Model: Standard LI3
&
LI3C (CEC)

BC

Legacy® Insight™ Battery Charger Owner's Manual

To automatically be connected to your closest Service Center, call us toll-free at 1-800-DOUGLAS (1-800-368-4527)

Or, visit us at: http://www.douglasbattery.com/

I.B. 1620
Rev. A (6/10/14)

Model:	S/N:	AC Input Voltage
Installed by		Date

IMPORTANT
Read and understand your user's manual before installing, operating, or servicing this product.
DO NOT DESTROY THIS BOOK

TABLE OF CONTENTS

AC LINE VOLTAGE LETTER CODES

The following table describes the code letters to be used in new charger part numbers to indicate the AC line voltage(s) and AC line frequency at which the charger can be operated.

Code Letters	Voltage(s) (volts rms)	Line Frequency (Hertz)	Comments
C	600	50 / 60	600 VAC only
Y	480	50 / 60	480 VAC only
W	240	50 / 60	240 VAC only
T	208	50 / 60	208 VAC only

SPECIALTY CHARGER OPTIONS LIST

Suffix	Description
C6	6' of #10AWG AC Cord with 30 AMP Plug.
C10	10' of #10AWG AC Cord with 30 AMP Plug.
C12	12' of #10AWG AC Cord with 30 AMP Plug.
C8	8' of #10AWG AC Cord with 30 AMP Plug.
CF	10' of #8AWG AC Cord with 50 AMP Plug.
CF12	12' of #8AWG AC Cord with 50 AMP Plug.
CR	6' of #10AWG AC Cord with 30 AMP Plug and 30AMP receptacle.
L10	10' of DC cable.
L13	13' of DC cable.
L15	15' of DC cable.
L18	18' of DC cable.
L20	20' of DC cable.
L25	25' of DC cable.
L30	30' of DC cable.
NC	No DC cables (**NOT UL APPROVED)**
PP	Charger shipped on a Plastic Pallet
S	Series DC Cables

Reference page 28 "Technical Specs" for charger cable sizes.

IMPORTANT SAFETY INSTRUCTIONS

1. This manual contains important safety and operating instructions. Before using the battery charger, read all instructions, **cautions**, and **warnings** on the battery charger, the battery, and the product using the battery.
2. This charger has been designed to only charge flooded, lead-acid batteries. Read and understand all setup and operating instructions before using the battery charger to prevent damage to the battery and to the charger.
3. **Do not** touch non-insulated parts of the output connector or the battery terminals to prevent electrical shock.
4. During charge, batteries produce hydrogen gas which can explode if ignited. Never smoke, use an open flame, or create sparks in the vicinity of the battery. Ventilate well when the battery is in an enclosed space.
5. **Do not** connect or disconnect the battery plug while the charger is on. Doing so will cause arcing and burning of the connector resulting in charger damage or battery explosion.
6. Lead-acid batteries contain sulfuric acid which causes burns. **Do not** get in eyes, on skin, or on clothing. In cases of contact with eyes, flush immediately with clean water for 15 minutes. Seek medical attention immediately.
7. Only factory qualified personnel can service this equipment. De-energize all AC and DC power connections before servicing the charger.
8. The charger is **not** for outdoor use.
9. Do not expose the charger to moisture. Operating **conditions** should be 0º to 104º F; 0 to 70% relative humidity.
10. Do not operate the charger if it has been dropped, received a sharp hit, or otherwise damaged in any way.
11. For continued protection and to reduce the risk of fire, install chargers on a floor of non-combustible material such as stone, brick, or grounded metal.

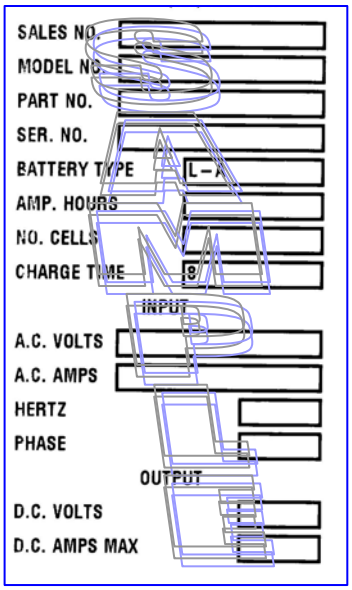
WARNING: The shipping pallet must be removed for proper and safe operation.

INSTRUCTIONS DE SÉCURITÉ IMPORTANTES

1. Ce manuel contient des informations et des consignes importantes pour l'emploi et l'utilisation du chargeur de batteries industrielles. Avant tout emploi, il est fortement conseillé de lire l'ensemble des instructions, recommandations, et avertissements concernant le chargeur et la batterie.
2. Ce chargeur a été conçu pour la charge des batteries industrielles type plomb-acide dite « ouverte ». (Il ne peut pas être adapté pour les batteries étanches.)
3. Lisez toutes les condisnes d'installation et d'utilisation avant d'employer le chargeur de batterie pour empêcher des dommages à la batterie et / ou au chargeur.
4. **Ne pas être en contact avec** les pièces sous-tension non-isolées tels que la prise de charge ou des éléments de connexion de la batterie pour empêcher le choc électrique.
5. Pendant la charge, le dégagement d'hydrogène rend l'emploi de feu strictement interdit «risque d'explosion ». Ne jamais fumer, employer une flamme nue, ou créez les étincelles à proximité de la batterie. Ventiler suffisamment pour éviter toute condensation de gaz dans un espace restreint.
6. **Ne brancher ou débrancher la batterie que si le chargeur est à l'arrêt.** Faire ainsi risque d'endommager la prise de charge pouvant avoir pour conséquence des dommages du chargeur ou l'explosion de la batterie.
7. Les batteries d'acide au plomb contiennent l'acide sulfurique, qui cause des brûlures. Eviter le contact avec les yeux, la peau, ou sur l'habillement. Dans le cas de contact avec les yeux, et faut nettoyer immédiatement avec de l'eau propre pendant 15 minutes et consulter un médecin immédiatement.
8. Seul le personnel qualifié par l'usine peut entretenir cet équipement. Pour le service, veuillez contacter la société EnerSys ou l'un de ces représentant (1-800-251-6560)
9. Avant toute intervention d'entretien ou de réparation il faut s'assurer que le chargeur est hors tension et la batterie est déconnectée.
10. Le chargeur **n'est** pas pour un usage extérieur.
11. Ne pas exposer le chargeur à l'humidité. Les conditions de fonctionnement devraient être – 15° à 40°c; humidité relative de 0 à de 70%.
12. Ne pas mettre en fonctionnement le chargeur s'il a reçu un choc mécanique ou tout autre dommage di quel que façon.
13. Pour une protection permanente et pour réduire le risque du feu, installez les chargeurs sur un plancher ou un matériel non-combustible tel qu'un mur plein en béton, en brique, ou l'acier.

TECHNICAL INFORMATION

The nameplate, located on the outside of the charger, should be used to check this application before installation.



Part Number

This number specifies in general the characteristics of this particular charger and for this reason it is required in any discussion or correspondence regarding this unit.

L I 3 C– F 10 – 24 1Y O

- Model type
- Phase
- CEC
- Floor Cabinet (W = wall cabinet)
- Power Level
- Max Number of Cells
- Input Volt code
- Options

Serial Number

This number indicates complete information about the specific charger. It must be supplied with the part number on any correspondence or discussion regarding this charger.

Battery Type

The chemical content construction of the battery this unit is designed to charge is given in this part of the nameplate. (L-A = Lead-Acid)

Ampere-Hours

The information supplied here is the maximum ampere-hours capacity of this charger. Charging batteries of ampere-hour capacities not specified here might cause the charger to deviate from the specifications.

Cells

This portion of the nameplate gives the number of cells this unit will charge. **This number must match exactly with any battery connected to the charger output.**

Input AC Volts

The nameplate shows the input voltage accommodated by this charger.
IMPORTANT: The charger will operate only on nominal line voltages stamped on the nameplate.
Failure to select the correct voltage will result in damage to the charger and/or the battery.

Input AC Amps

The external fusing and/or the line disconnect circuit breaker should be as specified in the National Electrical Code or other local code agencies. (AC fuse values can be found on the decal inside the charger).

Hz
This gives the frequency in cycles per second of the AC input voltage. Under no conditions operate charger at a different frequency or from a generator with unstable frequency.

Phase
Number "3" indicates a Three Phase Charger.

DC Volts
This gives the nominal DC output voltage of the system.

Rated DC Amps
This is the nominal DC value of current that this unit will deliver to a battery that is 100% discharged.

CEC

This logo is applied to chargers that are certified by California Energy Commission.

INSTALLATION

WARNING: The shipping pallet must be removed for proper and safe operation.

Location

For maximum trouble-free service, choose a location which is free of excess moisture, dust, and corrosive fumes. Also, avoid locations where temperatures are high or where liquids will drip on the charger. Do not obstruct the ventilating openings or the space under the charger.

Mounting Wall Cabinet Chargers

The charger must be mounted on a wall or stand in a vertical position. The lower part of the charger must be at least 24" from the ground and/or the charger below and the upper part 36" from the ceiling. The minimum distance between two chargers must be12".
The charger will be installed with four 5/16" bolts or with the bracket supplied. See the Wall Mounting Dimensions section at the end of this manual for proper bolt pattern.

Placing Floor Cabinet Chargers

Allow at least six (6) inches of clearance at rear and sides of the charger for air circulation.

Stacking Multiple Floor Cabinet Chargers

These chargers can be stacked up to a maximum of 3 units high. Chargers are not designed to be stacked side by side due to ventilation requirements.

1. Position the first charger so that a minimum of 6 inches of space is between the charger and any wall, and 12 inches between the charger and any other chargers or equipment.

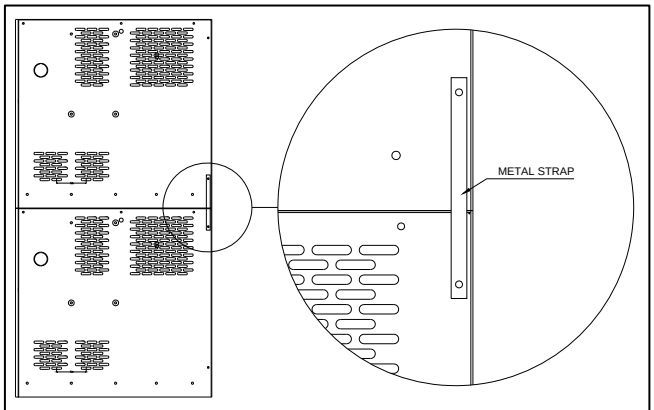
2. Place the second charger on top of the first. Align the bolt holes on each charger.

3. Fasten both charger cabinets together securely using 3/8" bolts and nuts.

NOTE: the two bolts toward the back of the charger may be omitted if an after market metal strap (about 8 inches) is used to secure both chargers. Remove existing 1/4" screws of the chargers' sides and attach strap with screws. Refer to picture.
Hardware kit # X225-99-0-2 can be ordered to attach two chargers.

