

**CM Series &
70 Series Battery Power Systems**

FILTERED BATTERY CHARGER

**OPERATION & MAINTENANCE
GUIDE**

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IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This manual contains important safety and operating instructions for Stored Energy Systems (SENS) model CM and Battery Power Systems type 70.

Before using the battery charger, read all instructions and cautionary markings on the battery charger, battery and equipment connected to the battery system.

Before You Begin

Particular attention should be paid to three types of notices throughout this guide. These are as follows:

WARNING: is used to warn of possible personal or property injury

CAUTION: is used to warn of possible equipment damage

NOTE: is used in this manual to provide advice on how to obtain maximum performance, reliability or life from components of your system.

WARNING: Please read these safety warnings and heed them. Failure to do so could result in either severe personal injury or equipment damage.

To reduce the risk of injury, charge only properly sized lead-acid batteries. Other types of batteries or under-sized batteries may burst causing personal injury and damage.

- Do not install or operate charger if it has been dropped or otherwise damaged. Return it to the factory for repair.
- Install the charger in accordance with all local codes.
- Do not expose charger to rain or snow.
- Do not disassemble charger; return to factory when service or repair is required. Incorrect assembly may result in a risk of electric shock or fire.
- To reduce risk of electric shock, de-energize and disconnect the AC input and the battery from the charger before attempting maintenance or cleaning.
- Use of an accessory not recommended or sold by SENS may result in a risk of fire, electric shock or personal injury.
- During normal operation, batteries may produce explosive hydrogen gas. *Never smoke, use an open flame, or create sparks near the battery or charger.*
- Remove jewelry, watches, rings, etc. before installing battery or charger.

Maintenance Instructions

User maintenance is limited to charger adjustment. All on-site servicing should be performed by qualified service personnel. If qualified personnel are not available, return the charger to the factory for repair, or contact the factory to arrange for field service.

When returning a unit to the factory for repair, ship it in the original factory packaging if possible. If the original carton is not available, pack in a carton with at least 2 inches of approved packaging material on all sides of the charger to help prevent shipping damage.

1 Installer's Instructions

CAUTION: Failure to follow installation instructions may cause equipment damage, and void the equipment warranty. Read the installation instructions before proceeding.

2 Installation

2.1 Mounting

Mount the charger in a 19" relay rack. Refer to the appended drawings for dimensions. Protect the unit from construction grit, metal chips, paint or other debris. Clean away debris after installation and before turning on the charger.

BATTERY POWER SYSTEM INSTALLATION

If your charger was supplied with a battery pack, install the battery pack in the rack before installing the charger. Remove the top of the battery pack, install the batteries according to the diagram inside the battery pack, and replace the battery pack top cover. Next install the charger and connect the charger and battery pack together with the keyed cable supplied with the charger.

2.2 AC Input Power Requirement and Connection

The charger will operate from either 115 or 230 volt AC mains supply, 50 or 60 Hz. **Before** applying power to the charger, select the input voltage using the switch on the charger's rear panel. The frequency does not need to be selected. An input cord with standard grounded NEMA 5-15P molded plug is included. For use with different AC sockets, cut off the standard plug and attach the correct plug.

WARNING: The battery charger should be connected to a grounded permanent wiring system. The input cord is equipped with a ground wire for this purpose

2.4 Output Power Connections

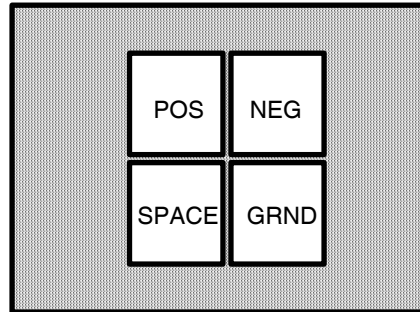
Chargers come with one of the two output schemes shown below.

Model suffix	Bulk output	Distribution/disconnect panel
-A410	Yes - keyed connector	None
-A4A0	Yes - keyed connector	Yes - 6-circuit

2.4a Bulk power connections

The bulk output required a special keyed connector supplied by SENS. The layout of the keyed connector on the charger, as viewed from the back, is shown below:

FIGURE 2.4a
Charger Output Connections



The connector and wire colors are as follows:

Bulk power output	Connector color	Battery or output cable wires
Negative	Black	Black
Positive	Red	White
Ground	Green	Green
Spacer	Red	n/a

