Storage Battery
Systems, Inc.
*Since 1915*

# SBS MODEL BCT-5000
# LOAD BANK (DC RESISTIVE)
# Part Number K492D26649

150A @ 21/42/105 VDC
171A @ 24/48/120 VDC

**16 October 1996**
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# SBS MODEL BCT-5000
# LOAD BANK (DC RESISTIVE)

## TABLE OF CONTENTS

# SBS MODEL BCT-5000
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## SECTION I

## SAFETY CONSIDERATIONS

Throughout this manual, you will find **WARNING** and **CAUTION** statements. Personal injury to an operator using or repairing the equipment may occur if a **WARNING** statement is ignored. Damage to the equipment and potentially hazardous conditions for personnel may occur if a **CAUTION** statement is ignored.

Each unit is safety checked for opens and shorts, and the insulation is high potential tested to insure safe operation. All safety devices have been proven reliable as part of the testing procedure of each unit.

As part of your safety program, an initial inspection after receiving the unit(s) and periodic preventive maintenance and safety inspections should be conducted to insure the reliability and safety built into your Load Bank.

The Model BCT-5000 Load Bank is an industrial test unit designed to be used indoors. However, because the nature of the Load Bank function is the dissipation of electrical energy, there are inherent dangers to the operator and to the equipment. These dangers shall be outlined in this section.

Electrical energy is transformed into heat by the resistor elements. The heat is removed from the Load Bank by airflow through the resistor elements. If there are any restrictions or stoppage of airflow, the Load Bank may overheat and may even start a fire. The following recommendations are made:

1. Read the manual before operating the Load Bank.

2. Run an approved ground wire from the Load Bank ground terminal (GND), located on the lower right side of the control panel, to the battery supply under test. Run an approved ground wire from the supply under test frame to a good earth ground. Size ground wire in accordance with National Electrical Code and any local codes.

3. Do not bypass OVER TEMP SAFETY switches to prevent nuisance tripping. The switches will drop out the load if insufficient cooling air is reaching the elements.

4. The Load Bank is not internally protected from short circuit faults or overcurrent applications. Therefore, it is recommended that the battery supply being tested contain a fuse or that an external fuse be added between the battery supply and the Load Bank input terminals.

5. Replace the lights on the control panel if they are burned out. The lights serve as indicators that the Load Bank is overheating, that reverse polarity is connected at input terminals, or that an over or under voltage condition and/or control power is present. This is important to the operation of the unit and the safety of the operator.

**********

**W A R N I N G**

Personal injury from electrical shock may result if power is not disconnected before servicing. Maintenance work must be done only by qualified personnel.

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6. Maintenance should be performed with no power on the unit. The majority of troubleshooting can be performed with an ohmmeter.

7. Venting the heated air from the exhaust toward overhead cables, sprinkler systems, or into a room with insufficient volume or make-up air, is a potential hazard. The Load Bank should be used in a cool, well-ventilated area.

8. Allow cool room air to pass into the unit to cool the elements. Do not allow the unit to be placed where hot exhaust air can recirculate back through the unit causing a constant rise in cooling air temperature.

9. After running a load test, residual heat may be removed from the Load Bank by allowing the blower to operate for a few minutes after load is removed. This procedure is not required for maintaining Load Bank integrity, but it may guard operating personnel from possible burn injuries.

10. The operator should avoid coming in contact with the resistor elements or surrounding covers during and for some time after operation. These portions of the Load Bank become quite hot and may result in a serious burn should contact be made with them.

11. Do not allow objects to enter or block the air intake or exhaust of the Load Bank. A blockage would cause Load Bank overheating. If an object enters the screens, it will cause damage to the resistor elements, possibly shorting them and causing shock and fire hazards.

12. Emergency Shutdown Procedure:

    In an emergency, disconnect the load and fans using the CONTROL POWER ON/OFF switch; then deactivate the battery source under test.

    The CONTROL POWER ON/OFF switch will disconnect both the load steps and the fans.

13. An approved electrical fire extinguisher should be on hand at all times.

14. It is the responsibility of the customer to take diligent care in operating the Load Bank. The National Electrical Code (NEC), sound local electrical and safety codes, and the Occupational Safety and Health Act (OSHA) should be followed when installing the equipment to reduce hazards to persons and property.

15. Observe proper polarity when connecting the Load Bank to the battery source. If the Load Bank is not connected properly, the meter will not monitor the load.

16. The Load Bank should never be left unattended while it is operating.

17. Read and heed all **WARNING** and **CAUTION** statements in the manual.

# SECTION II

# DESCRIPTION

The Model BCT-5000 Load Bank is an indoor, portable, self-contained unit designed for electrically loading and testing 24/48/120 VDC battery supplies. The Load Bank is designed for production line and job site use.

The loading capability at 21/42/105 VDC consists of six steps for a total of 150 Amps. They are: 5, 10, 10, 25, 50, and 50 Amps. When applying nominal voltages 24/48/120 VDC, the total load increases to 171A with load steps 5.7, 11.4, 11.4, 28.5, 57.1, and 57.1 amps.

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**C A U T I O N**

DO NOT operate the Load Bank at voltages greater than 20% the rated voltage as this will cause a catastrophic failure in the Load Bank.

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## CONTROL PANEL

Load application is controlled from the integral mounted control panel at the front of the Load Bank. Controls and indicators are located on the Load Bank control panel as follows.

1. The CONTROL POWER ON/OFF switch controls power to the unit, power to load steps, and fan power.

2. The MASTER LOAD switch controls power to the load steps. The MASTER LOAD switch will also reset Load Bank controls after an over/under voltage condition.

3. The OVER TEMP indicator lamp lights if the Load Bank overheats. This lamp lights momentarily when power is turned on, but goes off when the safety circuit is cleared.

4. The CONTROL POWER indicator lamp energizes when voltage is applied to the 120V receptacle and the CONTROL POWER switch is ON.

5. The OVER/UNDER VOLTS indicator lamp energizes when voltages greater than 28V or less than 18 volts is applied to the Load Bank 24 VDC input terminals. For the 48 VDC terminals, the limits are 56V and 36V. For the 120 VDC terminals, the limits are 140V and 90V. Note that these limit values may vary as much as 5%.

6. The load step ON/OFF switches are used to apply or remove load steps at the ratings listed above each switch.

7. The digital meter monitors the load applied. Meter monitoring banana style plug terminals are located on the control panel of the Load Bank. This allows for remote meter monitoring at the source being tested. Voltage, current, elapsed time, and amp-hours are units monitored to an accuracy of $\pm$1% of full scale. Full scale of volts and elapsed time is 199. Full scale of current and amp-hours is 1999.

   Note that the DC voltages that are not pure DC may not give accurate data. The meter monitors volts and amps with an averaging computation method.

## ENCLOSURE

The Load Bank is shown on Outline Drawing SB2615 and is 22 inches high, 25 inches deep, and 22 inches wide. The screened air intake is located on one side of the unit, and exhaust is discharged outward through the opposite side screened opening.

## POWER CONNECTIONS

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**C A U T I O N**

Never exceed the rated voltage by more than 20% as this will cause the Load Bank to overheat.

Failure to connect the battery supply under test to the correct polarity on the Load Bank will prevent meter from functioning. Refer to the Safety Considerations section of this manual.

**********

Control and fan power requirements are 120 VAC at approximately 5 Amps. This power is accepted through the 120V receptacle on the control panel. Use line cord P/N 390874.

To connect load power, attach load cables (B25464 supplied separately) to the input power terminals on the front of the Load Bank. The terminals are labeled 120V, 48V, 24V, COMMON, and GROUND. The COMMON terminal is common to all voltages. Use the terminals that match the voltage application to be tested.

## WHEEL/HANDLE/CORD RACK

The Load Bank is provided with rear wheels and an extended handle for easy portability. The handle is also convenient for storage of load cables when the Load Bank is not being used.

# SECTION III

# INSTALLATION

## BEFORE INSTALLATION

Inspect the Load Bank for obvious damage such as broken wires, broken or dented panels, cracked ceramic insulators, or any other component breakage that may have occurred in shipment.

## LOCATION

The BCT-5000 is a portable, indoor Load Bank, and should be installed in a cool, well-ventilated area. Cool air must be continually available so the hot exhaust air can be dissipated and not recirculated through the unit. Install such that the inlet and exhaust panels have unrestricted airflow clearance.

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**C A U T I O N**

Installation must prevent hot exhaust air from recirculating into the air intake. Inlet air temperatures exceeding 104°F may cause damage to the Load Bank. After installation, test the unit at full load and verify that the inlet air temperature does not exceed 104°F.

