



INSTRUCTION MANUAL

500 KW RESISTIVE LOAD BANK

MODEL NO. ULB-R500H-480-240-OP

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LIST OF EFFECTIVE PAGES

Insert latest changed pages and dispose of superseded pages in accordance with applicable regulations. The total number of pages in this manual is 41 and consisting of the following:

<u>Page No.</u>	<u>Change</u>	<u>Date</u>
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ABBREVIATIONS AND ACRONYMS

The following is a list of abbreviations and acronyms used throughout this manual.

A	Amperes (Amps)
AC	Alternating current
AI	Analog Input
AO	Analog Output
CMM	Component Maintenance Manual
DC	Direct Current
Deg	Degree
DI	Digital Input
DMM	Digital Multimeter
DO	Digital Output
F	Fahrenheit
F.S.	Full scale
Ft-lbs	Foot pounds
GND	Ground
HMI	Human Machine Interface
Hz	Hertz
In-lbs	Inch pounds
KVA	Kilovolt amps
kW	Kilowatt
LCD	Liquid Crystal Display
LED	Light Emitting Diode
L-L	Line to Line
L-N	Line to Neutral
mA	Milliampere
MSDS	Material Safety Data Sheet
mV	Millivolt
NEC	National Electric Code
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
UL	Underwriters Laboratory
VAC	Volts AC

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SAFETY POINTS

Safety Precautions

The following instructions are general safety precautions that are not necessarily related to any specific part or procedure, and do not necessarily appear elsewhere in this publication. These precautions must be thoroughly understood and applied to all phases of operation and maintenance.

This manual contains various **Warning** and **Caution** statements. Personal injury or death may occur to an operator and/or technician if a warning statement is ignored. Equipment damage or hazardous conditions for personnel could result if caution or warning statements are ignored. Carefully read and review this instruction manual, supplemental manuals, and all electrical schematic/interconnection drawings provided with the Load Bank prior to installation and operation.

Keep Away from Live Circuits

Operating and Maintenance personnel must at all times observe normal safety regulations. Do not replace components or make adjustments to equipment with power turned on. To avoid casualties, always remove power to the entire system. Turn off and disconnect the main-power source under test. Disconnect all sources of power to the Load Bank (Main input Cam-lok, blower motor circuit, and 120 VAC control circuits).

Shock Hazard

Load Banks contain lethal voltages when connected to the power source. Power to the load resistors (main input Cam-Lok), power to fan motor circuits, and power to 120 VAC control circuits must be removed before servicing. Allow adequate time after removing power before servicing or touching any components.

Do Not Service or Adjust Alone

Under no circumstances should any person reach into an enclosure for the purpose of service or adjustment of equipment except in the presence of someone who is capable of rendering aid.

Safety Earth Ground

An uninterruptible and approved earth ground must be supplied from the main power source. Serious injury or death can occur if this grounding is not properly supplied. Grounding of this equipment should be done by qualified personnel only and must be installed in accordance with all applicable national and local electrical codes and regulations.

Chemical Hazard

No chemicals are included in the manufacturing or operation of this unit. There are no chemical hazards to consider.

Emergency Aid

Personnel working with or near high voltages should be familiar with modern methods of resuscitation.

Potentially Hazardous Operator Conditions

- Read this manual prior to operation.
- Always run an approved ground conductor from the load bank frame to the power source under test which in turn must be properly earth grounded.
- Do not operate the unit unattended. Access to an approved electrical fire extinguisher should be on hand at all times.
- Do not operate the Load Bank with access panels removed or doors open. Doing so would expose personnel to potential injury from electrical shock or from a moving fan blade.
- Careful consideration needs to be taken during installation and equipment location during operation.
- Hot exhaust air can cause damage to other installed equipment.
- Do not direct hot exhaust air in the direction of other installed equipment.
- Do not allow hot-air exhaust to recirculate through the cold-air intake.
- Do not allow objects to enter or block the cold-air intake or hot-air exhaust.
- Do not install any external cold-air intake or hot-air exhaust duct work to the Load Bank for ventilation.
- The Load Bank must be installed and operated in a cool, well ventilated area with adequate clearance for both intake and exhaust air. Do not allow hot air exhaust to recirculate into the cold-air intake.
- The unit should always be operated outdoors in a clean, cool, well-ventilated area free of dust and debris.
- Operating personnel should avoid and never come in contact with the hot-air exhaust and/or surrounding covers during operation and for some-time after operation as these surfaces become hot and may result in a serious burn injury.
- Never bypass any blown fuse.
- Replace any indicator lamps on the operator control panel as required. Each indicator is important to the protection of the unit and safety of the operator and is an indication of proper system operation or failure.
- Do not bypass any safety circuit including but not limited to; air-safety switch, fan motor overload, exhaust over-temperature switch.
- Always short/shunt current transformer secondary circuits when troubleshooting metering and instrumentation circuits.
- Operating personnel should not come in contact with hot air exhaust opening, outside panels, system components, and load resistors for some time after operation.
- A recommended 5 minute cool down period of the blower motor circuit, with no load applied is recommended as best practice and will protect operating personnel from possible burn injuries. A 5 minute cool down should adequately remove any residual heat from the Load Bank and system components.

Emergency Shut-Down

The Emergency STOP pushbutton will immediately turn off control power to the load step application circuits, blower motor circuits.

In a controlled emergency stop condition, click <MASTER LOAD OFF> button on display allowing fan motor to run while all load steps are disconnected. Turning the “Power On” switch to the “OFF” position will then turn off all control and blower circuits. Turn off and disconnect

the main-power source under test. Disconnect all sources of power to the Load Bank (Main input Cam-lok), blower motor circuit, and 120 VAC control circuits).

- Maintenance should always be done only by qualified personnel and with all sources of power disconnected from the unit (main input Cam-lok power, power to all blower fan and control circuits). Always follow The National Electric Code (NEC), local electrical safety codes, and the Occupational Safety and Health Act (OSHA) when handling, installing and operating equipment to reduce hazards, personal injury and property damage.

Safety Symbols

WARNING Statements

Warning notes call attention to a procedure, which if not correctly performed could result in personal injury.

WARNING

Disconnect unit from all power sources before any disassembly or service. Main input Cam-lok, Blower Motor circuits, 120 VAC control circuits.

WARNING

Do not position the exhaust to blow on other equipment or material susceptible to excessive heat. Never direct exhaust air towards flammable materials.

WARNING

Do not remove the enclosure covers while unit is in operation or operate with covers removed. Unit will not properly cool without all covers in place and pose a shock hazard to personnel.

WARNING

Do not touch the enclosure surfaces while the unit is in operation. Enclosure surfaces are hot and exhaust temperatures can reach in excess of 500°F when unit is under load and in operation.

WARNING

Operation of the unit with any covers removed will pose a shock hazard and danger to personnel.

WARNING

Do not look into the exhaust of the enclosure while in operation. Exhaust temperatures can reach temperatures in excess of 500°F when unit is under load and in operation. Dust and or debris may also be present.

WARNING

Do not insert a screwdriver or any thin metal objects through the perforated cooling air grilles while the load bank is in operation. The fan blade and power within the unit could cause serious injury to personnel and damage to the unit.



CAUTION Statements

Caution notes call attention to a procedure, which if not correctly performed could result in damage to the unit. This symbol indicates that a shock hazard exists if the precautions in the instruction manual are not followed. The caution symbol appears on the equipment indicating there is an important information in the instruction manual regarding that particular area.

CAUTION

Load Banks is not designed to be mounted on trailer and used as trailer mounted load bank.

CAUTION

This load bank is not suited for shipboard applications and not designed/configured for Marine/shore-based applications

CAUTION

Air enters through the right (looking from HMI Control Panel) cold-air intake of the enclosure and exhausts at the left side hot-air exhaust end of the enclosure. Blocking these openings will cause overheating and unit failure.

CAUTION

Do not apply more than the rated Voltage or exceed the power rating of the Load Bank. Excessive power will damage the internal resistor banks.

CAUTION

Confirm all control voltages before operation. Improper Voltage or Over-Voltage will damage load resistors, fan motors, and control components.

CAUTION

Confirm that all load, control, and blower connections are securely attached, turned, and tightened, and that the unit is properly grounded prior to operation. Failure to do so may result in equipment damage and harm to personnel.

CAUTION

Check for fan direction before applying load. Air flow should be coming out of heater screen at the side of the load bank.

CAUTION

Do not operate under load without fan blower in motion. Immediate equipment damage may result.

CAUTION

Air intake opening should not be obstructed, and consideration should be given to provide combustibles free air at the air intake.

CAUTION

Avoid Blocking the air intake and ensure the area around the load bank is clear from debris. The Load bank must be positioned and installed to allow for a 4 feet intake clearance as well as a 20 feet exhaust clearance.

CAUTION

Operation of the unit with any covers removed will disrupt air flow and allow debris to pass through resistors possibly damaging equipment.

Inspection and Unpacking

As part of your safety program, an initial inspection of all equipment should occur after receiving the unit. Periodic preventative maintenance and inspections should be performed to ensure system reliability. Upon receipt of your Load Bank, be sure to carefully unpack the unit and inspect the unit carefully for any shipping damage. Check for loose, broken or otherwise damaged parts due to shipping. If damage is noticed, do not unpack the unit. Immediately notify ULB LLC and report any shipping damage to the freight carrier. Be sure to verify that the part number and ratings listed on the nameplate match the order specification. **The ratings listed on the nameplate are critical – installing, operating, and energizing the incorrect part number could damage the unit and load resistors.**

If the unit is not damaged, unpack the equipment and remove protective stretch wrap. Remove all covers and inspect all the components for visual signs of damage. Immediately notify the freight carrier and ULB LLC of equipment damage or missing parts. Reinstall packing materials for storage with exception of stretch wrap. **Do not store the unit with the protective plastic in place.**

NOTE: Do not reinstall or reapply protective stretch wrap. This material is meant for shipping protection only. Prolonged storage in stretch wrap may cause condensation damage to powder coat, painted, or mill galvanized finishes.

Product Overview

ULB-R500H-480-240-OP Series of Indoor/Outdoor Resistive Load Banks are designed for installation and operations Indoor/Outdoor. The Load Bank is an industrial power test unit specifically designed for Indoor/Outdoor operation and will absorb a balanced resistive load at unity power factor. The Load Bank is a self-contained unit that includes an Operator Control Panel which allows the user to control and monitor individual-discrete load steps, blower motor circuits, control circuits, and safety circuits. Electrical energy from the power source under test is absorbed by the load bank resistors and converted into heat. The blower motor provides the necessary cooling airflow to cool the resistor load elements. The Load Bank Unit contains all of the necessary principal system components for control and operation.