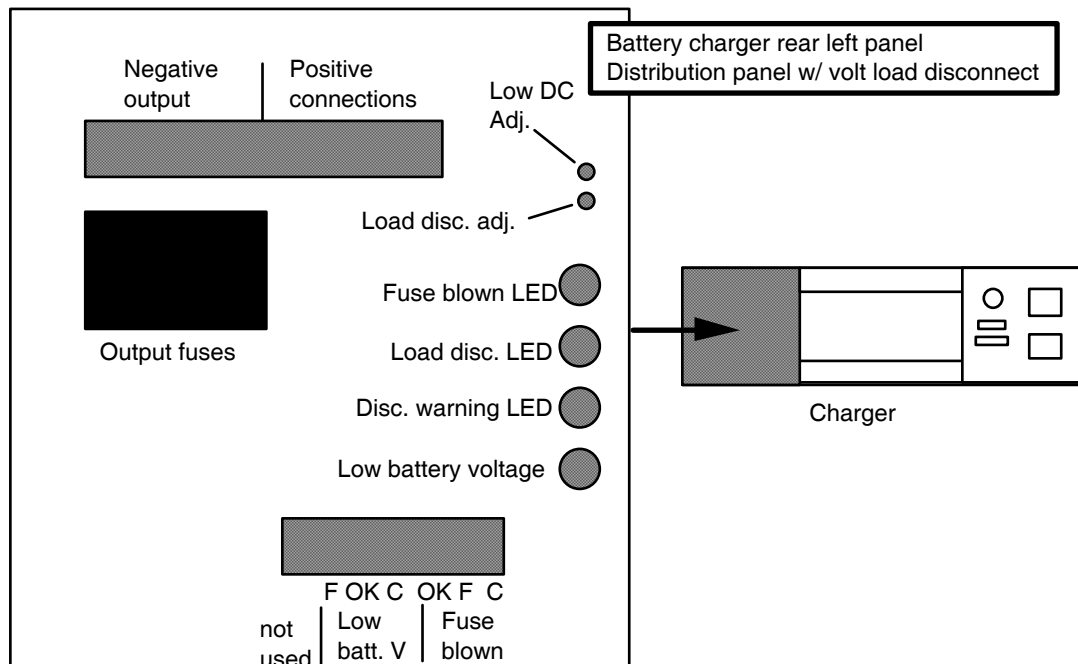
2.4b Distribution Panel Connections

This charger is equipped with an integral distribution panel. The rear panel includes six independently-fused output terminals (positive ground). Connect your load lead(s) directly to the appropriate compression terminals (see Figure 2.4). Connect all hot leads to the negative block; all return leads to the positive block. Use 12-gauge or 14-gauge wire.

Distribution panel fuses are the GMT type. The maximum output loading is as follows:

- 5 amps any one fuse
- 25 amps total all fuses

FIGURE 2.4b
Distribution Panel - Model A4A0

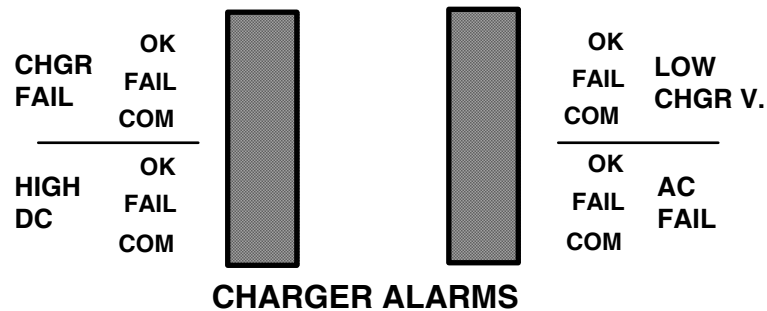


2.5 Charger alarm connections

Attach to the charger's Form C (dry contact) alarm connections located on the charger's rear panel, as shown in Figure 2.5. Use the following procedure:

1. Unplug the two plug-in alarm blocks. If no blocks are present, check the packaging material; the blocks may have been pulled out when the unit was unpacked.
2. Connect your alarm leads to the appropriate terminals in the lug block. Use 18-gauge wire.
3. Re-insert the plug-in alarm block into the distribution panel.

Figure 2.5
Charger Rear Panel Form C Alarm Configuration



NOTE: Do not exceed any relay's maximum current rating which is as follows:

- 0.25 A at 125 VAC
- 0.5 A at 54 VDC
- 1.0 A at 28 VDC

3 Operation

3.1 Start-up

After power is applied to the charger, the AC FAIL and CHARGE FAIL lights should extinguish, and be replaced by the green AC ON light. The charger will automatically supply power to the load and maintain the battery without further attention from the user.

If the charger does not start up as described, check the following:

- a) AC mains power is available, and the AC input fuse has not blown
- b) Contractor-installed AC connections are correct
- c) If the above steps do not solve the problem, contact SENS at the toll-free number listed on the front of this manual.

3.2 Alarm Indications

The charger contains a multi-alarm system with front panel status indicators and Form C contacts. The meaning of each indication is as follows:

AC POWER ON

Indicates that AC power is being supplied to the charger.

AC FAIL

Indicates that AC power is not available to the charger. The AC either failed, or the charger's input fuse is not installed, or has blown.

CHARGE FAIL

The charger senses voltage rather than current to detect "failure"; once battery voltage drops approximately 1 volt below nominal the alarm activates. This may occur when:

- The battery becomes discharged
- The AC power has failed
- There is an excessive load on the charger, causing the charger to operate in current limit
- The charger has failed

There is a time delay of approximately one minute between the start of the alarm condition and the actual alarm signal. This prevents spurious indications during short-term deep battery discharge.

LOW DC VOLTS

Indicates that DC voltage has dropped to approximately 8.5% below nominal battery voltage (e.g. 44 volts for a 48 volt system). Probable causes:

- a) The AC power has failed, and the battery has become discharged
- b) The charger has malfunctioned and the battery has become discharged
- c) The battery is defective

There is a time delay in the low voltage alarm which prevents the alarm from activating until approximately one minute after the low voltage condition starts.

HIGH DC VOLTS

Indicates that the charger's output has exceeded a pre-set threshold level (approximately 20% above nominal battery voltage - e.g. 58 volts for a 48 volt system). If this alarm stays activated for any period of time, the charger should be shut down and serviced. The charger may have malfunctioned, or the alarm card may be misadjusted. The alarm activates immediately upon high voltage condition, but stays activated for approximately one minute after the condition disappears.

4 Adjustments

Customer service of the charger is recommended only if the technician is experienced in electrical and electronic equipment. If a trained technician is not available, return the charger to the factory for adjustment, or contact SENS to make field service arrangements.

NOTE: Changing the factory settings on any potentiometers in the charger will VOID the warranty unless written authorization is received from SENS.

