



Diversified Power International

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ACCUSENSE CHARGE SERIES FULLY AUTOMATIC LEAD-ACID BATTERY CHARGER

SPECIFICATIONS:

Model: 5-12014D02-xxx O/P: 12Vdc 14Aac
Input Vac 120Vac or 230Vac (factory preset)
Input Aac 3.0Aac or 1.5Aac
Frequency: 48-62Hz

Model: 5-24007D02-xxx O/P: 24Vdc 7Aac
Input Vac 120Vac or 230Vac (factory preset)
Input Aac 3.0Aac or 1.5Aac
Frequency: 48-62Hz


Features

- Fully Automatic - starts and stops charging automatically
- 5 L.E.D. display to easily interpret charge and/or charge error conditions
- Many safety features, including Reverse Battery Protection
- Charge algorithm controls BOTH voltage and current for precise charging
- Microprocessor-based control implements an intelligent charge


**IMPORTANT: READ AND SAVE THIS SAFETY INSTRUCTION
MANUAL. KEEP IT WITH OR NEAR CHARGER AT ALL TIMES.**

Table of Contents

<u>Section</u>	<u>Description</u>	<u>Pg</u>	<u>Section</u>	<u>Description</u>	<u>Pg</u>
1	User Safety	2	6	L.E.D. Display	6
2	Installation	3	7	Troubleshooting	6
3	Grounding	3	8	Technical Notes	8
4	Preparing to Charge	4	9	Warranty	8
5	5-Stage Charge	4			

 Throughout this manual, look for this symbol. It means BE ALERT – YOUR SAFETY IS INVOLVED. If you do not follow these safety instructions, personal injury or property damage may occur.

1. User Safety Operations Guide


 **WARNING - RISK OF EXPLOSIVE GASES.**
WORKING WITH RECHARGEABLE BATTERY(S) IS DANGEROUS.
EXPLOSIVE GASES DEVELOP DURING NORMAL BATTERY OPERATION.
READ THIS MANUAL EACH TIME AND MAKE CERTAIN YOU FULLY UNDERSTAND IT AND FOLLOW THE SAFETY AND OPERATING INSTRUCTIONS AT ALL TIMES.

- To reduce risk of battery explosion, follow all safety instructions below and those published by the battery manufacturer. Review cautionary markings on vehicle or equipment containing the battery.
- Use of an attachment not recommended or sold by the battery charger manufacturer may result in a risk of fire, electric shock or injury to persons.
- Do not operate this charger if it has received a sharp blow, was dropped or otherwise damaged in any manner. Refer to a qualified service agent.
- Charger contains no serviceable parts. If it fails during its warranty period, contact your dealer for a warranty replacement.
- To reduce risk of electric shock, unplug charger from AC outlet before attempting any maintenance or cleaning.
- For external cleaning use a clean damp towel.
- Have your distributor, dealer or other qualified service agent, repair or replace worn or damaged parts immediately. **Repairs should not be attempted by people who are not qualified.**
- Whenever removing AC Plug from the receptacle, pull from the Plug Body; Not from the cord.
- Do not operate the charger if it is malfunctioning. Personal injury or property damage could result.

Personal Precautions While Working With Batteries

- Have someone within range of your voice to come to your aid if needed.
- Have plenty of fresh water and soap nearby in case battery acid contacts your skin, clothing or eyes. Wear eye and clothing protection and avoid touching eyes.

- If battery acid contacts skin or clothing, wash immediately with soap and water.
- If acid enters eye, immediately flush eye with running cold water for at least 10 minutes. Get medical attention immediately.
- NEVER smoke or allow a spark or flame in vicinity of battery.
- Be extra cautious not to drop a metal tool onto battery. It might spark or short circuit battery or other electrical part that may cause an explosion.
- Remove personal metal items such as rings, necklaces, watches, etc. Batteries can produce a short-circuit current high enough to weld such items causing a severe burn.
- NEVER charge a frozen battery. Thaw it out for safer and more efficient charging.