4. Repeat steps 2 and 3 for the third charger.

5. Stacked chargers must be fastened to the wall using devices suitable for the wall construction and the bolt holes at the top of the highest charger.



TWO STACKED CHARGERS, RIGHT SIDE VIEW

NOTE: Ambient temperature at all levels cannot exceed 104^{O}F / 40^{O}C.

Electrical Connections
To prevent failure of the charger, be sure it is connected to the correct line voltage.

On three phase units
Connect all chargers as follows:
Phase A to L1 (fuse block)
Phase B to L2 (fuse block)
Phase C to L3 (fuse block)

Connecting Input Power

WARNING: Make sure the power to the charger is OFF and the battery is disconnected before connecting the input power to the terminals of the charger.

Connect the input power to the appropriate terminals, ***including ground***. Follow your local electrical or National Electric Code in making these connections.

AC Connection
The user must provide suitable branch circuit protection and a disconnect method from the AC power supply to the charger to allow for safe servicing.

Plug Polarity
The charging cable is connected to the DC output of the charger with the positive lead marked RED. The output polarity of the charger must be strictly observed when connecting to the battery (read warning above).
Improper connection will open the DC fuse.

Grounding the Charger

DANGER: FAILURE TO GROUND THE CHARGER COULD LEAD TO FATAL ELECTRIC SHOCK. Follow National Electric Code for ground wire sizing.

Connect a grounding conductor to the lug provided on the horizontal support panel. This lug is marked as shown:

DESCRIPTION OF OPERATION

General

Legacy® Insight™ chargers are microprocessor-controlled. The processor calculates the battery's capacity so that the charging profile can be automatically adapted to the battery's actual state over a wide range of capacities. The charging coefficient is maintained absolutely on all types of batteries. Legacy® Insight™ chargers adapt to the battery's capacity and its discharge level.

Legacy® Insight™ chargers can easily be set to charge flooded batteries used in cold or freezer storage applications, ionic or opportunity profiles. This battery charger is also designed to charge flooded and sealed lead-acid storage batteries within the range of the cell and ampere-hour rating as marked on the nameplate.

Beginning the Charge

When a battery is connected to the charger, the control board senses voltage and after a 20 second delay, the charger energizes.

Charging

Charging current is determined by the battery voltage and interaction of the charger. Charging current declines automatically as battery voltage rises during the charge. As the battery charges, the LCD display will output various charge parameters including the percentage of battery capacity.

AC Power Fail

If the AC power fails with a battery connected to the charger during a charge cycle, the charger will reset and start a new charge cycle when power is restored. All charger settings as well as the time and date are preserved.

Series Charging

In series charging, the voltages of both batteries add up and must match charger's nameplate rating. The charger's ampere-hour rating must be equal to each of the batteries' ampere-hour rating. Charge cycle will not start unless both batteries are connected.

GLOSSARY

Charging Coefficient
The ratio of the number of ampere-hours restored during charging to the number of ampere-hours consumed during discharge.

Charging Profile
The charging profile defines the rate of current charge over time. The charger adapts to the battery's age and level of discharge. Controlling the overcharge coefficient, whatever the battery's discharge level, reduces the amount of electricity consumed.

Cold Storage
This is a charging profile that allows the configuration of the charger for use with batteries in cold storage application. The profile is an IEI (constant current, constant voltage, constant current) type with a number of user configurable parameters.

Equalization Charging
Equalization charging, performed after normal charging, balances the electrolyte densities in the battery's cells.

IGBT
The IGBT controls the charger output by rapidly switching the transformer primary at 20 to 30 kHz.

Ionic Profile
Also called "ionic mixing". This type of charging profile consists of sending short pulses of current to stimulate gas formation in the active material, causing sulfuric acid to be distributed outside the plates. This system of mixing the electrolyte enables more rapid charging of flooded cell batteries subject to very high demands and balances out differences in density, homogenizing the electrolyte across the surface of the plates.

OPPOR Profile

The OPPOR charge profile is used when opportunity charging is desired. It has a start rate of 25% of the batteries rated amp hour capacity, requires one opportunity recharge in every 24 hours of service and must have an equalize charge done once a week which is programmed to run automatically.

Operation:

During opportunity charging the user can plug the battery in and charge it during breaks, lunch or any work stoppage time. Sufficient time should be scheduled after the full charge to allow the battery to completely cool to ambient temperatures before use.

Daily Charge:

When Profile is set to Opp, the Value programmed will be the time of day for a Complete Ionic charge. Type is ignored when Profile is set to Opp. One complete Ionic charge per day is recommended.

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Note: The user must configure the charger for the time of day that the full recharge is to take place, they must also configure the day of the week that the equalize charge will take place.

Power Diodes

The power diodes rectify the AC input and the output of the transformer.

Refresh Charging

Refresh or maintenance charging enables the battery to be maintained at maximum charge all the time that it is connected to the charger.

Rest Function

The Rest function prevents the battery from being disconnected for a pre-defined period to ensure a period of inactivity after charging.

CEC

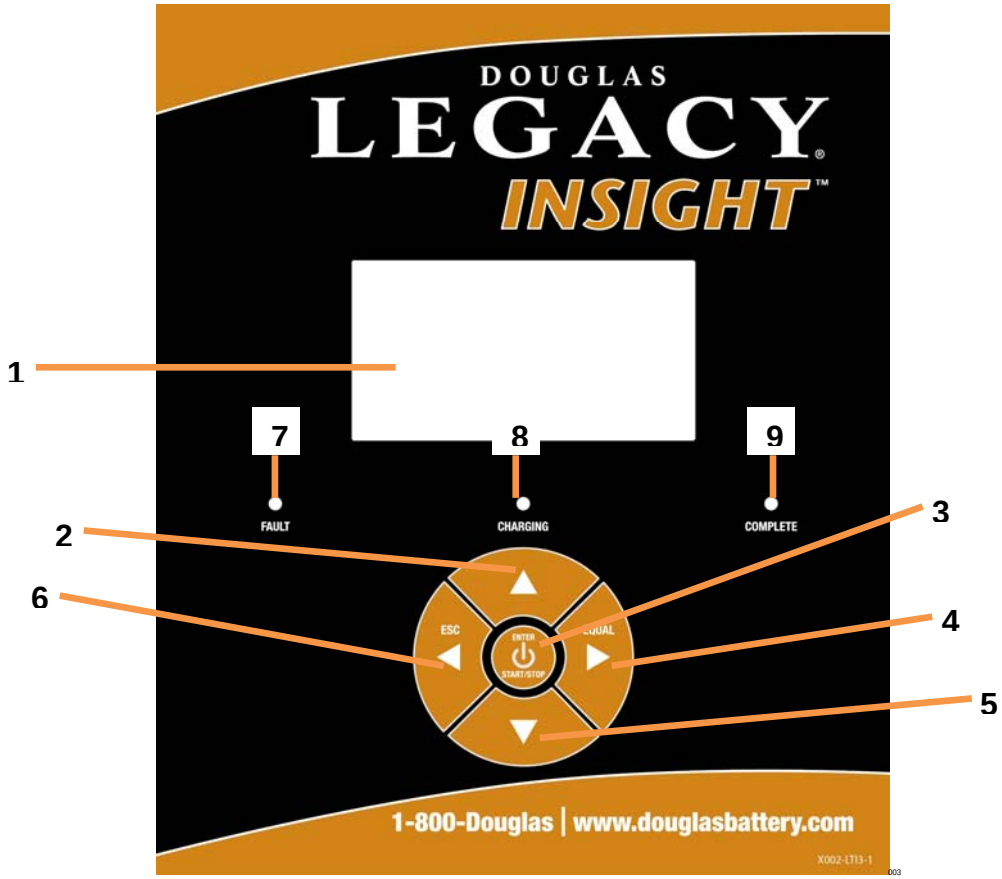
Describes that the chargers are certified by the California Energy Commission.

OPERATING INSTRUCTIONS

The Legacy® Insight™ series of chargers are compatible with batteries at 12, 24, 36, 48, 72 and 80 volts (depending on the version supplied). These chargers can automatically recharge batteries in the following ranges 12-24-36V, 24-36-48V, and 48-72V or 48-80V

Battery recognition (voltage, capacity and state of charge) is accomplished automatically by the microprocessor. Several charging profiles are available (Cold Storage, IONIC, Opportunity, VRLA) based on the configuration chosen by the operator. Furthermore, equalization and compensation charges are integrated.

Control Panel



Ref.	Function	Description
1.	Graphical LCD Display.	Display charger operation info/Menus
2.	Navigate UP button	Navigate menus/Change values
3.	ENTER/STOP&START button	Select menu items/Enter values/Stop and restart battery charge
4.	Navigate RIGHT/EQUALIZE button	Scroll right/Start equalize or desulfation
5.	Navigation DOWN button	Navigate menus/Change values
6.	Navigation LEFT/ESC button	Enter Main Menu/Scroll left/Exit menus
7.	RED fault indicator	OFF = no fault FLASHING = ongoing fault detected ON = fault
8.	YELLOW charging indicator	OFF = charger output is off ON = charging in progress
9.	GREEN charge complete indicator	OFF = charger off or battery not available Flashing = cooling phase ON = battery ready and available

Menu Access

When the charger is idle, press and hold <ESC>, the Main Menu is then displayed. The current menu is automatically exited after six minutes of inactivity or can be exited voluntarily by pressing the <ESC> button.

The menus provide access to the following functions:

- Last 896 charging cycles (MEMORIZATIONS menu).
- Viewing of faults, alarms, etc. (STATUS menu).
- Download of data stored in the charger via the USB storage memory.
- Charger configuration (CONFIGURATION menu).
- Setting of date, language and others (PARAMETERS menu).
- Management of password (PASSWORD menu)
- Viewing basic charger information (INFORMATION menu)

Main Menu

All menus are accessed from Main Menu; a detailed description of each menu is included in the next sections of this manual. The menus that require a password are not displayed until the correct password has been entered.

Memo
Status
USB (password)
Configuration (password)
Parameters
Information
Password

Memorizations

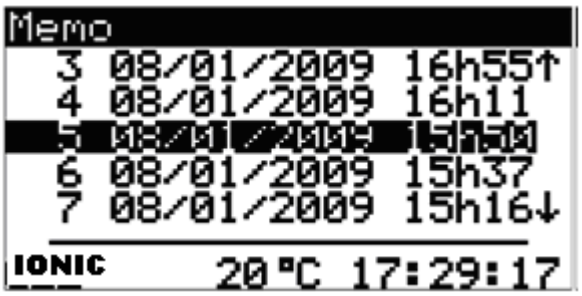
The charger can display the details of the last 896 charge cycles.

Memorization Access

On the Main Menu, select Memo and press <Enter>.

