



TO INFORM YOU

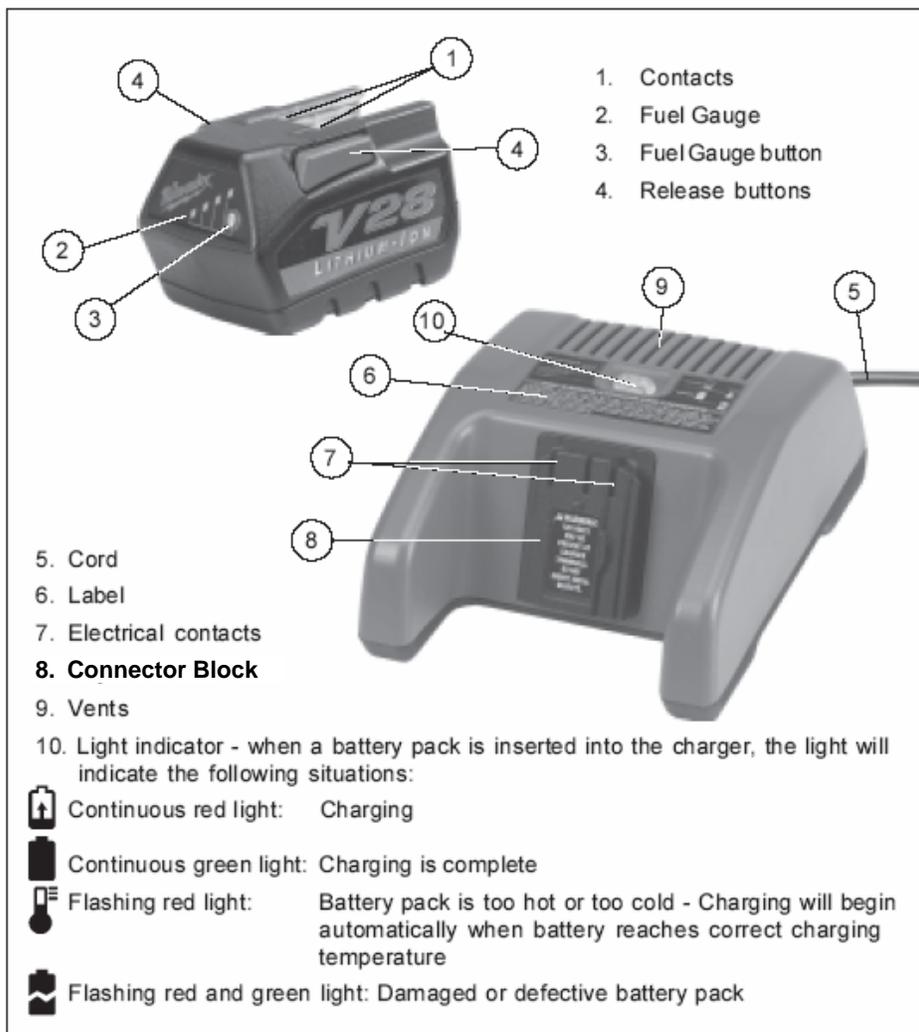
PRODUCT
SUPPORT
BULLETIN # 441

TO: AUTHORIZED *portable electric tool* SERVICE STATIONS
factory SERVICE / SALES SUPPORT BRANCH
SALES COMPANIES

DATE: June 2005

TOOL(S) \ PRODUCT(S) AFFECTED: 48-59-2801 28V Lithium-Ion Charger
48-11-2830 28V Lithium-Ion Battery Pack

SUBJECT: V28™ POWER Lithium-Ion Charger & Battery Pack Troubleshooting Guide



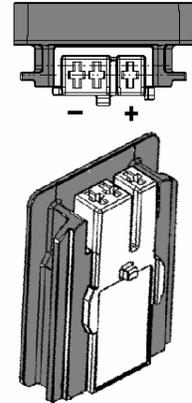
The following V28™ POWER Lithium-Ion Charger & Battery Pack Troubleshooting Guide used in conjunction with a 'new-from-stock • known good' 48-11-2830 28V Lithium-Ion Battery Pack and 48-59-2801 28V Lithium-Ion Charger will allow for initial troubleshooting of a customer's V28 Battery Pack and/or Charger.