- **Load Circuits:** Including load power resistors, load step switching and main input CAM-LOK.
- **Cooling System:** Including integrally powered blower motor and controls.
- **Control Circuits:** Including 120 VAC controls, load application circuits, blower circuits, and indicators.
- **Automatic Load Dump Circuit:** Provides user interface provisions to disconnect and disable all load steps from a remote device.
- **Safety Circuits:** Including branch circuit protection for load power resistor circuits, protection for blower and control circuits, motor overload protection, exhaust over temperature protection, cooling air-loss protection, wrong voltage protection, load dump indication, and E-Stop.
- **The Load Bank should never be used without the Fan Blower Motor operating. Inadequate cooling airflow will result in resistor load elements overheating, fire hazard, and danger to personnel.**

Operating Instructions

General

- All installation should be reviewed and checked by a qualified technician with all local and National Electric codes observed.
- Ensure all connections are properly tightened and all covers are installed.
- Never operate the unit un-attended.
- All wiring from external power sources to Load Bank Unit should be verified and checked by a qualified technician with all local and National Electric codes observed.
- The Load bank must be positioned and installed to allow for a 4 feet intake clearance as well as a 20 feet exhaust clearance.

The following Cautions should be strictly enforced:



CAUTION

To avoid damage, set Switches E5A/5B/5C, E7A (on control panel) in correct position before applying power & starting the load bank.

CAUTION

Load bank operates at either 240VAC(L-L) OR 480VAC (L-L), 3PH, 60Hz AC Power. Input power circuit breaker/Disconnect switch must be turned on only when Input Volage are stabilized nearby 240VAC (L-L) or 480VAC (L-L)

Keeping Input Power circuit breaker/disconnect switch on while bringing generator online may damage the load bank or cause malfunction.

CAUTION

Input power connection guidelines

Use CAM Type Plug for main power & ground connection (rating 400A each. Total 4 wire & plug assembly for each phase on input power.

To utilize full current capacity of load bank, all power cables must be connected to respective connectors on load bank.

CAUTION

Main disconnect to be provided by installer rated 600V maximum, sized 150% maximum of rated current.

Operation

Load Power Connection

Connect the power source under test to CAM-Type connectors provided on the load bank using suitable mating CAM-Type plugs and cables sized per the NEC (National Electric Code) or any local codes.

The Load Bank is provided with color coded qty.04 CAM-Type connectors (400A Max.) for each phase (L1/L2/L3) and two Connector for Ground Cable connection.

To utilize full current capacity of load bank, all power cables must be connected to respective connectors on load bank.

Load cable conductors from the power source to the load bank and mating CAM-Type cable plugs should be adequately sized and protected to handle the maximum rated load and in accordance with the National Electric Code and any local codes.

Load bank can be operated in following option for control/blower power source and voltage level. Selector switches on front/side of the load bank should be position as per following table.

A) Blower Power

	E5A BLOWER POWER EXT. or INT.	E5B BLOWER VOLTAGE 480V or 240V
External – 480VAC	EXT.	480VAC
240VAC	EXT.	240VAC
Internal – 480VAC	INT.	480VAC
240VAC	INT.	240VAC

B) Control Power

(For Operation: Derived internally from 480V/240VAC Power, For Diagnosis: 120VAC External or Internal from 480V/240VAC Power). Keeping E7A at OFF position will keep load bank control circuit OFF.

Control For operation	E5C CONTROL TRANS. TAP SELECTION 480V or 240 V	E7A CONTROL POWER EXT. or OFF or INT.	E5D 120VAC CONTROL POWER EXT. OR INT.
External 480VAC	480V	EXT.	INT.
External 240VAC	240V	EXT.	INT.
Internal 480VAC	480V	INT.	INT.
Internal 240VAC	240V	INT.	INT.

Note: For control circuit / load step diagnosis purpose, connect 120VAC, 1P, 60Hz power to E16A receptacle using suitable mating plug on the power cord. In this case, switch E5D should in 'EXT.' position. E5C & E7A switch positions are ignored.



CAUTION: Position of E5A and E5B switches must be in correct position prior to connecting load power to the load bank. Failure to put E5A and E5B switches in correct position may damage the load bank components.

Turn on the power source under test and make sure load power is ON and applied to the load bank.

- Display (E1A) will turn on.
- Verify – Check Emergency Stop Button (E2A) is in the “Released (Depressed)” operating position.
- Press green button on Power On/Off Switch (E3A) and orange lamp will illuminate to show that control power is on.
- Verify that Load Dump switch (E4A) is in OFF (Downward) Position.
- Use main screen on HMI display (See Figure.1 as below) to apply require kW.

Local mode

Use HMI display touch screen to apply require kW. Minimum kW resolution that can be applied is 5 kW (See figure 1),

Make sure that ‘Safety OK’ message appear in green color indicating all safety parameters are ok.

Soft push buttons are provided for

1. Master load ON/OFF
2. Load steps ON/OFF
3. Fan control ON/OFF

Click on < Master Load ON> button will start blower motor fan automatically. Master Load ON status is indicated by status indicator with ‘ON’ text in red background. Similarly fan ON status is indicated by fan status indicator with ‘ON’ text in red background color.

Note: Individual load steps are disabled/enabled for operations as per load bank settings screen accessible through<Maint screen> button on main screen.

Click on individual kw load step button will turn on respective KW load step as indicated by individual load step status indicator with ‘ON’ text in red background. Individual load step command button will show ‘OFF’ text when load is on, this indicates next action when respective button is clicked.

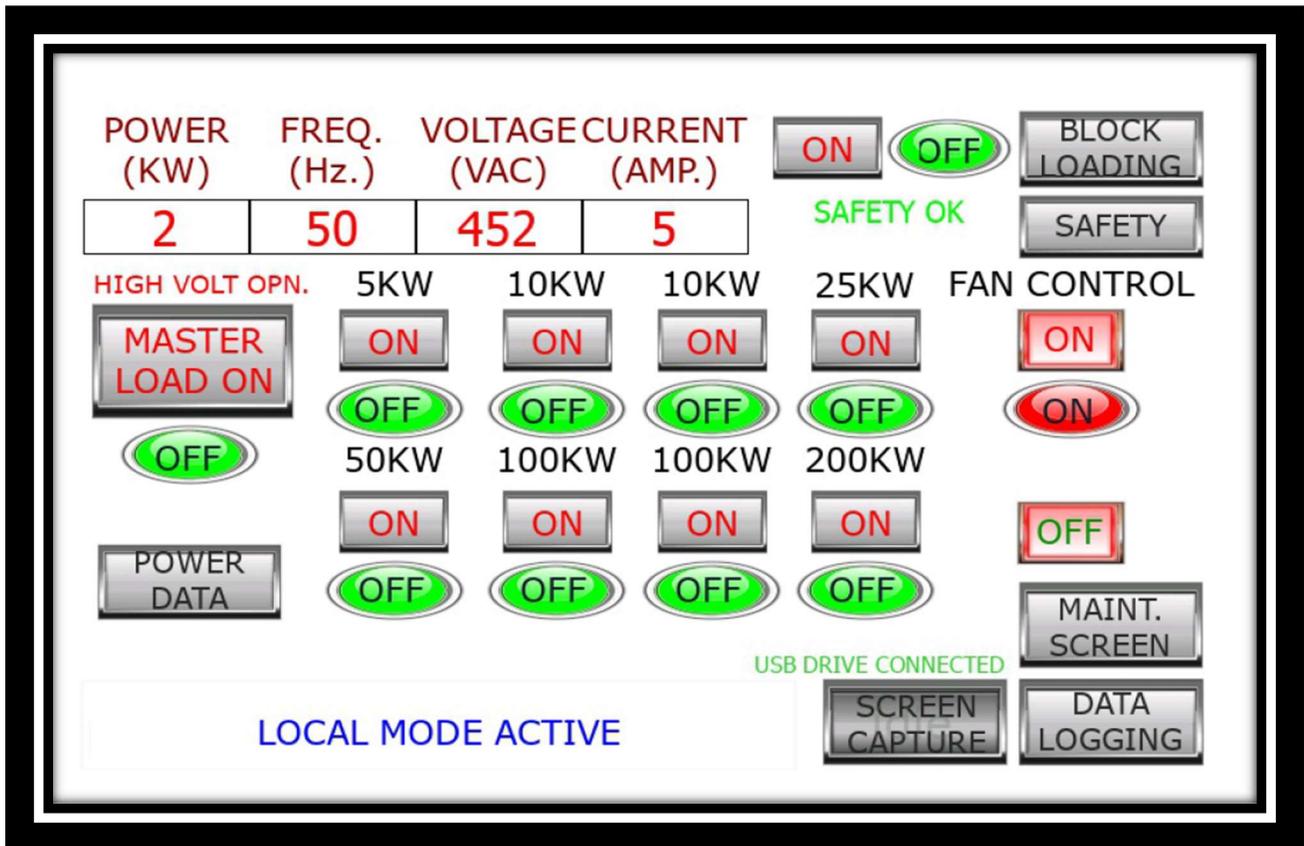


Figure 1 Main Screen.

Note:

While block loading is enabled <master load on>, <individual load step>button, fan<on> <off> are disabled.

Block loading

- Available KW is limited by operating voltage and load step enable/disable status in load bank setting screen accessible through maintenance button on main screen.
- Used to automatically apply load elements as per set KW for predefined time duration.

Click on <ON> button will start block loading option (See figure 1) as indicated by blinking 'Block loading' text and 'ON' indicator.

Load bank can be operated as per SET KW, Hrs., Minutes and <Load Apply>, <Load drop> buttons on the block loading screen as shown below (See figure 2).