4.1 Output Voltage Adjustment

WARNING: Working inside the charger exposes you to potentially lethal voltages. Exercise extreme caution to not touch circuit breakers, filter capacitors, heat sinks or any other exposed metal surfaces

Conditions under which you should make adjustments to the output voltage are as follows:

- a) To correct a previous unauthorized adjustment
 - b) If your battery is consistently being over-charged or under-charged
1. Use a precision external voltmeter connected directly across the battery terminals or to the DC plug that supplies the battery. Ensure that the charger is supplying at least one amp load.
 2. Open the charger's front panel and locate the control card. It contains two potentiometers labelled "FLOAT" and "BOOST".
 3. Remove the paper dot from the FLOAT pot. Adjust the FLOAT pot until the desired voltage is achieved. Replace the paper dot. Adjusting the BOOST pot does nothing.

4.2 Factory-Set Output Voltages

Chargers set for sealed maintenance-free lead-acid battery

	12 volt	24 volt	48 volt
Float voltage	13.56	27.12	54.24

5 Trouble- shooting Guide

SENS's policy is to help field technicians correct problems as fast and inexpensively as possible. Please do not hesitate to call SENS; toll-free number to obtain assistance in troubleshooting our chargers. Calling us will save you time and trouble.

Symptom	Possible cause	Test	Repair procedure
No output	AC fuse blown	#1	Replace fuse
	DC fuse blown	#1	Replace fuse
No output	No AC power		Restore AC
	TB-3 disconnected		Reconnect
	Defective control circuit		Call SENS for assistance
	Defective transformer	#2	Call SENS for assistance
AC fuse blows	Wrong input voltage	#3	Connect to correct voltage
	Defective control circuit		Call SENS for assistance

DC fuse blows	Defective control circuit Battery leads reversed		Call SENS for assistance Reconnect DC leads
Overcharging	Improper o/p voltage setting Defective control circuit	#4	Adjust output voltage Call SENS for assistance
Undercharging	Improper o/p voltage setting Defective control circuit	#4	Adjust output voltage Call SENS for assistance

Alarm Indications

Indication	Possible cause	Test	Repair procedure
AC fail	AC fuse blown No AC power Defective alarm circuit	#1	Replace AC fuse Restore AC Call SENS for assistance
Charge fail	AC fuse blown DC fuse blown No AC power Excessive load Battery voltage low Defective alarm circuit	#1 #1 #5	Replace AC fuse Replace DC fuse Restore AC Reduce load Dead battery Call SENS for assistance
High DC	Improper boost/float settings Defective control circuit Defective alarm circuit	#4	Adjust output voltages Call SENS for assistance Call SENS for assistance
Low DC	AC fuse blown DC fuse blown No AC power Excessive load Defective alarm circuit	#1 #1 #5	Replace AC fuse Replace DC fuse Restore AC Reduce load Call SENS for assistance

**6
Test Procedures**

Test #1: Remove the fuse and measure its resistance using an ohmmeter on the Rx1 range. Meter should read 0 ohms for a good fuse.

Test #2: Energize the charger after disconnecting the secondary leads from the control board and measure the secondary voltage. Do not short circuit the leads while performing this test. The AC voltage should be 1.5 to 2 times the nominal output voltage of the charger. The control winding (TB-3) should be approximately 10-14 volts AC rms. See Figure 6 below for location of leads.

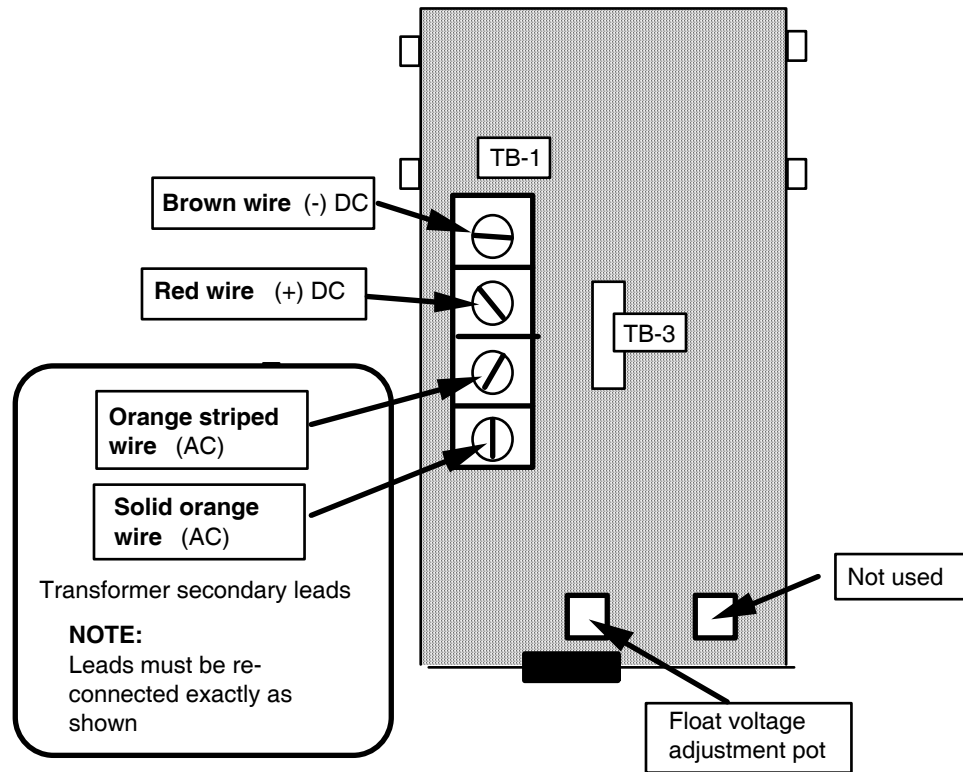
Test #3: Check the information on the nameplate to insure it agrees with the AC voltage applied.

