ASCO Power Technologies

2000 Series Load Bank

User's Guide

Part Number: Sigma LT

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Schneider Electric

ASCO 2000 SERIES USER MANUAL
SIGMA LT

Cleveland, Ohio

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PROPRIETARY NOTE

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WARRANTY

The last page of this document contains an express limited warranty. The provisions of this warranty cover any and all rights extended to holders of Load Bank products and systems by ASCO Power Technologies, LP.

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ASCO 2000 SERIES
LOAD BANK

TABLE OF CONTENTS

SUPPLEMENTARY DATA

ASCO 2000 SERIES
LOAD BANK

SECTION I

SAFETY CONSIDERATIONS

Throughout this manual, you will find **WARNING** and **CAUTION** statements. Personal injury or death may occur to an operator using or repairing the equipment 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 ensure safe operation. All fuses, safety interlocks, and related safety equipment 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 ensure the reliability and safety built into your equipment.

The Load Bank is an industrial test unit designed to be used indoors. However, because the function of the Load Bank is to dissipate 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 may be 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 lug located on the customer connection panel to the frame of the power source. Run an approved ground wire from the power source frame to a good earth ground. Size ground wire in accordance with National Electrical Code and any local codes.

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

W A R N I N G

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

4. Maintenance should be performed with no power on the unit. The majority of troubleshooting can be performed with an ohmmeter. There are multiple sources of power input to the Load Bank. Ensure each is disconnected.

5. 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.

6. 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.

7. After running a load test, residual heat will 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.

8. 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.

9. 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.

10. Emergency Shutdown Procedure

    A. In an emergency, shut down the MASTER LOAD switch, then the Control Power switch and finally the power source. The MASTER LOAD switch will allow disconnection of all load steps and still allow for the fan to run, cooling any heated elements.

    B. POWER ON/OFF switch will disconnect both load steps and the fan motor. The power source EMERGENCY OFF switch should be located near the load system.

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

12. It is the responsibility of the customer to take diligent care in installing 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.

13. Read and heed all WARNING and CAUTION statement in the manual

SECTION II

DESCRIPTION

The Series 2000 Load Banks are designed for electrically loading and testing power sources. The Load Bank is designed for production line and job site use.

Refer to the schematic for the load bank KW, voltage, phase and frequency rating. Using the Digital Toggle Switches™ (DTS™) on the control panel, any combination of the available load steps may be selected to achieve a desired load.

A single phase, 60 Hz, power source is required for the control circuit. This power is derived either from an external source or from an internal control power transformer connected to the load bus. Refer to the load bank schematic for control power requirement.

Fan power is obtained from either the power source under test (connected to Load Bank main load bus) or from a remote source (external power source).

GENERAL OVERVIEW

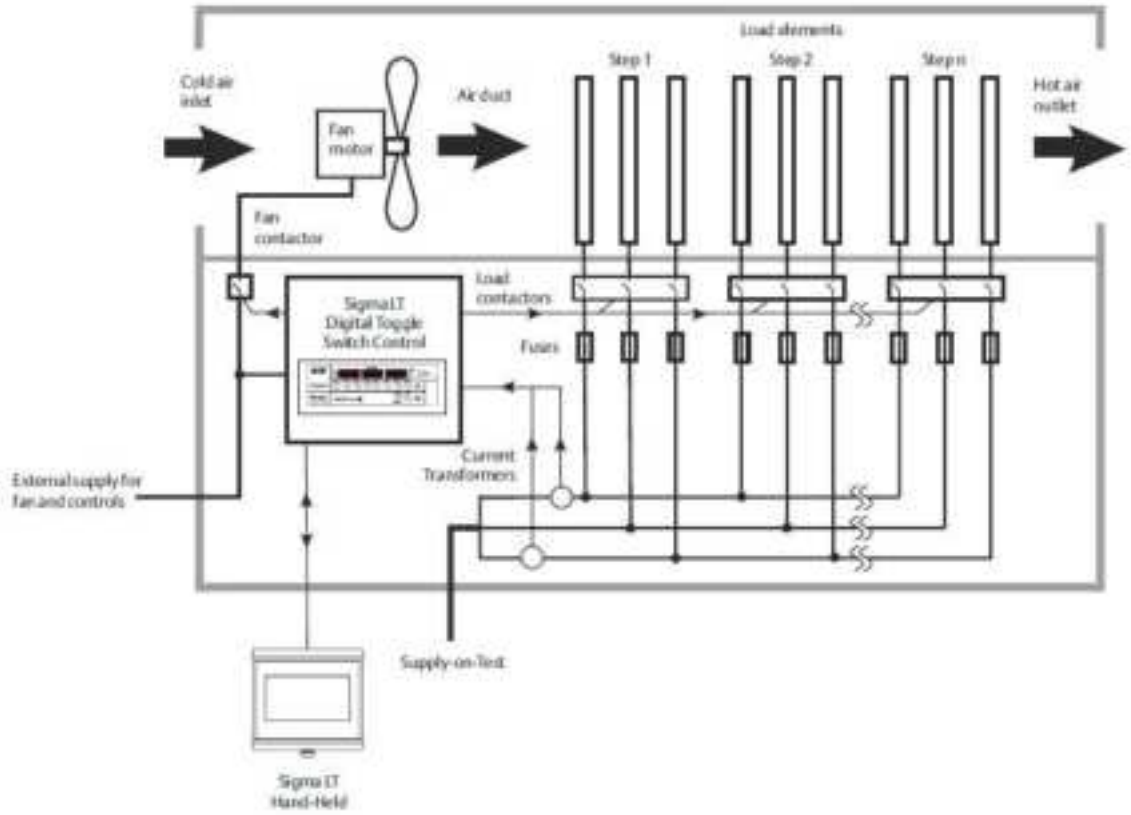


Figure 1-1 ASCO Sigma LT Load Bank Core Components

There are variations between different Sigma LT load bank models, but Figure 1-1 shows a simplified schematic of the core components to be found in most units.

The diagram contains:

- An array of load elements grouped in small steps that are individually activated by switchgear to allow the load applied to the generator to be precisely controlled.
- A fan and duct forced air system which ensures that the heat generated during testing is vented safely to atmosphere.
- Fuses and safety interlocks that ensure that the test can be shut down in a controlled fashion if any problems occur.
- Automatic precision control of the test and allow the results to be displayed with better than 0.5% accuracy.

CONTROL PANEL

The control panel is integrally mounted on the Load Bank. The controls on the control panel will vary depending on the model and available accessories. The control panel is for local control only and instrumentation is displayed on the seven segment digital display. Refer to the schematic for specific controls associated with the load bank provided. The general arrangement for the control is:

1. **Control Power:** The control power switch is used to activate/deactivate the load bank for operation. It does not remove control power internally within the load bank. (Not provided on all models).

2. **Blower Voltage Select:** The voltage select switch is used to select the voltage of the unit under test for operating the blower and control power. The switch also assigns the power source as either the load bus, or an external source and must match the blower/control INT/EXT switch. (Not provided on all models).

IMPORTANT NOTE

The "Blower Voltage Select" switch must be placed in the appropriate position prior to the application of power and not changed unless power is removed. Failure to do so may result in tripping CB1 and clearing fuses

3. **Voltage Select:** This pushbutton assigns the load voltage of the source to be tested when in Local Mode (no hand-held controller connected).