Memorizations Display Screen

The display shows here that 17 charges have been stored in memory (title line). MEMO 1 is the latest charge memorized. After memorizing the two-hundredth charge, the oldest record is deleted and replaced by the next oldest.



Displaying a charge cycle

Proceed as follows:

1. Select a record (MEMO x) using the ▲/▼ buttons.
2. Display the first History screen by pressing Enter.
3. Display the second History screen by pressing▼.
4. Return to the Main Menu by pressing Esc.

The charge history is displayed; use the ▲/▼ to scroll through the parameters.

The Memorizations can be cleared via the Reset command in the Configuration Menu (Password required).

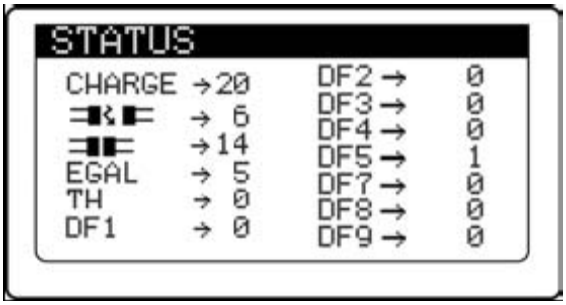
Status

This menu displays the status of the charger's internal counters (number of normal and equalize charges, faults by type, etc.).

Access

On the Main Menu, select Status and then press <Enter>.

STATUS SCREEN



Status	Information
Charge	Total number of charges. Corresponds to the total of normally terminated charges and charges terminated with or by faults.
	Number of charges terminated abnormally.
	Number of charges normally terminated.
EGAL	Number of equalization charges completed by the charger.
TH	Number of charger temperature faults*.
DF1 etc.	Number of faults recorded by the charger (see Fault Codes).

The Memorizations can be cleared via the Reset command in the Configuration Menu (Password required).

USB

This menu provides access to the USB function. The charger can store charging data in a USB memory. Password is required to view this menu.

Record Memo

Enables the storage of charge Memorizations and the Status data to a USB data storage device (aka memory stick, thumb drive). To record memos:

1. Insert the data storage device in the USB port on the side of the charger.
2. Go to Main Menu->USB->Record Memo. Select "On".
3. Display will show "Record MemoX (1, 2, 3, 4…….).
4. When finished, charger will return to idle state.
5. Remove data storage device from USB port. The file, in CSV format (useable with Memoreport or Excel), will be stored in the data storage device under the name "MDDDHHMM.CSV" where:
   M: is for Memorization data file
   DDD: Day of the year
   HH: Hour of file creation
   MM: Minute of file creation

Update Software

Update chargers internal software. The software is provided by Douglas and only authorized service personnel should perform this function.

Eject

For safe removal of the USB stick without damaging the data file.

Configuration

This menu allows for configuration of the charger. Password is required to view this menu. Only knowledgeable factory trained personnel should change these settings.

Battery

Auto/Manu capacity

When in Ionic mode, the charger can estimate the capacity of the connected battery automatically "Auto" or the charger will use the capacity entered manually "Manu" in the Capacity menu.

Capacity

Battery capacity used by the charger (must be set to "Manu" for Ionic profile) to determine start and finish rates.

Temperature

This parameter adjusts the regulation voltages on the charging profile (values between –15°C / 5°F and 65°C / 149°F) and defines the average operating battery temperature before the charge. It is recommended the average electrolyte temperature be entered, especially in cold areas.

Charge

Profile

For selecting the right charging profile for the application:
COLD STORE, IONIC, OPP, VRLA

The profile selected will be used. Values stored in the BATTERY menu, such as CAPACITY (except Ionic) and TEMPERATURE, are used to determine key charging parameters. Make sure these values match the battery to be charged or the battery may be over or under charged which will result in decreased battery life or performance.

Charge Delay

Under Type choices are either OFF, DELAY, or TIME OF DAY. VALUE is the amount or time day for the delay (00:00 to 24:00).

Delay: Start of charge is delayed for the amount of time stored in VALUE (0 to 24 hours)

Time of Day: Charge will not start until the time of day stored in VALUE (24 hour format).

Daily Charge

If charger profile is set to OPP, one complete Ionic charge per day is recommended. Enough down time should be allowed so the battery can remain plugged in to receive a full charge (Typically 4 to 5 hours depending on the state of discharge). As long as the battery is plugged in between the start time and the end time it will finish if allowed to do so.

Daily Chg Start: Start time for complete charge. (24 hour format, factory default if not specified, 22:00)

Daily Chg End: End time for complete charge. If charger is plugged in after this time it will revert back to opportunity charging. (24 hour format, factory default if not specified, 4:00)

Daily Chg On/Off: Sets the complete daily charge on or off.

Conditional charge

The charger will only commence the charge if the battery has reached the limit of ***depth of discharge (DoD)*** of more than x%. For example if the user wants to charge the battery only if it is discharged more than 30%, the parameter 30 has to be entered in the conditional charge. The 0 value disables the function.

Float Charge

This feature can be turned ON or OFF depending on the application. A float charge at the end of standard charge is intended to compensate for consumption by the truck electronics that are left on when truck is not used (typically AGV). The parameter VOLTAGE is in mVpc (millivolts per cell) determines the maximum float voltage. The parameter CURRENT defines the current output during float, the current will automatically decrease to keep the battery voltage at the under the maximum defined by the VOLTAGE parameter.

Maximum current

This manually decreases the maximum output current of the charger.

Equalization

Manu Current
This defines the equalization or desulphation current for a manual start.

Time
Sets the equalization time from 1 to 48 hrs

Delayed start (delay)
Sets the delay between the normal charge and the equalization charge from 0 hr to 23 hrs.

Frequency
Selects one or several periods for carrying out the equalization charge. The user can select one or several days per week.

Cable

Length
Select the length of DC cables from the charger to the battery terminals in 1 foot increments from 3 to 99 ft (1 to 30 m).

Section
Sets the DC cable gauge. Selections are 8, 6, 4, 2, 1/0, 2/0, 3/0, 4/0 AWG (10, 16, 25, 35, 50, 70, 95 or 120 mm^2).

Network (Option)

Set a protocol and configure the charge for the connecting the charger to a network.

> **JBUS:** Used only by the factory.
> **Ethernet:** Settings include *IP Address, DNS, Gateway, Subnet Mask, DHCP (OFF/ON), Speed*. The values for these settings will depend on the specific application and should be obtained from a network administrator for the network being used.

Option

Options Test
Turns on Battery Status (Red/Green) and Electrovalve output briefly to test operation.

Rst Memo/Status

Resets and clears all memorizations and status history.

WARNING! ONCE THE MEMORIZATIONS AND STATUS HAVE BEEN CLEARED THEY CANNOT BE RECOVERED!

Parameters

Date/Time
Sets date and time of the charger. The clock has a battery backup which will preserve the time when power to the charger is off.

Daylight Savings
Enable or disable automatic clock adjustment for daylight savings time. When enabled, time will move ahead on hour at 02:00 on the second Sunday in March and will move back one hour at 02:00 on the first Sunday of November. The charger must be powered up at the time of the change for it to take effect.

Language
Selects the language displayed in the menus.

Region
Select the format for date, metric (EU) or imperial (US) units for temperature, length, and cable gauge.

Contrast
Modifies the display contrast level (40 to 49).

Change Password (Password required to view this menu.)
Change the password to any 4 digit code.

Password

This is where the password is entered to gain access to protected menus such as USB and Configuration.

Information

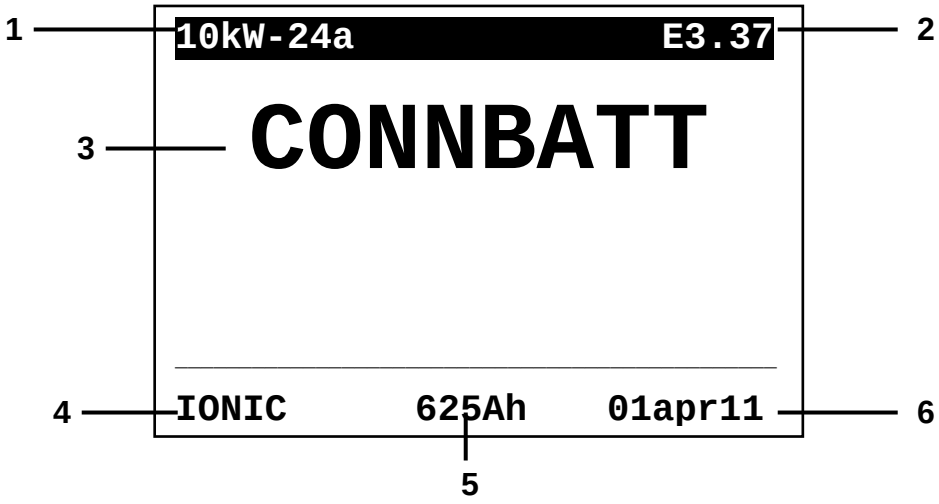
View information about the charger such as firmware version and charger type.

Charging the Battery

At this point, the charger should have been set up by a qualified service person. Charging can only begin with a battery of the proper type, capacity and voltage connected to the charger.

Charger Idle Display

With the charger in wait mode (No battery connected) and without pressing the Stop/Start button, the display will show the following information:



Ref	Description
1	Charger type
2	Firmware version
3	CONNect Battery
4	Selected charge profile
5	Programmed battery parameters (Cap, temp)
6	System time and date

Delayed Start

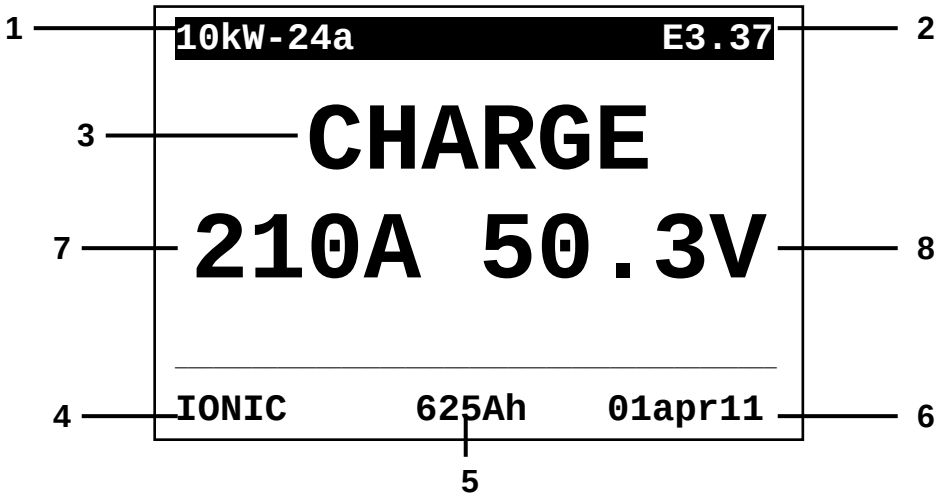
If the charger was programmed for delayed start (Configuration->Charge->Delay), charging will begin following that delay. When the battery is plugged in to the charger, the display shows the time remaining before the programmed charging starts.