 **WARNING: CHARGERS CAN IGNITE FLAMMABLE MATERIALS AND VAPORS. DO NOT USE NEAR FUELS, GRAIN DUST, SOLVENTS, OR OTHER FLAMMABLES. TO REDUCE THE RISK OF AN ELECTRIC SHOCK, KEEP THE CHARGER DRY. DO NOT EXPOSE IT TO RAIN OR WATER.**

2. Installation

The use of an improper extension cord could result in a risk of a fire or electric shock. If an extension cord must be used, it must be UL and/or CSA approved. Locate all cords so that they will not be stepped on, tripped over or otherwise subjected to damage or stress. Extension cord must be properly wired and in good electrical condition, and large enough for the AC rating of charger as specified in this TABLE:

RECOMMENDED MINIMUM AWG SIZE FOR EXTENSION CORDS FOR BATTERY CHARGERS				
Length of cord (feet):	25	50	100	150
AWG size of cord:	18	16	16	16

Accessories List:


AC Cord- 3 conductor, 18AWG, unshielded wire, with an IEC 60320 power connector, and a NEMA 5-15 3 pole power plug.

DC Cord- 2 conductor, 12 or 14AWG unshielded wire, both wires terminated (one on each end of cable) with Anderson Power Products connector housings.

USB cable- standard USB shielded cable 2 meters in length.


3. Grounding Instructions

This battery charger must be grounded to reduce the risk of electric shock. This charger is equipped with an AC cord set having an equipment-grounding conductor. This AC cord set must be connected to an appropriate receptacle that is properly installed and grounded in accordance with the National Electrical Code and all local codes and ordinances.

 **WARNING:** IMPROPER CONNECTION OF THE EQUIPMENT-GROUNDING CONDUCTOR CAN RESULT IN A RISK OF AN ELECTRIC SHOCK.

The conductor with insulation having an outer surface that is green, with or without yellow stripe(s), is the equipment-grounding conductor. If repair or replacement of the charger's AC cord set is necessary, refer to a qualified service agent, and do not connect the equipment-grounding connector to a live terminal.

4. Preparing to Charge

 **WARNING:** The instructions printed on the charger are for daily reference. For your own protection, when using ANY type of charger, always ensure that the batteries in your Battery Pack ARE ALL at the same state of charge, same condition, same size, and same rating. DO NOT MIX DIFFERING SIZES OR TYPES. Never use charger for any purpose contrary to its intended purpose of charging lead acid batteries in accordance with ALL instructions printed in this manual.

4.1 Be sure area around battery is well ventilated while battery is being charged. Gas can be forcefully blown away using a non-metallic material like cardboard.

4.2 The charger is factory preset to charge in one of 32 operating MODES. Each mode is set to charge a particular Battery Pack as listed:

5-12014D02-xxx models:

- Mode 1: 12Vdc 18AH Lead Acid battery at 5Amp Charge Rate
- Mode 2: 12Vdc 26AH Lead Acid battery at 6Amp Charge Rate
- Mode 3: 12Vdc 36AH Lead Acid battery at 10Amp Charge Rate
- Mode 4: 12Vdc 44AH Lead Acid battery at 12Amp Charge Rate

Do not set to or use any other mode

5-24007D02-xxx models:

- Mode 1: 24Vdc 18AH Lead Acid battery at 7Amp Charge Rate
- Mode 2: 24Vdc 26AH Lead Acid battery at 7Amp Charge Rate
- Mode 3: 24Vdc 36AH Lead Acid battery at 7Amp Charge Rate
- Mode 4: 24Vdc 44AH Lead Acid battery at 7Amp Charge Rate

Do not set to or use any other mode

4.3 For 3 consecutive seconds, upon connection to AC Power, the Front Panel L.E.D.s flash a binary pattern to annunciate the mode setting. The left most L.E.D. is the Most Significant Bit. The right most L.E.D. is the Least Significant bit. Up to 32 Modes may be announced.

10. LIMITED WARRANTY

Diversified Power International LLC (DPI) warrants exclusively to the original purchaser that this product will be replaced or repaired, at DPI's option, if it fails during the first 18mos after date of purchase due to a defect in material or workmanship. In order for a claim to be processed the product must be returned to DPI (i) with all transportation charges prepaid, (ii) accompanied by an acceptable proof of purchase, and with a Return Material Authorization (RMA) number, previously obtained from DPI, printed and clearly visible on the outside of the shipping container. This warranty does not apply if the product has been modified, abused, or damaged or improperly or negligently used, connected, maintained, or operated in any manner contrary to the instructions stated in this manual or affixed to the product's enclosure. Repair or replacement as provided under this warranty is the exclusive remedy of the purchaser, and the purchaser shall have no claim against DPI except for the breach of an express warranty stated herein. DPI shall not be liable for any incidental, consequential, or special damages for breach of any expressed or implied warranty. Except to the extent required by applicable law any implied warranty of merchantability or fitness for a particular purpose is limited in duration to the first 18mos after the date of purchase. Some states do not allow the exclusion or limitation of incidental or consequential damages or allow limitations on how long an implied warranty lasts, so the above limitations or exclusion may not apply to you. This limited warranty gives you specific legal rights, and you may also have other rights which vary from state to state. APART FROM THE WARRANTIES SET FORTH ABOVE, DPI MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, WITH RESPECT TO THE SUITABILITY OR MERCHANTABILITY OF THIS PRODUCT, THE FITNESS OR THIS PRODUCT FOR ANY SPECIFIC USE OR PURPOSE, OR ANY OTHER MATTER PERTAINING TO THIS PRODUCT.