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## AIRFLOW CONSIDERATIONS

Even with an ample supply of cooling air, the Load Bank may overheat if it is not properly installed. There are two types of airflow problems that should be avoided:

1. Recirculating Airflow - If the hot, exhausted air is permitted to recirculate through the Load Bank, it will reach such a high temperature and low density that it will no longer cool the resistance elements. A Load Bank should not be installed so close to any surface as to reflect the exhausted air back

to the air intake. When two or more Load Banks are being used, care must be taken in positioning the Load Banks so that the exhausted air of one unit does not feed the air intake of another.

2. Restriction of Cooling Air - Any obstruction located within two (2) feet of the inlet and exhaust screens will restrict the Load Bank's airflow. Airflow is also restricted when two or more Load Banks have air inlets positioned close to each other. This competition for cooling air causes a low pressure area, restricting adequate airflow.

**********

**W A R N I N G**

It is vitally important to install the Load Bank properly. Installation errors may result in a catastrophic failure. The temperature switches, and protective devices in the Load Bank, will guard against some of these problems. If protective circuitry prevents application of the load, determine the source of the problem. DO NOT DISABLE the TEMPERATURE SWITCHES. This causes a safety hazard and voids the warranty. The following installation instructions are critical to the safe operation of the Load Bank. Refer to the Safety Considerations section of this manual.

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## POWER REQUIREMENTS

The Load Bank derives its control/fan power from the control power receptacle on the Load Bank control panel. Use line cord P/N 390874. Control and fan power is derived at 120 VAC, approximately 5 Amps.

The battery supply under test load connections are at the terminals mounted on the control panel. The terminals are identified as 120 Volts, 48 Volts, 24 Volts, and COMMON. Cables (B25464-1 and -2 supplied separately) are to be connected to the respective load terminals as required for the voltage rating of the supply to be tested. The COMMON terminal is common to all voltages.

**********

**C A U T I O N**

The Load Bank is not internally protected from short circuit faults or overcurrent applications. Therefore, it is recommended that the battery supply being tested contain a fuse or that an external fuse be added between the battery supply and the Load Bank input terminals.

**********

Cables to the Load Bank should be of adequate size to handle maximum rated load according to the National Electrical Code and any local codes.

A case ground terminal is provided on the lower right side of the control panel and must be connected to the battery under test frame, which in turn should be connected to a good earth ground. Use cable P/N B25464-3 for this connection.

# SECTION IV

# OPERATION

## PURPOSE AND USE OF CONTROLS

1. CONTROL POWER ON/OFF switch - This switch turns on the cooling fans and powers the remainder of the control circuit.

2. OVER TEMP lamp - This lamp should momentarily light when MASTER LOAD switch is turned on. This shows the air safety circuit is working. The purpose of the OVER TEMP lamp is to warn the operator and remove the load to the Load Bank in case of improper cooling of the load elements.

3. Load step ON/OFF switches - Allow load steps to be applied or removed at the rating identified under each switch.

4. The MASTER LOAD switch controls power to the load steps. The MASTER LOAD switch will also reset Load Bank controls after an OVER/UNDER voltage condition.

5. The OVER/UNDER VOLTS indicator lamp energizes when voltages greater than 28V or less than 18 volts is applied to the Load Bank 24 VDC input terminals. For the 48 VDC terminals, the limits are 56V and 36V. For the 120 VDC terminals, the limits are 140V and 90V. Note that these limit values may vary as much as 5%.

6. The digital meter monitors the load applied. Meter monitoring banana style plug terminals are located on the control panel of the Load Bank. This allows for remote meter monitoring at the source being tested. Voltage, current, elapsed time, and amp-hours are units monitored to an accuracy of $\pm$1% of full scale. Full scale of volts and elapsed time is 199. Full scale of current and amp-hours is 1999.

   Note that DC voltages that are not pure DC may not give accurate data. The meter monitors volts and amps with an averaging computation method.

## LOAD BANK OPERATION

All tests start with control panel switches in the OFF position.

**********

**C A U T I O N**

Before energizing any load, verify that load voltage does not exceed rated voltage of Load Bank by more than 20%.

**********

The unit is energized by the CONTROL POWER ON/OFF switch. This switch also energizes the cooling fans. Upon energizing the unit, the red OVER TEMP lamp will light momentarily until the enclosed temperature switches signal that safe operating temperature is present, at which time the light goes off. The load steps are enabled by energizing the MASTER LOAD switch. If Load Bank voltage applied to the power terminals is between the volt sensor settings, activating the appropriate load switches will apply the load to the battery supply under test. If not, the MASTER LOAD switch will have to be reset by toggling on and off while voltage applied is within volt sensor settings.

If the operating temperature in the Load Bank reaches an unsafe level, the temperature switches disconnect the load and the red OVER TEMP lamp will light.

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**C A U T I O N**

Do not attempt operation if the fans are not running. Fan inlet and exhaust must be unrestricted. The operation of the fan is vital to the safe operation of this Load Bank. If the OVER TEMP indicator light comes on and stays on for more than a few seconds without the load dropping out, shut off the MASTER LOAD switch at once. Remove all power to the unit and check for proper operation of the fan safety circuit. Failure to correct an over temperature condition will result in the destruction of the Load Bank. Refer to the Safety Considerations section of this manual.

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## OPERATING INSTRUCTIONS

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**C A U T I O N**

Never exceed the rated voltage by more than 20% as this will cause the Load Bank to overheat.

Failure to connect the battery source to the correct polarity on the Load Bank will prevent meter from functioning. Refer to the Safety Considerations section of this manual.

**********

1. With all control panel switches in the OFF position, connect the 120V line cord and the appropriate battery supply leads to the Load Bank.

2. Connect cable from Load Bank ground terminal to battery supply under test frame.

3. Connect battery supply under test frame to a good earth ground.

4. Activate battery supply under test.

5. Move the CONTROL POWER switch to the ON position. Verify that the red OVER TEMP lamp momentarily lights and then goes off.

6. Enable the LOAD STEP switches by moving the MASTER LOAD switch to the ON position. Activate the desired load using control panel load switches.

7. After running tests, remove the load by moving the MASTER LOAD ON/OFF switch to the OFF position. Accumulated heat may be removed from the Load Bank by allowing the cooling fans to operate for a few minutes with load removed. This procedure is not required for maintaining Load Bank integrity, but it may guard operating personnel from possible burn injuries.

**********

**W A R N I N G**

DO NOT touch the exhaust screen during, and for some time after operation. The screen will become hot from the exhausted heat and may cause a serious burn. Refer to the Safety Considerations section of this manual.

DO NOT allow objects to enter or block screens.

**********

8. Move the CONTROL POWER ON/OFF switch to the OFF position.

9. Turn OFF the battery supply under test and disconnect all leads from the Load Bank.

## COMMON BATTERY TEST PROCEDURES

To discharge test stationary substation, UPS, or telecom batteries, either run a complete acceptance load test on the battery (ideal) or simply remove a percentage of the load with each test and compare the lowest voltage at the end of the like repeated tests.

### ACCEPTANCE TEST TIME AND DISCHARGE RATE CALCULATION

1. The discharge time and end point voltage selected should be one at which the battery has a published rating and is approximately the same as that of the intended application.

2. The discharge rate (amperes or watts/cell) to a specific end point voltage for the selected time, as taken from the published ratings for the battery, must be adjusted for battery temperature if outside the range of 75 to 80 deg. F. For elevated temperatures, the rate will be increased while for cooler temperatures, the rate is reduced. The temperature adjustment factors are noted in Table 1.

   For example, if a cell having a one hour rating of 61.5 amperes to 1.75 V/cell @ 77 deg. F were tested at 60 deg. F, the discharge rate used for a one hour discharge would be:

   61.5 amperes x 0.93 - 57.2 amperes

For accuracy, capacity tests should be performed between 60 deg. F and 90 deg. F, and as close to 77 deg. F as possible. This is because the temperature corrections factor can vary a few percent from Table 1 due to battery design factors.

ACCEPTANCE CAPACITY TEST

1. Equipment Requirements

   a. BCT-5000 Load Bank
   b. Digital Voltmeter: to monitor individual cells/unit voltage during discharge.
   c. Hydrometer (digital Preferred; e.e. SBS-2002 or SBS-1001.
   d. Other Nonessential Items: Non Contact Thermometer, SBS/Raytek ST-2 or ST-6 and MicroOhm Meter, SBS #5600.

2. Performance

   a. Connect BCT-5000 Load Bank to batteries as covered in paragraph 4-2 of manual. If parallel strings are being tested, the individual string current and total current must both be monitored.

   b. Measure and record the float voltage of each cell/unit and assure all cells/units are floating properly.

   c. Remove the charging current from the battery. If the charger cannot be disconnected, the current being drawn by the load must be increased to compensate for the current being supplied by the charger.

   d. With the Load Bank OFF, connect it to the battery.

   e. Reset the timer and turn the load bank ON, adjusting and maintaining it for the appropriate rate (amps or watts) per sections 4-2, 4-3, and 4-4 of user manual.

   f. Record the battery discharge voltage at the start and end of the test and periodically throughout the test as many times as practical.