48-11-2830 28V Battery Pack is sonic welded shut - CONTAINS NO USER SERVICEABLE PARTS

This bulletin is for informational purposes. PLEASE NOTE ON SERVICE PARTS LIST: 54-04-7000, 54-04-7010, 54-24-7010, 54-26-7000, 54-40-7000, 54-40-7020, 54-40-7040

— V28™ POWER LITHIUM-ION CHARGER TROUBLESHOOTING GUIDE —

Symptom	Possible Cause(s)	Solution(s)
Battery Pack connected to Charger, RED or GREEN LED lights failure to turn "on".	<p>Line voltage too high or too low (or no power present)</p> <p>Charger temperature too high (>212°F)</p> <p>Faulty Battery Pack</p> <p>Bad connection between Battery Pack and Charger</p> <p>Faulty Charger</p> <p>Battery Pack terminals out-of-position (not fully inserted into connector block at time of assembly)</p> <p>Charger needs to be reset</p> <p>Bad line cord</p>	<p>Remove Battery Pack. Unplug Charger and verify correct line voltage (90VAC - 132VAC for 120V units, 200VAC - 255VAC for 230V units; inverter power at levels higher than 230V may cause this condition.</p> <p>Allow Charger to cool 3-5 minutes before attempting charge. Power must be removed for a minimum of one minute then reapplied if this condition occurs.</p> <p>Try known good Battery Pack on Charger, or try questionable Battery Pack on known good Charger.</p> <p>Remove and clean Battery Pack terminals using cotton swab and 'terminal contact cleaner' or pencil eraser to clean oxidized and dirty battery contacts.</p> <p>Unplug from line power and inspect Charger terminals for proper polarity, see Battery Pack terminals out-of-position cause/solution..</p> <p>With battery Charger plugged-in use Volt-Ohm-Meter VOM to check polarity. Measure open circuit voltage of Charger across Charger positive + and negative - terminals with Charger plugged in. Voltage should be 29 VDC- 38VDC, ±10%.</p> <p>NOTE: Care must be taken when performing this test because high voltage can be present at the Charger terminals. In addition, do not use line powered voltmeters to perform this test. Use only a Battery Pack powered volt-ohm-meter. If correct voltage is present, try a known-good Battery Pack in Charger.</p> <p>Visually Check Battery Pack terminals inside connector block. If any are out of position open Charger and push terminal(s) into connector block to re-seat terminals. NOTE: Before checking battery pack terminals inside connector block or if servicing the power cord, unplug the Charger from power source and let it sit for 3-4 minutes before disassembling - this allows circuit board capacitor to self discharge.</p> <p>This can occur occasionally if power is interrupted and reapplied. Unplug Charger and remove Battery Pack for one minute. Plug Charger back in and reinstall Battery Pack on Charger.</p> <p>If no output is measured at Charger battery pack terminals, line cord may be bad. Inspect/replace as needed.</p>
Battery Pack takes a long time to charge.	<p>Cold Battery Pack under < 40°F</p> <p>Heavily cycled Battery Pack</p>	<p>Charger reduces charging current at low temperatures. Increased charge times are normal under these conditions. Move Charger and Battery Pack to warmer location, if faster charge time is desired.</p> <p>Heavily cycled batteries may take a long time to charge the last few percent. Full charge is present if all fuel gauge lights are on for approximately 10 - 15 minutes.</p>
Pack connected to Charger. Alternately flashing red/green Charger lights.	<p>Bad connection between Battery Pack and Charger</p> <p>Faulty Battery Pack</p> <p>Battery Pack temperature dropped below 14°F during charge</p> <p>Pack temperature higher than 194°F at start of charge</p> <p>Incorrect Battery Pack type for Charger</p> <p>Water inside Battery Pack or Charger as a result of condensation from bringing cold product into a warm environment</p> <p>Unknown transient condition - could be caused by Battery Pack or Charger</p>	<p>Clean Battery Pack terminals. Visually Check Battery Pack terminals inside connector block. If any terminals are out of position open Charger and push terminal(s) into connector block to re-seat terminals. NOTE: Before checking battery pack terminals inside connector block or if servicing the power cord, unplug the Charger from power source and let it sit for 3-4 minutes before disassembling - this allows circuit board capacitor to self discharge.</p> <p>Pack may not be accepting charge or Battery Pack electronics may be faulty. Attempt to charge Battery Pack on known-good Charger.</p> <p>Move Charger and Battery Pack to warmer environment. Allow to warm up, and then re-start charge.</p> <p>Allow Battery Pack to cool to appropriate temperature range (below 150°F) before attempting to charge.</p> <p>Use appropriate Battery Pack.</p> <p>Allow Battery Pack or Charger to dry out.</p> <p>Remove and re-insert Battery Pack several times. Try known-good Battery Pack on Charger.</p>