4. **Load Select:** Press any combination of the load select switches to choose the required load in kW. For example, if 40kW is required, press 5 kW, 10 kW, and 25 kW. Then press master load on. Alternatively if master load is already on there will be a 1 second delay; then load will be applied automatically. The delay permits the pre-selection of a load which is not possible with standard toggle switch load banks.

5. **Local/Remote Control Selection:** Switch between local and remote control. Remote control mode is only available when a Sigma LT hand-held controller is connected.

6. **Master Load:** Master load applies any load selected when turned on and rejects all load when turned off.

7. **Mode:** Press mode to cycle through the different instrumentation displays: 3 phase Voltage and Currents or Voltage, Frequency and Power. Press and hold for 10 seconds to select single phase (1ph A-C or 1ph AB-C) and three phase (3ph ABC) connections. Cycle to the required settings and leave for 5 seconds to select.

8. **CANbus IN Connector:** This connector is for taking an input from the hand-held controller or from a networked load bank forward in the total load bank string.

9. **CANbus OUT Connector:** This connector is for taking an output from a load bank in the network string and connecting it via network cables to the next load bank in the string.

10. **Control Power INT/EXT:** The control power select switch is used to select between internally supplied control power or externally supplied control power through a connector mounted to the load bank. (Not provided on all models).

11. **Blower/Control Power INT/EXT:** The Blower /Control Power Select Switch is used to configure the blower/control power circuit for either INTERNAL or EXTERNAL. This switch must match the Blower Voltage Select Switch for INT or EXT. (Not provided on all models).

12. **Metering and Error Warning Lamp:** Metering is displayed according the mode switch while in Local Mode. The LED warning lamp to the left of the display will illuminate if an error occurs, and the error type will then appear on the metering display. (Not Numbered For Clarity).

ENCLOSURE

The outside dimensions of the Load Bank are shown on Outline Drawing. The Load Bank is fabricated of aluminized steel, assembled with SST hardware, and mounted either with feet or casters. Handles may be provided for lifting and transporting the Load Bank.

C A U T I O N

Do not allow the Load Bank to be placed where hot exhaust air can recirculate back through the unit causing a constant rise in cooling air temperature.

The Load Bank contains fans which provide the necessary cooling air for the load elements. Sensors are provided to monitor the flow of cooling air. These sensors are electrically interlocked with the load application controls and if the fans are not working properly, the load steps are disabled and an error message is displayed on the load bank and also on the hand held (if connected).

Air to cool the load elements enters the screened intakes located on one end of the Load Bank. The air passes over the resistive elements and is then discharged through the screened opening at the opposite end of the Load Bank.

The Load Bank contains a control fuse and depending on the model, the load circuit will be protected with either branch circuit or main line fusing for short circuit protection.

W A R N I N G

Do not operate the Load Bank with any screen or cover removed. This may expose the operator to high voltage and rotating fan blades.

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 unit is a portable Load Bank, designed for indoor use, and should be used in a cool, well-ventilated area. Cool air must be continually available and the hot exhaust air must be dissipated, not recirculated through the unit. Install the Load Bank so that the inlet and exhaust panels have unrestricted airflow clearance.

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.

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 three (3) feet of the inlet and six (6) feet of the exhaust (Model 2700) and four (4) feet of the inlet and eight (8) feet of the exhaust Models 2800/2900) will restrict the Load Bank's airflow. Airflow is also restricted when two or more Load Banks have air inlets positioned too 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 overtemperature switches 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 OVERTEMPERATURE SWITCHES. This causes a safety hazard and voids our warranty. The following installation instructions are critical to the safe operation of the Load Bank. Refer to the SAFETY CONSIDERATIONS section of this manual

3. The heated exhaust air stream can damage any temperature sensitive items if they are positioned near the exhaust air.

4. Load Banks mounted into a channel, trough, hollow, well, or pit, or exhausting into a full wall or corner, require special considerations even if above conditions are met. In these cases, provide a detailed sketch of site layout for manufacturer to inspect and comment.

POWER REQUIREMENTS

The Load Bank requires a 120 volt, single phase, 60 Hz source of power for operation of the control circuit. Control power may be derived internally from the unit under test with a control power transformer, or from an external source. A power cord for control power may be provided with the Load Bank. Reference the schematic for specific control power requirements and control connections.

C A U T I O N

If the Load Bank includes a control transformer, never connect a control power line cord to the secondary of the control transformer. This would permanently damage the control transformer.

LOAD CONNECTION

Load power is connected to the Load Bank either through receptacles located on the exterior of the Load Bank or bus bars located within the Load Bank.

For units with receptacles on the exterior, loose connectors may be provided for the load cable to be connected to the load bank.

For internal connection to bus bars, run cables through opening in the Load Bank frame up to bus bars. Reference the outline drawing for the location of the opening. Verify proper phase to phase clearance on cable lugs, mounting hardware, and wiring.

For either load connection, cables to the Load Bank should be of adequate size to handle the maximum rated current according to the National Electric Code and any local codes. The current can be determined by the following formula:

$$\text{Line Current} = \frac{\text{kW} \times 577}{\text{VOLTAGE (Line to Line)}}$$

Lower voltages and different frequencies may be applied to the load circuit of the Load Bank. Frequency change causes no derating of the load; however, the applied kW with a lower voltage is computed by using the following formula:

$$kW_{Applied} = kW_{Rated} \times \frac{(\,Voltage\ Applied\,)^2}{(\,Voltage\ Rated\,)^2}$$

W A R N I N G

Do not energize the Load Bank with any covers removed.

GROUNDING

A permanent ground should be connected to the Load Bank enclosure either by a grounded conduit or with a separate ground wire to prevent a potential above ground on the enclosure. This ground conductor is connected to the load bank either through receptacles located on the exterior of the load bank or internally to a bus bar. No internal ground connections are made to any terminal on the Load Bank.

The ground conductor should be run with the load power conductors to provide the lowest impedance fault path. The ground receptacle or bus bar on/within the Load Bank must be connected to both the generator frame and a good earth ground. The ground conductor should be sized per the National Electric Code Table 250.122 if not superseded by local codes.

C A U T I O N

Never exceed the Load Bank rated voltage as this will cause the Load Bank to overheat.

BLOWER MOTOR CONNECTIONS

For units with blower motor connections separate from the control power circuit, the blower circuit consists of fuses, motor starters, contactors, overload relays, and the fan motor. The blower may be connected in one of two ways.

A. INTERNAL BLOWER POWER OPERATION: The blower motor is connected to load bus through a relay and fuses. When operating the blower motor from the UUT, an additional load will be applied. This additional load will be reflected in the meter readings and should be noted on load readings to prevent errors.

B. REMOTE BLOWER POWER OPERATION: When testing single phase system or systems or a frequency other than 60 Hz, the blower motor must be run from a separate source. First review schematic, set the control panel selector switch to match the external voltage applied and then connect external power. Connect the external blower power source to terminals as shown on the schematic.

C. BLOWER MOTOR VOLTAGE/FREQUENCY: Blower motor will operate between 208 and 250 V (low voltage) and between 416 and 500 V (high voltage) at 3-phase 60 Hz for 240/480 V load banks. Connections for 50 Hz operation are identical to 60 Hz, with a motor voltage range of 190 to 220 V (low voltage) and 380 to 440 V (high voltage)

Blower motor will operate between 208 and 250 V (low voltage) and between 575 and 600 V (high voltage) at 3-phase, 60 Hz for 300/600 V load banks.

