guarantee the pump motor will receive the maximum available battery power.

The vacuum line connection to the engine is critical to the the operation of the EVP. Drawing oil into the EVP may result in damage to the reeds. Care must be taken to baffle and/or separate the engine oil from the air drawn by the pump. More important to the performance of the pump is the sealing of the engine, the better the seal the higher the potential vacuum. We also recommend that a check valve be installed in the vacuum line, at the pump inlet.

REVISION DETAILS	REV	DATE



CENTER LINE
OF 1/4"-20
MOUNTING HOLES

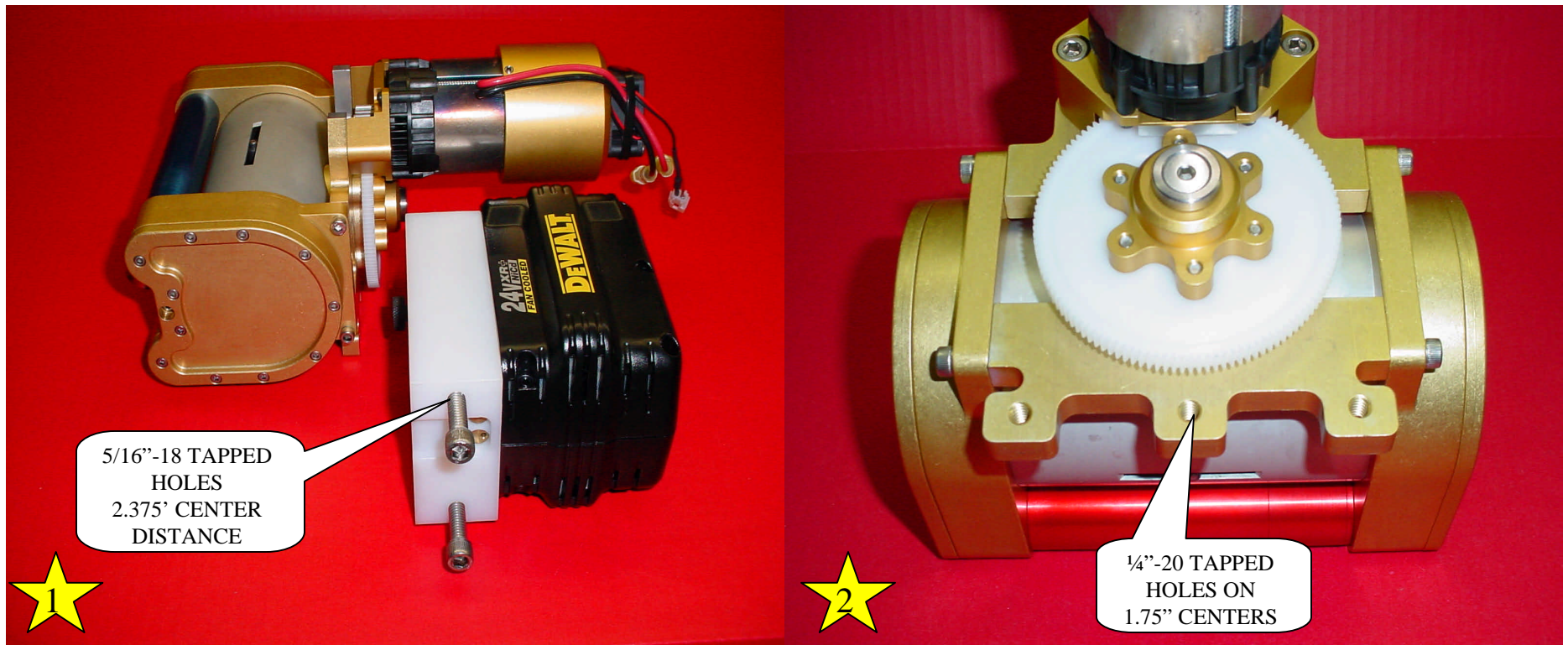
star machine, llc.
6618 Blackhead Road Baltimore MD. 21220

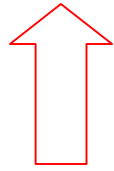
TOLERANCES (EXCEPT AS NOTED)	TITLE
DEC. INCH	LAYOUT DIMENSIONS
.X ± .020	EVP 24V MOTOR
.XX ± .010	VARIOUS
.XXX ± .005	VARIOUS
ANGULAR	VARIOUS
X ± 1.0°	DRAWN DATE
XX ± 0.5°	T.HIGDON 6/04
	DRAWING NDL
	STR.04.06.000
	SHEET
	1 OF 1

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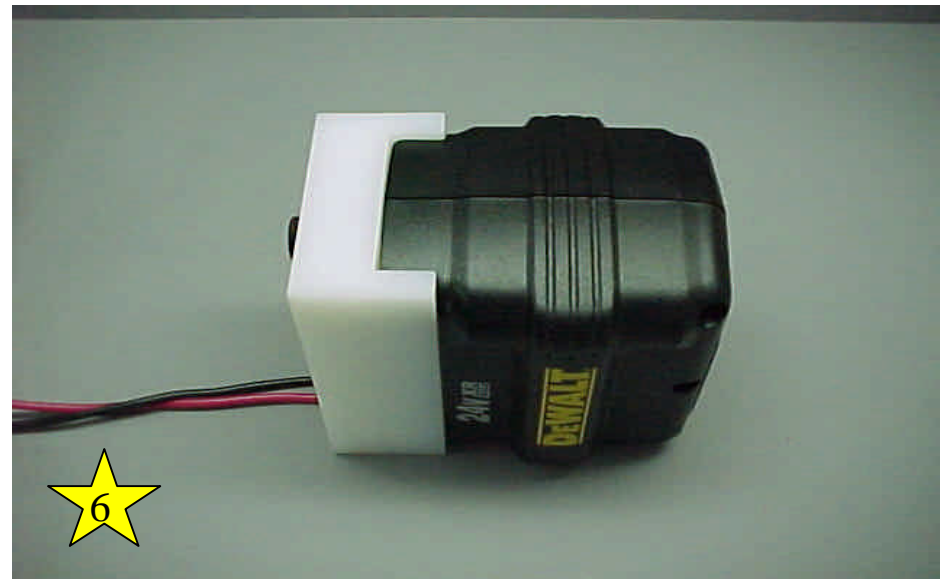
MOUNTING THE VACUUM PUMP AND BATTERY HOLDER