      The individual cell/unit voltages shall also be measured and recorded as often as is practical during the discharge. The number of sets of discharge readings must be 3 or more. The longer the test duration, the more readings should be taken so the capacity of individual cells can be analyzed.

Continue the discharge beyond the required battery end point voltage (e.g., 1.85 V/C) to a lower rated voltage (e.g. 1.75) when possible to assure most cells actually discharge to the required end point.

Terminate the capacity test when the battery is discharged to the predetermined system end point voltage, a cell or unit is going into reversal, or a safety hazard is noted.

## CALCULATING BATTERY CAPACITY

The % rated capacity is calculated as:

$$\text{\% rated capacity @ 77 deg. F To specified end point voltage} = \frac{\text{Actual Discharge Time}}{\text{Specified Discharge Time}} \times 100\%$$

## PARTIAL CAPACITY LOAD TESTING

Partial capacity load testing is an approved method of performing load tests. By comparing discharge voltage readings under identical test conditions, meaningful data can be collected. This test can be done, normally without removing more than 50% of the battery capacity, leaving 50% to handle the load should the AC power be interrupted soon after the test has been completed.

This partial load test should be done about four times per year. The test takes less than one hour to perform and no back up (spare) batteries are needed. The comparison data is reliable test data on the batteries' condition, second only to a full discharge test.

## RECOMMENDED PARTIAL LOAD TEST CURRENTS

Look at the battery manufacturer's ampere current capability to 1.75 VPC (volts per cell). Find the current that is below 150 amps and use that current for the test; i.e., if battery is rated to deliver 150 amperes for one hour, test at 150 amps for 50% of one hour (30 minutes). Do not be concerned about maintaining exactly 150 amps; just be sure to always have the same load switch on for exactly 30 minutes.

At the end of the test, you should record the lowest voltage at the 30 minute mark. If you want to test each cell, do so after the 30 minute voltage is recorded. Be sure to time each test the same when doing the same battery on subsequent tests. You will still have about 50% capacity remaining in the battery system. If any battery has failed, you must replace it as soon as possible. Be sure to use Table 1 load correction tables for temperature compensation.

Since you may have many batteries that are the same model, make, etc., you can compare test data on like batteries as well.

Call SBS with your battery types and quantities, and we will provide a recommended test for each.

If a partial load test shows lower end of test readings, your battery is failing or nearing its life's end (see Life Curve Data - Table 2). You may also want to run a full performance test (same as acceptance test) to confirm your findings.

**Example of Typical 200 AH Cell Test - 50% Depth of Discharge (D of D)**

| 8 Hr. Rated AH Capacity 200 | 1 Min. | 5 Min. | 10 Min. | 15 Min. | 20 Min. | 30 Min. | 1 Hr. | 1½ Hrs. | 3 Hrs. | 5 Hrs. | 8 Hrs. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ampere Load Capacity to 1.75 VPC | 296 | 268 | 234 | 210 | 190 | 154 | 100 | 80 | 50 | 34 | 25 |

You could either take 100 amps out for 30 minutes (based on 50% of one hour) or 80 amps out for 45½ minutes (based on the 1½ hour rate).

**Example of Typical 24 AH Battery Test**

| 8 Hr. Rated AH Capacity 24 | 5 Min. | 10 Min. | 15 Min. | 30 Min. | 1 Hr. | 2 Hrs. | 3 Hrs. | 5 Hrs. | 6 Hrs. | 8 Hrs. | 10 Hrs. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ampere Load Capacity to 1.75 VPC | 56.5 | 41.3 | 32.5 | 20.5 | 13.3 | 8.25 | 6.25 | 4.00 | 3.50 | 2.75 | 2.35 |

24 AH - 8 Hr. Rate

Having a: 30 Min. Rate of 20.5 amps to 1.75 VPC
1 Hr. Rate of 13 amps to 1.75 VPC

You could either load test at 20 amps for 15 minutes or 13 amps for 30 minutes. (50% Depth of Discharge)

**NOTE**

What is important is not whether your current is set exactly but that you use the same load steps on each subsequent partial load test.

TABLE 1

BATTERY LOAD CORRECTION FACTOR VS. BATTERY TEMPERATURE

| Battery Temperature | | Battery Load Correction Factor | | | | |
|---|---|---|---|---|---|---|
| C Deg. | F Deg. | 15 Min Rate | 1 Hour Rate | 5 Hour Rate | 8 Hour Rate | 20 Hour Rate |
| -9.4 | 15 | .550 | .580 | .650 | .705 | .735 |
| -6.7 | 20 | .660 | .630 | .690 | .735 | .765 |
| -3.9 | 25 | .650 | .680 | .735 | .765 | .790 |
| -1.1 | 30 | .700 | .725 | .765 | .790 | .815 |
| 1.7 | 35 | .740 | .765 | .800 | .820 | .840 |
| 4.4 | 40 | .780 | .800 | .830 | .845 | .865 |
| 7.2 | 45 | .820 | .840 | .855 | .870 | .890 |
| 10.0 | 50 | .860 | .865 | .880 | .895 | .910 |
| 12.8 | 55 | .875 | .890 | .910 | .920 | .930 |
| 15.6 | 60 | .920 | .930 | .940 | .945 | .950 |
| 18.3 | 65 | .940 | .950 | .955 | .960 | .965 |
| 21.1 | 70 | .960 | .970 | .975 | .978 | .980 |
| 25.0 | 77 | 1.00 | 1.000 | 1.000 | 1.000 | 1.000 |
| 26.7 | 80 | 1.010 | 1.005 | 1.003 | 1.002 | 1.001 |
| 29.4 | 85 | 1.030 | 1.020 | 1.015 | 1.010 | 1.005 |
| 32.2 | 90 | 1.040 | 1.025 | 1.020 | 1.015 | 1.010 |
| 35.0 | 95 | 1.050 | 1.030 | 1.025 | 1.020 | 1.015 |
| 37.8 | 100 | 1.060 | 1.040 | 1.030 | 1.025 | 1.020 |

Watts per Cell and Ampere's Load Derating vs. Temperature

Note: 1) Perform acceptance tests only in the range of 60 deg. to 90 deg. F and preferably as near to 77 deg. F as possible.

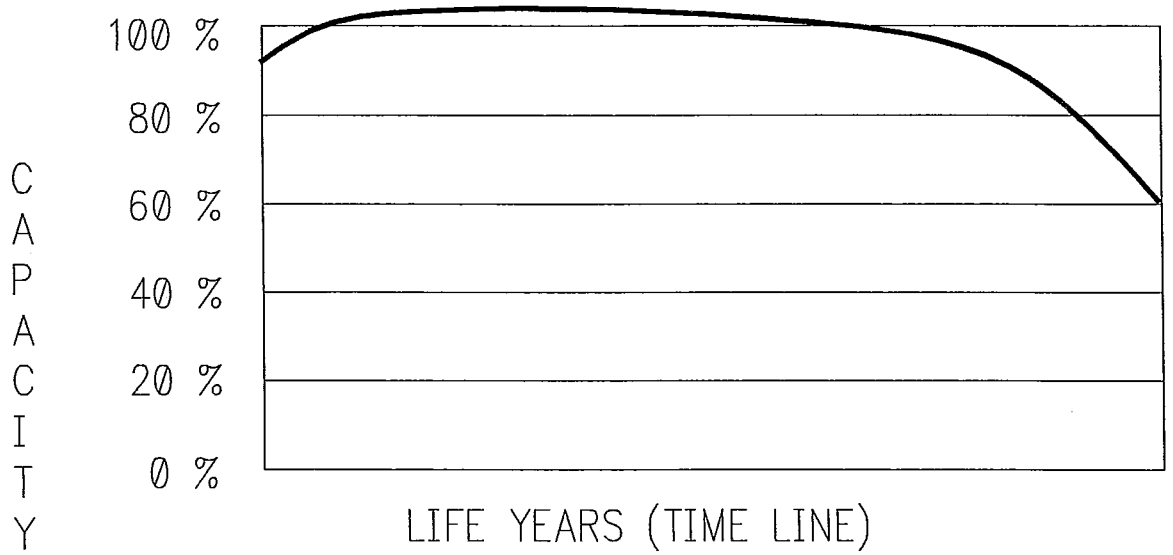
2) When conducting constant power (watts) capacity tests, the battery load in watts is equal to the terminal voltage times the discharge current in amperes.