Starting a Charge cycle

The charger will start automatically when a battery is connected or push the Stop/Start button if the battery is already connected. Effective charging starts after a 20 second countdown. The charger uses Profile, Capacity, and Temperature settings programmed in the Configuration menu.

Effective charge

A few moments into the effective charge, the display will begin alternating between the following charging information:



Ref	Description
1	Charger type
2	Firmware version
3	Charger status (CHARGE, AVAIL, EQUAL, FAULT)
4	Selected charge profile
5	Programmed battery parameters (Cap, temp)
6	System time and date (if set)
7	Charger output current
8	Alternating battery charge statistics (Batt V, Vpc, Ah returned, time on charge, estimated time remaining, % State of Charge)

End of charge without equalization

The green complete LED comes on after proper end of charge. The green complete LED is on and the display shows AVAIL. The display alternates between:

- Total charging time.
- Amp/hrs restored to the battery.

Any other lit LED indicates a problem during charging. Please refer to paragraph *Control Panel* for more information.

If the battery remains plugged in and refresh charge has been enabled, refreshes will occur to maintain an optimal charge.

The battery is now ready for use. Push the ON/OFF button before unplugging the battery.

End of charge with equalization

An Equalize charge can be started manually or automatically.

Manual Start

1. At the end of charge (green LED on or flashing), press on the <EQUALIZE> button. The equalize button can also be pressed any time during the charge and an equalize charge will be started after charging is complete.

> **NOTE:** When an equalize is manually started, the output current will be set to the value saved in Configuration->Equalize->Manu Current.

2. The start of the equalization charge is indicated by the message **EQUAL**. During the equalization charge, the charger displays the output current and alternating, the battery voltage, voltage per cell, remaining time.

3. The battery will be available when the green LED comes back on and the display shows AVAIL.

4. The battery is now ready for use. If the battery remains plugged in and refresh charge has been enabled, refreshes will occur to maintain an optimal charge. Push the ON/OFF button before unplugging the battery.

Automatic start

If an equalization day has been programmed (Configuration->Equalization->Frequency) the equalization charge will start automatically on the programmed day of the week after charging is complete.

The battery will be available when the green LED comes back on and the display shows AVAIL. The battery is now ready for use. If the battery remains plugged in and refresh charge has been enabled, refreshes will occur to maintain an optimal charge. Push the ON/OFF button before unplugging the battery.

Fault Codes

In case of a fault, one of the corresponding fault codes listed below will appear on the display. If it is a critical fault, charging will stop and the red Fault LED will be illuminated.

Fault	Critical	Cause	Solution
DF1	Yes	Low output current	Check input voltage and fuses. Call for service.
DF2	Yes	Output fault	Check for proper battery connection (reversed polarity). Check output fuse. Call for service
DF3	Yes	Improper battery	Battery voltage too high (>2.3 Vpc) or too low (<1.6 Vpc). Use proper charger for battery.
DF4	No	The battery has been discharged more than 80% of its capacity	Prevent future over discharging of battery. Battery charge gauges and lift interrupts may need calibration.
DF5	No	Battery requires inspection	Non critical fault. Check battery cables for condition and size, check for loose connections, check for defective cells.
DF7	No	Current rise in Phase 2 of the charge cycle	If current rises more than 10A in Phase 2 it will cause the charger to stop. Call for service.
TH	Yes	Charger overheating	Check that fans are working. Verify that ambient temperature is not too high. Inspect to see if charger ventilation is obstructed or impaired.
STOP	Yes	Critical battery electrolyte level	Make sure battery electrolyte is brought up to the proper level.
TEMP	Yes	Battery temperature reached maximum	Allow battery to cool. Check max temperature setting in Configuration->Battery->High Temp
DEF CFG/ DEF EEP/ DEF MENU	Yes	Error in Configuration/ Memory/Charger menu	Call for service.
	No	Low battery electrolyte	Check battery electrolyte level.
	No	Battery balance fault	Check battery cell voltages.
T°	No	High battery temperature	Allow battery to cool. Battery may need service.

MAINTENANCE & SERVICE

CAUTION: THERE ARE DANGEROUS VOLTAGES WITHIN THE BATTERY CHARGER CABINET. ONLY QUALIFIED PERSONNEL SHOULD ATTEMPT TO ADJUST OR SERVICE THIS BATTERY CHARGER

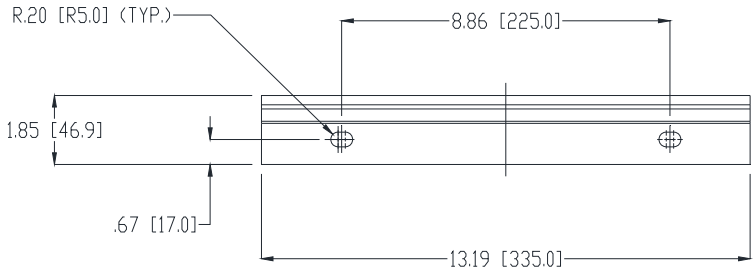
The charger requires a minimum of maintenance. Connections and terminals should be kept clean and tight. The unit (especially the heatsink) should be periodically cleaned with an air hose to prevent any excessive dirt build up on components. Care should be taken not to bump or move any adjustments during cleaning. Make sure that both the AC lines and the battery are disconnected before cleaning. The frequency of this type of maintenance depends on the environment in which this unit is installed.

For service, contact the closest Service Center at:

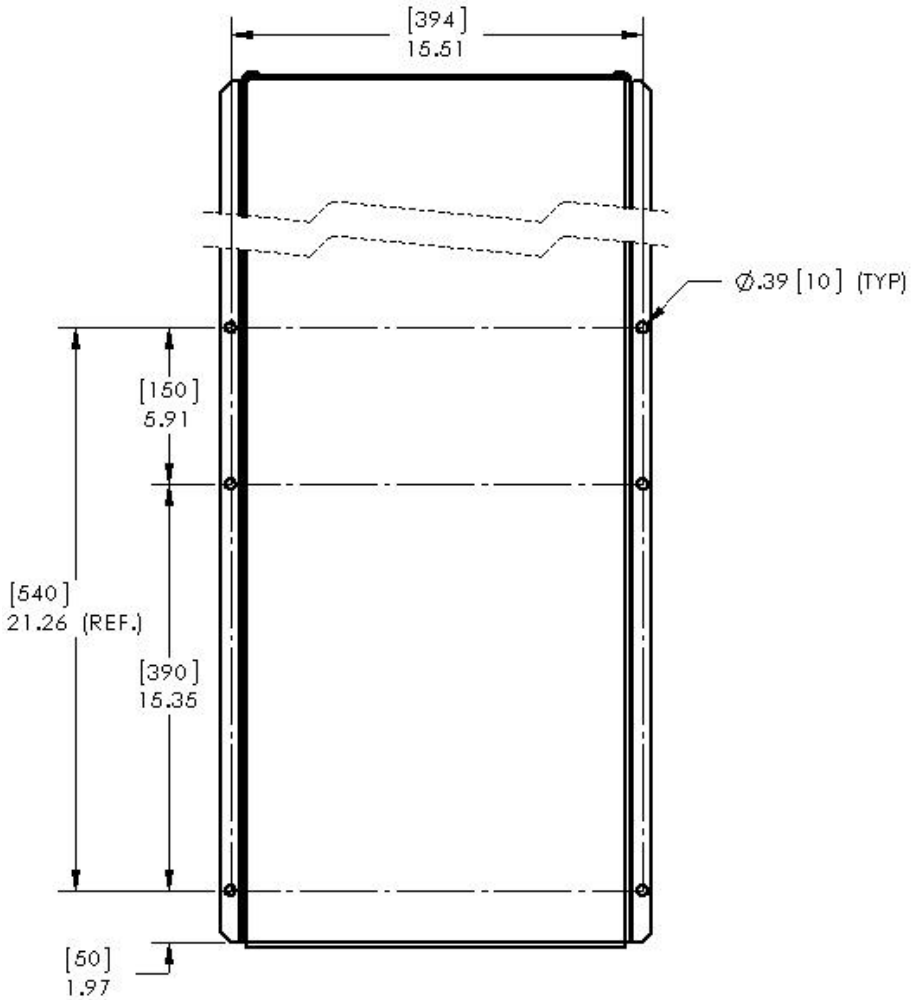
1-800-DOUGLAS (1-800-368-4527)