- PHOTO 1 SHOWS THE OPTIMUM POSITIONING FOR THE PUMP AND THE BATTERY HOLDER. THE MOTOR SHAFT IS PARALELL TO THE DRIVE AXLE(S), THE EXHAUST TUBE (RED) IS ON THE BOTTOM AND THE INTAKE (BLUE) TUBE IS ON TOP. THE BATTERY HOLDER BASE FACES TO THE REAR OF THE VEHICLE.
- PHOTO 2 SHOWS THE THREE MOUNTING HOLES OF THE PUMP.
- PHOTOS 3 THRU 6 (Pg. 4) SHOW ADDITIONAL (ACCEPTABLE) MOUNTING POSITIONS FOR THE BATTERY HOLDER.





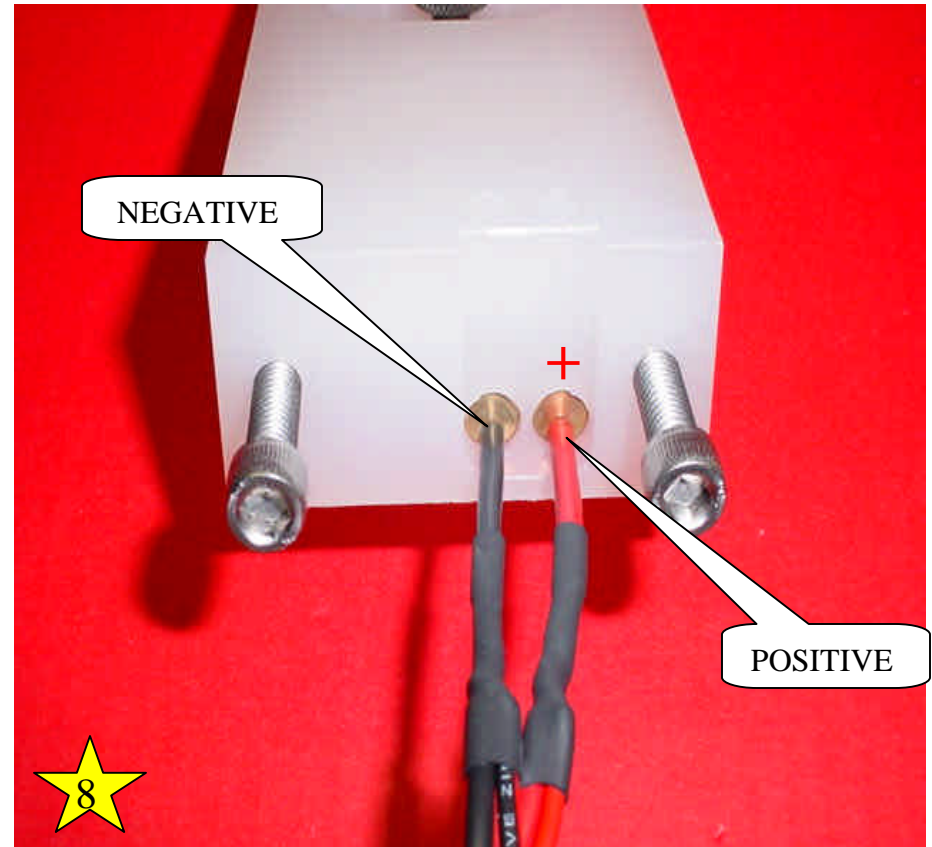
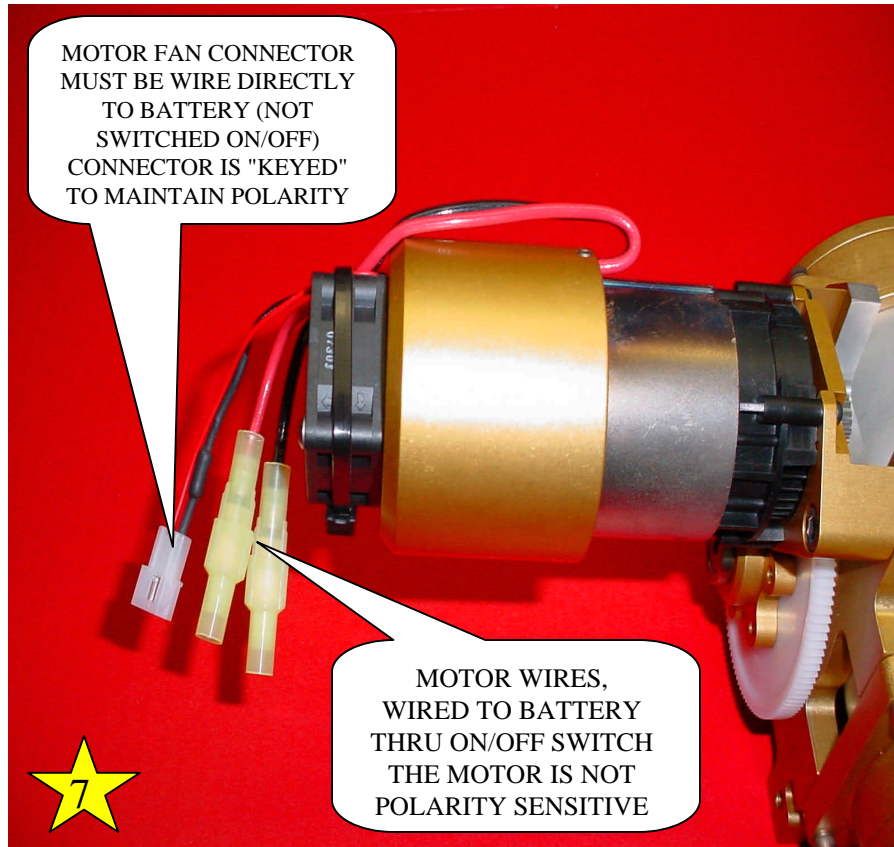
FRONT OF VEHICLE