Test #4: Measure the battery voltage using a 1% accuracy voltmeter. If the charger's voltage is not set properly for your batteries, adjust float/boost settings according to the adjustment

procedure.

Test #5: Loads greater than the charger's rating will cause the output current to "fold back" (reduce). This is normal with a dead or deeply discharged battery.

FIGURE 6



7 Printed Circuit Card Assemblies

Model	V	A	Main pwr board	Alarm board	Remote alarm output
CM	48	8	205849K	203340	203962
		12	205850K	203340	203962
		15	205860K	203340	203962
	24	6	205879K	203320	203962
		8	205880K	203320	203962
		12	205852K	203320	203962
		15	205861K	203320	203962
	12	12	205856K	203310	203962

8

Product Description, Features

Stored Energy Systems' CM chargers are fully automatic battery chargers and DC current sources which offer the following features:

- Constant voltage output
- Electronic current limiting
- Filtered output to meet common telecommunications standards
- Battery charger or battery eliminator operation

The chargers are designed for use with telecommunications or other equipment requiring a low ripple DC source. The battery charger automatically recharges and maintains maintenance-free lead-acid batteries.

1.2 Specifications

Input voltage and frequency

115/230 volts $\pm 10\%$; 47-63 Hz

Output voltage

- 48, 24 or 12 volts nominal, single rate charging

NOTE: Output voltage is factory set for maintenance-free batteries unless otherwise specified

- Float voltage adjustable from approximately 90% to 120% of nominal.

Power conditioning

Power conditioning input transformer and varistors; plus single or two-stage inductor system for additional protection

Voltage regulation

Better than 1% from no load to full load with simultaneous variations in input voltage of 10% and frequency of 5%

Current limiting & overload protection

Inherent current limiting at 100% to 110% of rated output

Ripple & noise

30 mV maximum ripple when connected to a battery having capacity in AH four times the ampere output rating of the charger. 50 mV rms maximum (25 mV typical) with battery disconnected

Parallel operation

Chargers can be operated in parallel for redundancy. Chargers may share the load depending on how close the voltage settings are.

Protection

Current limited output; sustains short circuit

Standard AC and DC circuit fuses

Output blocking diode

Indicators

- | | | |
|----------------|----------------------|-----|
| • Front panel: | Charge fail | LED |
| | AC fail | LED |
| | Power on | LED |
| | High battery voltage | LED |
| | Low battery voltage | LED |

- Alarms
 - Charger fail Form C (dry contact) relay
 - AC fail Form C (dry contact) relay
 - High battery voltage Form C (dry contact) relay
 - Low battery voltage Form C (dry contact) relay

Delay circuitry in the low and high battery alarm systems prevents spurious indications

Controls & adjustments

- Float voltage adjustment
- Separate adjustments for low and high charger voltage alarms

Ambient

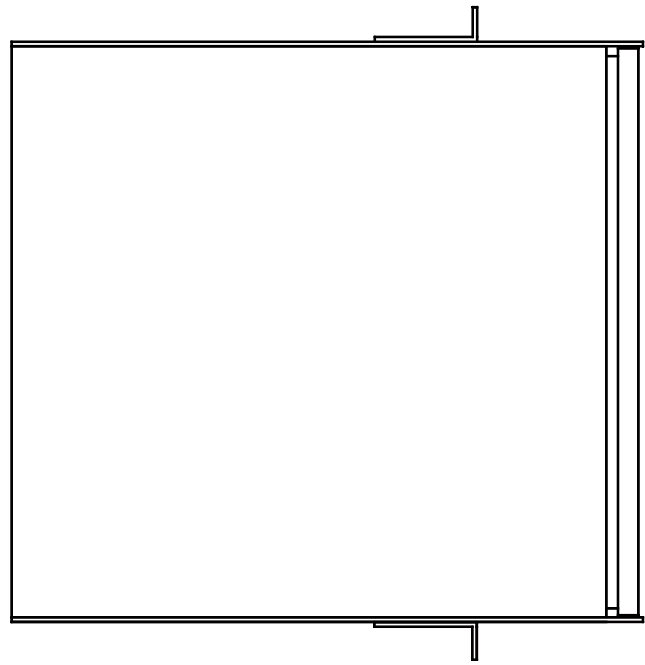
Operates without de-rating from -10C to +50C. Humidity 5% to 95%, non-condensing. Natural convection cooled.

REV.	DATE	DESCRIPTION	BY	APP.
02/19/91	NRG	PHG DESCRIPTION	2-3-98	AM

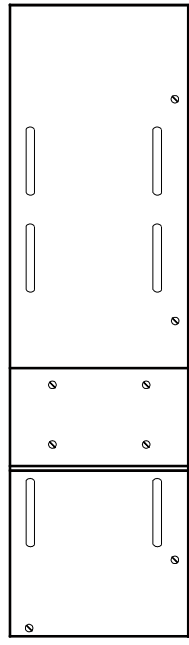
MIN. CLEARANCE
FOR REAR PANEL
CONNECTORS
.50"

19.00"