## HIGH CURRENT MOMENTARY LOADS

High current momentary loads also provide a way of checking the integrity of batteries, allowing you to identify weak cells and poor connections. These tests can be done any time while taking

little energy from the batteries (because it is a high current over a short time, less than one minute typical). Call SBS for our high rate test recommendations. This short test will provide more information than other non-load testing in terms of guaranteed performance.

TABLE 2
TYPICAL LIFE CURVE OF BATTERY

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Battery Load testing is the only dependable procedure by which battery condition and performance can be determined. Lack of load testing has resulted in losses of millions of dollars reported by companies with substations, power generating, and data center failures. Call SBS at 1-800-554-2243 for answers to any battery system questions.

# ESD PRECAUTIONARY GUIDELINES

**C A U T I O N**

Certain circuit card assemblies and their components, typically integrated circuits, may be damaged by seemingly undetectable electrostatic discharge (ESD). Care must be exercised during handling/repair of these items. Use electrostatic discharge precautionary procedures.

The following guidelines are not necessarily all inclusive but rather serve as reminders for good shop practices for the handling/ repair of ESD sensitive circuit card assemblies and devices.

- Store ESD sensitive items in their original containers. These items are often marked with the symbol shown at the top of this page.
- Put on a grounded wrist strap before handling any ESD sensitive item.
- Clear work area of Styrofoam®*, plastic, and vinyl items such as coffee cups.
- Handle ESD items by the body, never the open edge connectors.
- Never slide ESD sensitive items over any surface.
- Transport ESD sensitive items in a static shielding container to a static-free work station.
- If a static-free work station is not available, ground the transport container before removing or inserting an ESD item.
- Electric tools used during repair should be grounded. For example, use only anti-static type solder suckers and grounded tip soldering irons. Discharge non-electric tools before use.
- Pack ESD items in static shielding containers before shipping them to Avtron for repair.

* Styrofoam® is a registered trademark of Dow Chemical.

# SECTION V

# MAINTENANCE

To provide long equipment life and to reduce the chance of electric shock, fires, and personal injury, good maintenance procedures must be used. Before servicing, review the Safety Considerations section of this manual.

The following examples of scheduled maintenance procedures are not intended to be all-inclusive, but must be accomplished to maintain the equipment in a good, safe condition. All maintenance work must be done only by qualified personnel.

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**W A R N I N G**

Personal injury from electrical shock or from the moving fan blades may result if power is not disconnected from the Load Bank prior to performing maintenance procedures. Refer to the Safety Considerations section of this manual.

**********

## DAILY

1. Remove any restrictions to airflow through the Load Bank.
2. Check the screens to make sure that no objects have blocked or entered the openings.
3. Verify that the airflow is in the proper direction.
4. Assure that there is no recirculation of the exhaust air through the Load Bank.

## THREE MONTHS OR 500 HOURS

1. Remove access panels and screens.

2. Inspect the load resistors for mechanical breakdown which is demonstrated by excessive sagging of the elements. Replace with new resistor elements as required.

3. Inspect for loose hardware or loose connections. Tighten where required.

4. Inspect all connections for oxidation or corrosion. Clean the connection or replace the hardware where required.

5. Inspect magnetic contactors to make sure that the contacts are not severely pitted or corroded. The contacts must move freely and be properly seated.

6. Clean all dirt and debris out of the Load Bank. This can be accomplished by blowing the inside of the unit with clean, dry compressed air (not to exceed 40 PSI). Eye protection should be worn when cleaning the Load Bank with compressed air.

7. Inspect all the wiring for any sign of insulation failure.

8. Replace all access panels and screens. Tighten all the fastening hardware securely.

9. Check the indicator lamp on the control panel.

## PARTS REPLACEMENT

Access to any component is easily made with the removal of the cover panels. Major components in the unit are listed in the replacement parts list.

# SECTION VI

# REPLACEMENT PARTS LIST

## INTRODUCTION

The parts list in this section contains the description, quantity required, and part numbers for each listed part. The list also includes, where appropriate, the manufacturer's part number and federal code number, as well as schematic reference designators to facilitate troubleshooting.

**NOTE**

Every effort has been made to insure the accuracy of this information. However, changes are sometimes necessary and revisions to the parts list may be made at any time without notice.

## REFERENCE DESIGNATORS

Service personnel may use this parts list along with the system schematics to identify and order replaceable parts. The reference designators were carefully selected and matched to those on the schematic diagrams and equipment to simplify the troubleshooting and repair process.

**NOTE**

When ordering replacement parts, be certain to state the part's description and part number, not the schematic reference designator number. Also include the model and serial number of the equipment.

## MANUFACTURERS' FEDERAL CODE NUMBERS

The manufacturer and part number column contains, in parentheses, the Commercial and Government Entity code number (CAGE code), a five character string listed in H4-1/H4-2. This CAGE code identifies the manufacturer of the listed part. The following is a numerical cross-reference listing of CAGE codes to manufacturers' names and addresses.

# FEDERAL CODE NUMBER LIST

03030 Empro Mfg. Co. Inc.
10920 E. 59th St.
P.O. Box 26060
Indianapolis, IN 46226

06352 Empire Products Inc.
CAM-LOK Div.
Subdivision of KDI Corp.
Cincinnati, OH

12066 Ohio Semitronics, Inc.
4242 Reynolds Dr.
Hilliard, OH 43026-1260

15605 Eaton Corporation
Administrative &
Technical Center
4201 N. 27th St.
Milwaukee, WI 53216

16428 Cooper Industries
Belden Division
350 N.W. N St.
Richmond, IN 47374

5S447 Test Probes Inc.
LaJolla, CA 92037

51107 Diversified Electronics
320 E. Main St.
P.O. Box 207
Leesburg, FL 34748-0207

59270 Selco Products Inc.
7580 Stage Rd.
Buena Park, CA
90621-1224

63279 Weidmuller Terminations
821 Southlake Blvd.
Richmond, VA 23236-3917

63681 Crouzet Corp.
(Formerly Syrelec Corp.)
3237 Commander Dr.
Carrollton, TX
75006-2503

71400 Cooper Industries Inc.
Bussmann Div.
114 Old State Rd.
Ballwin, MO 63021-5942

71785 TRW Cinch Connectors
1501 Morse Ave.
Elk Grove Village,
IL 60007

73559 Carlingswitch Inc.
60 Johnson Ave.
Plainville, CT
06062-1156

77342 Potter & Brumfield Inc.
200 S. Richland Creek
Dr.
Princeton, IN
47671-0001

82807 Milwaukee Resistor Corp.
8920 W. Heather Ave.
P.O. Box 24200
Milwaukee, WI 53224-0200

72619 REPLACED BY:
83330 Dialight Corp.
Manasquan Div.
1913 Atlantic Ave.
Manasquan, NJ 08736-1005

# REPLACEMENT PARTS LIST

| SCHEMATIC REFERENCE | DESCRIPTION | MANUFACTURER and PART NO. | P/N | QTY/ UNIT |
|---|---|---|---|---|
| | LOAD BANK | | D26649 | |
| | .SCHEMATIC/INTCON DIAGRAM | | C23218 | REF. |
| R31,32 | .RESISTOR, 4 OHM | | AWR400 | 2 |
| R33 | .RESISTOR, 12 OHM | | AWR1200 | 1 |
| R34,35,37,38 | .RESISTOR, 2 OHM | | AWR200 | 4 |
| R36,39 | .RESISTOR, 6 OHM | | AWR600 | 2 |
| R4,5,7,8,10, 11,13,14, 16,17 | .RESISTANCE ELEMENT | | A23368-1 | 10 |
| R6,9,12,15,18 | .RESISTANCE ELEMENT | | A23368-2 | 5 |
| | .INSULATOR, .500+/-.005 X .385+/-.005 X .530+/-.006 | | 411182 | 60 |
| | .INSULATOR, .370+/-.005 X .195+/-.005 X 1.195+/-.012 | | 411181 | 30 |
| | .TUBE, INSUL; .530+/-.005 X .330+/-.005 X 2.00+/-01 | | 411141 | 105 |
| | .INSULATOR, CERAMIC; .500+/-.005 X .375+/-.005 X .625+/-.010, S-151 | | 411145 | 15 |
| S9,10 | .THERMOSTAT: 300F OPENS ON TEMP RISE | (59270) OA-300 | 491012 | 2 |
| K1 | .RELAY; 3P, N.O., 600 VAC, 35A @ 0.05PF, 120 VAC, 60 HZ COIL | ABB CONTROLS B30DC-1 | 351891 | 1 |
| K2,3 | .RELAY; 3P N.O., 65A @ 600V RES, 52A @ 600V IND, 120 VAC COIL | ABB CONTROLS B50DC-1 | 350350 | 2 |
| K4 | .RELAY, VOLTAGE SENSING | (51107) VBA-1201 WITH 100-54-80 BRACKET | 350675 | 1 |
| XK4 | .SOCKET | (77342) 27E123 | 358206 | 1 |
| K7 | .RELAY | ABB CONTROLS B9DC-1 | 351889 | 1 |
| K6 | .RELAY, 120 VAC | (77342) KUP14A55-120 | 351170 | 1 |
| | .BRACKET, END, TERMINAL BLOCK | (63279) 3835.6 | 364433 | 2 |
| K8,9 | .RELAY | ABB CONTROLS B12DC-1 | 350830 | 2 |
| TB1 | .TERMINAL BOARD BARRIER TYPE | (71785) 10-141 | 364072 | 1 |
| XTB1 | .INSULATION ELEC, MARKER STRIP | (71785) MS-10-141 | 450087 | 1 |
| R20 | .SHUNT, INSTRUMENT; DC, 0-200A, 0-100MV | (03030) MLB-200-100 | 337995 | 1 |
| F1 | .FUSE, 5 AMP, 600V | (71400) KTK-R-5 | 324211 | 1 |
| XF1 | .FUSEHOLDER FOR 13/32 X 1-1/2 FUSE | (71400) HPS-RR | 324985 | 1 |
| R21,24 | .RESISTOR, CARBON FILM, 1/2W, 1%, 10 KOHM | | 123037 | 2 |
| M1 | .METER, DIGITAL; DC VOLTS, AMPS, AMP HOUR & ELAPSED TIME | (12066) PTP-4605 | 338159 | 1 |