Return information:

DIVERSIFIED POWER INTERNATIONAL LLC

414 CENTURY COURT

PINEY FLATS, TN 37686, U.S.A.

423 538-9002

RMA # _____

For further information, product updates, technical information, or general inquiries, also, please visit our web site at:

www.DPIpower.com

TABLE 206

Recommended separation distances between portable and mobile RF communications equipment and the "ACCUSENSE CHARGER"			
Rated maximum output power of transmitter <i>P</i>	Separation distance according to frequency of transmitter <i>d</i>		
	150 kHz to 80 MHz	80 MHz to 800 MHz	800 MHz to 2.5 GHz
	$d = 1.2\sqrt{P}$	$d = 1.2\sqrt{P}$	$d = 2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

The "ACCUSENSE CHARGER" is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the "ACCUSENSE CHARGER" can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the "ACCUSENSE CHARGER" as recommended below, according to the maximum output power of the communications equipment.

For transmitters rated at a maximum output power not listed above, the recommended separation distance *d* in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where *P* is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

5. FIVE(5)-STAGE CHARGE

- The following instructions assume the charger is operating in Mode 4.
- Upon A.C. POWER connection, and for the first 3 seconds, the MODE is announced where the middle L.E.D. only, flashes. This is Binary 4 or Mode-4, which is applicable to that battery listed in the table in Section 4.2 and other similarly constructed batteries. Following the Start-Up Flash Sequence, the 'Power On' L.E.D. will illuminate to indicate that AC power is applied, and the charger will then commence charging as described below.
- The charger may be left connected to battery with the A.C. Power Removed. The amount of drain from the battery is minimal.

DPI'S 5-Stage Charging Process works as follows:

5.1. STAGE ONE - PRE-QUALIFICATION TEST

- 5.1.1. Yellow (Charging), Light Emitting Diode (L.E.D.), flashes on and off SLOWLY at a rate of once per second during this stage. This stage applies tests to the battery pack. Further charging is prohibited if the charger discovers a fault such as connection of 12v charger to a 6V battery pack or reversed battery connections, etc. Refer to Section 7 - 'Troubleshooting Guide' for understanding faults.
- 5.1.2. Duration of this stage is dependent on the condition of battery - approximately 10 seconds under average circumstances, but if your battery pack was allowed to severely discharge to less than 10.5v (for every 12v battery), then the charger may take several hours of slow charging to try to slowly bring the battery up beyond 10.5Vdc.

5.2. STAGE TWO - CONSTANT CURRENT CHARGE (Bulk Peak Charge)

- 5.2.1. Yellow (Charging) L.E.D. illuminates continuously indicating that the charger is charging the battery at the full rated output. While charging, the voltage is monitored for the occurrence of the next stage.

5.3. STAGE THREE - CONSTANT CURRENT CHARGE (Top-Off Charge)

- 5.3.1. Yellow (Charging)L.E.D. remains illuminated continuously. The charger now regulates voltage while monitoring charge current.
- 5.3.2. Once Charge Current has decreased to a sufficiently low level, the charger then illuminates continuously, both the Green (Charged) and Yellow (Charging)L.E.D.
- 5.3.3. The Battery Pack is now at about 80-90% State of Charge and this top-off stage replenishes the last 10-20%.

5.4. STAGE FOUR - CHARGE COMPLETE (Standby)

- 5.4.1. Green (Charged) L.E.D., only, illuminates continuously. Output Voltage is regulated at a reduced voltage to maintain the battery at full charge. However, no further charging action is occurring. If flashing, AND a temperature measuring device is installed in the charger, the battery was found to be overly warm. Flashing will stop once battery temperature returns to normal.

5.5. RECYCLE CHARGE STAGE FIVE

5.5.1. Only after the completion of Stage 4, and if a substantial load should be applied, the charger will reset itself; thereby automatically initiating a new charge cycle routine and restoring battery to full capacity.