WIRING THE VACUUM PUMP

- PHOTO 8 IDENTIFYS THE WIRE TO BATTERY CONNECTOR ORIENTATION
- PHOTO 7: USE A NORMALLY OPEN SWITCH RATED FOR 12 VDC @ 20 AMPS (CONTINUOUS) TO ACTIVATE THE PUMP. THE PUMP MOTOR IS NOT POLARITY SENSITIVE. IT WILL RUN IN EITHER DIRECTION.
- PHOTO 7: THE FAN CONNECTION IS MADE DIRECTLY TO THE BATTERY AND IS POLARITY SENSITIVE, RED WIRE TO POSITIVE AND THE BLACK WIRE TO NEGATIVE. THE FAN WILL NOT RUN IF NOT CONNECTED PROPERLY.

NOTE: THE FAN WILL RUN CONTINUOUSLY UNTIL THE BATTERY IS REMOVED.



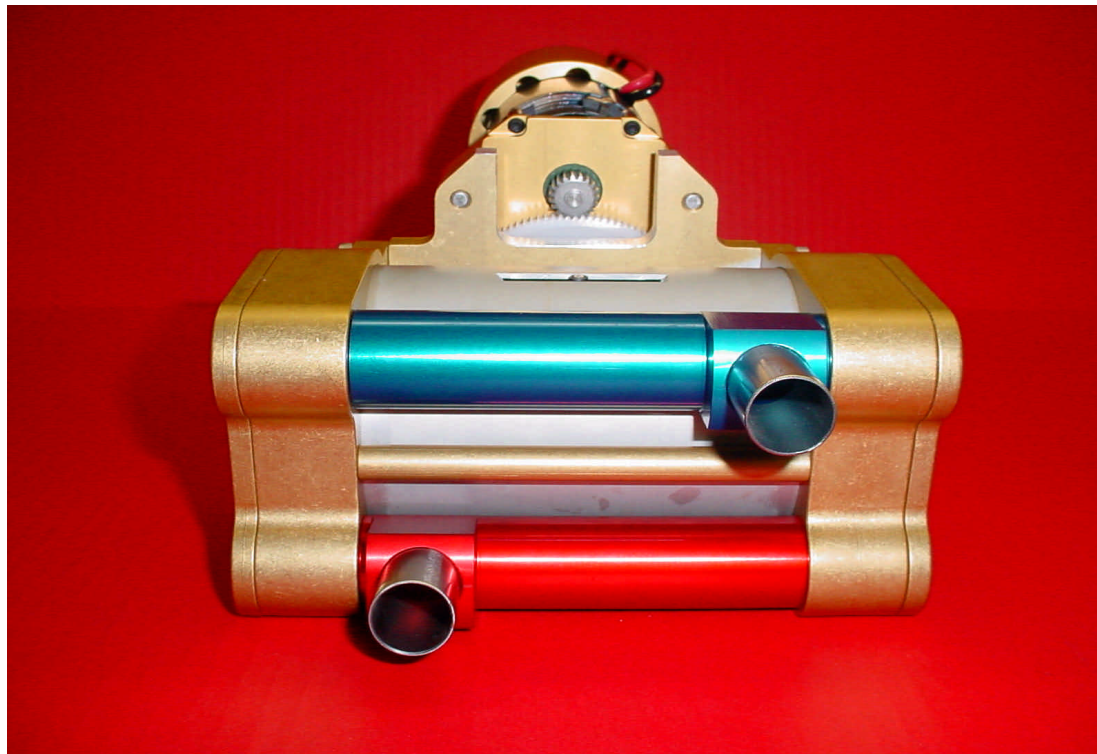
WIRING THE VACUUM PUMP

- PHOTOS 9 THRU 14 DETAIL THE BATTERY CONNECTION, USE 14 or 12 ga. WIRE



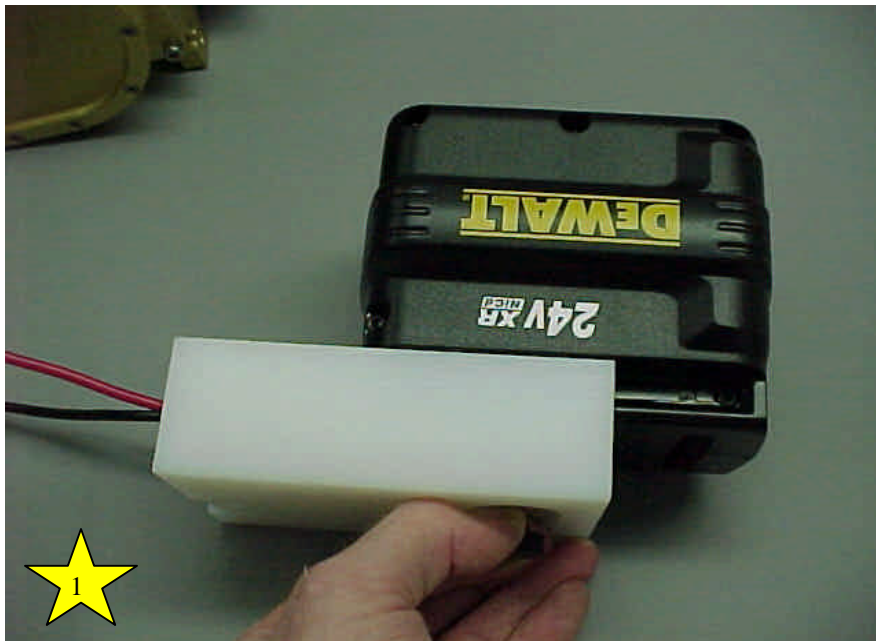
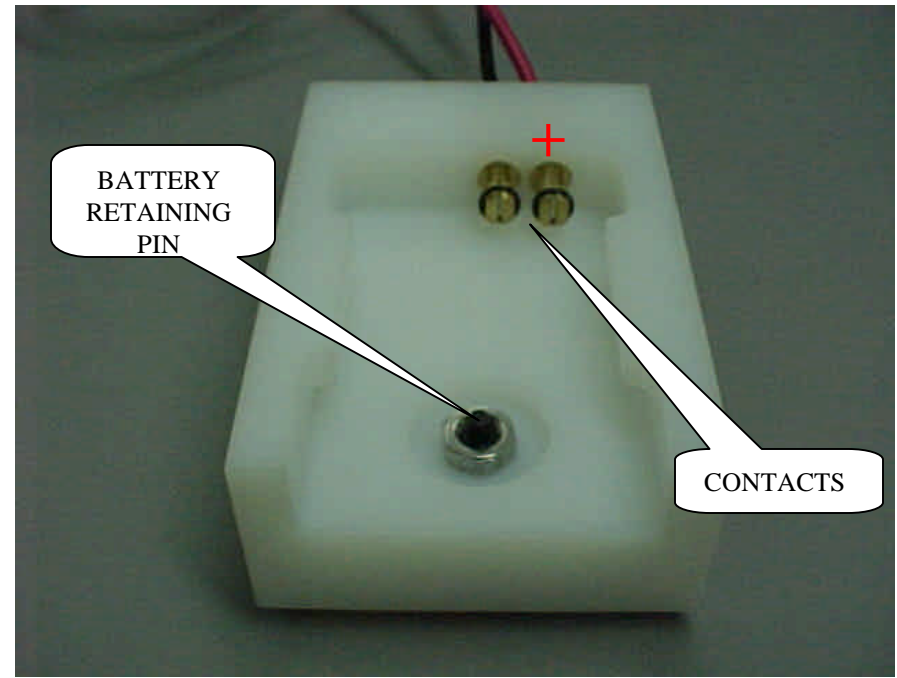
PLUMBING THE VACUUM PUMP