— V28™ POWER LITHIUM-ION BATTERY PACK TROUBLESHOOTING GUIDE —

Symptom	Possible Cause(s)	Solution(s)
Battery Pack connected to Charger. Red Charger light flashing.	Battery Pack temperature is below 14°F or between 150°F and 194°F Faulty Battery Pack	This is normal. Charger is waiting for Battery Pack temperature to reach acceptable range for charging. Charge will commence once temperature reaches proper range. If Battery Pack is obviously in the acceptable temperature range - between 15°F and 149°F - and flashing red charger light persists, try known good battery pack on charger.
Battery Pack connected to Charger. Green Charger light turns on almost immediately.	Battery Pack was nearly fully charged at time of connection to Charger Faulty Battery Pack	This is normal. Charger does not charge a Battery Pack that is more than about 85% fully charged. If electronics of Battery Pack are damaged, Charger may receive a false signal that Battery Pack is fully charged. Try charging Battery Pack on known-good Charger or try Charging known-good Battery Pack on questionable Charger.
Battery Pack connected to Charger. Red Charger light turns on and a “chirping” sound is heard coming from the Charger.	Pack was depleted to a very low voltage	This is normal. Charger will attempt to “recover” a deeply depleted Battery Pack. Chirping sound is due to electronics inside the Charger. If Battery Pack does not recover, Charger will flash red/green. In that case, make several attempts to charge by removing/reinserting the Battery Pack. If it still does not go into normal charge, Battery Pack is probably damaged.
Charger lights go out after charging for a period of time.	Line voltage became too high or too low Battery Pack was cold and/or Battery Pack has been used for many cycles	Move Charger to more stable power. Remove/reinsert Battery Pack. If lights do not turn on, unplug Charger for one minute and plug it back in. Charging in cold weather can cause this effect to occur. This effect is more prevalent with heavily used Battery Packs. Packs will generally still reach full charge under this condition. If all fuel gauge lights were on for approximately 15 minutes, Battery Pack will be close to fully charged. There is no defect present.
Fuel gauge lights blink when Battery Pack is placed on Charger.	Battery Pack voltage is in transition point for lighting next fuel gauge light Pack is cold while charging	This is normal. If the Battery Pack voltage is near the point where the next fuel gauge light turns on, it may blink on and off for a short time until the voltage increases. If the Battery Pack is cold, charge current is “pulsed” at a slow rate. This can show up as blinking fuel gauge lights. Wait for green Charger LED to indicate full charge, or in some conditions, Charger lights will turn off (see above).
Fuel gauge lights inaccurate while charging.	Battery Pack is cold	If the Battery Pack is cold, the Battery Pack voltage rises higher than normal during times when charge current is applied. This can cause the fuel gauge to read higher than the Battery Pack actually is. This effect will be more apparent at the start of charge with a cold, discharged Battery Pack. Wait for green Charger LED to indicate end of charge or in some conditions, charge lights will turn off (see above).
Fuel gauge button does not operate with Battery Pack connected to Charger.	Normal	Pack fuel gauge button is inoperable while Battery Pack is on Charger. Remove Battery Pack from Charger.
Fuel gauge lights turn on, but tool does not run.	Bad connection between pack and tool Internal pack connection or electronics damage	Check pack and tool terminals. Check Battery voltage Bat+ to Bat - with a voltmeter. Voltage to be in range of 25 VDC- 29VDC. If voltage is in this range, and tool still does not run, electronics are probably damaged. If a low voltage is measured, there may be a broken connection inside pack..  Do not attempt to open battery pack - Pack is sonic welded shut - CONTAINS NO USER SERVICEABLE PARTS
Lowest fuel gauge light blinks momentarily when button is pushed, but tool runs in a steady manner (not pulsing).	Pack electronics damaged	Replace Battery Pack.