- If, while charging, the charger finds an abnormal charge condition, it will attempt to shutdown and indicate the 'Condition' by flashing any one of the 4 left most L.E.D.s Refer to the 'Troubleshooting' section for a description of the Charge Error Condition, if you encounter a flashing 1st, 2nd, 3rd or 4th L.E.D.

6. L.E.D. DISPLAY

While A.C. Power Is Connected....

Under normal charge circumstances, the L.E.D.s operate as follows:


- Power On (Grn) Illuminates continuously when AC power present. Refer to the section 'TROUBLESHOOTING' if Flashing.
- Shutdown (Grn) Normally not illuminated. Refer to 'TROUBLESHOOTING' if Flashing.
- Detection (Grn) Illuminates when battery not connected or battery voltage is less than 1V. Refer to 'TROUBLESHOOTING' if Flashing.
- Charging (Yellow) Charge Status Indicator – flashes or illuminates during the 5-Stage Charge Process. Refer to Section 5.
- Charged (Green) Illuminates continuously during the 4th Stage of the Charge Process. Refer to Section 5. If flashing, it indicates that a Hot Battery was detected – no charging is occurring, but flashing will automatically stop once battery has cooled off.

7. TROUBLESHOOTING GUIDE

To be able to troubleshoot safely and effectively, it is important to read this guide completely before beginning any tests.

⚠ WARNING: DO NOT DISASSEMBLE THE CHARGER. TAKE IT TO A QUALIFIED SERVICE AGENT WHEN SERVICE OR REPAIR IS REQUIRED. INCORRECT REASSEMBLY MAY RESULT IN A RISK OF ELECTRIC SHOCK OR FIRE. THE FOLLOWING PROCEDURES ARE INTENDED ONLY TO DETERMINE IF A MALFUNCTION MAY EXIST IN THE CHARGER.

TABLE 204

Guidance and manufacturer's declaration – electromagnetic immunity			
The "ACCUSENSE PORTABLE UPS CHARGER" is intended for use in the electromagnetic environment specified below. The customer or the user of the "ACCUSENSE CHARGER" should ensure that it is used in such an environment.			
Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment—guidance
Conducted RF IEC 61000-4-6	3Vrms 150 kHz to 80 MHz	3 Vrms	Portable and mobile RF communications equipment should be used no closer to any part of the "ACCUSENSE CHARGER", including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d = 1.2 \sqrt{P}$
Radiated RF IEC 61000-4-3	3 V/m 80MHz to 2.5GHz	3 V/m	$d = 1.2 \sqrt{P}$ 80 MHz to 800 MHz $d = 2.3 \sqrt{P}$ 800 MHz to 2.5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, should be less than the compliance level in each frequency range. Interference may occur in the vicinity of equipment marked with the following symbol: 
NOTE 1 At 80 MHz and 800 MHz the higher frequency range applies.			
NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			
<ul style="list-style-type: none"> • Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the "ACCUSENSE CHARGER" is used exceeds the applicable RF compliance level above, the "ACCUSENSE CHARGER" should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the "ACCUSENSE CHARGER". • Over the frequency range 150 kHz to 80 MHz, field strengths should be less than [3] V/m. 			

⚠ DANGER: TO REDUCE THE RISK OF ELECTRIC SHOCK, ALWAYS DISCONNECT THE CHARGER'S AC CORD SET FROM AC POWER AND ITS DC CORD SET FROM BATTERIES BEFORE ATTEMPTING ANY MAINTENANCE OR CLEANING

If any of the first four (counted from the left side) L.E.D.s flash in a pattern of '3-Fast, then pause, 3-fast', then pause', repeatedly, the charge cycle has terminated prematurely. An abnormal charging condition was detected and charging stopped due to a Charge Error Condition. Refer to the following Charge Error Table for a description of the possible failure or condition.

TABLE 202

Guidance and manufacturer's declaration – electromagnetic immunity			
The "ADCUSENSE CHARGER" is intended for use in the electromagnetic environment specified below. The customer or the user of the "ADCUSENSE CHARGER" should ensure that it is used in such an environment.			
Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment—guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±6 kV air	±6 kV contact ±6 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	+/-2 kV for power supply lines +/-1 kV for input/output lines	+/-2 kV for power supply lines +/-1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV differential mode ±1kV common mode	±1 kV differential mode ±1kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 81000-4-11	<5% Ut (>95% dip in Ut) for 0.5 cycle 40% Ut (60% dip in Ut) for 5 cycles 70% Ut (30% dip in Ut) for 25 cycles <5% Ut (>95% dip in Ut) for 5 sec.	<5% Ut (>95% dip in Ut) for 0.5 cycle 40% Ut (60% dip in Ut) for 5 cycles 70% Ut (30% dip in Ut) for 25 cycles <5% Ut (>95% dip in Ut) for 5 sec.	Mains power quality should be that of a typical commercial or hospital environment. If the user of the "ADCUSENSE CHARGER" requires continued operation during power mains interruptions, it is recommended that the "ADCUSENSE CHARGER" be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE: Ut is the a.c. mains voltage prior to application of the test level.			