Form No. 277

## Replacement Parts

| SCHEMATIC REFERENCE | DESCRIPTION | MANUFACTURER and PART NO. | P/N | QTY/ UNIT |
|---|---|---|---|---|
| P1 | .CONNECTOR, RECP., MALE, 15A, 250V, PANEL MNT. RECESSED | (16428) 17252 | 314681 | 1 |
| DS1-3 | .INDICATOR RED, 115 VAC | IMLEC NR151-110R | 329665 | 3 |
| S1-6,8 | .SWITCH, TOGGLE DPST, 4 TERM ON-NONE-OFF | (73559) 2GK50-73 | 360589 | 7 |
| E1-5 | .CONNECTOR, RECP; FEMALE, BLK, #2-3/0 WIRE, 315A @ 120V, 3/8-16 STUD | (06352) E1012-333 | 315168 | 5 |
| | .FEET | | A23362 | 4 |
| B1-6 | .FAN, MUFFIN; 115 CFM, 115V, 50/60 HZ, 20W, 3100 RPM, SLEEVE BRG, PIN CON | SUNONWEALTH ELEC. SP100A1123XST | 322140 | 6 |
| | .BRACKET, RESISTOR | | A23443 | 6 |
| | .LINE CORD | | 390874 | 1 |
| R22 | .RESISTOR, 30 KOHM, 1/2W, 5% | | 119815 | 1 |
| | .CABLE, BLACK | (5S447) 123501B | 424223 | 1 |
| | .CABLE, RED | (5S447) 12501R | 424224 | 1 |
| | .CABLE, RED | | B25464-1 | 1 |
| | .CABLE, BLACK | | B25464-2 | 1 |
| | .CABLE, GREEN | | B25464-3 | 1 |
| E6 | .PLUG, BLACK | (83330) 257-103 | 366851 | 1 |
| E7 | .PLUG, RED | (83330) 257-102 | 366852 | 1 |
| R21 | .RESISTOR, 10 KOHM, 1/2W, 1% | | 123037 | 1 |
| S7 | .SWITCH | (15605) 8373K107 | 360598 | 1 |
| | .ALLIGATOR CLIP, RED | (5S447) 126000/R | 367516 | 1 |
| | .ALLIGATOR CLIP, BLACK | (5S447) 126000/B | 367517 | 1 |

# APPENDIX

# LOAD BANK
# TROUBLESHOOTING GUIDE

**NOTE**

Servicing should always be done only by trained, qualified service technicians.

**********

**W A R N I N G**

Be sure that all sources of power to the Load Bank are disconnected before servicing.

**********

| PROBLEM | POSSIBLE CAUSES/REMEDIES |
|---|---|
| 1. Load Bank main power fails to come on. | a. Main switch or circuit breaker is not closed.<br>b. Unit is not connected according to the Schematic/Interconnection Diagram.<br>c. Terminals were damaged during shipment.<br>d. Fuses are blown. (Check and replace as required.)*<br>e. Fuse is blown in Load Bank control circuit. (Check and replace as required.)*<br>f. Dirty or loose connection at Main Power Switch. |
| 2. Blower motor does not operate. | a. Main switch or circuit breaker is not closed.<br>b. Power is not connected to Load Bank blower circuit.<br>c. External power source is inadequate.<br>d. Motor fuses are blown. (Check and replace as required.)* |

* When checking fuses for continuity, be sure to remove all fuses from clips (in fuseblock or Disconnect Switch). Test each fuse individually, out of circuit. (If tested in circuit, there is the possibility of feedback which causes false readings. A blown fuse may still check out OK.)

| PROBLEM | POSSIBLE CAUSES/REMEDIES |
|---|---|
| 2. Blower motor does not operate. (Cont.) | e. Motor overload is tripped.<br>f. Motor start is malfunctioning.<br>g. Main Power Switch is inoperative.<br>h. Connections are broken or loose.<br>i. Motor shaft does not turn due to improper lubrication. (Replace or repair as necessary.) |
| 3. BLOWER FAILURE indicator lights, yet blower is operating. | a. Airflow restrictions present at Load Bank intake or exhaust.<br>b. Improper fan blade rotation or phase reversal. (Check fan motor power connections for proper phase sequence.)<br>c. Air Differential Pressure Switch is malfunctioning.<br>d. Blower Fail Relay is malfunctioning. |
| 4. Fan blade is broken or not turning. | a. Fan blade motion is obstructed.<br>b. Fan blade is loose at hub or is not keyed properly. |
| 5. Load step(s) cannot be energized. | a. A blower failure exists. (See problem 2.)<br>b. MASTER LOAD Switch is inoperative.<br>c. Control power is inadequate.<br>d. Fuse is blown in Load Bank control circuit or individual branch circuit load fuse (if so equipped) is blown. (Check and replace as required.)*<br>e. Blower Fail Relay is malfunctioning.<br>f. Load step switch is inoperative.<br>g. Load step contactor is inoperative.<br>h. Magnetic contactor has an open coil.<br>i. Load step resistor is open. |

* When checking fuses for continuity, be sure to remove all fuses from clips (in fuseblock or Disconnect Switch). Test each fuse individually, out of circuit. (If tested in circuit, there is the possibility of feedback which causes false readings. A blown fuse may still check out OK.)

| PROBLEM | POSSIBLE CAUSES/REMEDIES |
|---|---|
| 6. Contactor "chattering" exists. | a. Contacts and/or core are dirty or corroded.<br>b. Connections to contactor coil are loose.<br>c. Control circuit line voltage is too low. |
| 7. Load Bank or load step does not give rated load. | a. Applied load voltage is either derated or inadequate.<br>b. Contactor does not close properly.<br>c. Load step resistor element is open.<br>d. One of the individual load branch circuit fuses is blown (if so equipped). |
| 8. Disconnect Switch fuses are blown. | a. Fuses are undersized.*<br>b. A short circuit exists in the blower or control circuit.* |

* When checking fuses for continuity, be sure to remove all fuses from clips (in fuseblock or Disconnect Switch). Test each fuse individually, out of circuit. (If tested in circuit, there is the possibility of feedback which causes false readings. A blown fuse may still check out OK.)