Or, visit us at: http://www.douglasbattery.com/

WALL MOUNTING DIMENSIONS

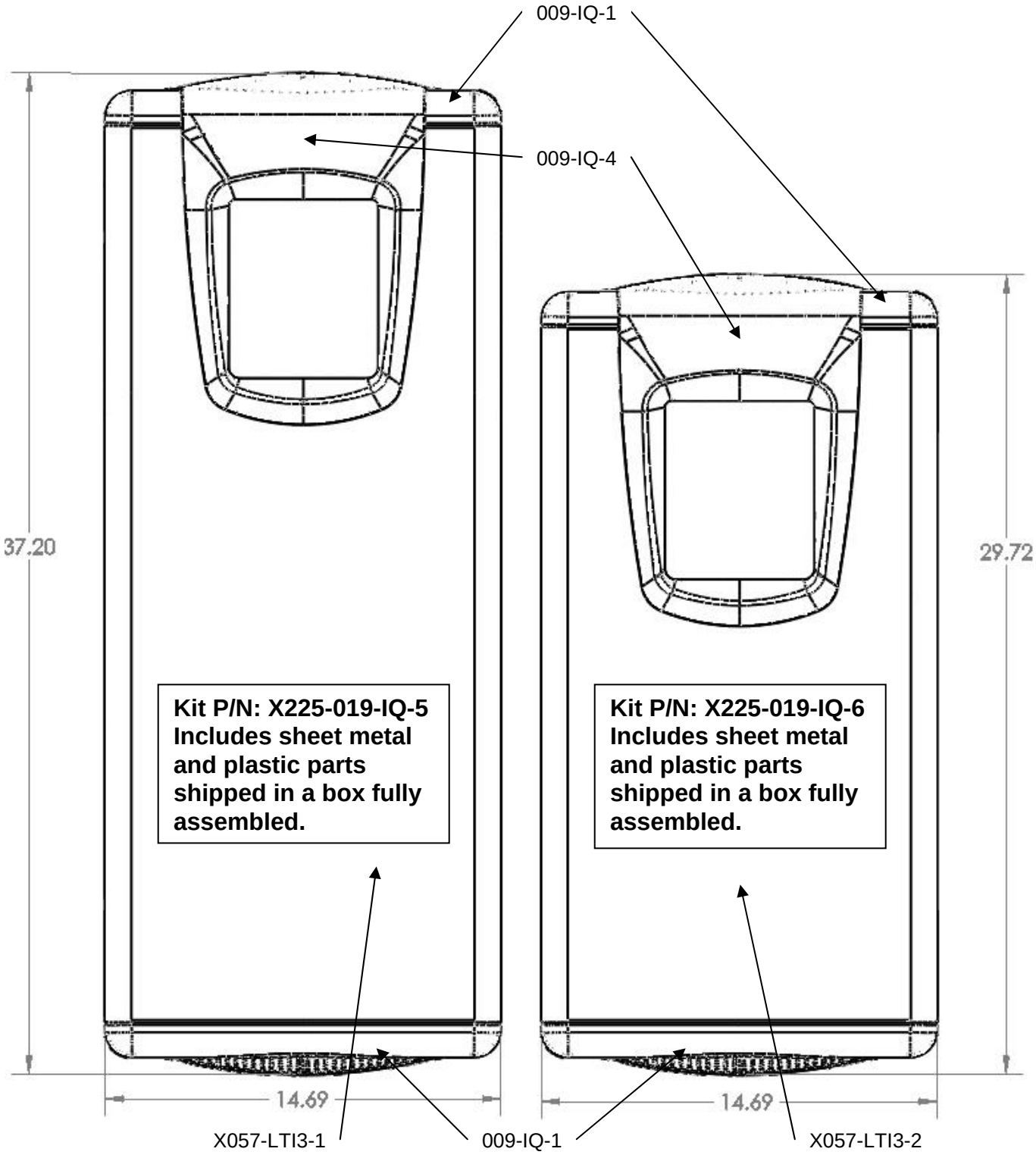


WALL SUPPORT BRACKET (P/N: 159-6LA20319),
SLOT CENTERS,
3/8" HARDWARE IS RECOMMENDED



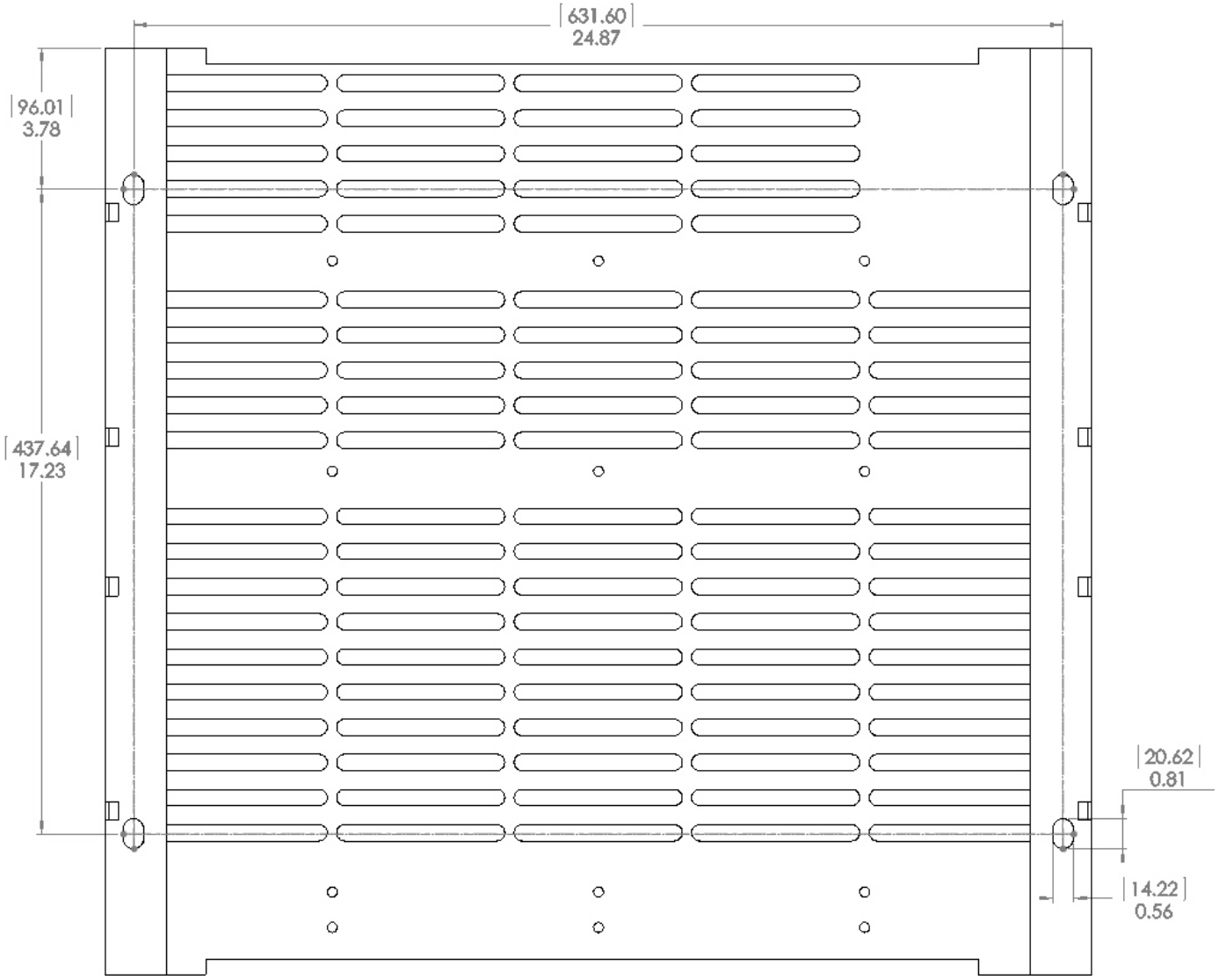
DIMENSIONS SHOWN IN THE DRAWING TO THE LEFT ARE FOR WALL MOUNTING THE CHARGER AND ARE ACCURATE FOR BOTH THE LARGE AND SMALL WALL MODELS AS LONG AS THE MEASUREMENTS ARE TAKEN FROM THE BOTTOM OF THE CABINET'S BASE