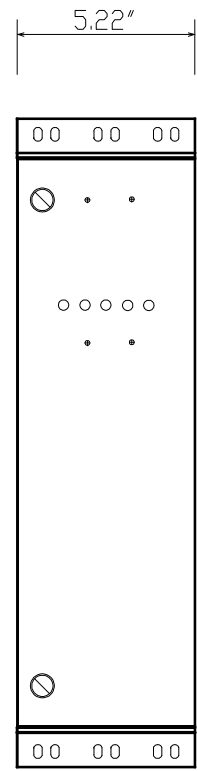
18.50"



TOP VIEW



RIGHT SIDE VIEW

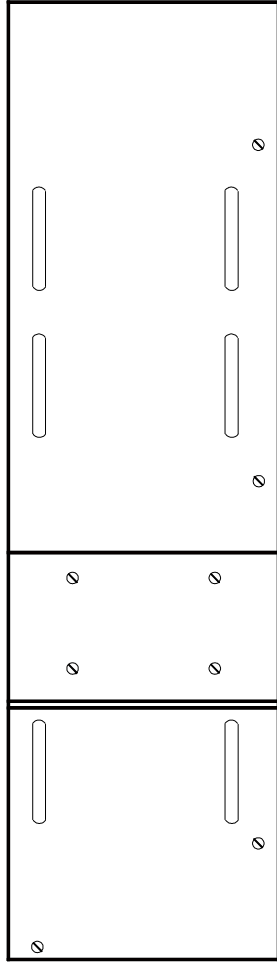
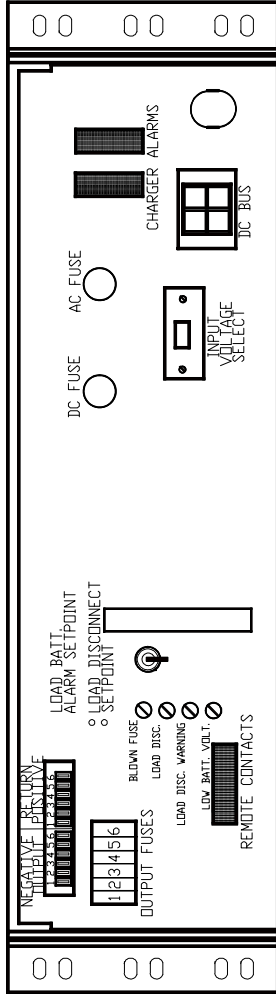


5.22"

FRONT VIEW

Tolerances (unless otherwise specified)		Fract. dec.		Inches	
F	± .015	F	± .015	F	± .015
SENS STORED ENERGY SYSTEMS DESIGN, CO. Project: KAG Description: CM SERIES Part: MIN. PACKING CLEARANCES Code: 7-02-91 Size: N/A Pkg. no.: DIA\00070 ID: N/A DO NOT SCALE DRAWING Page 1 of 1					

rev	description	date	app



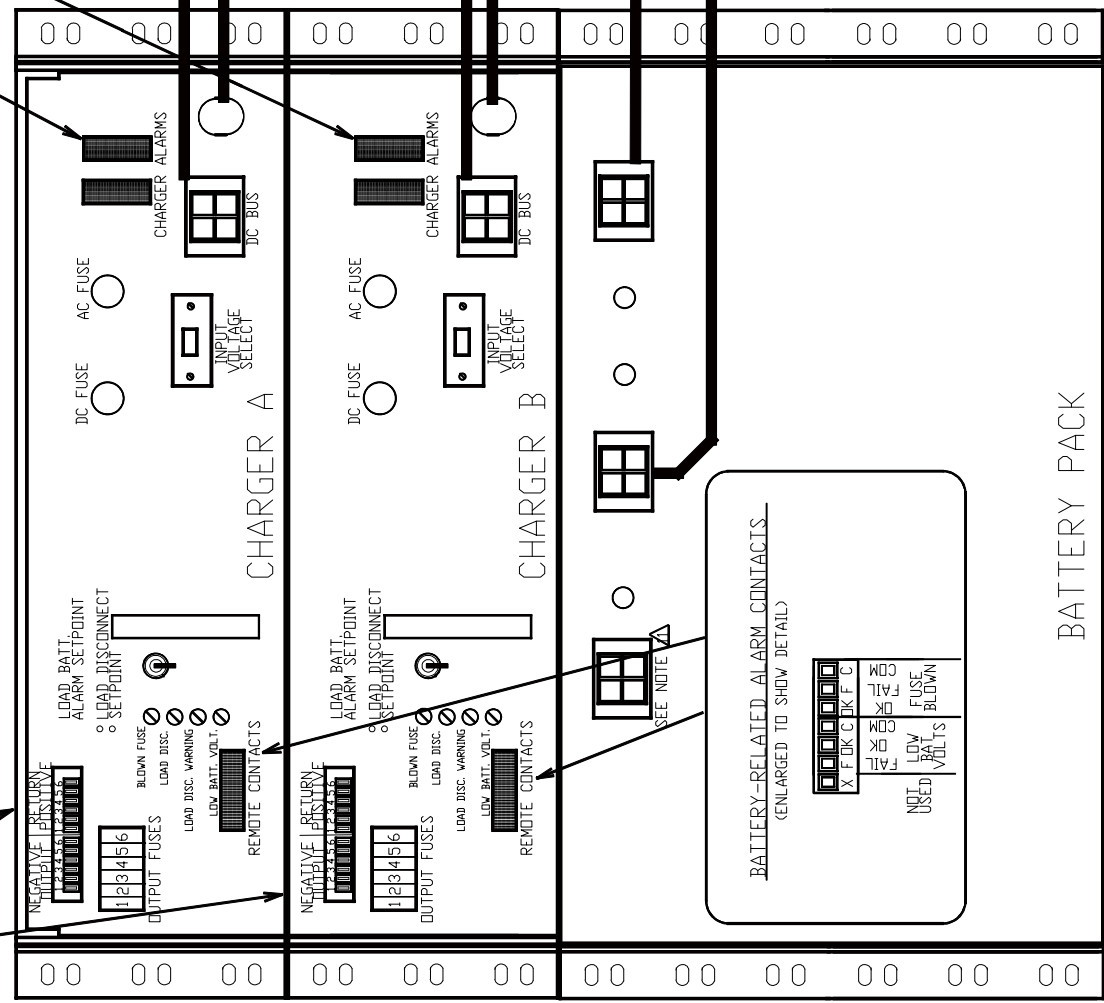
SENS STORED ENERGY SYSTEMS HOLLISTER, CA		description:	CM48-8-A4A0
		code:	CM48-12-A4A0
engineer:	drawn:	checked:	WITH DISTRIBUTION PANEL
date:	size:	brwg. no.:	DIA\00099
1-015	10	N/A	
tolerances (unless otherwise specified)			page: 1 of 1
angles	dec:	DO NOT SCALE DRAWING	