W A R N I N G

When operating at 50 Hz the motor speed (RPM) is reduced which also reduces the cooling of the load bank. Do not 400 V in the 480 V mode or 200 V in the 240 V mode to the input bus when the fans are running at 50 Hz.

SECTION IV

OPERATION

C A U T I O N

Before energizing any load, verify that load voltage does not exceed rated voltage of load bank.

C A U T I O N

Do not attempt operation if the cooling system is not running. Fan inlet and exhaust must be unrestricted. The operation of the fans is vital to the safe operation of this Load Bank. If an Over-Temperature is displayed on the front of the load bank display, or, on the hand-held controller, shut off the control power switch at once. Remove all power to the unit and check for proper operation of fan safety circuit. Failure to correct cooling air loss condition will result in destruction of the Load Bank. Refer to the SAFETY CONSIDERATIONS section of this manual.

OPERATING INSTRUCTIONS (Individual Unit)

To Operate:

1. Connect a conductor from the Load Bank ground to the unit under test frame. Reference Section III, GROUNDING.

2. Ensure the unit under test frame is grounded. Reference Section III, GROUNDING.

3. Connect the unit under test to the Load Bank as described in Section III, INSTALLATION.

4. Connect the Load Bank to a 120 volt, single phase, 60 Hz power source if required.

5. Position the BLOWER VOLTAGE SELECT switch (2) to the correct voltage (if applicable) to the voltage being applied.

6. Position the BLOWER/CONTROL POWER select switch (11) to either INT or EXT. Must match BLOWER VOLTAGE SELECT switch (2). (Not provided on all models).

7. Position the CONTROL POWER select switch (10) to either the internal or external position. This function is normally used when the load bus supplies blower power, but it is expected that the bus may momentarily drop low enough for contactors to drop out. Therefore, typically, Blower Power (11) would be set to internal, when the CONTROL POWER switch is set to external. Voltage selection for the bus is made as described in step 5. (Not provided on all models)

8. Turn external power on.

9. Start the generator.

10. Turn the Control Power switch (1) on. (Not provided on all models).

11. Note that the load bank fan will immediately start once the controller becomes powered (approximately 3 seconds). On units with 3-phase fans the blower will run 10 seconds in the forward direction, experience a 10 second spin down, and then run 10 seconds in the reverse direction. This assigns the correct direction to the blower during subsequent operation and is also a test of the load bank air-fail protection.

12. Depress the load VOLTAGE SELECT pushbutton to select the load voltage being applied.

13. Position the Digital Toggle Switch(es) (DTS^{TM}) to the desired load.

14. Turn on the MASTER LOAD switch to apply desired load. Load steps may be added or deleted at any time. A two-second time-delay will occur between the application of a new DTS^{TM} setting and load application. This permits load "preset," something previously not possible with toggle switch load banks.

15. Monitor load applied with the digital metering (V, A, Hz, kW). Press the mode switch to change the function being monitored.

16. After running tests, remove the load by placing the MASTER LOAD switch to the OFF position.

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

17. Place the CONTROL POWER switch to the OFF position.

18. Shut down the generator and disconnect all sources of power to the load bank.

19. Remove load and ground cables

W A R N I N G

DO NOT touch the exhaust screen during 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.

SINGLE-PHASE OPERATION

IMPORTANT NOTE

When operating the load bank in single-phase mode, external three phase power must be provided at connector J1001 to operate the blower and controls. Refer to the schematic for the appropriate jumper locations.

Single-phase operation is achieved by connection between two phase terminals, one of which is used as neutral.

L1-L3 Connection Mode: The L1-L3 connection mode shown in Figure 4-2 will give approximately 50% loading capacity (250 kW) when the nominal load bank supply voltage is connected.

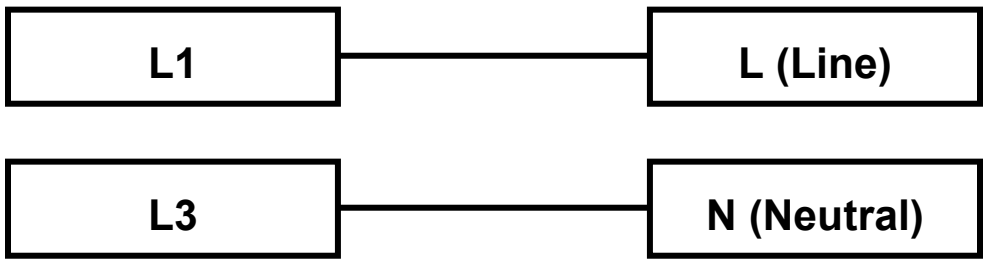


Figure 4-2: L1-L3 Connection for a Single-Phase Supply

NOTE

Place VOLTAGE SELECT switch in the low voltage mode.

W A R N I N G

The three phase AC bus and any attached wiring are electrically hot when operating Load Bank in single phase, per Figure 4-2.

L1/L2-L3 Connection Mode: The L1/L2-L3 connection mode shown in Figure 4-3 will give approximately 66% loading capacity when the nominal load bank supply voltage is connected.

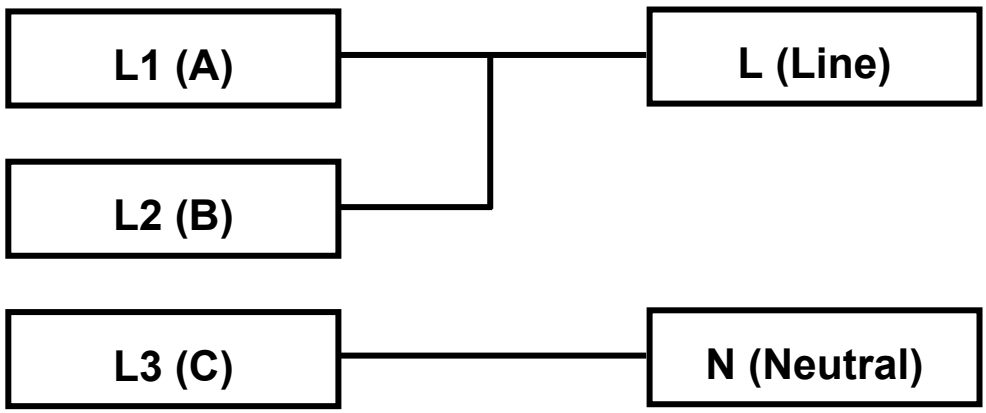


Figure 4-3: L1/L2-L3 Connection for a Single-Phase Supply

NOTE

Place VOLTAGE SELECT switch in the low voltage mode.

W A R N I N G

The three phase AC bus and any attached wiring are electrically hot when operating Load Bank in single phase, per Figure 4-3.