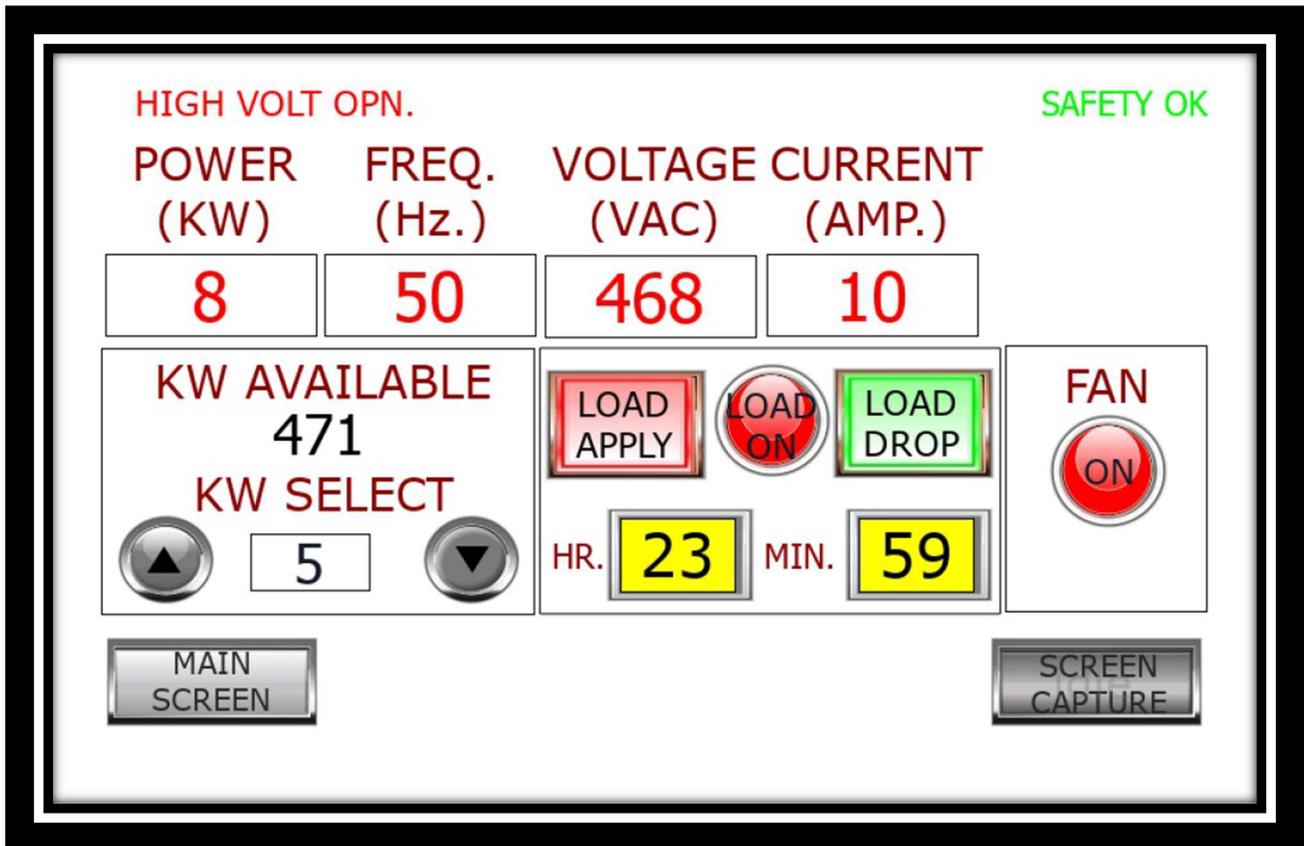


Figure 2 Block Loading Screen

- Use HMI display touch screen to set require KW. Minimum KW resolution that can be selected is 5KW. Set desired time duration in Hours (HR.) and Minutes (MIN.) for which selected KW is to be applied.
- Click <LOAD APPLY> button. This action will start cooling fan and the preselected amount of load KW will be applied to the power source under test for the defined time duration in HR & min.
- Any available combination of incremental KW load values can be turned ON/OFF during operation to achieve the desired load on the power source under test.
- Also, when set time duration is expired, load will automatically disconnect, and cooling fan will continue to run for pre-set cooling time of 5 minutes (OR as set in the Maintenance screen).

Safety

Any alarm condition existing in the load bank is indicated by load bank 'SAFETY NOT OK' indication on the top right corner of the main screen on HMI. To investigate safety NOT OK status, click <SAFETY> button on Main screen to see following screen (See figure 3).

Note: "Busbar Voltage Wait Time" and Control Power & E-Stop" doesn't require reset and gets reset by its own under healthy condition. "Busbar Voltage Wait Time" safety requires minimum 18 secs to get reset after healthy condition.

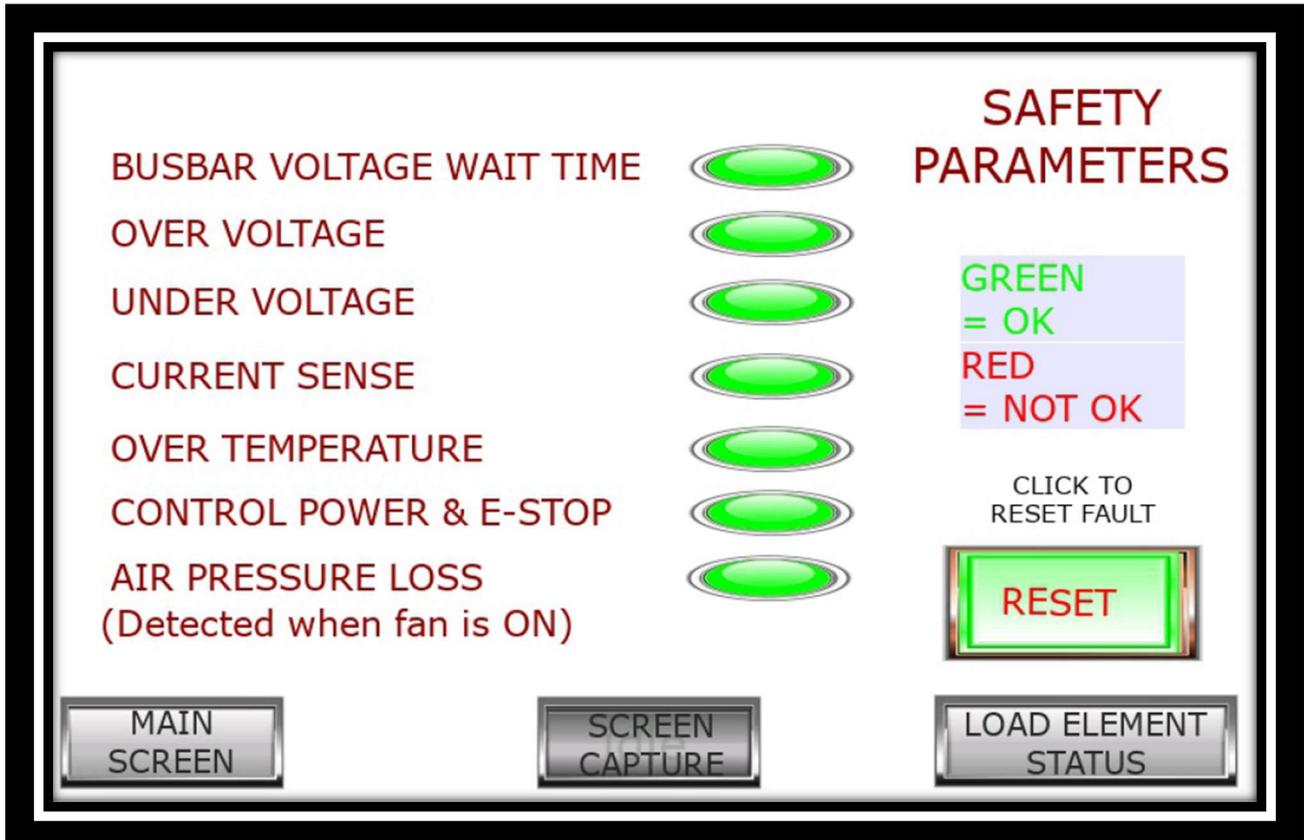


Figure 3 Safety Parameters

All load steps are disabled, and load cannot be applied unless all above parameters in OK status (Green Color).

Safety and Shut-Down Indicators

Pressing "Emergency Stop" Pushbutton (E2A – E-stop on control panel), turns off all active load steps and blower motor. Use this button during emergency only. When situation become normal, turn on blower motor for duration and cool down load bank.

- 1) Busbar Voltage Wait Time: Used to disable load 'ON' action until internal time of 18 seconds is expired after the Main Input Power (480VAC/240VAC) is applied to the load bank.

- 2) Over voltage fault: Main Input power voltage is higher than the fault detection value.
- 3) Under Voltage fault: Main Input power voltage is lower than the fault detection value.
- 4) Current Sense fault: Phase currents are imbalance higher than the fault detection value.
- 5) Over temperature, indicates an over-temp condition in hot air exhaust or in control panel section.
- 6) Cooling air pressure (Air Failure) indicates a loss of cooling airflow due to blower issue.
- 7) Control power / E Stop indicates E-Stop is operated or Control power is OFF.

Note: Fault detection values for Over Voltage / Under Voltage / Current Sense are set in Voltage / Current Faults setting screen described somewhere in the Maintenance Section in this manual.

Note: Ensure and check for proper phasing of blower motor and direction of airflow form cold-air intake to hot-air exhaust. If airflow is exhausted from cold-air intake, shut down the unit, disconnect all sources of load power, blower power, control power.

Set correct blower direction by setting the BLOWER ROTATION switch 'E6A' (On front control panel) to 'FWD' or 'REV' position.



CAUTION

DO NOT attempt to bypass the air switch or over temperature switch as this will cause catastrophic damage to the unit.

Load element status

Click <LOAD ELEMENT STATUS> button on safety parameter screen and following load element screen will appear (See figure 4)

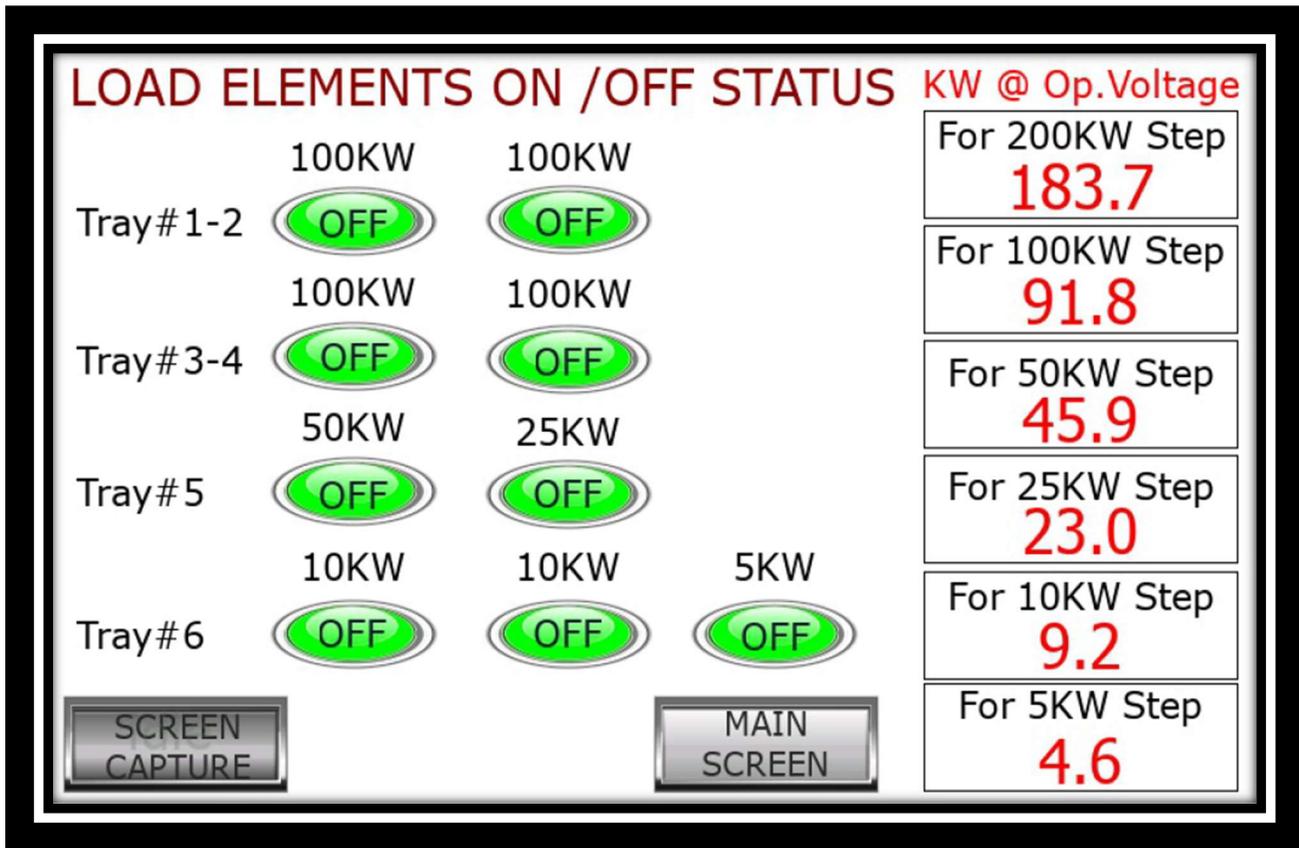


Figure 4 Load element status

This screen also shows KW value at operating voltage for individual load step.