date	rev	description	date	rev
10/4/74	A	Shaw 3rd conn & fuse	2/21/03	RRB

CHARGER-RELATED ALARM CONTACTS
(ENLARGED TO SHOW DETAIL)

OK	1	OK	1	OK
FAIL	2	FAIL	2	CHRG V.
CDM	3	CDM	3	CHRG V.
OK	4	OK	4	CHRG V.
FAIL	5	FAIL	5	AC FAIL
CDM	6	CDM	6	AC FAIL

MAKE LOAD CONNECTIONS HERE.



BATTERY-RELATED ALARM CONTACTS
(ENLARGED TO SHOW DETAIL)

X	OK	OK	OK	OK
F	OK	OK	OK	OK
C	OK	OK	OK	OK
D	OK	OK	OK	OK
E	OK	OK	OK	OK
F	OK	OK	OK	OK
G	OK	OK	OK	OK
H	OK	OK	OK	OK
I	OK	OK	OK	OK
J	OK	OK	OK	OK
K	OK	OK	OK	OK
L	OK	OK	OK	OK
M	OK	OK	OK	OK
N	OK	OK	OK	OK
O	OK	OK	OK	OK
P	OK	OK	OK	OK
Q	OK	OK	OK	OK
R	OK	OK	OK	OK
S	OK	OK	OK	OK
T	OK	OK	OK	OK
U	OK	OK	OK	OK
V	OK	OK	OK	OK
W	OK	OK	OK	OK
X	OK	OK	OK	OK
Y	OK	OK	OK	OK
Z	OK	OK	OK	OK

NOTE: USED FOR LOW BATTERY FUSE BLOWN

INSTRUCTIONS:

1. MOUNT BATTERY PACK IN RACK.
2. REMOVE TOP & FRONT OF BATTERY PACK.
3. PLACE BATTERIES INSIDE BATTERY PACK ACCORDING TO WIRING DIAGRAM.
4. VERIFY POLARITY AT OUTPUT TERMINALS WITH VOLT METER.
5. REPLACE BATTERY PACK FRONT & TOP.
6. MOUNT CHARGER(S) IN RACK.
7. MAKE LOAD CONNECTIONS AS SHOWN IN DIAGRAM.
8. MAKE ALARM CONNECTIONS:
 - A) LOCATE REMOVABLE CONNECTORS EITHER AT CONNECTION POINTS OR WITHIN PACKING MATERIAL.
 - B) IF AT CONNECTION POINTS, REMOVE BACK HALF OF CONNECTOR.
 - C) MAKE LOAD CONNECTIONS TO REMOVABLE BLOCK, THEN INSERT REMOVABLE BLOCK INTO ALARM RECEPTACLE.
9. CONNECT POLARIZED DC CABLE BETWEEN CHARGER(S) & BATTERY PACK AS SHOWN.
10. CONNECT CHARGER(S) TO AC LINE AFTER VERIFYING THAT AC INPUT VOLTAGE IS SET CORRECTLY.
11. THIRD CONNECTOR AND FUSE NOT USED WITH 12VOLT MODELS.

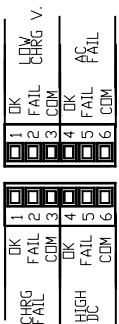
NOTE: APPLIES TO SYSTEMS WITH 2 CHARGERS & 1 BATTERY PACK

		STORED ENERGY SYSTEMS HOLLISTER, CA	
Description: 734XF-2-1XXX-BB1 CONNECTION DIAGRAM	Engineer: KAG	Code: 8-08-91	Size: N/A
Fract. otherw/wise specified)	Dec.	DIA\00108	DO NOT SCALE DRAWING
Tolerances (unless otherwise specified)	Angles	Rev	Page 1 of 1