ERROR MESSAGES AND TROUBLESHOOTING

Error Type	Display	Latched
Communications Loss	Err Conn	
Wrong Voltage	Err Volt	Latched
Over Voltage	Err OVEr Volt	Latched
Air Fail	Err Air FAIL	
Motor Overload	Err FAn OVEr	
Over Temperature Chamber "1"	Err OVEr tC 1	Latched
Internal Software Error	Err SoFt FAIL	

Figure 4-4: Error Messages Displayed on the Load Bank Front Panel

Fault	Possible Causes	Possible Causes
Cooling fan does not start or run	Correct operation	• The cooling fan may not run until load is applied. Apply the load and verify that the fan starts.
	No power to fan	• Check that the control and fans supply selector switch and the Fan and Controls Supply Isolator are in the correct position and the Start button has been pressed. • Confirm that the control supply fuses are not blown.
	Fan thermal overload tripped	• Allow the load bank to cool, and then press the Stop button followed by the Start button to reset. • Check that the fan is not obstructed and that it is free to rotate. Check the motor current and overload setting.
No load is being applied	Supply-on-test is not switched on.	• Confirm that the Supply-on-Test circuit breaker is switched on. • If fitted, ensure that the load bank circuit breaker(s) is switched on.
	Load bank over temperature trip	• Allow the load bank to cool and then reset. • Check that the airflow through load bank is unobstructed. • Check for any signs of hot air re circulation.
	Faulty or damaged connecting lead	• Check that the IHT lead and connectors are not damaged.
Incorrect or wrong load is applied	Supply-on-test voltage and/or Frequency	• Ensure the Supply-on-Test settings are correct.
	Excessive volt drop	• Check rating of cables or if an MV test, transformer. • Check AVR droop setting.
	Single phase operation or phase missing	• When testing a single phase generator, check the method of connection. Refer to Chapter two • For three phase operation verify that all of the phases are present.
	Loading problem	• Check the load fuses • Check the load contactors • Check the load elements

Figure 4-5: Typical Faults and Possible Solutions

LIMITING THE LOAD BANK TOTAL CAPACITY

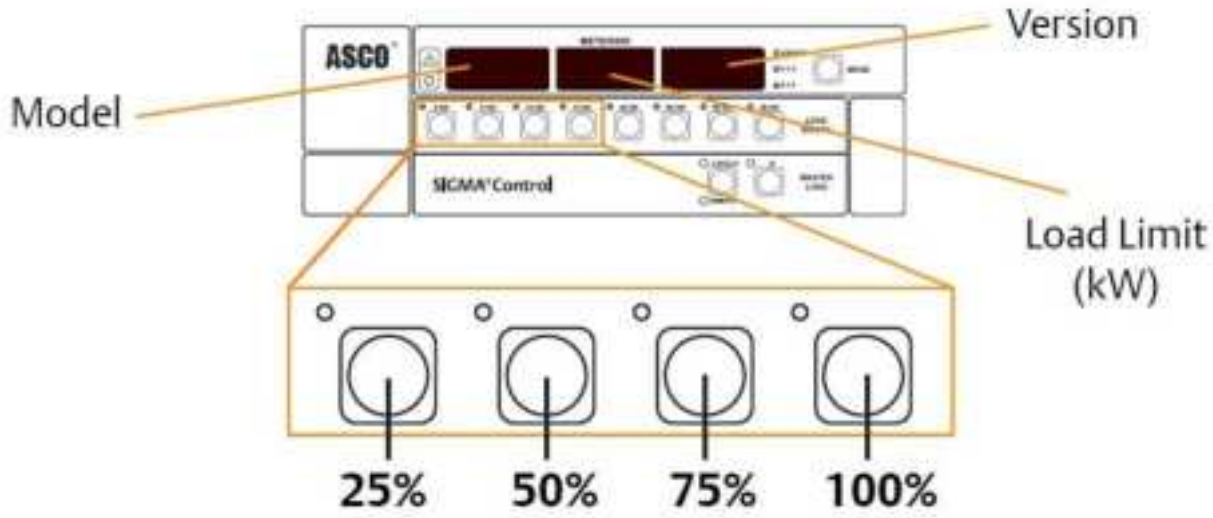


Figure 4-6

During certain testing it may be desirable to limit the capacity of a given load bank. This is done at start up. When the load bank is first powered up, the Model, Load Limit (kW), and software version are displayed.

To limit the load bank capacity according to the figure above, depress and hold the corresponding load step button when power is applied. This will limit the kW to 25%, 50%, 75%, or 100%.

Note as well, that limiting the capacity is retentive, and if a different capacity is required, it must be set the same way during a control power on condition.

SECTION V

NETWORK OPERATION

NETWORK OPERATION (Using the Hand-Held Controller)

The load banks may be operated individually using a hand-held controller to select and apply load in place of the Digital Toggle Switches™. However, it is often used in a network configuration.

The Sigma LT control system allows up to 25 load banks to be interconnected and controlled from a single hand-held controller as if they were a single large unit. This means that multiple load banks can be combined to match particularly large generating sets.

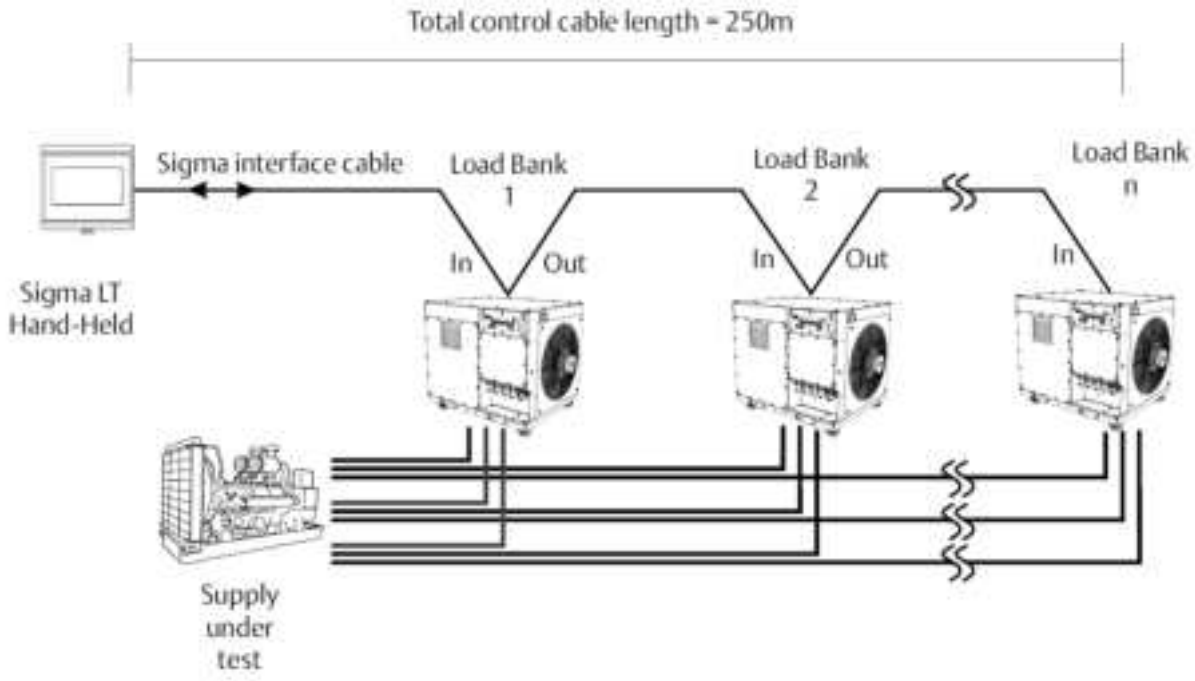


Figure 5-1: Connecting Multiple Load Banks

Figure 5-1 shows an example of multiple connected load banks (load banks shown not representative of 2800 units). One example of a distributed and networked load bank system is for HVAC testing and commissioning in a data center. The linked load banks produce heat discharge through specifically selected areas in the data center, all controlled from a single Sigma LT hand held controller.