| REVISIONS | | | | |
|---|---|---|---|---|
| ECN NO. | REV | DESCRIPTION | DATE | APPROVED |
| AD291 | A | REV PER ECN Zivkovic | 9/13/96 | BOHRER |
| AD459 | B | REV PER ECN Zivkovic | 11/7/96 | BOHRER |
| AD699 | C | REV PER ECN Zivkovic | 1/15/97 | BOHRER |
| AD825 | D | REV PER ECN Zivkovic | 1/15/97 | BOHRER |
| AD856 | E | REV PER ECN Zivkovic | 1/15/97 | BOHRER |
| AD894 | F | REV PER ECN Martin | 1/31/97 | BOHRER |
| AD964 | G | REV PER ECN GILLISSIE | 2/20/97 | BOHRER |
| AD996 | H | REV PER ECN, ALSO SEE SHEET 2 & 3 FACKELMANN | 3/7/97 | BOHRER |
| AH399 | J | ITEM 20 WAS 351891, ITEM 23 WAS 351889, ITEM 27 WAS 350830. SCHNEIDER | 5/31/00 | PALINKAS |
| CD158 | K | REVISED SHEET 2 PER ECN FACKELMANN | 8/14/02 | J.HUDSON |
| AN489 | L | REV'D SHT 1 & 3. ADD ITEM 49. R.FLAUTO | 5/26/04 | PALINKAS |

| REF DES | ITEM NO. | NO. REQD | PART NO. | DESCRIPTION | MATERIAL |
|---|---|---|---|---|---|
| | 81 | 4 | 507011 | SCREW 1/4-20 X 1.75 | |
| | 80 | 1 | B25464-3 | CABLE, POWER, GREEN | SEE NOTE 1 |
| | 79 | 1 | B25464-2 | CABLE, POWER, BLACK | SEE NOTE 1 |
| | 78 | 1 | 367517 | ALLIGATOR CLIP, BLACK | SEE NOTE 1 |
| | 77 | 1 | 367516 | ALLIGATOR CLIP, RED | SEE NOTE 1 |
| S7 | 76 | 1 | 360598 | SWITCH | |
| | 75 | 1 | B25338-2 | BRACKET | |
| | 74 | 1 | B25338-1 | BRACKET | |
| | 73 | 1 | B25339 | BRACKET | |
| | 72 | 3 | A23640-1 | BUS LINK | |
| | 71 | 14 | 531046 | WASHER, MICA | |
| R36,39 | 70 | 2 | AWR600 | RESISTOR, 6 OHM | |
| R34,35,37,38 | 69 | 4 | AWR200 | RESISTOR, 2 OHM | |
| | 68 | 2 | 461703 | COTTER PIN | |
| | 67 | 6 | 530078 | WASHER | |
| E7 | 66 | 1 | 366852 | PLUG, RED | |
| E6 | 65 | 1 | 366851 | PLUG, BLACK | |
| | 64 | 1 | A23616 | SHAFT | |
| | 63 | 2 | 492004 | WHEEL | |
| | 62 | 1 | C23446 | HANDLE, BOTTOM | |
| | 61 | 1 | 424223 | CABLE, BLACK | SEE NOTE 1 |
| | 60 | 1 | 424224 | CABLE, RED | SEE NOTE 1 |
| | 59 | 1 | B25464-1 | CABLE, POWER, RED | SEE NOTE 1 |
| R22 | 58 | 1 | 119815 | RESISTOR, 30K | |
| | 57 | 5 | 516059 | NUT, 3/8-16 | |
| | 56 | 5 | 532537 | WASHER, 3/8 | |
| | 55 | 1 | 507042 | SCREW, 3/8-16 x 1.00 L | |
| | 54 | 12 | A17912 | BUS LINK | |
| | 53 | AR | 469004 | GROMMET | |
| | 52 | 10 | A23443 | BRACKET, RESISTOR | |
| | 51 | 1 | C23218 | SCHEMATIC/WIRING DIAGRAM | |

LIST OF MATERIAL

| REF DES | ITEM NO. | NO. REQD | PART NO. | DESCRIPTION | MATERIAL |
|---|---|---|---|---|---|
| | 50 | 16 | 509108 | SCREW, 6-32 x 2.00" L | |
| | 49 | 2 | 411086 | SPANNER BUSHING | |
| XB1-6 | 48 | 12 | 366939 | TERMINAL | |
| B1-6 | 47 | 6 | 322140 | FAN | |
| | 46 | 1ft | 390025 | WIRE, #1/0 | |
| | 45 | 1 | 390874 | LINE CORD | SEE NOTE 1 |
| | 44 | 4 | A23362 | FEET | |
| | 43 | 1 | A23641 | HANDLE, TOP | |
| | 42 | 2 | 440133 | HANDLE | |
| | 41 | 1 | C20560 | SCOTCHCAL, SET | |
| | 40 | 1 | A23355-2 | PLATE, IDENT | |
| E1-5 | 39 | 5 | 315168 | CONNECTOR, TERMINAL | |
| XK4 | 38 | 1 | 358206 | SOCKET | |
| S1-6,8 | 37 | 7 | 360589 | SWITCH, TOGGLE | |
| DS1-3 | 36 | 3 | 329665 | LIGHT, INDICATOR | |
| P1 | 35 | 1 | 314681 | CONNECTOR, RECP | |
| M1 | 34 | 1 | 338159 | METER | |
| R21 | 33 | 1 | 123037 | RESISTOR, 10K | |
| XF1 | 32 | 1 | 324985 | FUSEHOLDER | |
| F1 | 31 | 1 | 324211 | FUSE, 5A | |
| R20 | 30 | 1 | 337995 | SHUNT, 200A, 100mV | |
| XTB1 | 29 | 1 | 450087 | INSULATOR, TB | |
| TB1 | 28 | 1 | 364072 | TERMINAL BOARD | |
| K8,9 | 27 | 2 | 351650 | RELAY | |
| | 26 | 2 | 364433 | END BRACKET | |
| | 25 | 14in | 408189 | MOUNTING RAIL | |
| K6 | 24 | 1 | 351170 | RELAY | |
| K7 | 23 | 1 | 351687 | RELAY | |
| K4 | 22 | 1 | 350675 | RELAY | |
| K2,3 | 21 | 2 | 350350 | RELAY | |
| K1 | 20 | 1 | 351783 | RELAY | |
| S9,10 | 19 | 2 | 491012 | SWITCH, THERMOSTATIC, 300° F | |
| | 18 | 62 | 523205 | NUT ASSEMBLED WASHER, 10-32 | |
| | 17 | 15 | 411145 | TUBE, INSULATOR | |
| | 16 | 105 | 411141 | TUBE, INSULATOR | |
| | 15 | 30 | 411181 | TUBE, INSULATOR | |
| | 14 | 60 | 411182 | TUBE, INSULATOR | |
| | 13 | 30 | A21179 | SUPPORT, ROD BUSHING | |
| | 12 | 15 | A23383 | SUPPORT, ROD ELEMENT | |
| R6,9,12,15,18 | 11 | 5 | A23368-2 | RESISTANCE ELEMENT | |
| R4,5,7,8,10,11,13,14,16,17 | 10 | 10 | A23368-1 | RESISTANCE ELEMENT | |
| XR31-39 | 9 | 5 | A23712 | ROD, ELEMENT SUPPORT | |
| R33 | 8 | 1 | AWR1200 | RESISTOR, 12 OHM | |
| R31,32 | 7 | 2 | AWR400 | RESISTOR, 4 OHM | |
| | 6 | 2 | C23223 | SUPPORT, SIDE , ELEMENT | |
| | 5 | 1 | C23222 | SUPPORT, ELEMENT | |
| | 4 | 1 | C23219 | PANEL, MACH ,CONTROL | |
| | 3 | 1 | C23220 | COVER, MACH, TOP | |
| | 2 | 1 | C23221 | COVER, MACH, BACK | |
| | 1 | 1 | D26696 | CHASSIS. MACH | |

LIST OF MATERIAL

4. REMOVE AUX CONTACTS FROM K1-3,7-9 AND DISCARD.
3. USE #8-32 HDW TO MOUNT DEVICES & FAB COMPONENTS.
2. USE DEVICE LABELS TO IDENTIFY COMPONENTS.
1. SHIPPED LOOSE

UNLESS OTHERWISE SPECIFIED THE ABOVE NOTES APPLY

| | |
|---|---|
| NEXT ASSY | USED ON |
| APPLICATION | |

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES: ANGLES±1° DECIMALS .XX± .XXX±
FINISH
PAINT PER PS
PLATE PER
COAT PER PS
ANODIZED PER
OTHER

| | | DATE |
|---|---|---|
| DRAWN | Zivkovic | 7/31/96 |
| *CHECKED | Zivkovic | 8/8/96 |
| ENG APVD | BOHRER | 8/8/96 |
| APVD PROD | ZIMMERMAN | 8/8/96 |

SBS STORAGE BATTERY SYSTEMS, INC.