CHARGE ERROR TABLE

Condition	Flashing L.E.D.s			
	Error-1	Error-2	Error-3	Error-4
Battery Voltage High	Off	Off	Off	Flash
Battery Polarity Reversed	Off	Off	Flash	Off
Output Overload	Off	Off	Flash	Flash
Charge Level Unbalanced-1	Off	Flash	Off	Off
Charge Level Unbalanced-2	Off	Flash	Off	Flash
Excessive Charging Time-1	Off	Flash	Flash	Off
Excessive Charging Time-2	Off	Flash	Flash	Flash
Excessive Overload	Flash	Off	Off	Off
Battery Testing - 1	Flash	Off	Off	Flash
Battery Testing - 2	Flash	Off	Flash	Off
Battery Testing - 3	Flash	Off	Flash	Flash

- Battery Voltage High. Charger's DC cord set possibly connected to a battery pack with voltage higher than the output rating of the charger.
- Battery Polarity Reversed. Check output connector and ensure proper polarity. Remake connections.
- Output Overload. While charging, and, for example, under severe motor loading, charger may shut down. This error is not very likely to occur.
- Charge Level Unbalanced-1,2. Caused by unbalanced battery condition. Example: some batteries are at a much higher state of charge than others. This may require replacement of the batteries. Refer to the Equipment's Operators manual for instructions on servicing the battery pack.
- Excessive Charging Time-1,2,3. Occurs when charging took too long. Possible causes include: use of a battery load that is draining energy from the battery while the charger is trying to charge that same battery, aged or unbalanced battery cell conditions, etc.

- **Excessive Overload.** In the unlikely event that a heavy load is placed across the battery pack while the charger is trying to charge the battery and the charger cannot keep up with supplying energy to both the battery and the load, and then the battery voltage will decrease. Further charging is terminated.
- **Battery Testing.** This error is only generated by one of two conditions found during the Pre-Qualification Test Stage.
 - Condition 1: A severely discharged battery pack did not charge up to 10.5Vdc for 12v-system, or 21Vdc for 24V-system, within 3 hrs.
 - Condition 2: A heavy load, applied, prevents charger from charging battery pack above 10.5Vdc for 12v-system, or 21Vdc for 24V-system.

8. TECHNICAL NOTES

- Do not charge more than one battery pack at a time. Battery pack characteristics differ and may cause the microprocessor to function improperly.
- If charging a series connected string of 2 or more batteries, ensure that all batteries in the series connected string, are all at the same state of charge, age type and condition.
- The “ACCUSENSE CHARGER” uses RF energy only for its internal functions. Therefore its RF emissions are very low and are unlikely to cause any interference in nearby electronic equipment.
- The “ACCUSENSE CHARGER” has an operating temperature range of 0C to +40C, and a shipping/storage temperature range of -20C to +70C. It needs to be stored in clean dry conditions.
- Medical Electrical Equipment needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in this manual.
- Portable and mobile RF communications equipment can affect Medical Electrical Equipment.
- The use of Accessories, transducers, and cables other than those specified by the manufacturer, may result in increased Emissions or decreased Immunity of the 12Vdc or 24Vdc Battery Charger.

- The 12Vdc or 24Vdc Battery Charger should not be used adjacent to or stacked with other equipment and that if adjacent or stacked use is necessary, the 12Vdc or 24Vdc Battery Charger should be observed to verify normal operation in the configuration in which it will be used.

9. ETL SPECIFICATION TABLES

TABLE 201

Guidance and manufacturer's declaration – electromagnetic emissions		
The “ACCUSENSE PORTABLE UPS CHARGER” is intended for use in the electromagnetic environment specified below. The customer or the user of this charger should assure that it is used in such an environment.		
Emissions test	Compliance	Electromagnetic environment—guidance
RF emissions CISPR 11	Group 1	The “ACCUSENSE CHARGER” uses RF energy only for its internal function. Therefore its RF emissions are very low and not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	The “ACCUSENSE CHARGER” is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC61000-3-2	Not applicable	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	