- THE PUMP IS DESIGNED FOR 3/4" ID VACUUM HOSE SUPPLIED WITH THE PUMP. ALTHOUGH THERE ARE PRETTIER BRAIDED LINES AVAILBLE, THEY ARE OFTEN PRONE TO SUCKING FLAT DECREASING FLOW INTURN REDUCING VACUUM POTENTIAL.
- CONNECT THE HOSE FROM THE ENGINE TO THE BLUE TUBE
- CONNECT A HOSE FROM THE RED TUBE TO A CATCH CAN. THE CATCH MUST BE CAPABLE OF FLOWING A MINUMIM OF 16 SCFM.
- THE POSITION OF THE INTAKE AND EXHAUST TUBES OF THE PUMP CAN BE CHANGED. IN THE PHOTO THE BLUE TUBE IS ON THE RIGHT, THE RED ON THE LEFT. THEY CAN BE PLACED: BOTH TO THE RIGHT (OR LEFT) OR BLUE-LEFT, RED- RIGHT (SEE PAGE 14, REPOSITIONING INT/EXH TUBES).



LOADING BATTERY INTO HOLDER

- RETRACT BATTERY RETAINING PIN (PHOTO 1)
- SLIDE BATTERY OUT OF HOLDER
- SLIDE FULLY CHARGED BATTERY INTO HOLDER
DO NOT FORCE BATTERY! CHECK FOR GAP IN CONTACT(S). SEE: REGULAR MAINTENANCE (PG. 9)
- PULL BACK ON BATTERY TO INSURE THAT RETAINING PIN IS ENGAGED