Power data

- 1) Power data display: Click <POWER DATA> button on main screen and following power data screen will appear (See figure 5),

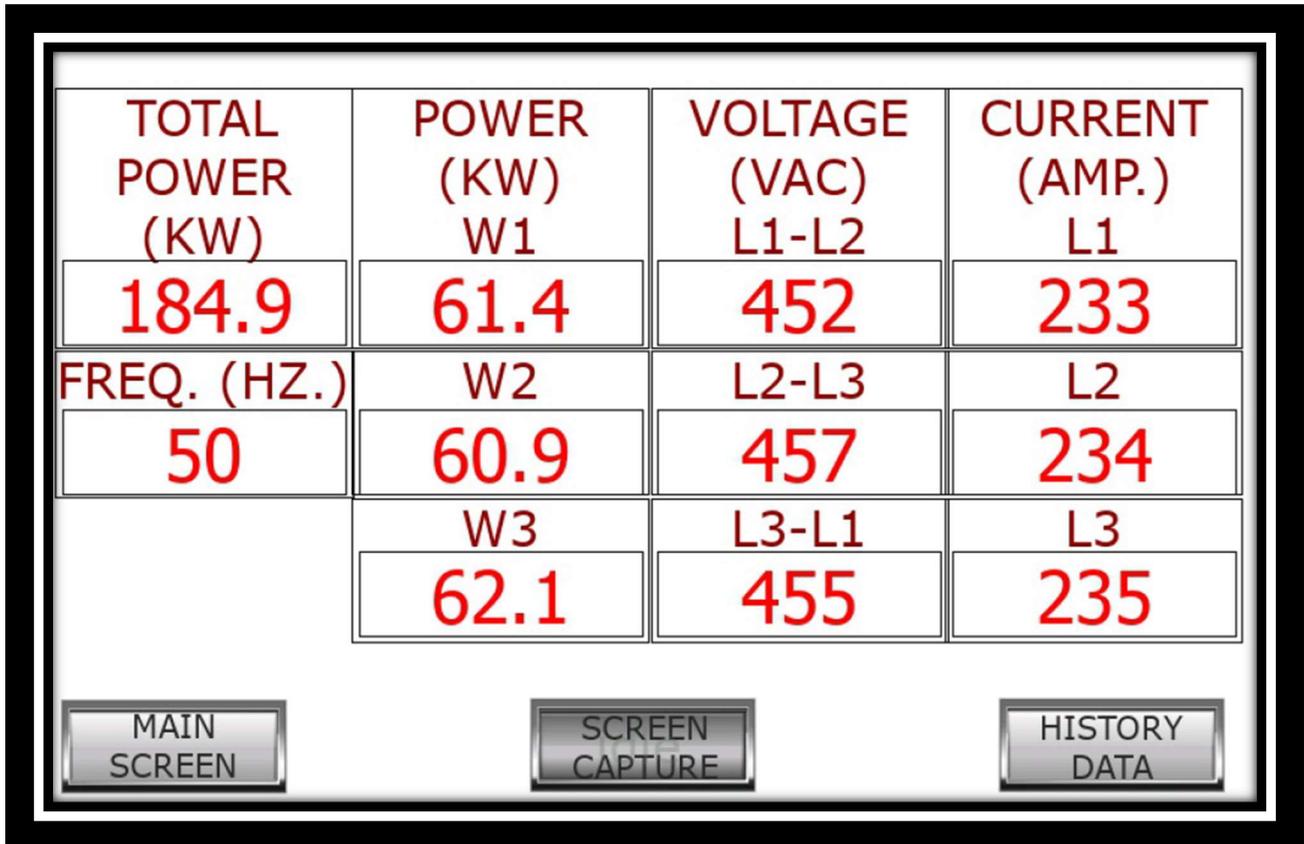


Figure 5 Power Data

History data

2) History Data for Power / Voltage

Click <HISTORY DATA> button on Power Data Screen and history data screen showing past history of KW/Voltage loading (See figure 6).

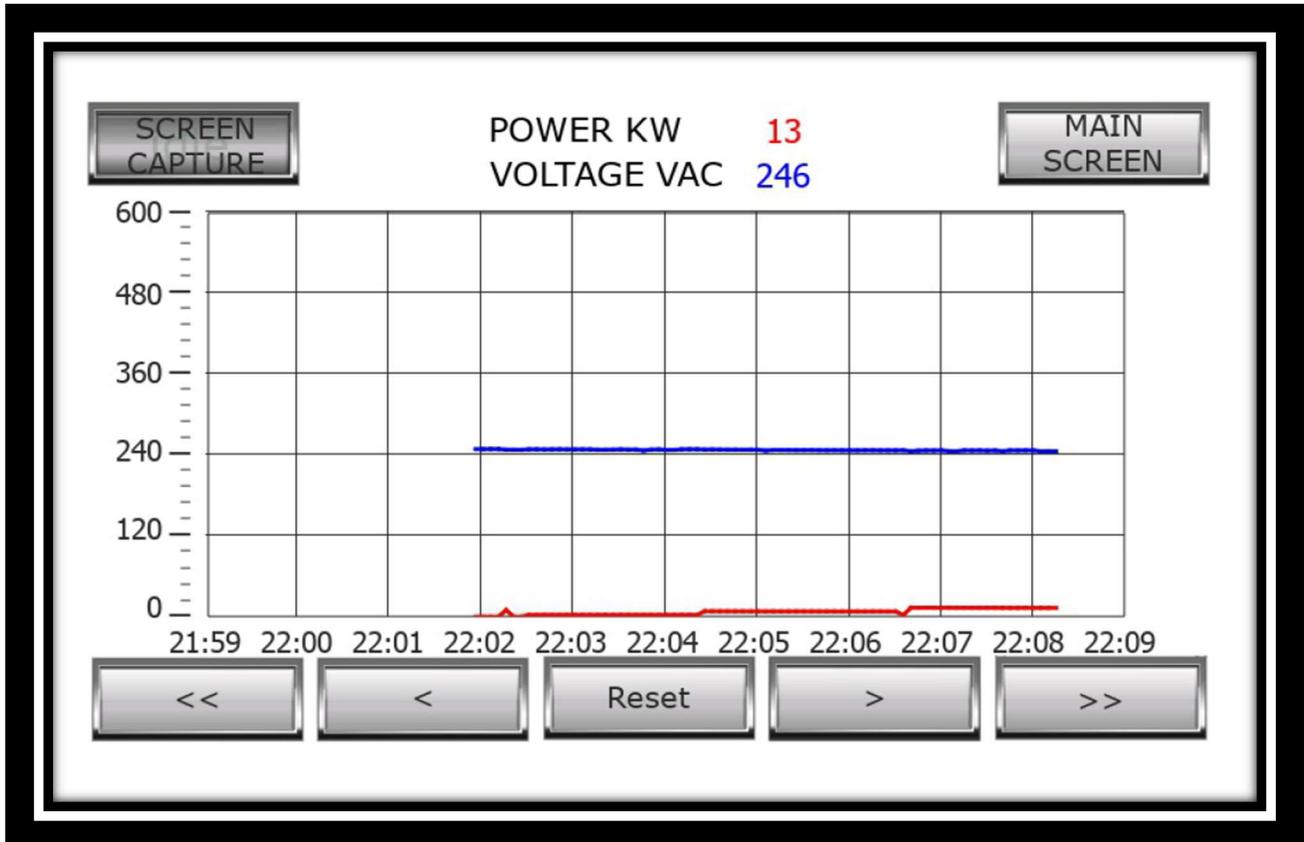


Figure 6 History data

Click <Main Screen> button to switch back to Main Screen.

Note:

If USB stick is inserted into USB port (E307A) on the front control panel box then "SCREEN CAPTURE" button will appear on various screens.

Click <SCREEN CAPTURE> button to copy screen image to USB Stick.

WARNING

While Load bank is running (with load applied condition) setting Load Dump Switch to ON (upward) position will cut off all applied load immediately. However, cooling fan will continue to run until pre-set cooling time is over.

A recommended 5-minute cool down period of the blower motor circuit, with no load applied, should adequately remove any residual heat from the Load Bank and system components.

WARNING

Click <MASTER LOAD OFF> button any time will cut of all applied load. However, cooling fan will continue to run until pre-set cooling time is over.

Data Logging

- 1) Insert USB stick into USB port (E307A) on the front control panel box.
- 2) Click <DATA LOGGING> button, will show following screen (see figure 7),