Symptom	Possible Cause(s)	Solution(s)
Lowest fuel gauge light blinks on/off several times when button is pushed.	Low state of charge.	This is normal. Lowest fuel gauge light will blink at less than about 10% remaining charge. Recharge pack.
Charger light stays on for a period of time if Charger is unplugged.	Normal	If the Charger is unplugged with a Battery Pack installed and the Charger is in maintenance mode (green LED), the green LED may stay on for a period of time (approx. 10 seconds). There is nothing wrong. Likewise, if the Charger is unplugged near the end of charging, the red LED may stay on for several seconds.
Battery Pack fuel gauge led lights do not light when button is pushed.	Pack is a NEW, never charged Pack is deeply depleted Pack electronics damaged	“Wake Up” Battery Pack by placing it on a Charger. Place Battery Pack on Charger. Replace Battery Pack.
Tool “pulses” when switch is actuated but does not run.	Pack is discharged	This is normal. The pulsing is an indicator to let the user know that the Battery Pack is still functional but needs to be re-charged. Place Battery Pack on Charger.
Pack is dead but lowest fuel gauge light blinks momentarily when button is pushed.	Pack is discharged and is in “power saving” mode	Place Battery Pack on Charger.
Tool seems to stall easily and “buzzes” when stalled.	Pack is cold and/or tool is being loaded very heavily	This is most prevalent at cold temperatures. If Battery Pack is continued to be used, the tool current will tend to warm the Battery Pack and more power will be delivered to the tool. Reduce force of tool into work piece.
Fuel gauge inaccurate or fewer lights come on immediately after tool use than were on prior to using the tool.	Pack rest time required	Fuel gauge readings will be most accurate if Battery Pack is allowed to rest for several minutes after use on tool. They will be very inaccurate immediately after the tool is turned off. Some time is required for cells to “recover” to their rest voltage.

RBRC Seal



Rechargeable Battery Recycling Corporation. RBRC is a non-profit, public service organization created to promote the recycling of portable rechargeable batteries and cellular phones.

The RBRC licensees, participating battery manufacturers and marketers, purchase the rights to imprint the RBRC Battery Recycling Seals on their Ni-Cd, Ni-MH, **Li-Ion** and Pb **portable rechargeable batteries** and products. Rechargeable batteries are the power source for cordless power tools, cellular and cordless phones, laptop computers and camcorders. If it's rechargeable, it's recyclable!

A depleted, used up, worn-out, faulty or defective *and not being returned to Milwaukee* **48-11-2830 28V Lithium-Ion Battery Pack should be recycled using the RBRC** consolidation centers in the USA and Canada. For additional information on recycling portable cordless power tool battery packs visit the RBRC website <http://www.rbrc.org>