THE HAND-HELD CONTROLLER

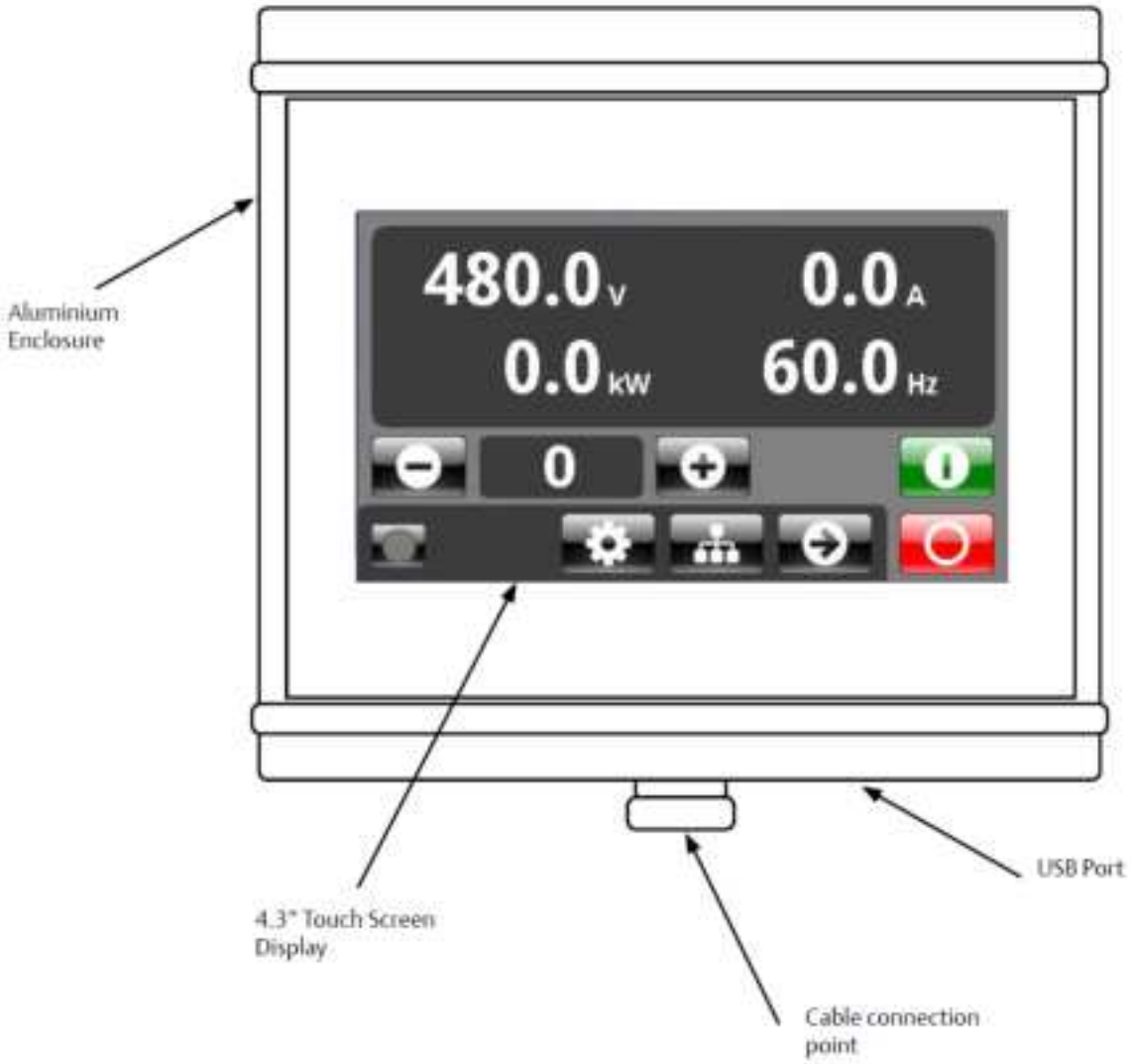


Figure 5-2: The Hand-Held Controller

The hand-held controller is used to control either a single load bank, or more often a network of load banks. The controller features a high-resolution, high visibility color touch-screen, a rugged aluminum enclosure, and a cable connection point. As well a USB port is provided to perform software updates to the hand-held controller or load bank. The USB port can also be used for data-logging.

NETWORK CONNECTION AND OPERATION

Figure 5-3: Connecting the Hand-Held Controller to Front Panels in a Network.

Figure 5-3 details how the hand-held controller should be connected to front panels in a network. The hand-held is always connected to the mating connector located at top of the panel and the next network cable exits the lower connector and is cabled to the upper connector of the next load bank in a string. The process continues this way until all load banks in the network are "daisy-chained" together.

Note that when the load banks are powered-up and the hand-held controller is connected, it will assign addresses to each load bank, the controller will then display the number of load banks and the total system kW available on the network. This will be described in more detail.

Load Bank Addressing: The load bank addresses are arbitrary with respect to physical location. If specific load bank address numbers need to be assigned to corresponding physical locations the units can be located by viewing their MAC addresses. A unit with a specific MAC address can utilize the MAC address as a nickname corresponding to the unit number. The MAC address button is found in the tools menu, and appears as three horizontal lines in a vertical column.

Note: The 2000 SERIES load banks by default have load steps calibrated at the nominal voltage. Setting the working voltage and phase of the supply connections in the setting menu will de-rate the load steps from the nominal, allowing the correct load to be applied.