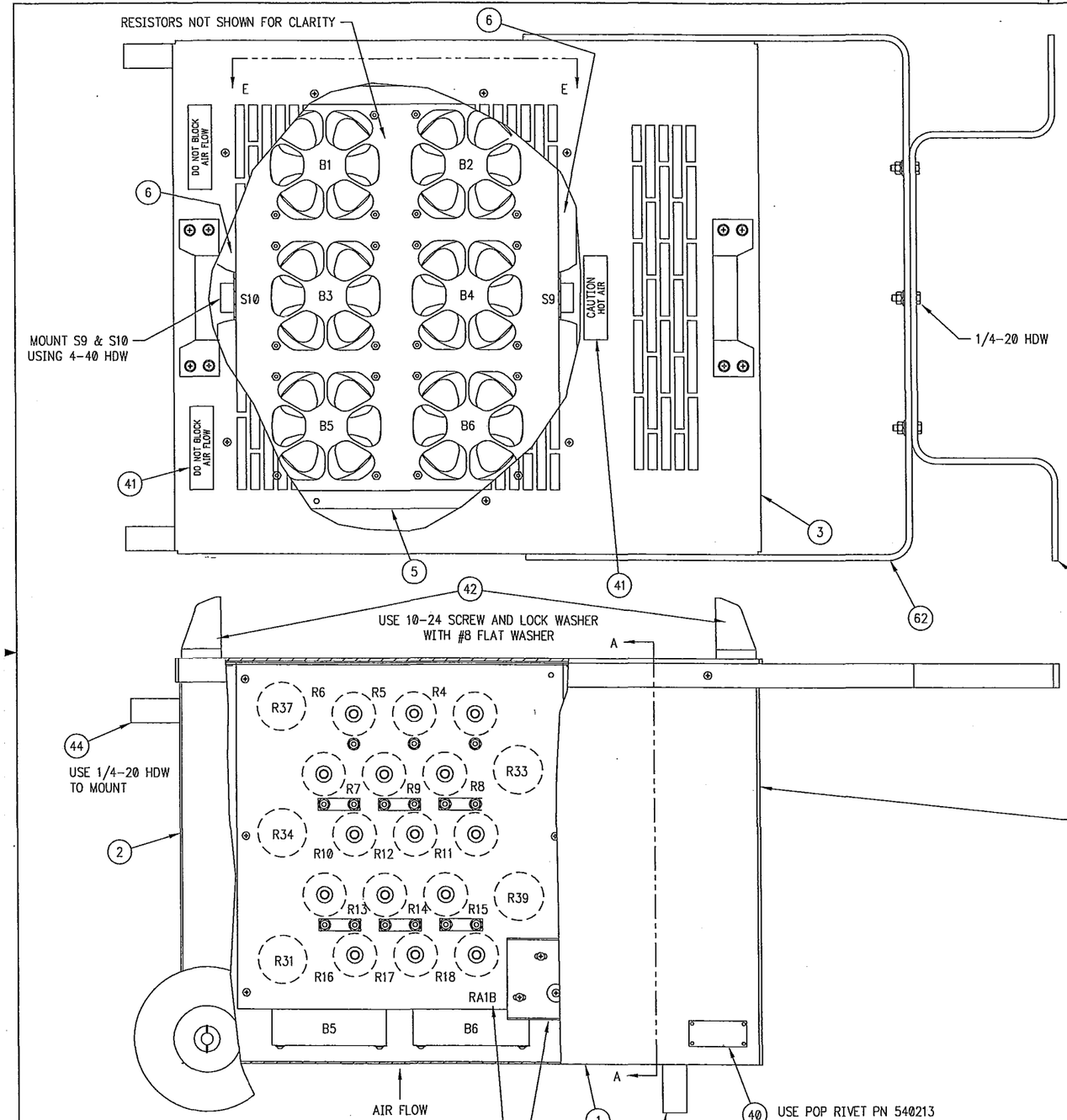
LOAD BANK
(OUTLINE DWG SB2615)

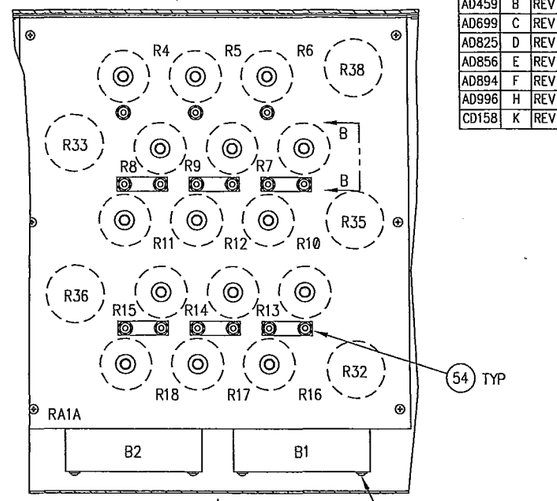
IMF ☐ PSF ☒

| SIZE | CAGE NO. | DWG. NO. | REV |
|---|---|---|---|
| D | | D26649 | L |

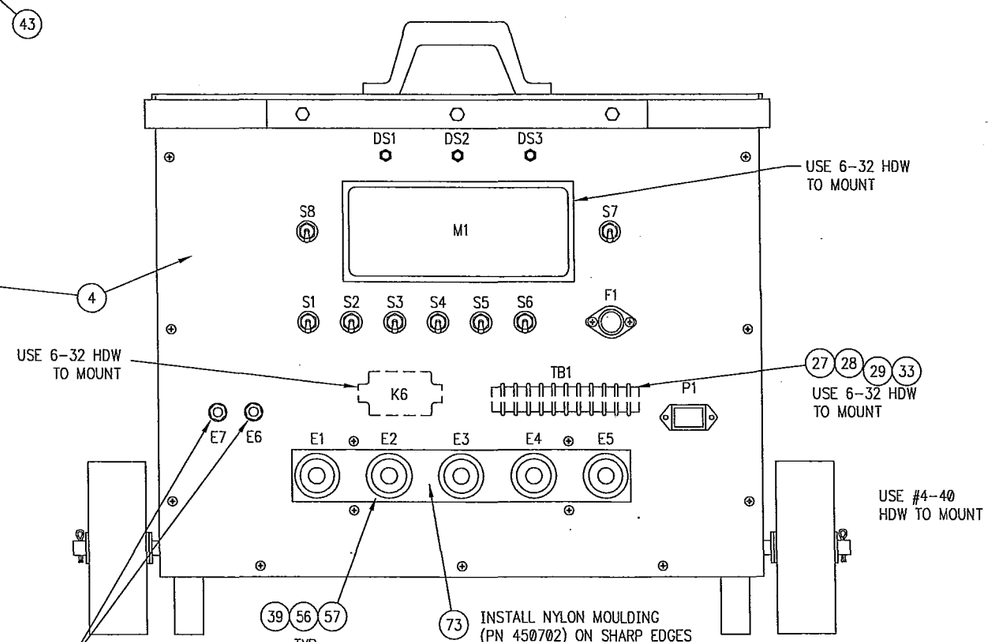
SCALE FULL | MODEL BCT-5000 | SHEET 1 OF 3

| REVISIONS | | | | |
|---|---|---|---|---|
| ECN NO. | REV | DESCRIPTION | DATE | APPROVED |
| AD291 | A | REV PER ECN Zivkovic | 9/13/96 | BOHRER |
| AD459 | B | REV PER ECN Zivkovic | 11/7/96 | BOHRER |
| AD699 | C | REV PER ECN Zivkovic | 1/15/97 | BOHRER |
| AD825 | D | REV PER ECN Zivkovic | 1/15/97 | BOHRER |
| AD856 | E | REV PER ECN Zivkovic | 1/15/97 | BOHRER |
| AD894 | F | REV PER ECN Martin | 1/31/97 | BOHRER |
| AD996 | H | REV PER ECN Fackelmann | 3/7/97 | BOHRER |
| CD158 | K | REV PER ECN Fackelmann | 8/14/02 | J.HUDSON |




SECTION "E-E"
VIEW ROTATED 180°




SEE SHT 1 FOR NOTES

UNLESS OTHERWISE SPECIFIED THE ABOVE NOTES APPLY

| | | UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES | DRAWN | DATE |
|---|---|---|---|---|
| | | TOLERANCES: ANGLES±1° DECIMALS .XX± .XXX± | Zivkovic | 7/31/96 |
| | | FINISH | CHECKED Zivkovic | 8/8/96 |
| | | PAINT PER PS | ENG APVD BOHRER | 8/8/96 |
| | | PLATE PER | APVD PROD ZIMMERMAN | 8/8/96 |
| NEXT ASSY | USED ON | COAT PER PS | | |
| | | ANODIZED PER | | |
| APPLICATION | | OTHER | | |

SBS STORAGE BATTERY SYSTEMS, INC.