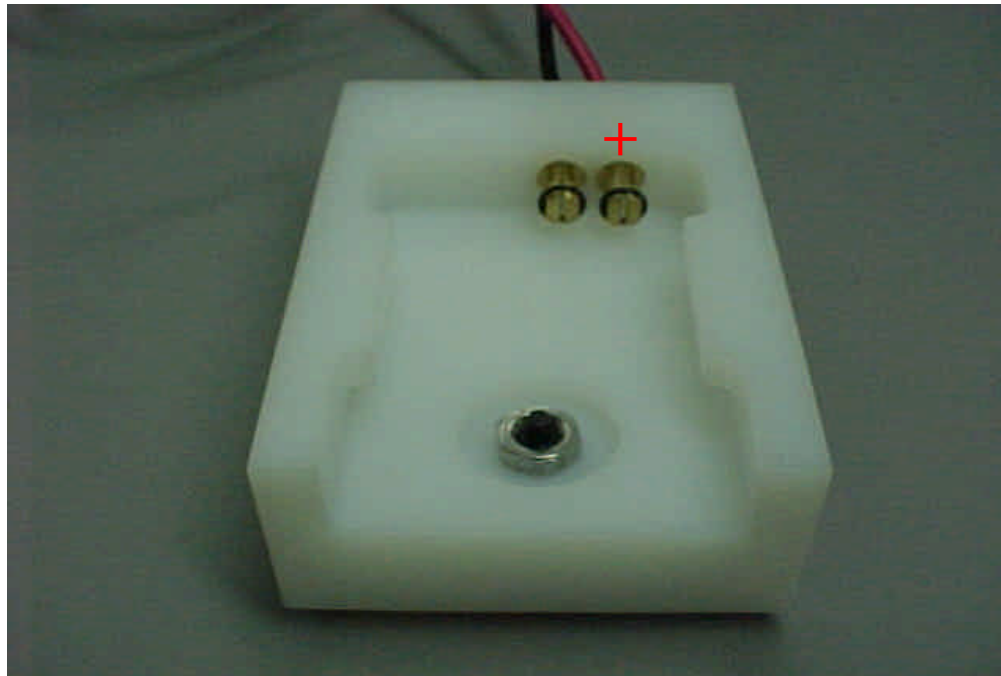


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REGULAR MAINTENANCE

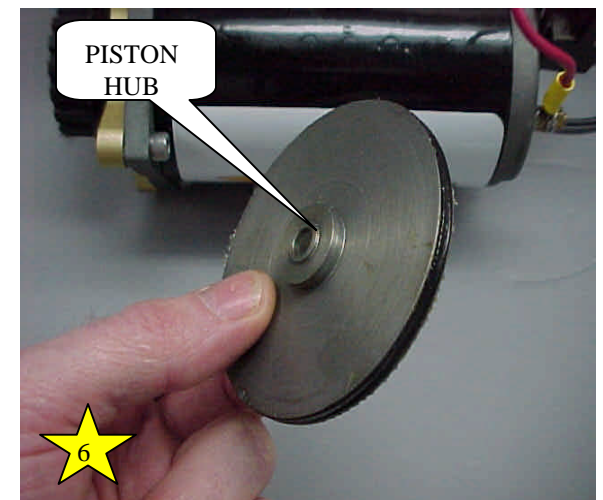
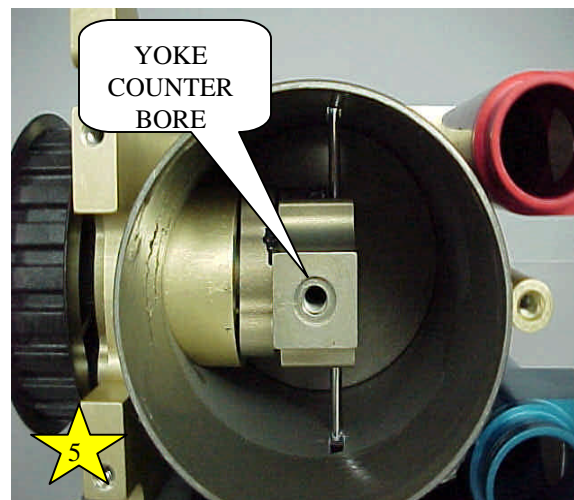
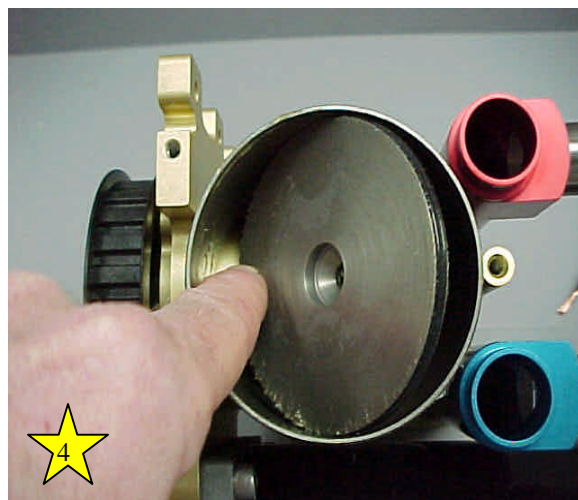
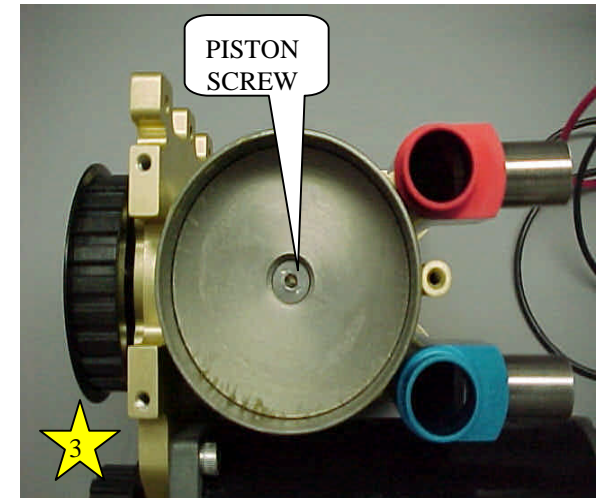
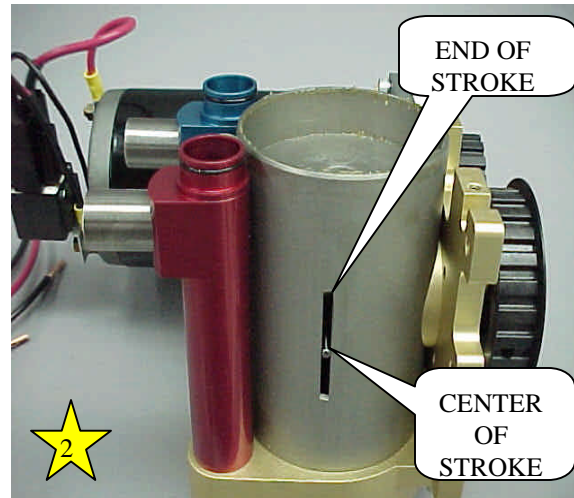
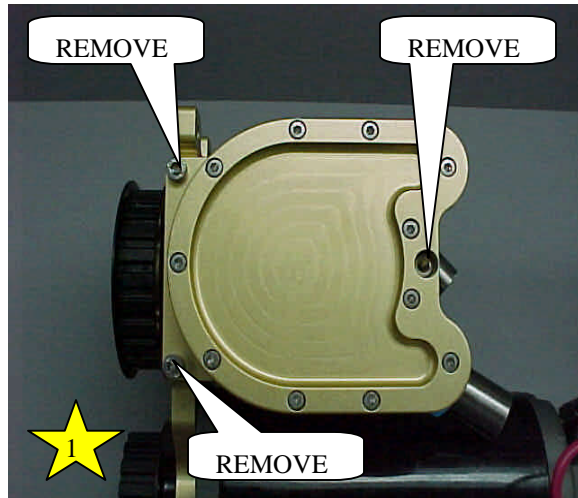
- BATTERY CHARGING IS THE MOST IMPORTANT PART OF PUMP PERFORMANCE. FOLLOW THE MANUFACTURERS INSTRUCTIONS FOR CHARGING. A FULLY CHARGED BATTERY WILL RUN THE PUMP FOR 4 MINIUTES
- THE BATTERY MOUNTING BLOCK CONTACTS WILL NEED TO BE CHECKED FOR GAP (.017"). THE O-RING WILL MAINTAIN THE GAP, HOWEVER IF A BATTERY TERMINAL IS BENT, IT WILL SPRING THE CONTACT OPEN OR MAY FOLD IT OVER. IF THE BATTER DOSE NOT "SLIDE" INTO PLACE THE GAP IS TOO SMALL OR THE BATTERY TERMINAL(S) MAY BE BENT. THE GAP IS EASILLY OPENED WITH A SCREW DRIVER OR CLOSED WITH PLYERS.