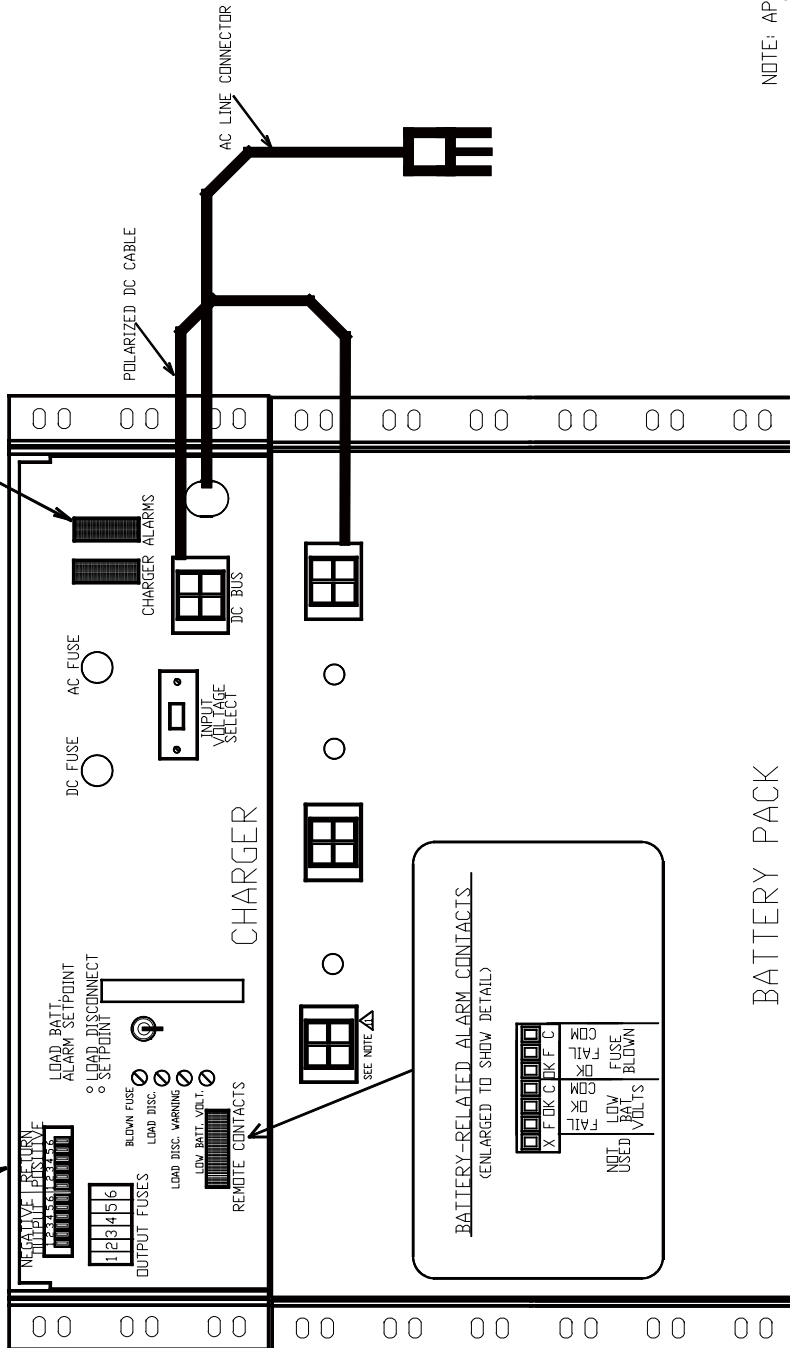
revisions

dcn	rev	description	date	app
104174	A	show 3rd conn. & fuse	2-18-03	KRD

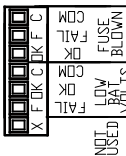
CHARGER-RELATED ALARM CONTACTS
(ENLARGED TO SHOW DETAIL)



MAKE LOAD CONNECTIONS HERE



BATTERY-RELATED ALARM CONTACTS
(ENLARGED TO SHOW DETAIL)