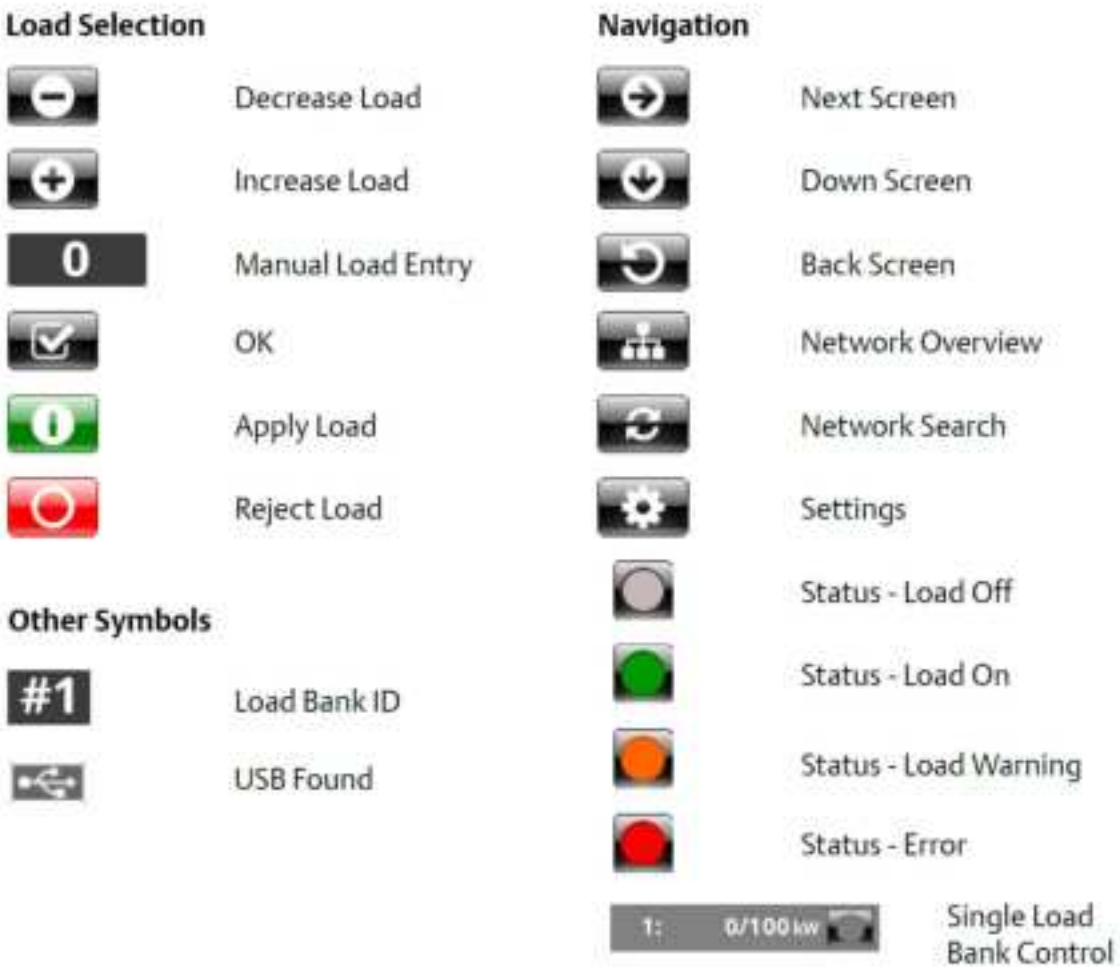


Figure 5-4: Navigation Keys

Figure 5-4 are the Navigation Keys found on the hand-held controller. These are a useful reference for subsequent instructions.

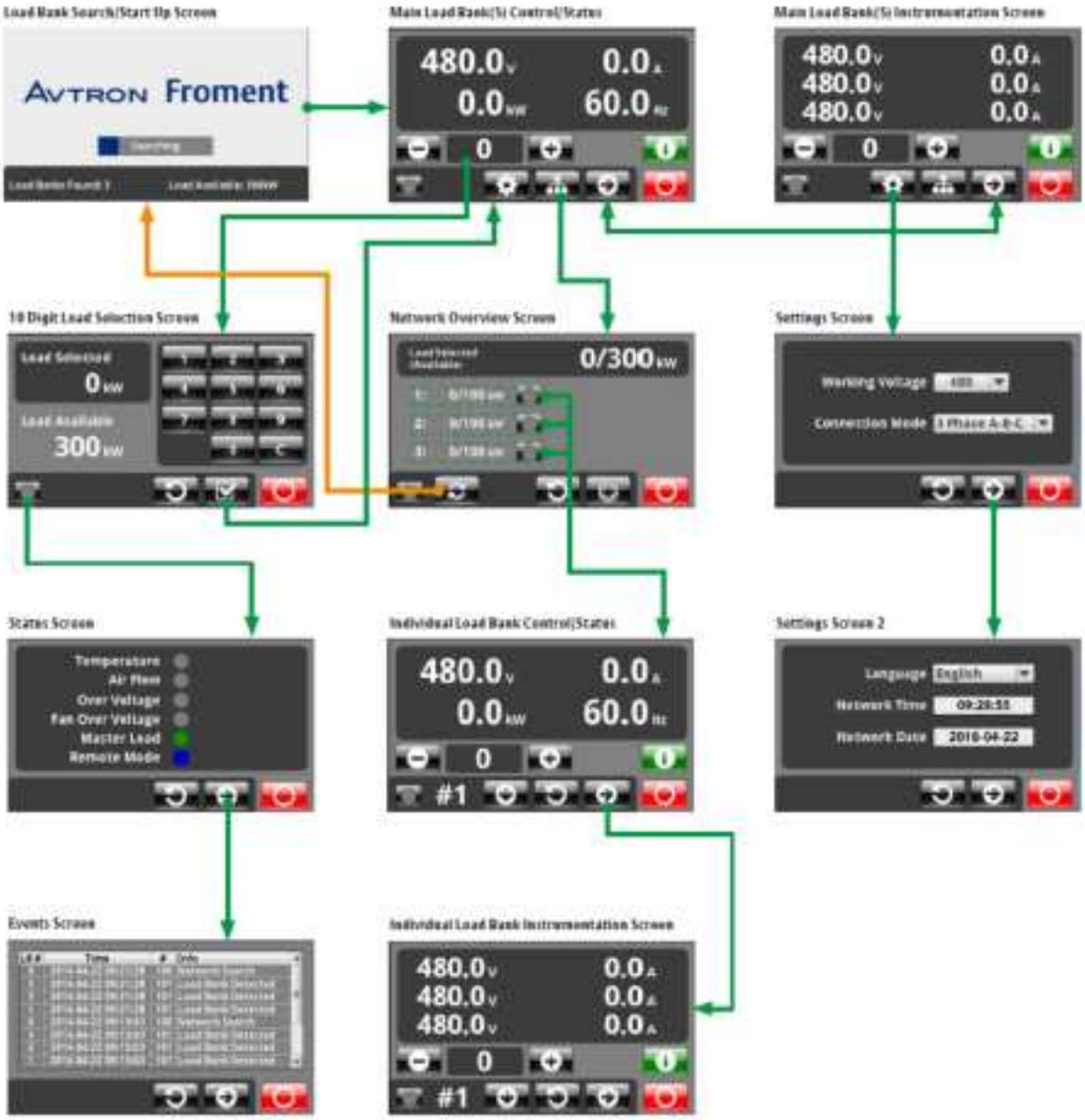


Figure 5-5: Hand-Held Controller Screens Overview

The hand-held control has a number of screens for various functions. Figure 5-5 depicts the main screen types with arrows showing the button used for transitioning to other screens and outlining
the navigation flow.

Figure 5-6: Hand-Held Controller Load Selection Screen

Refer to figures 5-4, 5-5, and 5-6 as required.

Voltage, Current, Power and Frequency are shown in the frame at the top of the screen. Press Next Screen (→) button to display full 3-phase instrumentation.

Select Load (load values in kW)

- Select load by pressing the (+) and (-) keys and press the accept button.
- Alternatively, press on the manual entry (O) key to open the keypad and type in the new load selected and press OK (Check Mark) to return to the home screen.

Apply and Reject (Remove) Load

- Apply load by pressing the apply load button (|). Applied load will be shared between the load banks on the network according to the load bank size and minimum load steps.
- The load change is synchronised across all load banks.
- The hand-held instrumentation will disply the total power and current from all load banks on the network.
- The status button on the bottom left will turn green as a sign that load is applied.
- The load banks will now be in remote mode, and a blue remote light will be illuminated on the load bank control panels.
- To stop all load on test, press the reject load button (o).

Figure 5-7: Load Bank Networking Screens

With more than one load bank in a network it may be useful to see an overview of the load banks connected and individually control each one.

- From the main insturmentation screen, press the Network Overview Button 
- The Network Overview will summarize the load measured and the load available on the entire network and for each individual load bank.
- Load banks will be added to the network in the background as they are discovered, however the Network Search button will refresh the search if required.
- Press the row of a load bank to view instrumentation and control the individual load bank.
- The load bank ID is displayed on the bottom line and the blue remote lamp will flash on that load bank. This permits identification of the load bank you are controlling.
- Load control from this screen will be specific to this particular load bank, however, load applied to the entire network will over-ride individually assigned load on a specific load bank.
- Press down screen to move to the next load bank. 
- Alternately press Network Overview to view all load banks in the network. 