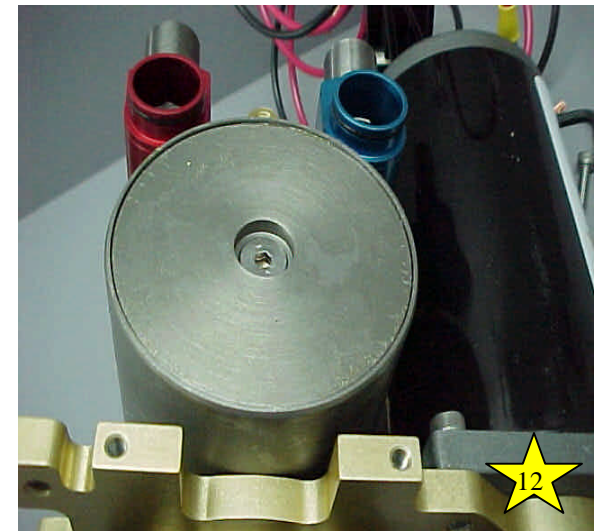
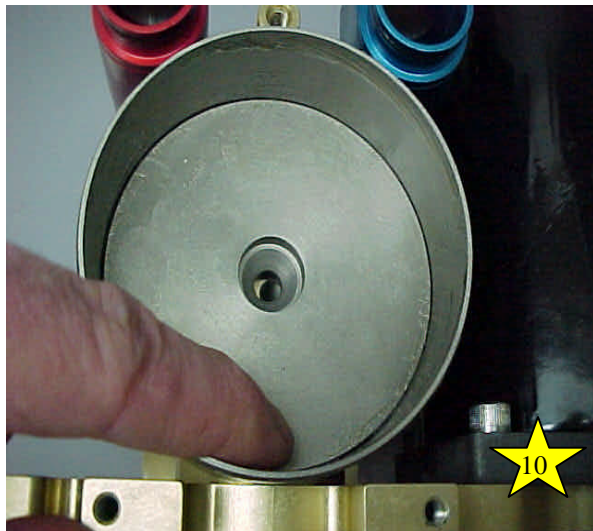
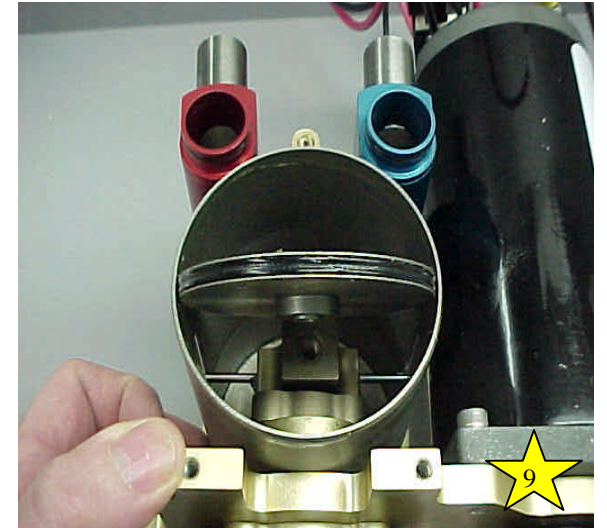
DYNAMIC SEAL REPLACEMENT

- REPLACE ONE SEAL AT A TIME (REMOVE ONE HEAD ONLY)
- REMOVE THE THREE #10-24 SHCS MOUNTING THE HEAD (PG. 11, PHOTO 1)
ROTATE THE PUMP PULLEY TO POSITION THE YOKE (PIN) IN THE CENTER OF STROKE (PG. 11, PHOTO 2)
- REMOVE THE PISTON SCREW, PUSH ON ONE SIDE OF THE PISTON, ROTATING IT 90 DEGS.
PULL THE PISTON OUT (PG. 11, PHOTO 4)
- REMOVE THE SEAL AND CLEAN THE PISTON GROOVE. LUBRICATE THE GROOVE AND NEW SEAL (LIBERALLY) WITH A NON-DRYING LIGHT GREASE (NEVER USE MOLYBDENUM BASED LUBES)
PLACE NEW SEAL ON PISTON.(PG. 12, PHOTOS 7 & 8)
- PLACE PISTON INTO BORE (PG. 12, PHOTO 9)
- PUSH ON EDGE TO ROTATE PISTON SQUARE IN BORE (PG. 12, PHOTO 10)
- USE ALLEN WRENCH TO ALIGN BOLT HOLE IN PISTON TO TAPPED HOLE IN YOKE (PG. 12, PHOTO 11)
INSTALL SCREW (DO NOT TIGHTEN)
- ROTATE PULLEY TO PUT THE PISTON (PIN) TO END OF STROKE (PG. 11, PHOTO 2)
- BEFORE TIGHTENING THE SCREW, BE SURE THAT THE PISTON HUB (PG. 11 PHOTO 6) IS SEATED INTO THE YOKE COUNTER BORE (PG. 11 PHOTO 5) THIS IS EVIDENT WHEN THE PISTON (WITH THE YOKE AT END OF STROKE) IS .030" DOWN FROM THE CYLINDER LIP.
- LUBRICATE THE HEAD O-RING AND THE TUBE BORES WITH MOTOR OIL. (PG. 13 PHOTO 13)
- REPLACE THE HEAD (PG. 13. PHOTOS 14 & 15)
- REPEAT ABOVE TO REPLACE THE OTHER SEAL