INSTRUCTIONS

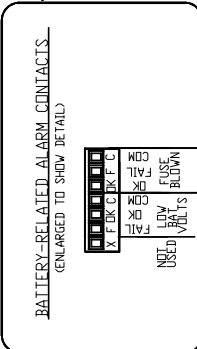
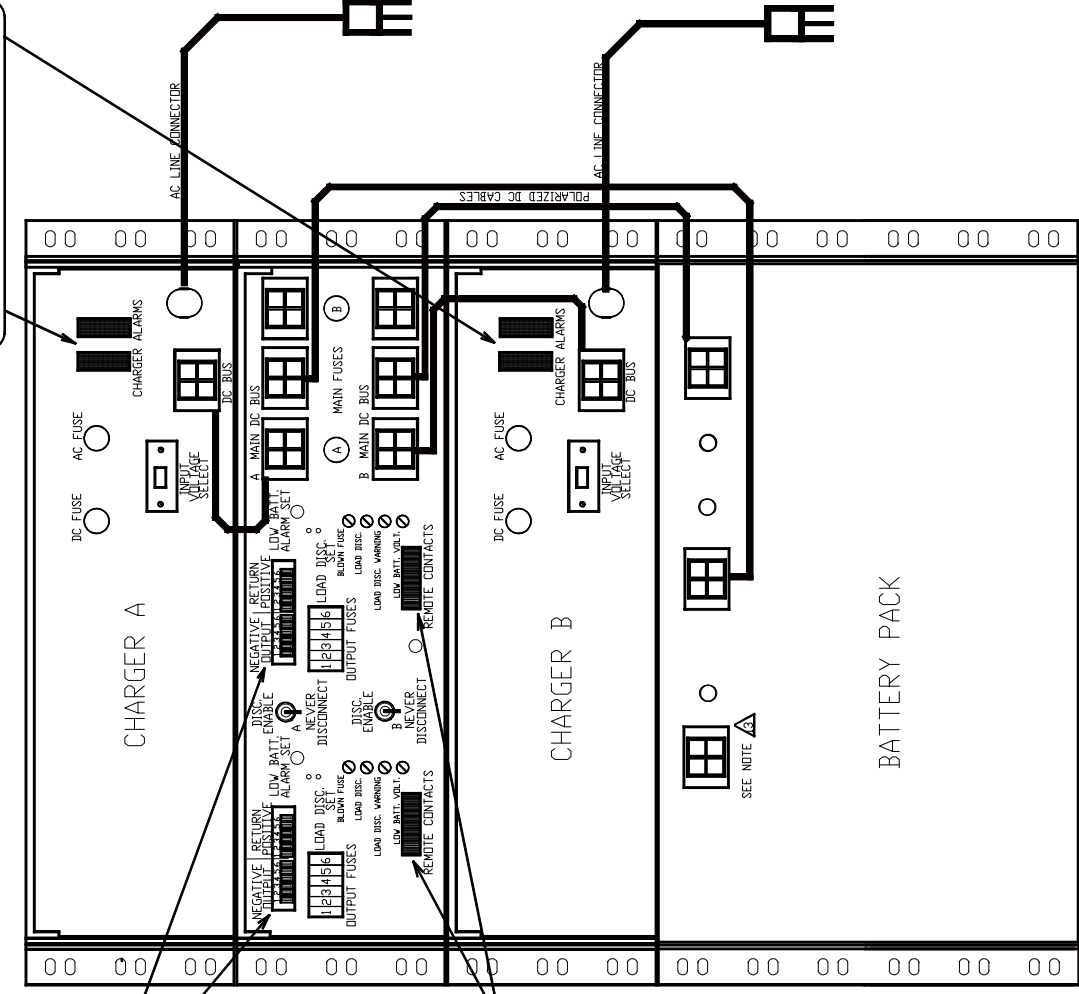
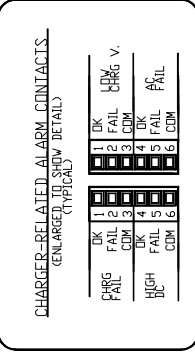
1. MOUNT BATTERY PACK IN RACK.
2. REMOVE TOP & FRONT OF BATTERY PACK.
3. PLACE BATTERIES INSIDE BATTERY PACK ACCORDING TO CONNECTION DIAGRAM.
4. MEASURE VOLTAGE & POLARITY AT OUTPUT TERMINALS WITH VOLT METER.
5. REPLACE BATTERY PACK FRONT & TOP.
6. MOUNT CHARGER(S) IN RACK.
7. MAKE LOAD CONNECTIONS AS SHOWN IN DIAGRAM.
8. MAKE ALARM CONNECTIONS:
 - A) LOCATE REMOVABLE CONNECTORS EITHER AT CONNECTION POINTS OR WITHIN PACKING MATERIAL.
 - B) IF AT CONNECTION POINTS, REMOVE BACK HALF OF CONNECTOR.
 - C) MAKE LOAD CONNECTIONS TO REMOVABLE BLOCK, THEN INSERT REMOVABLE BLOCK INTO ALARM RECEPTACLE.
9. CONNECT POLARIZED DC CABLE BETWEEN CHARGER(S) & BATTERY PACK AS SHOWN.
10. CONNECT CHARGER(S) TO AC LINE AFTER VERIFYING THAT AC INPUT VOLTAGE IS SET CORRECTLY.
11. THIRD CONNECTOR AND FUSE NOT USED WITH 12VOLT MODELS.

NOTE: APPLIES TO SYSTEMS WITH 1 CHARGER & 1 BATTERY PACK

SENS STORED ENERGY SYSTEMS HOLLISTER, CA	
engineer:	drawn: KAG
checked:	date: 8-08-91
code:	size: N/A
prwg. no.:	DIA\00079
DO NOT SCALE DRAWING page: 1 of 1 rev: A	

dcn	rev	description	date	apr
104174	A	show 3rd conn & fuse.	2-21-03	KRD

revisions	



INSTRUCTIONS

1. MOUNT BATTERY PACK IN RACK.
2. REMOVE TOP & FRONT OF BATTERY PACK.
3. PLACE BATTERIES INSIDE BATTERY PACK ACCORDING TO CONNECTION DIAGRAM IN BATTERY PACK.
4. MEASURE VOLTAGE & POLARITY AT OUTPUT TERMINALS WITH VOLTMETER.
5. REPLACE BATTERY PACK FRONT & TOP.
6. MOUNT CHARGER B IN RACK.
7. MOUNT DISTRIBUTION MODULE IN RACK.
8. MOUNT CHARGER A IN RACK.
9. MAKE LOAD CONNECTIONS TO DISTRIBUTION MODULE AS SHOWN.
10. MAKE ALARM CONNECTIONS AS FOLLOWS:
 - A) REMOVE BACK HALF OF CONNECTOR.
 - B) MAKE LOAD CONNECTIONS TO REMOVABLE BLOCK, AND FUSES, REMOVABLE BLOCK INTO ALARM RECEPTACLE.
11. CONNECT BATTERY PACK & CHARGERS TO DISTRIBUTION MODULE WITH POLARIZED CABLES SUPPLIED, AS SHOWN IN DIAGRAM.
12. VERIFYING THAT AC INPUT VOLTAGE IS SET CORRECTLY.
13. THIRD CONNECTOR AND FUSE NOT USED WITH 12VOLT MODELS.

NOTE: APPLIES TO SYSTEMS WITH A-B DISTRIBUTION MODULE AND REDUNDANT CHARGERS.

SENS STORED ENERGY SYSTEMS
HOLLISTER, CA

Engineer: KAG
Drawn: WFK
Checked: WFK
Date: 11-25-91
Size: N/A
Proj. no: DIA\00104
Page: 1 of 1
Rev: A

tolerances (unless otherwise specified)
Frac. dec. angles
+/-

VIEW OF SYSTEM FROM BACK