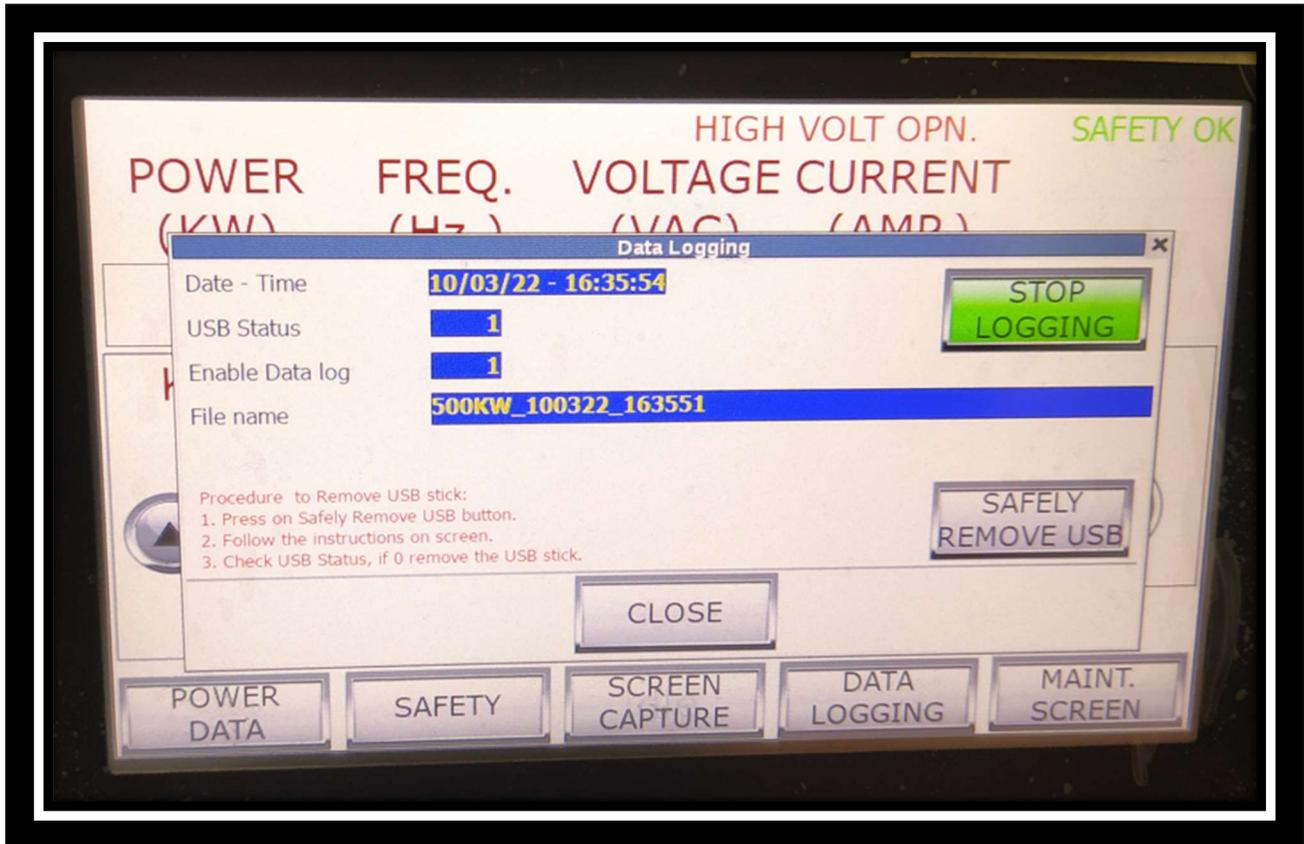


Figure 7 Data logging

- 1) Click <START LOGGING> will also start recording following values of load bank in which USB stick is inserted at every 10 seconds.

Total kW, Average Voltage, Average Current, Frequency, Phase wise kW, Line Voltage, Line current

All values are stored in 'csv' format file having following naming convention,

500kW_MMDDYY_HHMMSS.csv e.g., 500kW_100322_163551.csv

Click <CLOSE> to close above dialog box.

Click < STOP LOGGING> will stop data recording in csv file on USB stick.

Click <SAFELY REMOVE USB> to remove USB stick from HMI USB port.

Single Phase Testing

Load bank can be used for single phase testing also.



CAUTION: Following are the procedures/switch positions that needs to be strictly followed before carrying out 1Ph testing.

- **240VAC Single Phase testing (Max 333 KW available)**
 - E5A, Blower power internal external selection switch should be set at “External”
 - E5B, Blower voltage selection switch should be in correct position (as it relates to the voltage provided to E14A)
 - E5C, Control Transformer Tap Selection switch should be in correct position (as it relates to the voltage provided to E14A)
 - E5D, 120V AC control Power switch should be set at “Internal” position
 - E7A, Control Power Selection Switch should be set at “External” position
 - E14A, 240V or 480V external power to be connected
 - E16A, 120V, 1 ph, - No power to be connected
 - Connect generator **PHASE** leads to E10A &/or E10B &/or E10C &/or E10D (depending upon the load values – Each Camlock can handle 400 Amps)
 - Connect generator **NEUTRAL** leads to E12A &/or E12B &/or E12C &/or E12D (depending upon the load values – Each Camlock can handle 400 Amps)
 - Connect ground lead to E13A
 - Connect wire jumpers between E11C & E11D, E12C & E12D
- Please proceed with testing as per normal procedure.

- 120VAC Single Phase testing (Max 83 KW available)

- E5A, Blower power internal external selection switch should be set at “External”
- E5B, Blower voltage selection switch should be in correct position (as it relates to the voltage provided to E14A)
- E5C, Control Transformer Tap Selection switch should be in correct position (as it relates to the voltage provided to E14A)
- E5D, 120V AC Control Power switch should be set at “External” position
- E7A, Control Power Selection Switch should be set at “OFF” position
- E14A, 240V or 480V external power to be connected
- E16A, 120V, 1 ph, external power to be connected
- Connect generator **PHASE** leads to E10A &/or E10B &/or E10C &/or E10D (depending upon the load values – Each Camlock can handle 400 Amps)
- Connect generator **NEUTRAL** leads to E12A &/or E12B &/or E12C &/or E12D (depending upon the load values – Each Camlock can handle 400 Amps)
- Connect ground lead to E13A
- Connect ground lead to E13A
- Connect wire jumpers between E11C & E11D, E12C & E12D

Please proceed with testing as per normal procedure.

Shut-Down- Local Mode

Click <OFF> button on HMI to drop load of individual load steps.

Click on <MASTER LOAD OFF> will disable all load steps.

Press red button on Power On/Off Switch (E3A) and orange lamp will turn off to show that control power to contactors and blower motor is off.

Turn off and disconnect the main-power source under test.

Disconnect all sources of power to the Load Bank (Main input Cam-Lok, blower motor circuit, and 120 VAC control circuits).

WARNING

DO NOT touch the exhaust louver during operation. Hot-Air exhaust will cause serious burns

DO NOT allow objects to enter or block air intake or exhaust louvers.

DO NOT operate the Load Bank overrated nameplate Voltage as this will cause catastrophic Failure and danger to personnel. DO NOT apply DC voltages to main input Cam-Lok.

Remote Mode

Load bank can be operated in remote mode by connecting a Laptop / Desktop PC (Running Rx Monitoring software) and connected to Rx Interface board (E308A) in load bank using Wi-Fi/Ethernet cable as shown below. Connect ethernet cable from ethernet / Wi-Fi router to connector E305A or E305B provided on the side panel of load bank.

SETUP

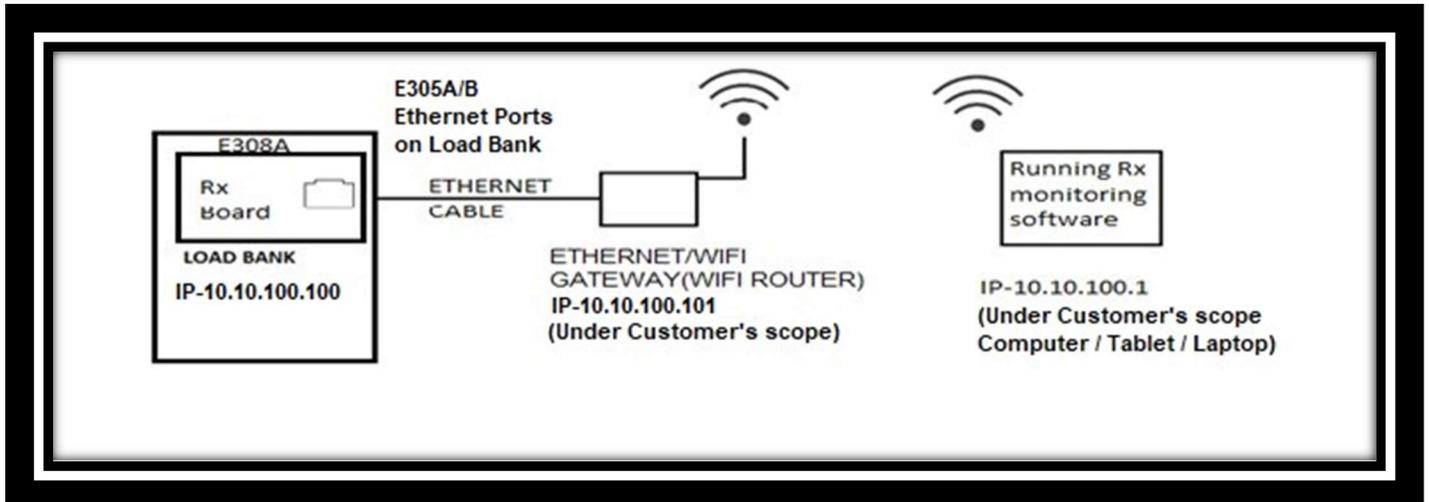


Figure 8 Hardware setup

- Create hardware set up as shown above(See figure 8).
- Connect Laptop / PC to ethernet / Wi-Fi router.
- Open RX monitoring software by clicking <LOAD BANK U1> short-cut on PC screen. This will open following screen on the laptop / PC,

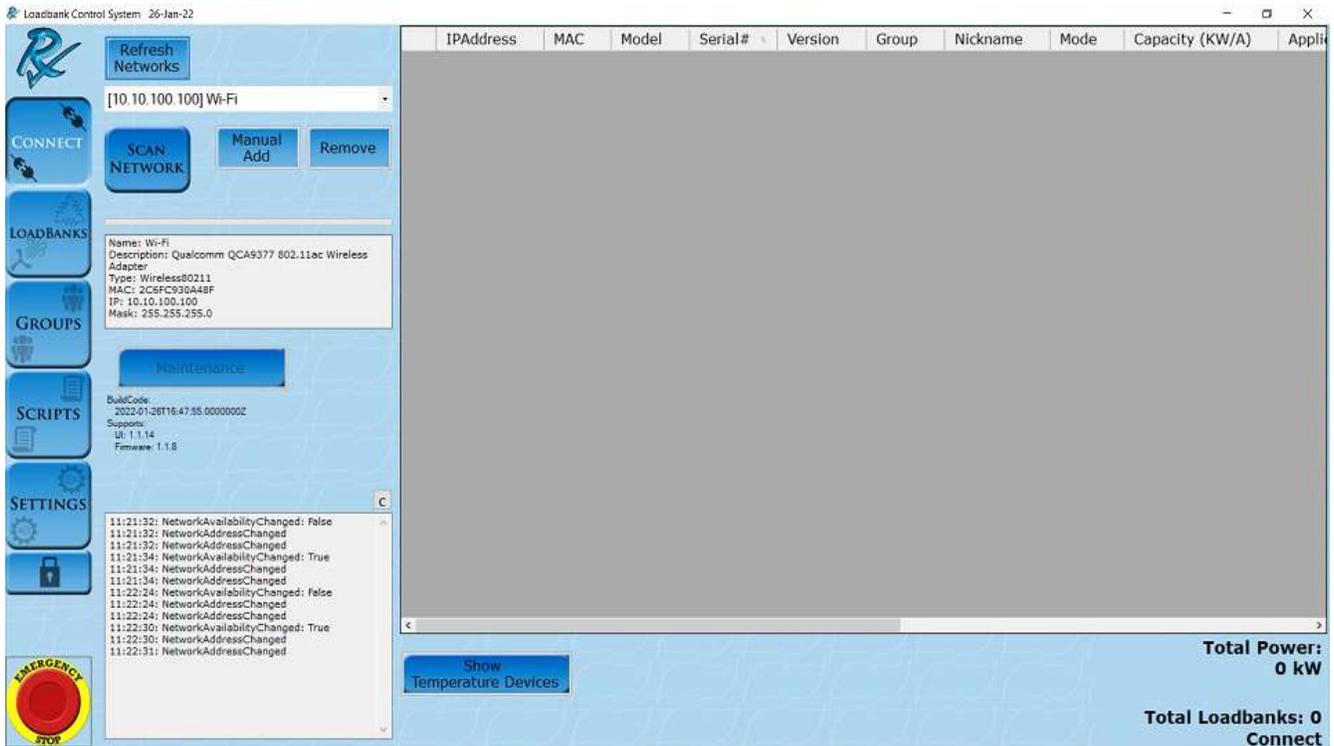


Figure 9 software main screen

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- Click <REFRESH NETWORKS> button to see router ip address ([10.10.100.101] Wi-Fi) appears in network list.
- Click <SCAN NETWORK> button to see connected load bank in right section.
- Select connected load bank. If only one load bank is connected, the software automatically selects that load bank.