EXTERIOR WALL CABINET DIMENSIONS AND PARTS



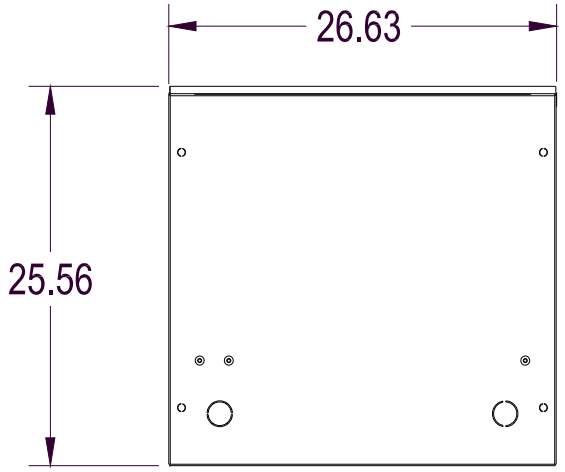
FLOOR MOUNTING DIMENSIONS

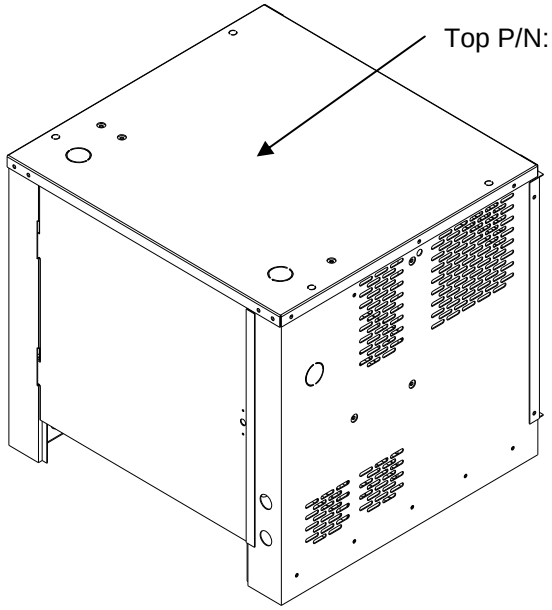
FRONT

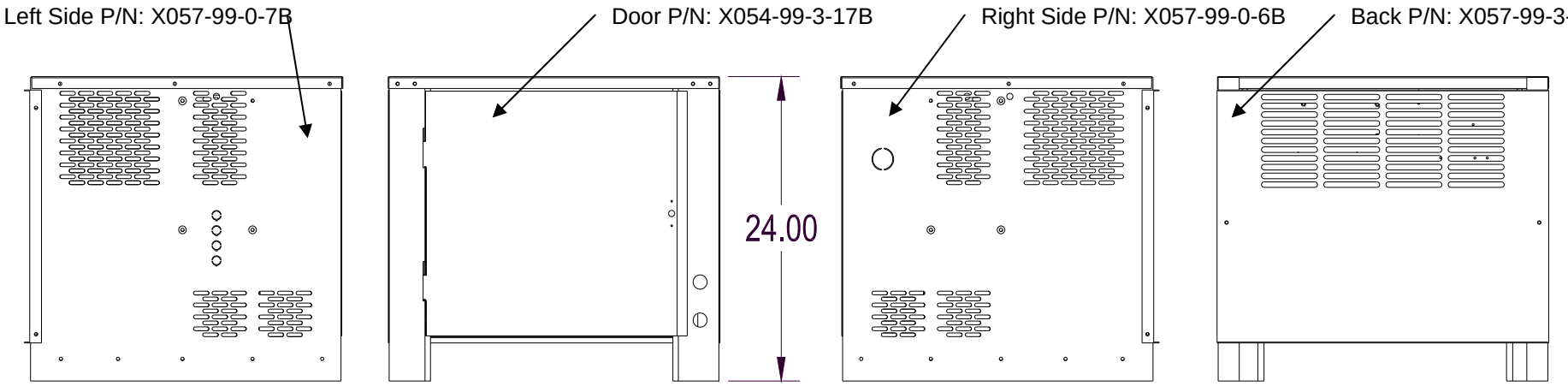


BACK

EXTERIOR FLOOR CABINET DIMENSIONS AND PARTS







TECHNICAL SPECIFICATIONS

KW - Output Voltage Codes	AC Input			DC Output		Max 8 hour Capacity (Ah)	Charger Cable AWG
	Voltage	Max Amps	Phase	Cells	Max Current (A)		
4-1T	208	12.4	3	12/18/24	85/80/70	530/500/400	#2
4-1W	240	11.4	3	12/18/24	85/80/70	530/500/400	#2
4-1Y	480	5.7	3	12/18/24	85/80/70	530/500/400	#2
4-1C	600	4.3	3	12/18/24	85/80/70	530/500/400	#2
4-3T	208	12.6	3	6/12/18	100/100/95	625/625/595	#2
4-3W	240	11.0	3	6/12/18	100/100/95	625/625/595	#2
4-3Y	480	5.5	3	6/12/18	100/100/95	625/625/595	#2
4-3C	600	4.4	3	6/12/18	100/100/95	625/625/595	#2
6-1T	208	18.5	3	12/18/24	110/110/105	690/690/655	1/0
6-1W	240	17.0	3	12/18/24	110/110/105	690/690/655	1/0
6-1Y	480	8.5	3	12/18/24	110/110/105	690/690/655	1/0
6-1C	600	6.4	3	12/18/24	110/110/105	690/690/655	1/0
6-3T	208	18.5	3	6/12/18	140/140/140	875/875/875	1/0
6-3W	240	17.0	3	6/12/18	140/140/140	875/875/875	1/0
6-3Y	480	8.5	3	6/12/18	140/140/140	875/875/875	1/0
6-3C	600	6.4	3	6/12/18	140/140/140	875/875/875	1/0
8-1T	208	24.7	3	12/18/24	150/150/140	940/940/875	1/0
8-1W	240	22.8	3	12/18/24	150/150/140	940/940/875	1/0
8-1Y	480	11.4	3	12/18/24	150/150/140	940/940/875	1/0
8-1C	600	8.5	3	12/18/24	150/150/140	940/940/875	1/0
10-1W	240	27.5	3	12/18/24	200/200/180	1250/1250/1125	3/0
10-1Y	480	15.0	3	12/18/24	240/240/180	1500/1500/1125	3/0
10-1C	600	11.0	3	12/18/24	240/240/180	1500/1500/1125	3/0
10-2Y	480	15.0	3	24/36/40	120/115/110	750/720/690	#2
10-2C	600	11.2	3	24/36/40	120/120/110	750/750/685	#2
15-1Y	480	20.5	3	12/18/24	260/260/250	1625/1625/1565	4/0*
15-1C	600	15.3	3	12/18/24	260/260/250	1625/1625/1565	4/0*
15-2Y	480	21.5	3	24/36/40	170/170/160	1065/1065/1000	1/0
15-2C	600	16.3	3	24/36/40	170/170/160	1050/1050/1000	1/0

***LTI3-W wall mount chargers have a maximum cable gauge of 3/0 AWG**

REPLACEMENT PARTS and QUANTITY

Part Number	Description	4-1T	4-1W	4-1Y	4-1C	4-3T	4-3W	4-3Y	4-3C	6-1T	6-1W	6-1Y	6-1C	6-3T	6-3W	6-3Y	6-3C	8-1T	8-1W	8-1Y	8-1C	10-1W	10-1Y	10-2Y	10-1C	10-2C	15-1Y	15-1C	15-2Y	15-2C
X1060-IQ4-1T3	Control Board	1																												
X1060-IQ4-1W3	Control Board		1																											
X1060-IQ4-1Y3	Control Board			1																										
X1060-IQ4-1C3	Control Board				1																									
X1060-IQ4-3T3	Control Board					1																								
X1060-IQ4-3W3	Control Board						1																							
X1060-IQ4-3Y3	Control Board							1																						
X1060-IQ4-3C3	Control Board								1																					
X1060-IQ6-1T3	Control Board									1																				
X1060-IQ6-1W3	Control Board										1																			
X1060-IQ6-1Y3	Control Board											1																		
X1060-IQ6-1C3	Control Board												1																	
X1060-IQ6-3T3	Control Board													1																
X1060-IQ6-3W3	Control Board														1															
X1060-IQ6-3Y3	Control Board															1														
X1060-IQ6-3C3	Control Board																1													
X1060-IQ8-1T3	Control Board																	1												
X1060-IQ8-1W3	Control Board																		1											
X1060-IQ8-1Y3	Control Board																			1										
X1060-IQ8-1C3	Control Board																				1									
X1060-IQ10-1W3	Control Board																					1								
X1060-IQ10-1Y3	Control Board																						1							
X1060-IQ10-2Y3	Control Board																							1						
X1060-IQ10-1C3	Control Board																								1					
X1060-IQ10-2C3	Control Board																									1				
X1060-IQ15-1Y3	Control Board																										1			
X1060-IQ15-1C3	Control Board																											1		
X1060-IQ15-2Y3	Control Board																												1	
X1060-IQ15-2C3	Control Board																													1

REPLACEMENT PARTS and QUANTITY

Part Number	Description	4-1T	4-1W	4-1Y	4-1C	4-3T	4-3W	4-3Y	4-3C	6-1T	6-1W	6-1Y	6-1C	6-3T	6-3W	6-3Y	6-3C	8-1T	8-1W	8-1Y	8-1C	10-1W	10-1Y	10-2Y	10-1C	10-2C	15-1Y	15-1C	15-2Y	15-2C
X026-EQ3-1	Display Board	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
X1060-12-SB208	208V Power Board	1				1				1				1				1												
X1060-6LA11713	240V Power Board		1				1				1				1				1			1								
X1060-6LA11668	480V Power Board			1				1				1				1				1			1	1			1		1	
X1060-6LA11722	600V Power Board				1				1				1				1				1				1	1		1		1
X127-6LA10659	Power Transformer	1				1				1				1																
X127-6L10655	Power Transformer		1								1																			
X127-6LA10678	Power Transformer			1	1							1	1																	
X127-6L10643	Power Transformer																							1						
X127-6L10644	Power Transformer																			1			1				1			
X127-6L10648	Power Transformer						1								1															
X127-6L10649	Power Transformer							1	1							1	1													
X127-6LA15252	Power Transformer																									1			1	1
X127-6LA15262	Power Transformer																	1	1		1	1			1			1		
X014-99-8	8A AC Fuse				3				3																					
X014-99-10	10A AC Fuse			3				3					3				3													
X014-99-12	12A AC Fuse																				3									
X014-99-15	15A AC Fuse											3				3														
X014-99-20	20A AC Fuse	3	3			3	3													3					3	3				
X014-99-25	25A AC Fuse																						3	3				3		3
X014-99-30	30A AC Fuse									3	3			3	3															
X014-99-35	35A AC Fuse																										3		3	
X014-99-40	40A AC Fuse																		3											
X014-99-50	50A AC Fuse																	3				3								
X014-33-3	160A DC Fuse	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1							1		1				
X014-6L10466	315A DC Fuse																	1	1	1	1	1	1		1		1	1	1	1
X117-150-50	150A Shunt	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1													
X117-6L10326	250A Shunt																	1	1	1	1	1	1	1		1			1	1
X117-6LA18620	300A Shunt																								1		1	1		

REPLACEMENT PARTS and QUANTITY

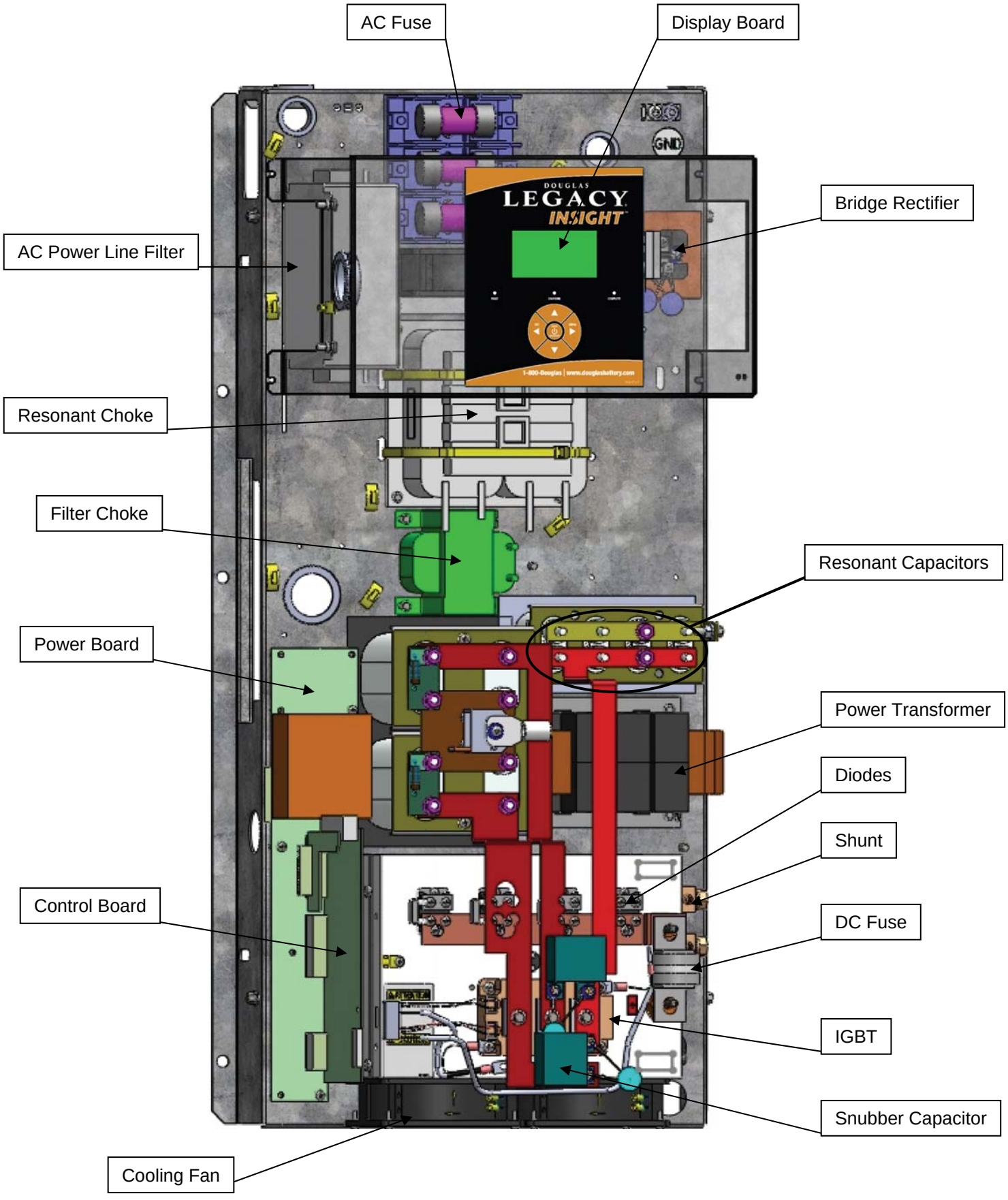
Part Number	Description	4-1T	4-1W	4-1Y	4-1C	4-3T	4-3W	4-3Y	4-3C	6-1T	6-1W	6-1Y	6-1C	6-3T	6-3W	6-3Y	6-3C	8-1T	8-1W	8-1Y	8-1C	10-1W	10-1Y	10-2Y	10-1C	10-2C	15-1Y	15-1C	15-2Y	15-2C
R507-6LA14008	Output Diode	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	4		4	4		4		4	4		
R507-6L14028	Output Diode																				4			4		4			4	4
R507-6L14022	Bridge Rectifier	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
X020-6L18616	Line Choke	1				1				1				1				1	1	1	1	1	1	1	1	1	1	1	1	1
X020-6L10310	Line Choke		1	1	1		1	1	1		1	1	1		1	1	1													
X020-6LA10334	Resonant Choke	1								1									1	1			1	1					1	
X020-6LA10323	Resonant Choke		1	1			1	1			1	1			1	1														
X020-6LA18621	Resonant Choke					1								1				1				1					1			
X020-6L10353	Resonant Choke				2				2				2				2				2									
X020-6LA18614	Resonant Choke																								2			2		
X020-10-1	Resonant Choke																													1
X020-10-2	Resonant Choke																									1				
X225-IQ-200-600	IGBT Kit	1	1			1	1			1	1			1	1			1	1			1								
X225-IQ-6L19610	IGBT Kit			1				1				1				1				1			1	1					1	
X225-IQ-200-1700	IGBT Kit				1				1				1				1				1				1	1		1		1
X225-IQ-6LA19617	IGBT Kit																										1			
029-101	Snubber Capacitor (QTY)																		2	2	2		2	2	4	4	2	4		4
029-6LA13170	Snubber Capacitor (QTY)		2		2		2		2		2		2		2		2													
029-6LA13182	Snubber Capacitor (QTY)			2				2				2				2														
029-6LA13183	Snubber Capacitor (QTY)	2				2				2				2				2				2							2	
X020-6LA18624	Output Choke																							1		1			1	1
029-6LA13000	Res. Capacitor 1 (QTY)		1	2	1		2	2	2		1	2	1		2	2	2				1						2	3		
029-6LA13001	Res. Capacitor 1 (QTY)	2				2				2				2				4	3	3		4	3	3	3	1			2	
029-6L13099	Res. Capacitor 1 (QTY)																													3
029-6LA13000	Res. Capacitor 2 (QTY)	1				2				1				2																1
029-6LA13001	Res. Capacitor 2 (QTY)		1								1																2			
029-6L13099	Res. Capacitor 2 (QTY)				1								1								1					1			1	
029-6L13104	10uF Capacitor (QTY)	4	2	2	2	4	2	2	2	4	2	2	2	4	2	2	2	4	4	4	4	4	4	4	4	4	4	4	4	4