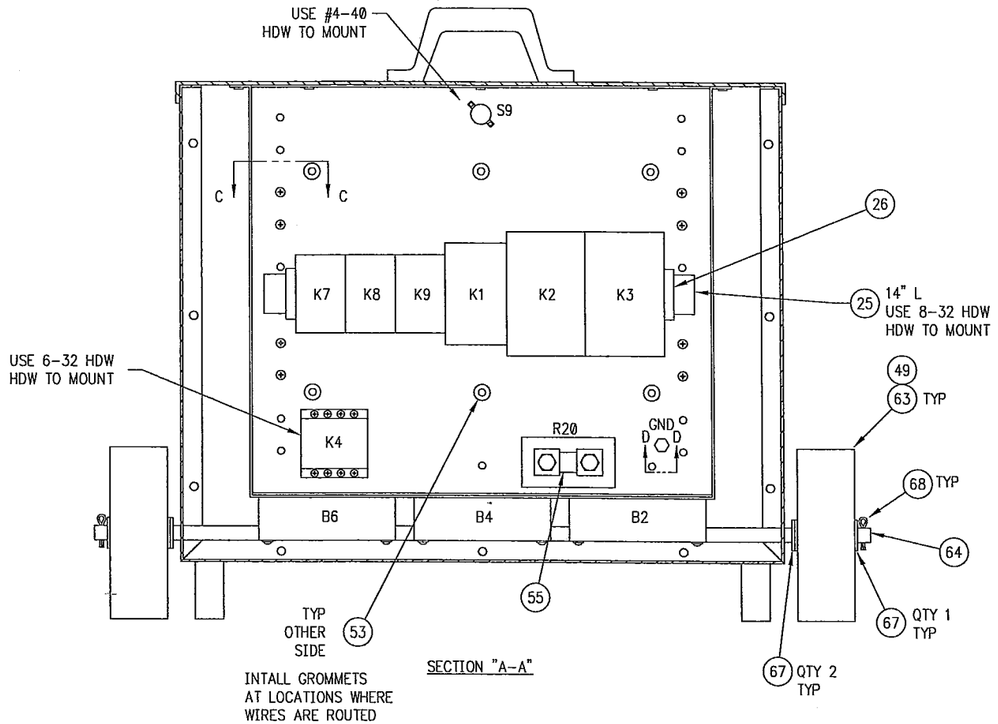
LOAD BANK
(OUTLINE DWG SB2615)

IMF ☐ PSF ☒

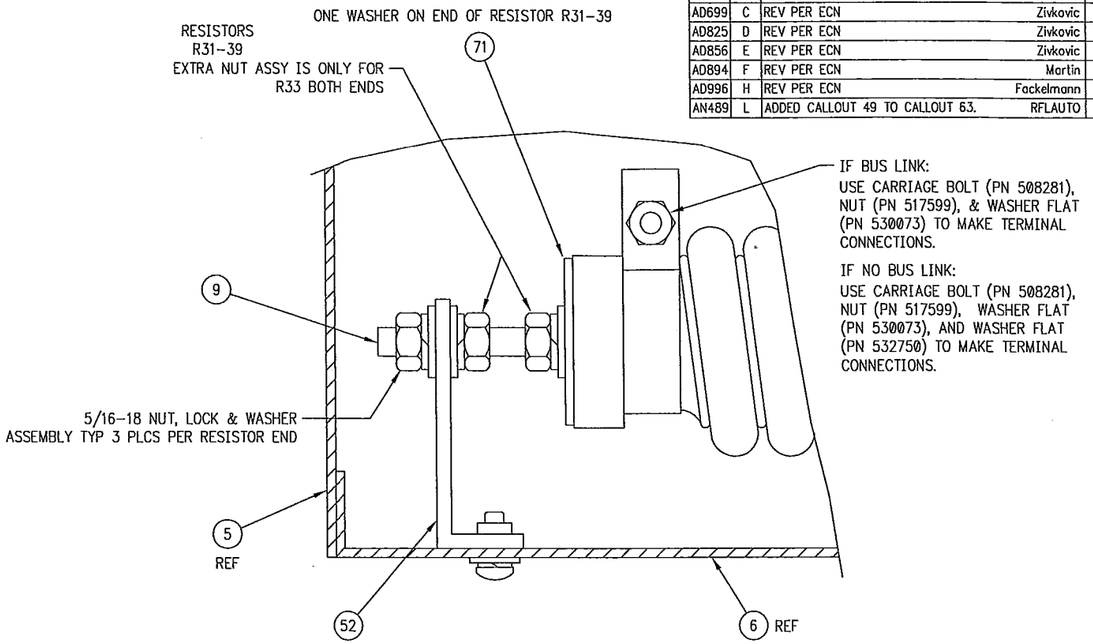
SIZE D | DWG. NO. D26649 | REV L

SCALE 3/8 | MODEL BCT-5000 | SHEET 2 OF 3

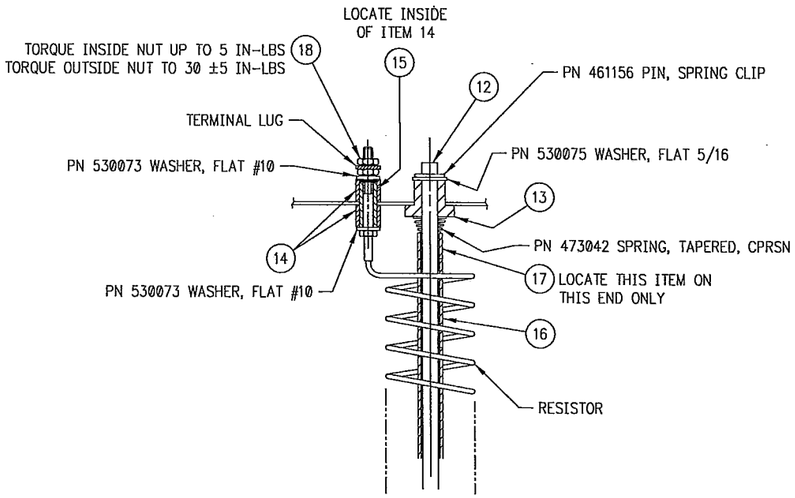
| REVISIONS | | | | |
|---|---|---|---|---|
| ECN NO. | REV | DESCRIPTION | DATE | APPROVED |
| AD291 | A | REV PER ECN Zivkovic | 9/13/96 | BOHRER |
| AD459 | B | REV PER ECN Zivkovic | 11/7/96 | BOHRER |
| AD699 | C | REV PER ECN Zivkovic | 1/15/97 | BOHRER |
| AD825 | D | REV PER ECN Zivkovic | 1/15/97 | BOHRER |
| AD856 | E | REV PER ECN Zivkovic | 1/16/97 | BOHRER |
| AD894 | F | REV PER ECN Martin | 1/31/97 | BOHRER |
| AD996 | H | REV PER ECN Fackelmann | 3/7/97 | BOHRER |
| AN489 | L | ADDED CALLOUT 49 TO CALLOUT 63. RFLAUTO | 5/26/04 | PALINKAS |




SECTION "A-A"

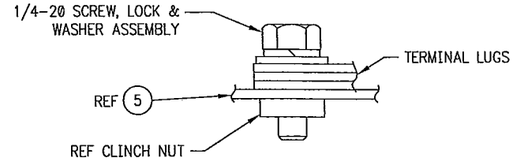



SECTION "C-C"
TYP ASSEMBLY AT EACH END OF RESISTORS.
NOTE: WIRING TERMINALS OF RESISTORS SHOULD
BE POINTING DOWN TO THE BOTTOM OF THE UNIT.




SECTION "B-B"
ROTATED -90°
TYPICAL ASSEMBLY
FOR R4-18

SECTION "D-D"




SEE SHT 1 FOR NOTES

UNLESS OTHERWISE SPECIFIED THE ABOVE NOTES APPLY

| | | | | |
|---|---|---|---|---|
| | | UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES | DRAWN Zivkovic | DATE 7/31/96 |
| | | TOLERANCES: ANGLES±1° DECIMALS .XX± .XXX± | CHECKED Zivkovic | 8/8/96 |
| | | FINISH | ENG APVD BOHRER | 8/8/96 |
| | | PAINT PER PS | APVD PROD ZIMMERMAN | 8/8/96 |
| | | PLATE PER | | |
| NEXT ASSY | USED ON | COAT PER PS | | |
| | | ANODIZED PER | | |
| APPLICATION | | OTHER | | |

SBS STORAGE BATTERY SYSTEMS, INC.

LOAD BANK
(OUTLINE DWG SB2615)

IMF ☐ PSF ☒

SIZE D | DWG. NO. D26649 | REV L

SCALE 3/8 | MODEL BCT-5000 | SHEET 3 OF 3


CORPORATE HEADQUARTERS: N56 W16665 RIDGEWOOD DR. • MENOMONEE FALLS, WI 53051 • TEL. (262) 703-5800 • FAX (262) 703-3073
ILLINOIS DIVISION: 179 EASY STREET • CAROL STREAM, ILLINOIS 60188 • TEL. (630) 221-1700 • FAX (630) 221-1701
APPLETON DIVISION: N926 TOWER VIEW DRIVE UNIT B • GREENVILLE, WISCONSIN 54942 • TEL. (920) 757-1175 • FAX (920) 757-1180
Email: sbs@sbsbattery.com • web Site: http://www.sbsbattery.com