Operation

- Click <LOAD BANKS> button to display control screen as shown in figure below (See figure 10),

The screenshot shows the main control interface. At the top, a table displays load bank details:

Model	Serial#	Group	Nickname	Mode	Capacity (KW/A)	Applied(KW)	Applied(KVAR)	Avg Vrms	Avg Irms	Avg KW	Avg KVAR	IO
ULB-R500H	LB01199	--		480	500/601	0.00	0.00	482.053	0.00	0.00	NaN	00000000000000000000

On the left side, there is a vertical menu with buttons for CONNECT, LOAD BANKS, GROUPS, SCRIPTS, SETTINGS, and an emergency stop button. The main area contains a parameter table, control state indicators (On/Off), group settings, and switch states. A 'Tap for info' button is also present.

Parameter	Nominal	Meter-Feedback
AB Voltage	480	480.03
BC Voltage	480	482.4
CA Voltage	480	483.73
A Current	0	0
B Current	0	0
C Current	0	0
Power(KW)	0	0
Power(KVAR)	0	NaN
Power(KVA)	0	NaN
Frequency	60	60.01
Power Factor	NaN	NaN

Control State: On
Blowers State: Off
Voltage Mode: 480 / 240
Alarms: OK
Total Loadbanks: 1 Individual

Parameter	Nominal	Meter-Feedback
AB Voltage	480	486.29
BC Voltage	480	489.07
CA Voltage	480	489.33
A Current	0	0
B Current	0	0
C Current	0	0
Power(KW)	0	0
Power(KVAR)	0	NaN
Power(KVA)	0	NaN
Frequency	60	60
Power Factor	NaN	NaN

Figure 10 software main screen

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- Verify that screen shows correct voltage and load steps.
- Click Control <On> button, status indicator will shows 'On' text in green color.
 - Verify that HMI screen on local display (on load bank) is on and shows REMOTE MODE ACTIVE message.
 - Verify that local switch E5A/B/C and E7A are positioned in correct voltage mode.



CAUTION: Position of E5A and E5B switches must be in correct position prior to connecting load power to the load bank. Failure to put E5A and E5B switches in correct position may damage the load bank components.

- Verify that power meter (E8A) shows applied busbar voltage and phase input indicator (E9A/B/C) L1, L2, L3 are 'ON'.
- Verify that blower rotation FWD/REV selection (E6A) is positioned in correct selection.
- Verify that Volt mode selection <480> or <240> is automatically selected by software correctly.
- Click BLOWER <On> button. Status indicator will show 'On' text in green color.
 - Load bank blower will start.
 - Verify that it is running in correct direction with air coming out of the exhaust and louvers are lifted up.
 - Verify that alarms state indicator is in 'OK' green color state.

- Click <Pick Switches> button and select required individual load steps and click <Apply Switches> button.

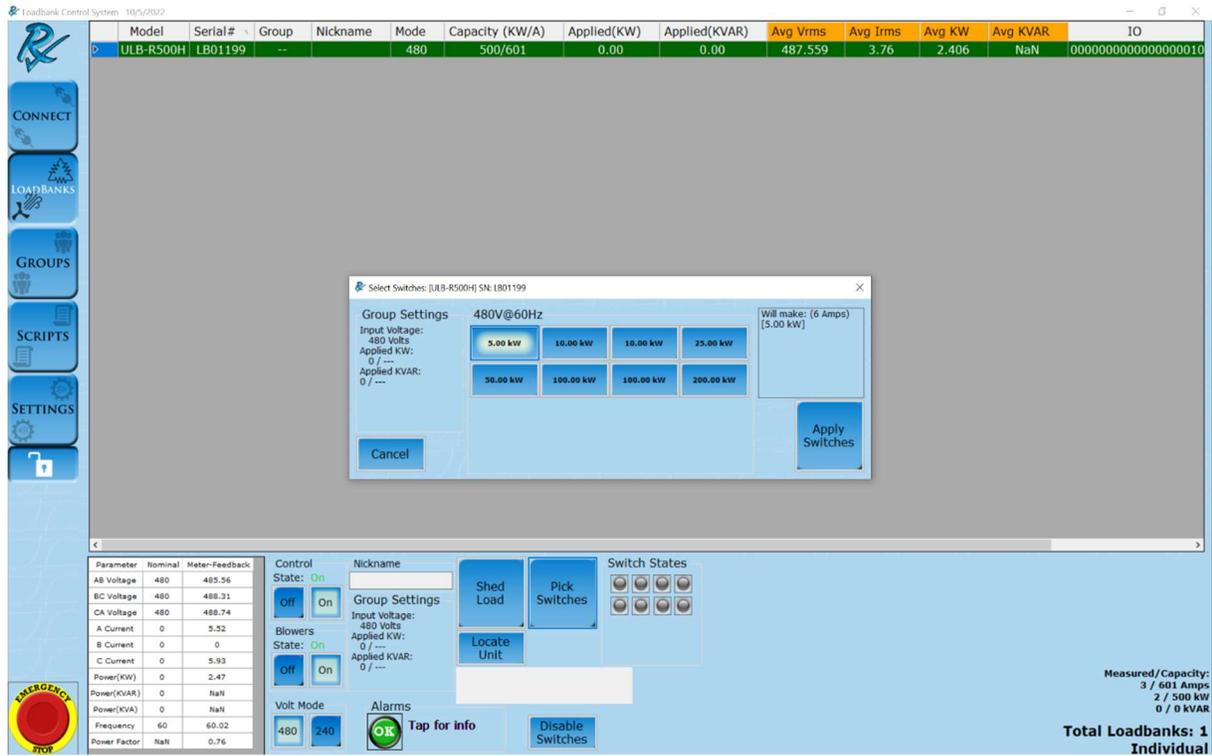


Figure 11 software main screen (with Load selection window)

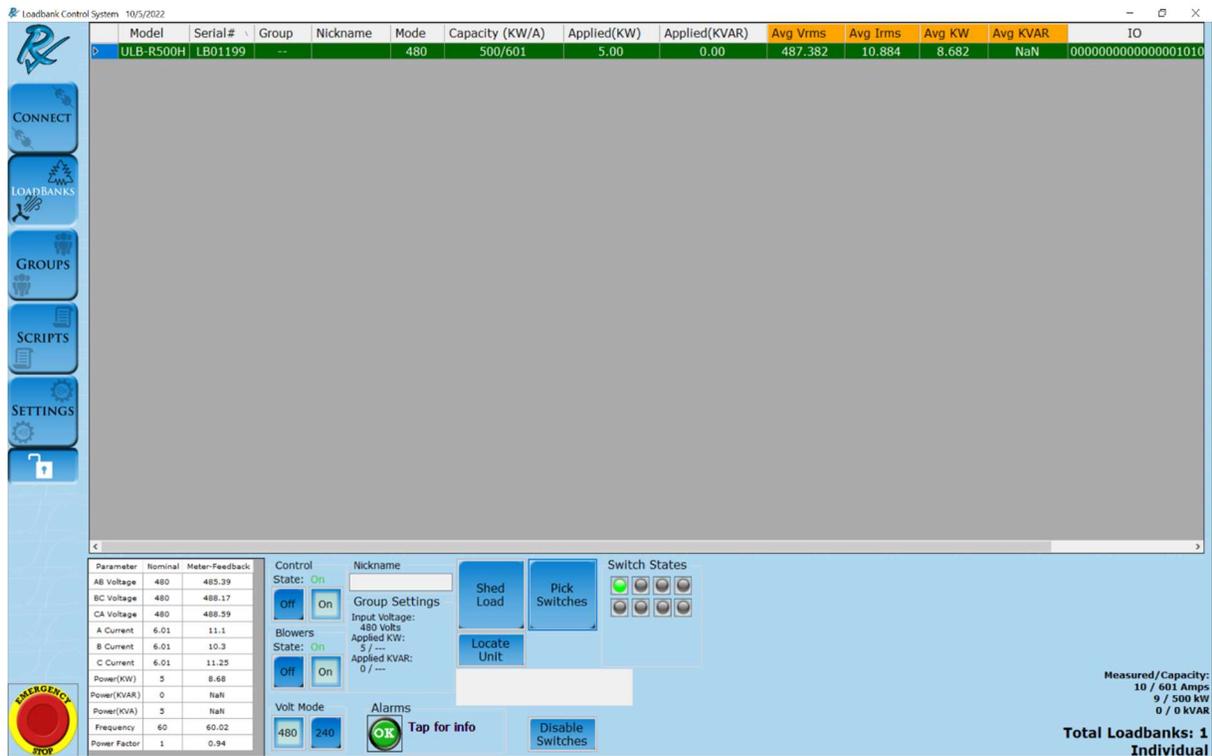


Figure 12 software main screen (with Load selection status)

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- Verify that applied load step is turned on and respective 8 Switch State indicators (at the bottom middle section on laptop screen) are in green color.
- Verify that current A/B/C, voltage AB/BC/CA, and power KW matches with power meter value.

Note: Double click “Emergency Stop” button provided on screen to stop all load steps / blower immediately in case of any emergency.

Cold Resistance Check Out using Rx monitoring software and Sunbelt DMM

- Ensure green jumper in placed between wire number 3A and 63. This setting will bypass air flow failure fault and will allow software to perform cold resistance testing.