REPLACEMENT PARTS and QUANTITY

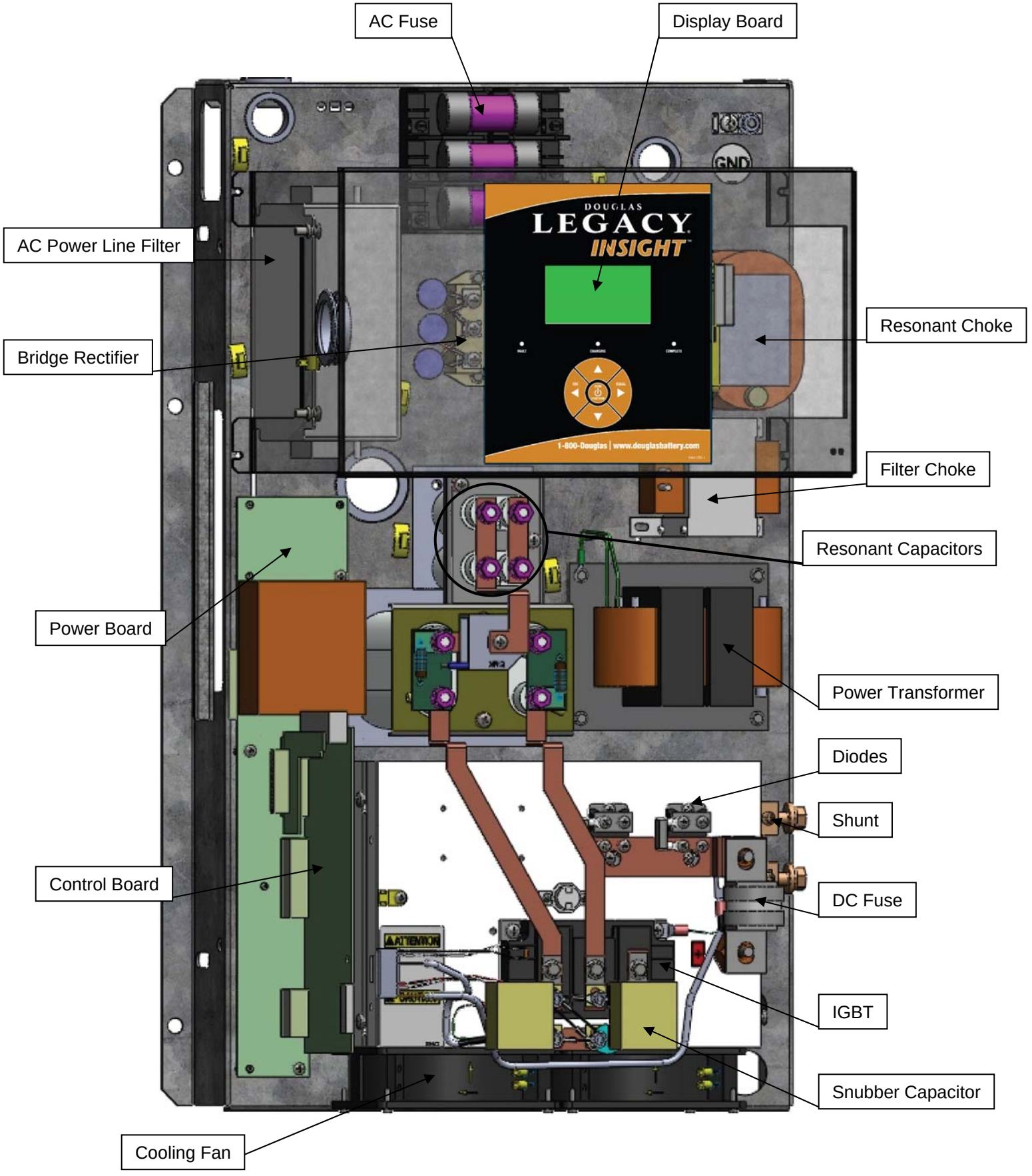
Part Number	Description	4-1T	4-1W	4-1Y	4-1C	4-3T	4-3W	4-3Y	4-3C	6-1T	6-1W	6-1Y	6-1C	6-3T	6-3W	6-3Y	6-3C	8-1T	8-1W	8-1Y	8-1C	10-1W	10-1Y	10-2Y	10-1C	10-2C	15-1Y	15-1C	15-2Y	15-2C
X020-6L-3	AC Power Line Filter	1	1	1		1	1	1		1	1	1		1	1	1		1	1	1		1	1	1			1		1	
X020-6L-4	AC Power Line Filter				1				1				1				1				1				1	1		1		1
126-EQ3-1	Display Ribbon Cable	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
X026-60-1	Control BD Ret. Clip	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
X1106-99-PT23	Current Sensor	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
438-326-2	Cooling Fan	3	2	2	2	3	2	2	2	3	2	2	2	3	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3
X225-019-IQ-5	8kW to 15kW Cover	1				1				1				1				1	1	1	1	1	1	1	1	1	1	1	1	1
X225-019-IQ-6	4kW to 6kW Cover		1	1	1		1	1	1		1	1	1		1	1	1													
X002-6L10721	85 Degree Thermostat	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
X015-50-2	30A Fuse Holder	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			1	1		1	1	1	1		1		1
X015-50-4	60A Fuse Holder																	1	1			1					1		1	
X1106-99-3-7	Shunt MOV Assembly	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
X1106-99-3-8	IGBT MOV Assembly	2	2	2		2	2	2		2	2	2		2	2	2		2	2	2		2	2	2			2		2	
X1106-6LA02840	IGBT MOV Assembly				2				2				2				2				2				2	2		2		2
X1106-99-3-9	Bridge MOV Assembly	1	1	1		1	1	1		1	1	1		1	1	1		1	1	1		1	1	1			1		1	
X1106-6LA02608	Bridge MOV Assembly				1				1				1				1				1				1	1		1		1
006-201-11A	Insulated Standoff	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	2	3	3	3
033-406-30	M6x30mm Socket Set Screw for Insulated	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	2	3	3	3
X1060-06-HFR-1	Bleeder Resistor Board	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
X1106-99-3-13	Output Diode Suppressor	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	4	4	4	4	4	4	4	4	4	4	4
X002-LTI3-1	LTI3-W Wall Keypad	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
X002-LTI3-2	LTI3-F Floor Keypad	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
X039-IQ-11C	USB Port Assembly	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
126-IQ-11	USB Patch Cable	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
X225-12-RC-3	Remote Control*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

*Remote control can only be used on remote control ready chargers. Retrofit kit P/N: **X225-RCK-7** is used for chargers not factory equipped with the remote control ready option.