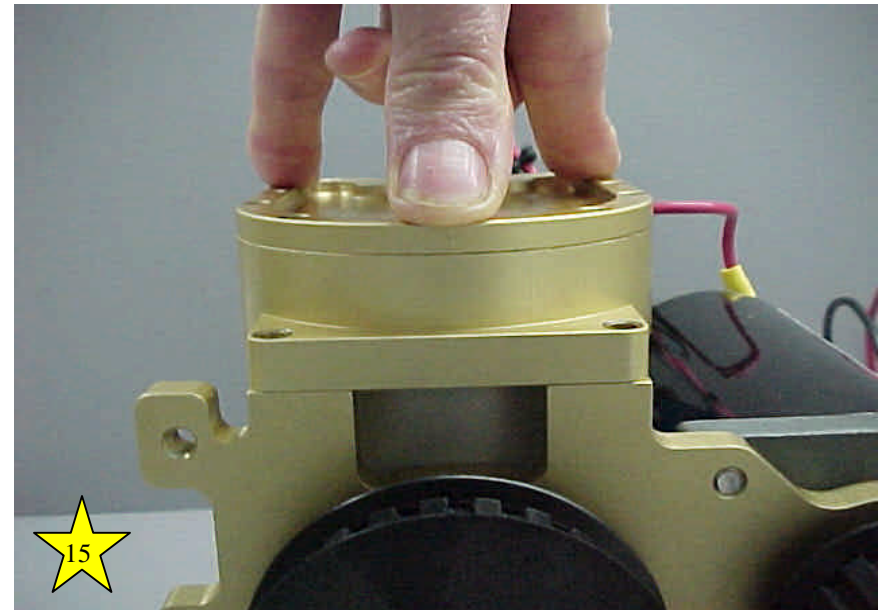
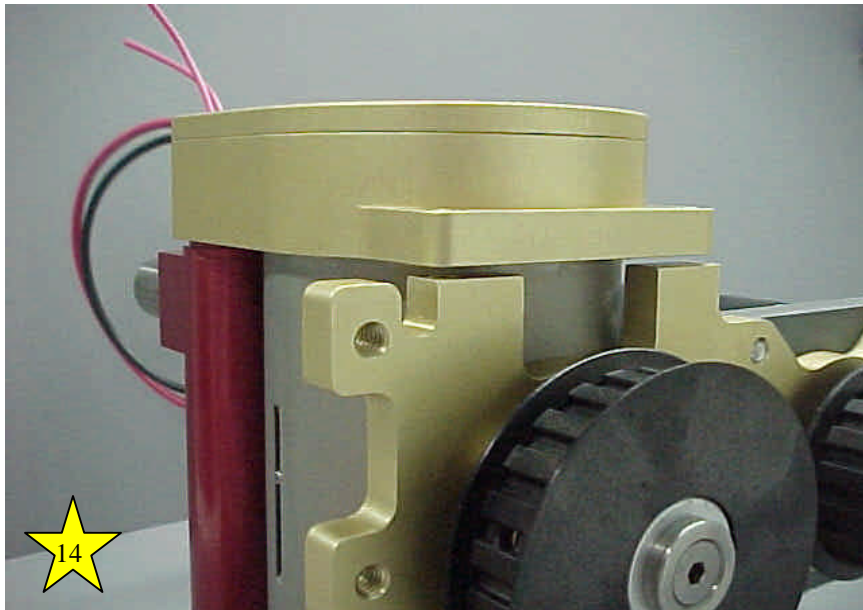
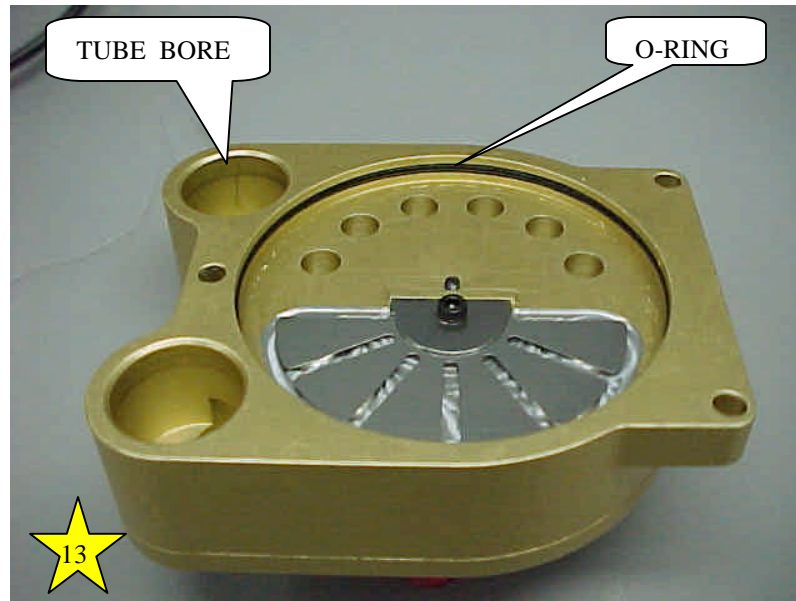
DYNAMIC SEAL REPLACEMENT



DYNAMIC SEAL REPLACEMENT



DYNAMIC SEAL REPLACEMENT



INTAKE/EXHAUST TUBE REPOSITIONING

- FOLLOW THE INSTRUCTIONS ON PG. 11, PHOTO 1
- MOVE THE TUBES, KEEP THE BLUE TUBE DIRECTLY BELOW THE MOTOR. LUBE THE O-RINGS. REINSTALL THE HEAD.