DATA LOGGING

Figure 5-8: Data Logging using a USB Flash Drive

- Instrumentation data logging is available when a USB flash drive is connected to the hand-held controller. A USB symbol will appear in the top right corner of the main screen to show it has been found.
- Data logging will automatically start and stop when load is applied and rejected to **all** load banks in the network. The USB symbol will blink when writing data the to the USB flash drive.
- The log collects instrumentation of 3 voltages, 3 currents, Frequency, and kW every second.
- A tabular seperated file is created with the file name ddhhmmss.txt.
- The data can be opened in spreadsheet software for further analysis.
- **USB flash drives that contain upgrade filess can be connected to upgrade the firmware for either the hand-held controller, or, for all of the load banks in the network simultaneously. The upgrade files are placed in the root of a UBS flash drive and are different for the load banks and the hand-held controller. Each upgrade file should be placed on its own USB flash drive.**
- **Upgrade files, which are part of continuous improvement of features and performance, are available for download at:**

  www.ascopower.com/firmware

SETTINGS

Figure 5-9: Hand-Held Controller Settings

- From the main screen press Setting as shown in figure 5-9.

Working Voltage

- Setting the Working Voltage will de-rate the load available on the load banks, allowing he correct load to be applied at any voltage.

Connection Mode

- If the supply is connected in single phase, then select single phase connection type.

Network Time & Date

- Press the next screen button  . Network Time and Date will synchronize the time stamp in all of the the networked load banks.

STATUS AND EVENTS

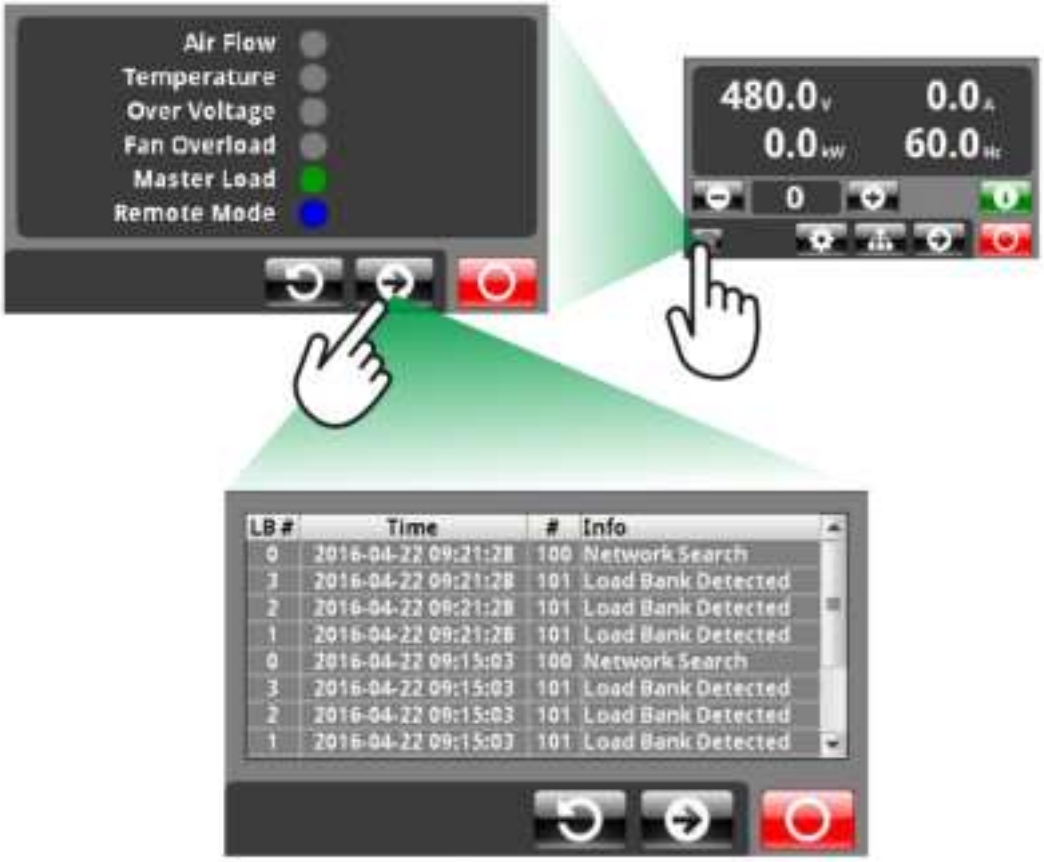
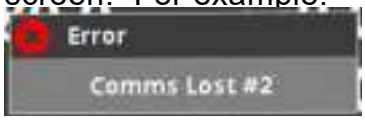


Figure 5-10: Status and Event Screens

- If an error occurs on the load bank, and error message will be displayed on the screen. For example:



- Pressing the screen will clear the error, and the load bank will be removed from the network until the error has been cleared.
- From the main screen, press  to access load bank status. The status will quickly show any errors on the load bank.
- Press next screen button  to display the load bank and hand-held event history. This will be updated as new events occur. This feaure is also available for individual load banks in the network.

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 VI

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 purported 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.

W A R N I N G

Personal injury from electrical shock or from the moving fan blade may result if ALL sources of power are not disconnected. 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 broken ceramic insulators. Replace with a new ceramic insulator if any cracks are found.

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

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

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

7. 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.

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

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

PARTS REPLACEMENT

Access to any component is easily made with the removal of the cover panels. Replaceable components in the unit are listed in the replacement parts list. maintains an inventory of normally used items.

DRAWINGS

PROPRIETARY NOTE

This document contains information PROPRIETARY TO Load Bank products and systems by ASCO Power Technologies, LP. It is furnished solely to provide information sufficient for instruction, operation, maintenance, evaluation, and testing of the equipment herein disclosed; is not to be used for manufacturing or procurement; and is not to be disclosed to anyone other than persons in the Division, or the Company, or the Government, as the case may be, responsible for action relating to this document without the express written permission of ASCO Power Technologies, LP.

6255 Halle Drive, Cleveland, Ohio 44125
Tel: 216-573-7600

Limited Warranty

ASCO Power Technologies

Loadbank Warranty

This Warranty is given ONLY to purchasers who buy for commercial or industrial use in the ordinary course of each purchaser's business.

General
ASCO Power Loadbank branded products and systems by ASCO Power Technologies, L.P., are in our opinion the finest available. We take pride in our products and are pleased that you have chosen them. Under certain circumstances we offer with our products the following Two-Year Limited Warranty against defects in material and workmanship.

Please read your Warranty carefully. This Warranty sets forth our responsibilities in the unlikely event of defect and tells you how to obtain performance under this Warranty.

TWO YEAR LIMITED WARRANTY
AGAINST DEFECTS IN MATERIAL AND WORKMANSHIP

Terms of Warranty:

As provided herein, the ASCO Power Loadbank product is warranted to be free of defects in material and workmanship for a period of two years from the date of shipment. The product shipment date will be determined only from the ASCO Power bill of lading.

The foregoing Limited Warranty is conditioned upon User's compliance with the following:

1. The ASCO Power Product is deployed in accordance with ASCO Power specifications and state and local codes and standards, including installation by an electrician licensed in the state where used if required.