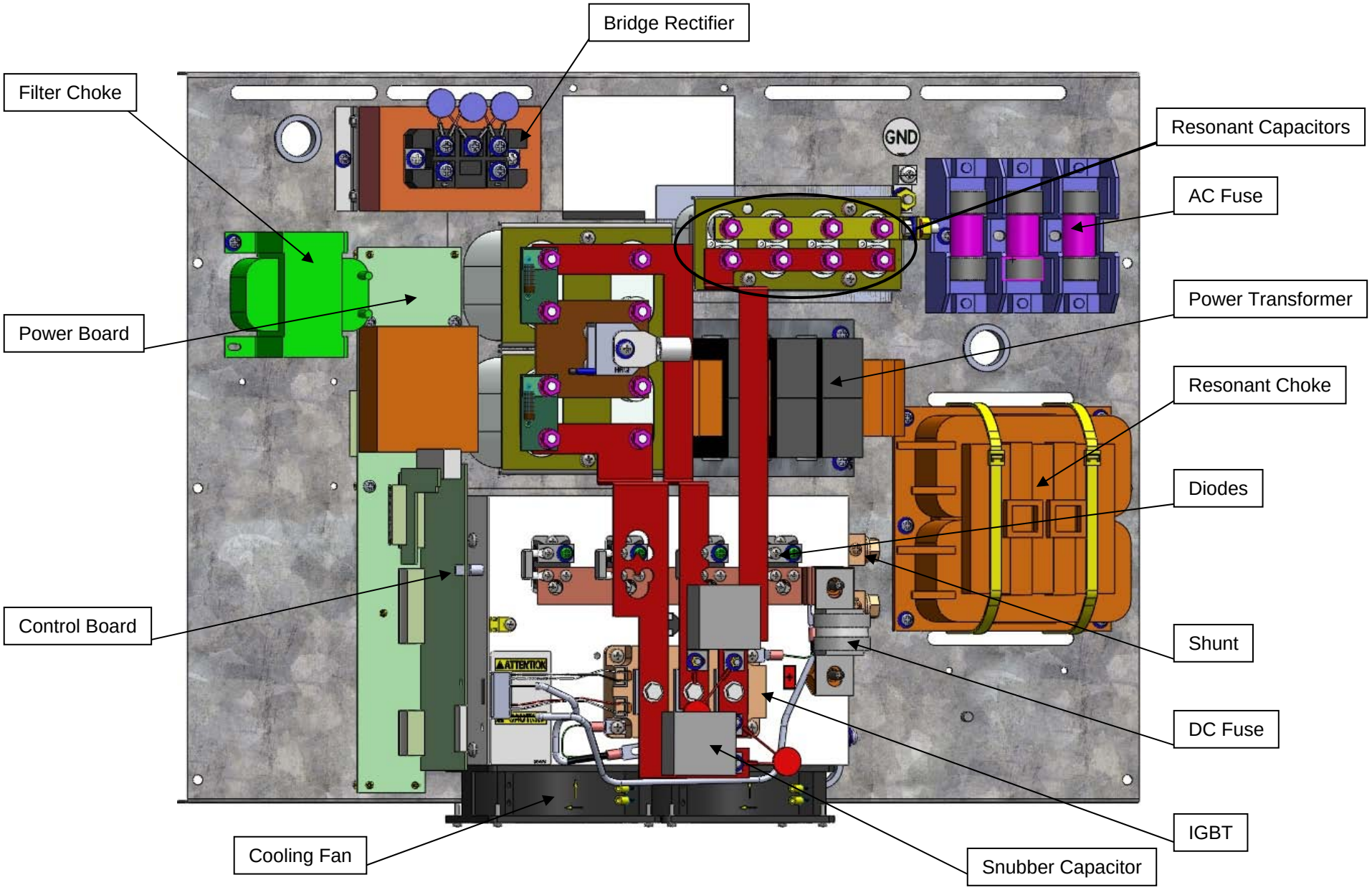
LARGE WALL CHARGER COMPONENT LOCATIONS



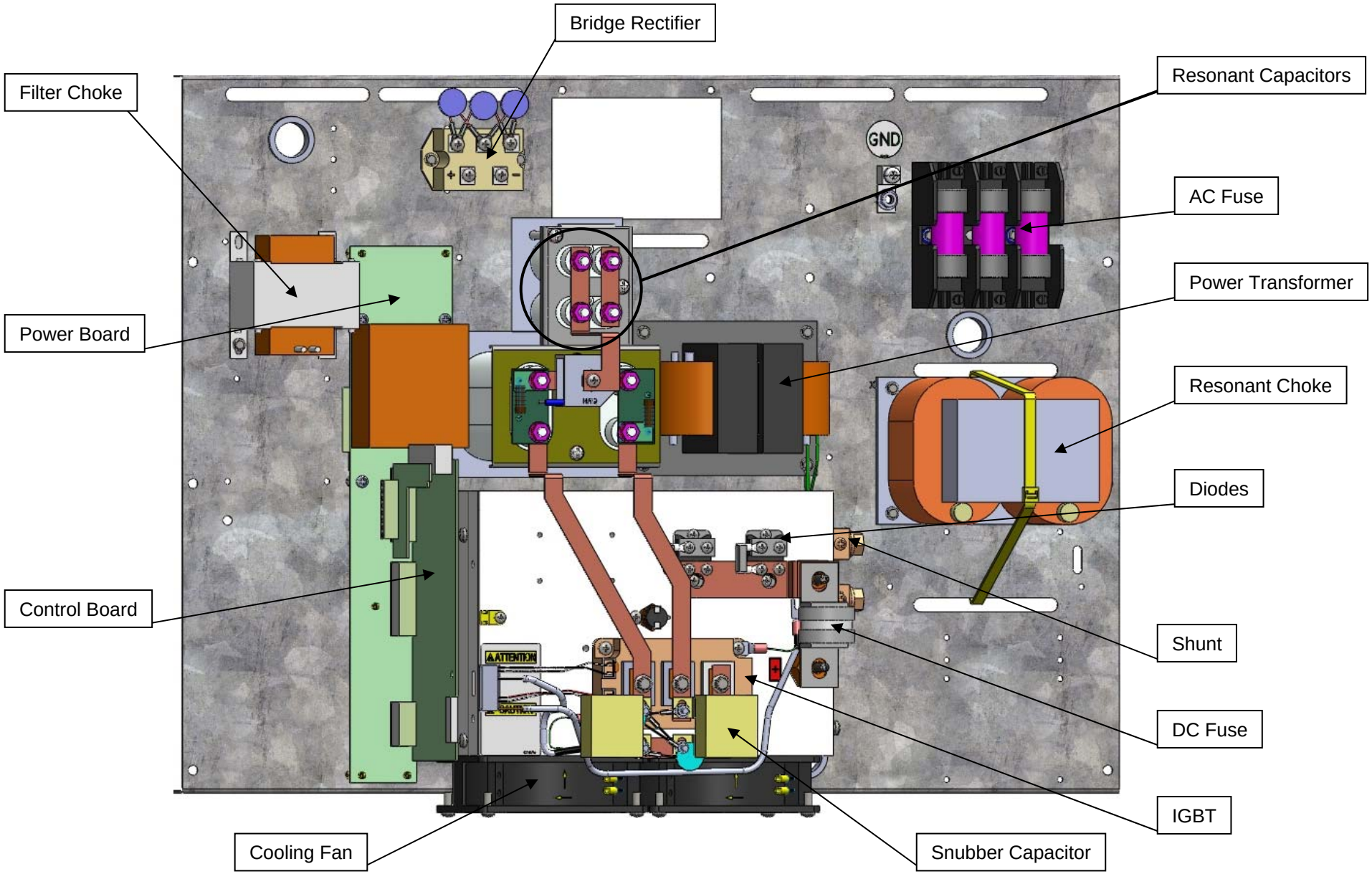
SMALL WALL CHARGER COMPONENT LOCATIONS



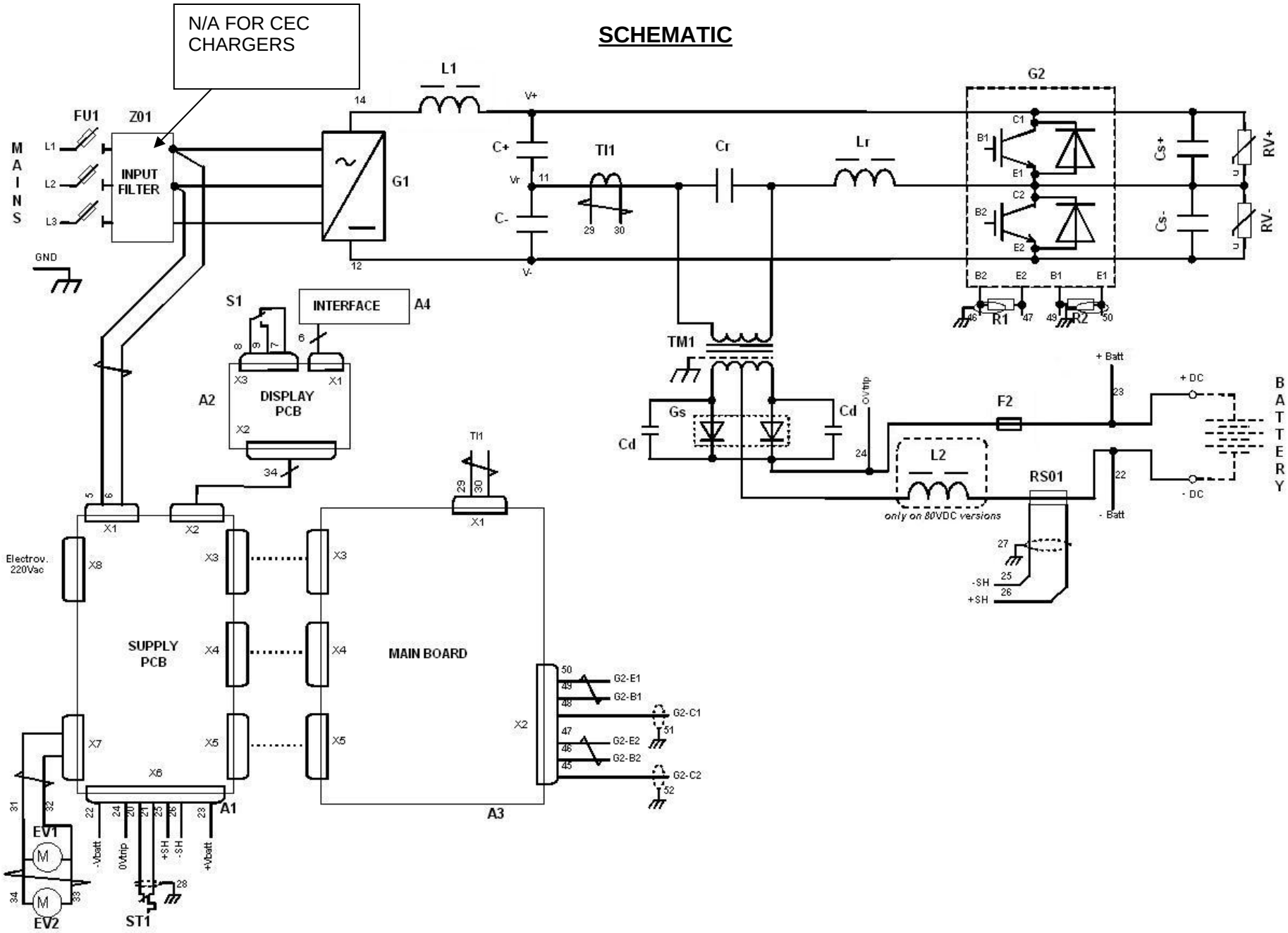
FLOOR CHARGER LARGE CONFIGURATION COMPONENT LOCATIONS



FLOOR CHARGER SMALL CONFIGURATION COMPONENT LOCATIONS



SCHEMATIC


N/A FOR CEC CHARGERS
MAINS
L1
L2
L3
GND
FU1
Z01
INPUT FILTER
G1
L1
14
12
V+
V-
C+
Vr
C-
11
TI1
29
30
Cr
Lr
G2
C1
B1
E1
C2
B2
E2
Cs+
Cs-
RV+
RV-
B2
E2
B1
E1
46
R1
47
49
R2
50
S1
INTERFACE
A4
8
9
7
6
X3
X1
A2
DISPLAY PCB
X2
34
TM1
Gs
Cd
Cd
OV trip
24
F2
+ Batt
23
+ DC
BATTERY
- DC
- Batt
22
L2
only on 80VDC versions
RS01
27
-SH
25
+SH
26
5
6
X1
X2
TI1
29
30
X1
Electrov. 220Vac
X8
X3
X3
SUPPLY PCB
X4
X4
MAIN BOARD
X7
X5
X5
X6
A1
A3
X2
50
49
G2-E1
48
G2-B1
G2-C1
51
47
46
G2-E2
G2-B2
45
G2-C2
52
31
32
EV1
M
34
33
M
EV2
22
24
20
21
28
23
-Vbatt
0Vtrip
+SH
-SH
+Vbatt
ST1
28

MAINTENANCE LOG

1. Modifications to Factory Settings

Date	Variable	Change	Service Technician

2. Service

Date	Description	Service Technician

DOUGLAS BATTERY

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