DEWALT®

BATTERY & CHARGER FACTS

1. Is it better for DeWALT® batteries to be completely discharged before charging?

No. Just the opposite. You should stop using a battery as soon as you feel a substantial decrease in power from the tool. Completely running down a battery may damage it. *Do not tape the trigger to run down the battery.*



2. What is Memory, and do DeWALT batteries have it?

Memory is one of many conditions which causes a loss of runtime. Memory is created from repetitive light use in the exact same application (i.e. Cordless Phones, Video Cameras, Electric Shavers, etc.) Our products rarely see light use or the exact same loads, due to variability from the user, the accessory

size, as well as the material. The same variability which causes different runtimes prevents our cells from developing memory. Power tools are considered high-drain applications. Memory typically develops in lower-drain rate applications, such as cordless phones, laptops, etc..., because the rate at which the battery is draining is continuously the same. Power tools draw higher currents and have sporadic drain rates minimizing the opportunity for the battery to develop a memory.

3. Does it hurt DeWALT batteries to leave them in the charger?

No. The DeWALT chargers have a maintenance mode which allows batteries to remain in the charger, maintaining a fully charged pack until the user is ready to work. If the batteries are stored outside of the charger, they will discharge naturally, 15-20% the first 24 hours, 7-10% the next day, and about 1% every day thereafter. NiCd batteries lose the bulk of the capacity when outside of the charger in the first 3 days. In fact, it is better for the battery to leave it in the charger to be sure it goes through Equalization and Maintenance Modes.

4. What can I do to improve the runtime of my battery?

If no permanent damage has been done to your battery, you may be able to improve its runtime. The correct procedure for charging your batteries is as follows:

1. Discharge the battery under normal use. Remove the battery, once you feel a loss of power from the tool. *Do not tape the trigger on.*



2. Let the battery sit out of the charger for at least 2 hours until the battery is at room temperature.
3. Place the battery in the charger overnight to allow for a full charge on each individual cell (A minimum of 8 hours at room temperature). If there is no difference in runtime, there is either permanent damage or the battery has reached the end of its usable life. In either case, the battery should be replaced.

5. Does the outside temperature affect batteries? How?

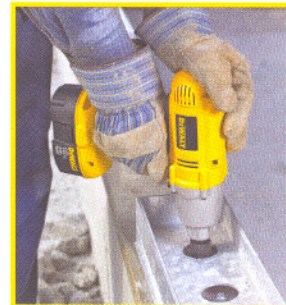
Yes. If the batteries are too hot (105°F or higher) or too cold (below 40°F), the batteries will not take a full charge. Attempting to charge batteries outside the 40°F-105°F range can result in a permanent loss of runtime. When batteries are being charged and discharged, a chemical reaction is taking place, and if it is too hot or cold the chemical reaction is disturbed causing a loss of runtime.

6. Can the DeWALT charger be used with a generator?

Yes. All DeWALT chargers, excluding the DW9106, have been designed to handle the variations in voltage and current delivered by generators.

7. Should any special precautions be taken when transporting or traveling with batteries?

Transporting batteries can possibly cause fires if the battery terminals inadvertently come in contact with conductive materials such as keys, coins, hand tools and the like. The U.S. Department of Transportation Hazardous Material Regulations (HMR) actually prohibit transporting batteries in commerce or on airplanes (i.e. packed in suitcases and carryon luggage) UNLESS they are properly protected from short circuits. So anytime you transport individual batteries, make sure that the battery terminals are protected and well insulated from materials that could contact them and cause a short circuit.



8. What should be done with batteries once they have gone bad?

RECYCLE THEM. DeWALT is an active participant with RBRC (Rechargeable Battery Recycling Corporation), the organization which is the international leader in the collection, transportation and recycling of NiCd cells. Old batteries should be disposed of at DeWALT Service Centers. For more information call 1-800-8-BATTERY or 1-800-8-228-8379.

DEWALT®

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CHARGERS

DW9216



7.2V - 18V Dual Port
1 Hour Charger

DW9117



7.2V - 18V
15 Minute Charger

DW9116



7.2V - 18V
1 Hour Charger

DW9109



7.2V - 18V
1 Hour Vehicle Charger

DC011



7.2V - 18V 1 Hour
Worksite Radio/Charger

High Efficiency Speakers
Up to 78% Louder*

**Dual Pivoting
Flexible Antenna**
Up to 65% Better Reception*

Digital Tuner
With shatter proof LCD display

* Compared to DW911

DEWALT'S Ground Breaking 3-Stage Charging Technology

- 1) 1 Hour Fast Charging**
Provides the maximum charge of the battery within 1 hour
- 2) 1-3 Hour Equalization**
Each individual cell is fully charged to maximize battery pack performance and life
- 3) Automatic Tune-Up**
A trickle charge maintains the full charge of the battery pack when left on the charger after equalization stage



BATTERIES

XRP™ EXTENDED RUN-TIME BATTERIES

2 year free service on XRP™ battery packs:
DC9096, DC9091 & DC9071

DC9096



XRP 18V XRP™ Extended
Run-Time Battery Pack

DC9091



XRP 14.4V XRP™ Extended
Run-Time Battery Pack

DC9071



XRP 12V XRP™ Extended
Run-Time Battery Pack

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DWBCSS 06/04

BATTERY & CHARGER FACTS