2. The ASCO Power Product is maintained in accordance with ASCO Power instructions and used under normal conditions for the purposes intended by ASCO Power.

All warranty field-related repairs, replacements or adjustments must be made by ASCO Power Services Inc. or its duly authorized representative.

Warranty Extends to First Purchaser for Use, Non-transferable:
This Warranty is extended to the first person, firm, association or corporation for whom the ASCO Power product specified herein is originally deployed for use (the "User") in the fifty United States or Canada. This Warranty is not transferable or assignable without the prior written permission of ASCO Power.

Assignment of Warranties:
ASCO Power assigns to User any warranties which are made by manufacturers and suppliers of components of, or accessories to, the ASCO Power product and which are assignable, but ASCO Power makes NO REPRESENTATIONS as to the effectiveness or extent of such warranties, assumes NO RESPONSIBILITY for any matters which may be warranted by such manufacturers or suppliers and extends no coverage under this Warranty to such components or accessories.

Drawings, Descriptions:
ASCO Power warrants for the period and on the terms of the Warranty set forth herein that the ASCO Power product will conform to the descriptions contained in the certified drawings, if any, applicable thereto, to ASCO Power's final invoices, and to applicable ASCO Power product brochures and manuals current as of the date of product shipment ("Descriptions"). ASCO Power does not control the use of any ASCO Power product. Accordingly, it is understood that the Descriptions are NOT WARRANTIES OF PERFORMANCE and NOT WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE.

Warranty Claims Procedure:
Within a reasonable time, but in no case to exceed thirty (30) days, after User's discovery of a defect, User shall contact ASCO Power product service department at **loadbanks.ascopower.com** and select the support tab or by phone at **(216) 573-7600.**

Subject to the limitations specified herein, an ASCO Power Services field service representative will repair the non-conforming ASCO Power product warranted hereunder, without charge for parts, labor, or travel expenses. Warranty coverage will apply only after ASCO Power's inspection discloses the claimed defect and shows no signs of treatment or use that would void the coverage of this Warranty. All defective products and component parts replaced under this warranty become the property of ASCO Power.

Warranty Performance of Component Manufacturers:
It is ASCO Power's practice, consistent with its desire to remedy Warranty defects in the most prompt and effective manner possible, to cooperate with and utilize the services of component manufacturers and their authorized representatives in the performance of work to correct defects in the product components. Accordingly, ASCO Power may utilize third parties in the performance of Warranty work, including repair or replacement hereunder, where, in ASCO Power's opinion, such work can be performed in less time, with less expense, or in closer proximity to the ASCO Power product.

Items Not Covered By Warranty:
THIS WARRANTY DOES NOT COVER DAMAGE OR DEFECT CAUSED BY misuse, improper application, wrong or inadequate electrical current or connection, negligence, inappropriate on site operating conditions, repair by non-ASCO Power designated personnel, accident in transit, tampering, alterations, a change in location or operating use, exposure to the elements, water, or other corrosive liquids or gases, Acts of God, theft, installation and/or deployment contrary to ASCO Power's recommendations or specifications, or in any event if the ASCO Power serial number has been altered, defaced, or removed.

THIS WARRANTY DOES NOT COVER shipping costs, installation costs, or maintenance or service items and further, except as may be provided herein, does NOT include labor costs or transportation charges arising from the replacement of the ASCO Power product or any part thereof or charges to remove or reinstall same at any premises of User.

REPAIR OR REPLACEMENT OF A DEFECTIVE PRODUCT OR PART THEREOF DOES NOT EXTEND THE ORIGINAL WARRANTY PERIOD.

THE PRODUCTS LISTED IN THIS WARRANTY ARE NOT FOR USE IN THE CONTROL AREA OR ANY REACTOR CONNECTED OR SAFETY APPLICATIONS OR WITHIN THE CONTAINMENT AREA OF A NUCLEAR FACILITY OR FOR INTEGRATION INTO MEDICAL DEVICES.

Limitations:
THIS WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

USER'S SOLE AND EXCLUSIVE REMEDY IS REPAIR OR REPLACEMENT OF THE ASCO POWER PRODUCT AS SET FORTH HEREIN.

IF USER'S REMEDY IS DEEMED TO FAIL OF ITS ESSENTIAL PURPOSE BY A COURT OF COMPETENT JURISDICTION, ASCO POWER'S RESPONSIBILITY FOR PROPERTY LOSS OR DAMAGE SHALL NOT EXCEED THE NET PRODUCT PURCHASE PRICE.

IN NO EVENT SHALL ASCO POWER ASSUME ANY LIABILITY FOR INDIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL OR EXEMPLARY DAMAGES OF ANY KIND WHATSOEVER, INCLUDING WITHOUT LIMITATION LOST PROFITS, BUSINESS INTERRUPTION OR LOSS OF DATA, WHETHER ANY CLAIM IS BASED UPON THEORIES OF CONTRACT, NEGLIGENCE, STRICT LIABILITY, TORT, OR OTHERWISE.

Miscellaneous:
NO SALESPERSON, EMPLOYEE OR AGENT OF ASCO POWER IS AUTHORIZED TO ADD TO OR VARY THE TERMS OF THIS WARRANTY. Warranty terms may be modified, if at all, only in writing signed by an ASCO Power officer.

ASCO Power obligations under this Warranty are conditioned upon ASCO Power timely receipt of full payment of the product purchase price and any other amounts due. ASCO Power reserves the right to supplement or change the terms of this Warranty in any subsequent warranty offering to User or others.

In the event that any provision of this Warranty should be or becomes invalid and/or unenforceable during the warranty period, the remaining terms and provisions shall continue in full force and effect.

This Warranty shall be governed by, and construed under, the laws of the State of New Jersey, without reference to the conflict of laws principles thereof.

This Warranty represents the entire agreement between ASCO Power and User with respect to the subject matter herein and supersedes all prior or contemporaneous oral or written communications, representations, understandings or agreements relating to this subject.

California Proposition 65 Warning—DINP and DIDP
Advertencia de la Proposición 65 de California—DINP y DIDP
Avertissement concernant la Proposition 65 de Californie—DINP et DIDP

WARNING: This product can expose you to chemicals including DINP, which is known to the State of California to cause cancer, and DIDP which is known to the State of California to cause birth defects or other reproductive harm. For more information go to: www.P65Warnings.ca.gov.

ADVERTENCIA: Este producto puede exponerle a químicos incluyendo DINP, que es (son) conocido(s) por el Estado de California como causante(s) de cáncer y DIDP, que es (son) conocido(s) por el Estado de California como causante(s) de defectos de nacimiento u otros daños reproductivos. Para mayor información, visite : www.P65Warnings.ca.gov.

AVERTISSEMENT: Ce produit peut vous exposer à des agents chimiques, y compris DINP, identifiés par l'État de Californie comme pouvant causer le cancer et DIDP, identifiés par l'État de Californie comme pouvant causer des malformations congénitales ou autres troubles de l'appareil reproducteur. Pour de plus amples informations, prière de consulter: www.P65Warnings.ca.gov.

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California Proposition 65 Warning—Lead and Lead Compounds
Advertencia de la Proposición 65 de California—Plomo y compuestos de plomo
Avertissement concernant la Proposition 65 de Californie—Plomb et composés de plomb

WARNING: This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to: www.P65Warnings.ca.gov.

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