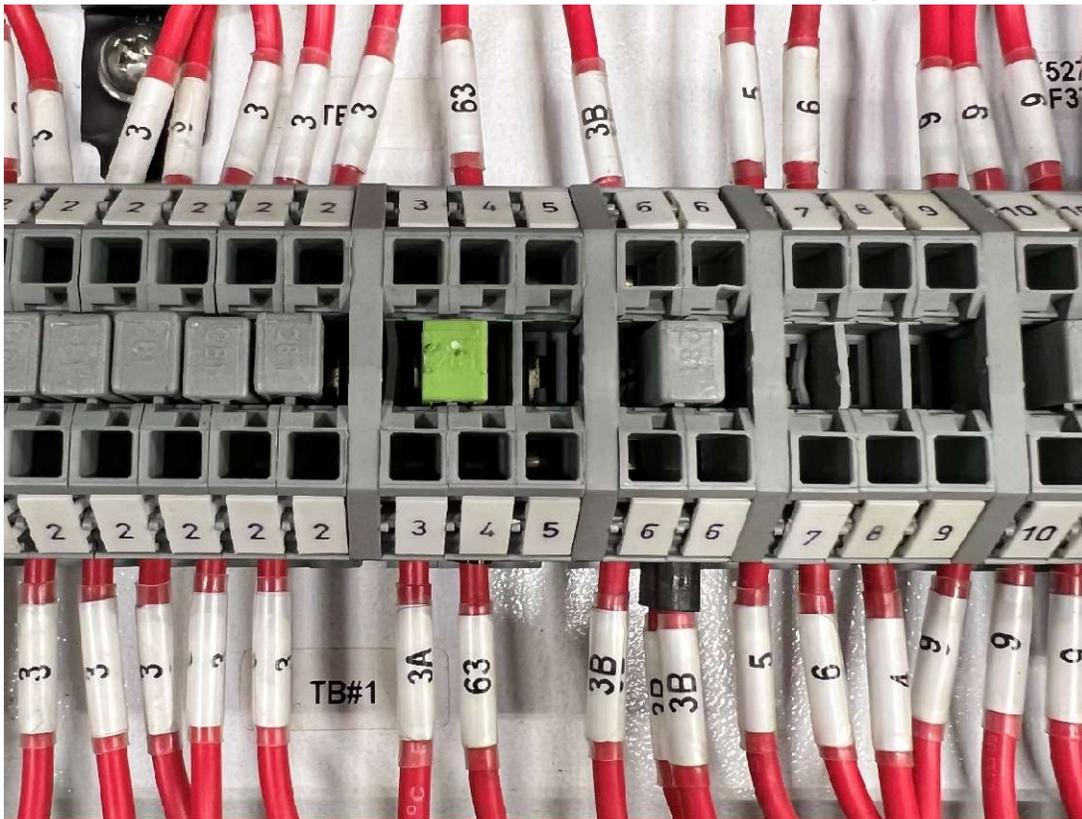


Figure 12 Green Jumper Position for Resistance Check out

- Once testing is complete, please re-install the jumper back into its original position which is between wire numbers 63 and blank position

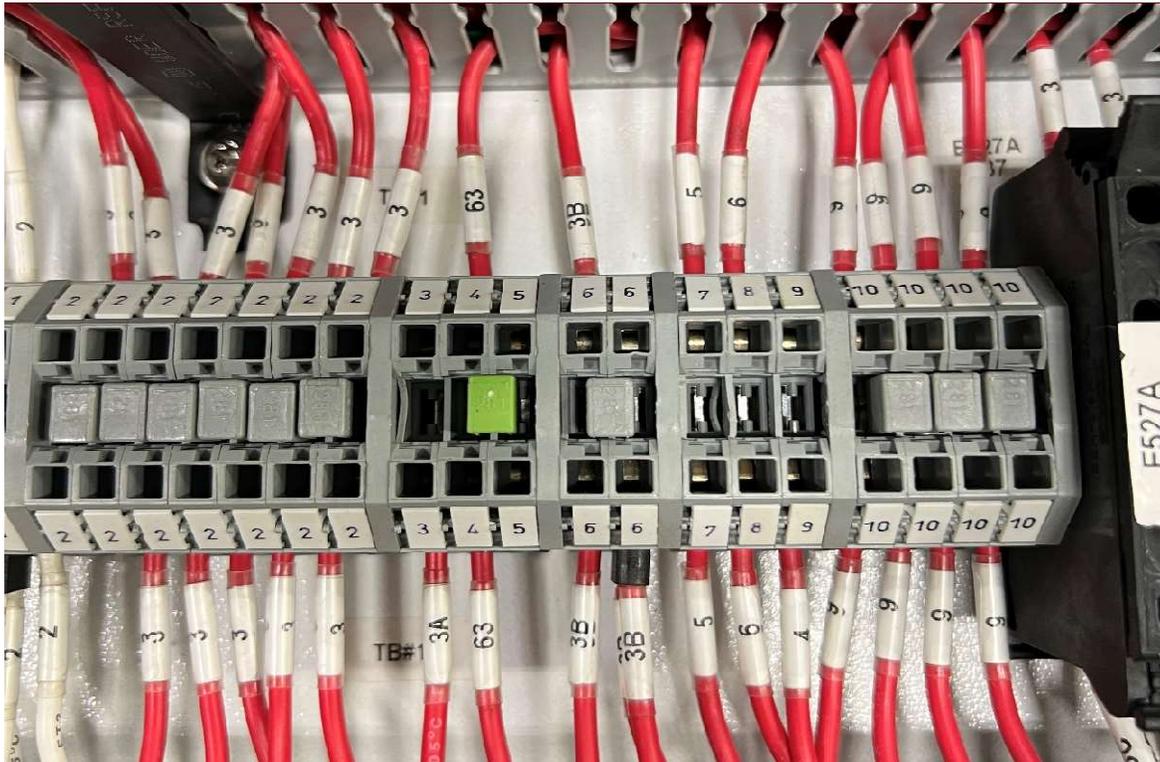


Figure 13 Green Jumper Position for Normal Load Bank Operation

Shut-Down-Remote Mode

- Deselect by clicking the same load steps and click <Apply Switches> to turn off all active load steps.
- Click BLOWER <Off> button. Load bank blower will stop.
- Click Control <Off> button, status indicator will shows 'Off' text.

Verify that HMI screen on local display (on load bank) is on and shows LOCAL MODE ACTIVE message.

Turn off and disconnect the main-power source under test.

Disconnect all sources of power to the Load Bank (Main input Cam-Lok, blower motor circuit, and 120 VAC control circuits).

Note: If application is closed or computer disconnects without following above instructions, load bank will remain in remote mode until control power is turned OFF.

MAINTENANCE

Maintenance Mode Accessible in Local Mode Only

Click <MAINT. SCREEN> Button and enter correct use name, password to see below screen.

A pop-up window will ask user to enter password. Upon correct password entry following Set up / Maintenance screen will appear (See figure 14)

WARNING

Stop Load Test / blower motor before entering this set up screen. Setting should be changed by only qualified person who clearly understands implication of changing each setting.

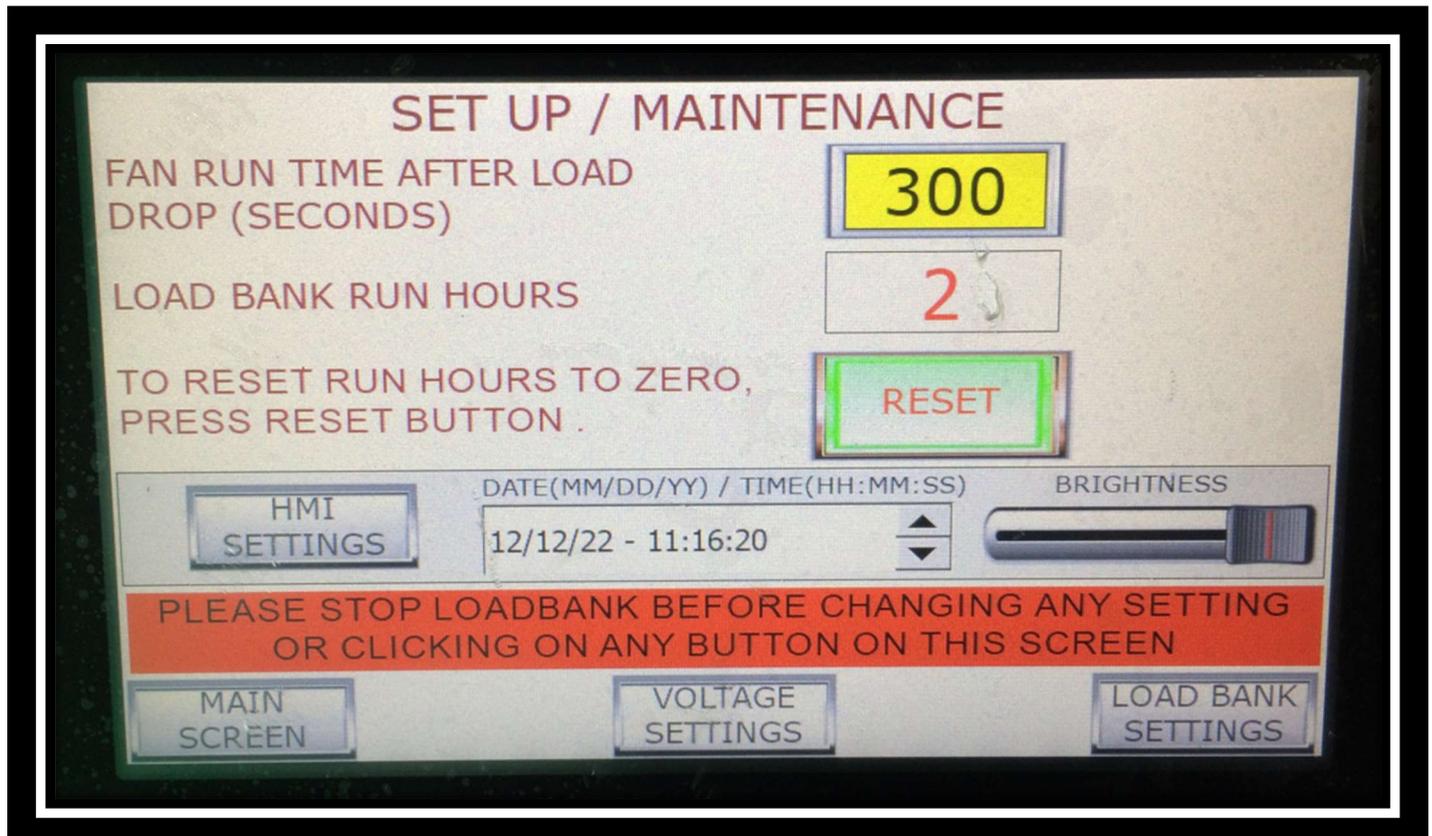


Figure 14 Set up/Maintenance

On this screen following settings can be done,

- 1) Fan Run Time after Load Drop (Seconds): Cooling time, Typically, 300 Seconds (5 Minutes)
- 2) HMI Setting: Click on this button to change various settings as per HMI Display manufacturer manual.
- 3) HMI Date/Time: Set date / time to current date / time. Used for time stamping in data logging on USB stick.

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4) Brightness: Adjusts brightness of display screen.

This screen also shows Load Bank running hours based on run time of blower motor since last reset. In case of major maintenance or replacement of blower motor, run hours can be reset to zero by pressing <RESET> button.

Voltage and Current faults settings

Click <VOLTAGE SETTINGS> button to display the following screen. (See figure 15)

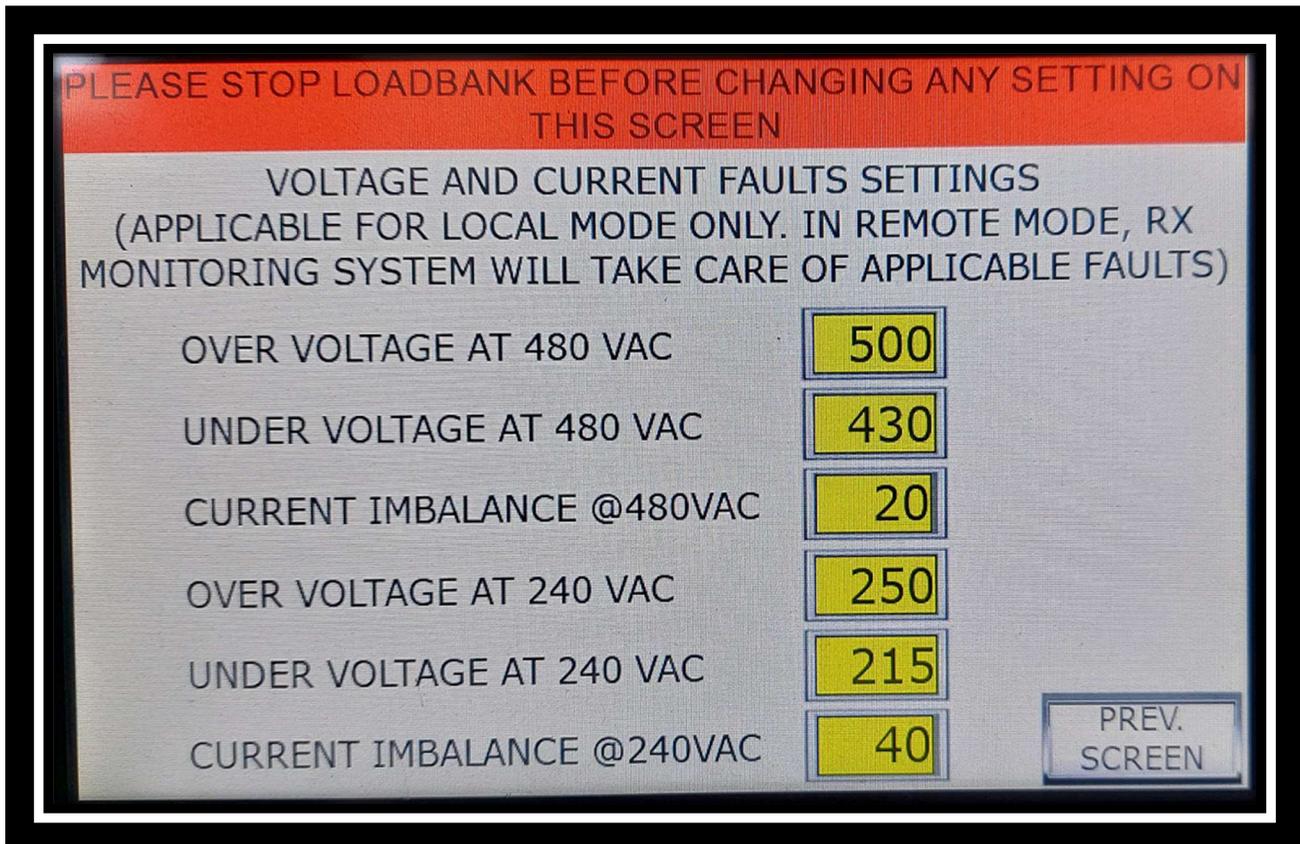


Figure 15 Voltage and current settings

Faults are sensed based on Main Input power voltage applied at the CAM-LOK connectors

Click <PREV SCREEN> button to display the Main Set up / Maintenance screen again. (See figure 9)

Load bank settings

Click <Load Bank Settings> button to display following screen (See figure 16),

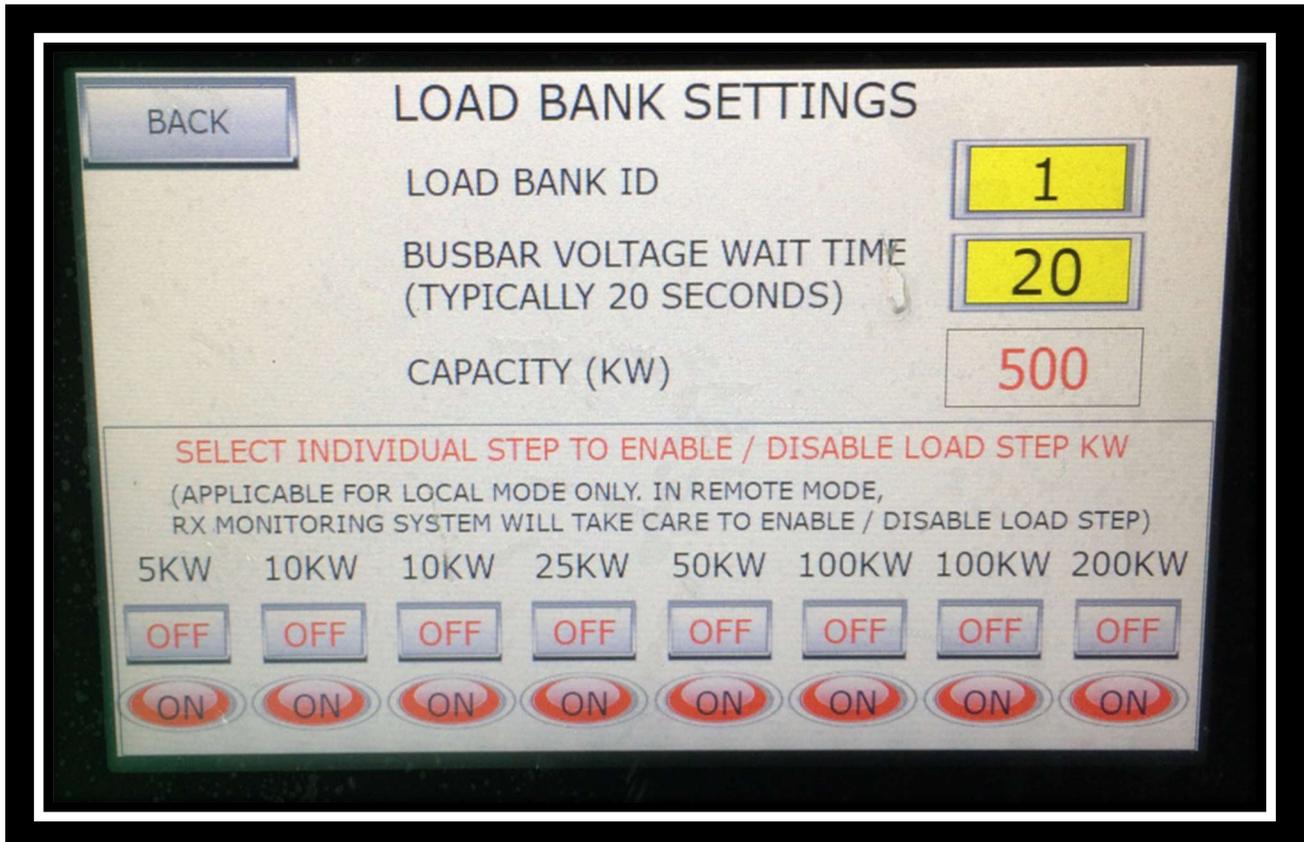


Figure 16 Load bank settings

Click on individual kw load step button will enable respective KW load step as indicated by individual load step status indicator with 'ON' text in red background. Individual load step command button will show 'OFF' text when load is enabled, this indicates next action when respective button is clicked.

Load bank KW capacity value based on enabled load steps will be reflected in capacity (KW) value filed.

Click <BACK> button on this screen and <MAIN SCREEN> button on next screen to exit from Maintenance mode.

Maintenance Guidelines:

Maintenance personnel must always exercise caution when access panels are removed. Personal injury from electrical shock or from moving fan blades could result unless all sources of power are completely disconnected before servicing.

Maintenance must always be done by qualified technician.

Maintenance procedures must be followed to provide longevity of equipment life, and to reduce the probability of electric shock hazard, fire, personal injury, or property damage. Before servicing this equipment, completely review the “**Safety Points**” and “**Potentially Hazardous Operator Conditions**” sections of this manual.

Maintenance must always be done by a qualified and certified technician. Proper protective arch-flash clothing, eye protection, ear protection, gloves, and hard-hat should be worn when servicing or maintaining the unit.

WARNING

Disconnect from all sources of power to the unit (Main input Cam-lok, external Blower Power, External Control Power) prior to any inspection, service, or cleaning. Electric Shock Hazard exists while connected. For optimum performance and service life, preventative maintenance is a key factor. It is recommended that during scheduled inactiveness, reactivation from storage, or unit relocation the following maintenance steps are performed:

Daily Maintenance Prior to Operation

1. Inspect and remove any restrictions and/or obstructions to cold-air intake and hot-air exhaust of the Load Bank unit.
2. Check screens to make sure objects have not blocked/entered openings.
3. Verify the direction of the airflow is in the proper direction from cold-air intake to hot-air exhaust.
4. Verify that there is no possibility of re-circulation of hot-air exhaust to cold-air intake.

Quarterly Maintenance (every three months)

1. Remove all exterior access panels to Load Bank enclosure (including air intake and exhaust covers).
2. Inspect the intake and exhaust covers. Blow or brush away any noticeable dirt or debris from air intake and exhaust openings. Ensure covers are functional and free of debris. Replace any respective panel that is compromised or damaged.
3. Clean any and all dirt and/or debris from the interior of the entire Load Bank. Do not exceed 40 PSI when using clean, dry, compressed air for blowing and removing dust and debris.
4. Inspect blower motor and fan blade, clearing any debris or removing any obstruction. Check fan blade for balance and all respective fan blade and motor mounting hardware for tightness. Torque to proper values of tightness as required.
5. Inspect all resistor elements ensuring all hardware is tightened and elements are clear and free of debris.

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6. Inspect all resistors for mechanical and structural integrity and location. Replace any excessive sagging resistor elements, ceramics and support rods. Replace any and all broken or cracked termination ceramics, and ceramics on resistor support rods as required.
7. Inspect all termination ceramic insulators at resistor case ends (both sides) for breaks or cracks and replace as necessary.
8. Inspect all support rod ceramic insulators for breaks or cracks and replace as necessary.
9. Inspect the entire inside of the enclosure for loose hardware or loose connections and tighten to proper torque values as required.
10. Inspect all load and control wiring for signs of insulation failure or breakdown.
11. Inspect for any signs of heat stress on connections and terminals. This could be a sign of loose hardware or corroded/oxidized connections. Repair and replace connection hardware as required.
12. Inspect all electrical connections to terminal blocks, main input Cam-lok bars, fuses mounted to bus bars, all resistor connections for corrosion and oxidation. Clean connections and replace hardware as required. Tighten as necessary.
13. Inspect all load step contactors. Inspect magnetic contactor coils for oxidation and rust. Inspect contacts that carry load if pitted, rusted or corroded. Contacts must all move freely and properly seal when closed. Replace as necessary.
14. When replacing current transformers, mark all leads before removing to ensure proper phasing of new current transformer. Never leave the secondary of a current transformer unshunted.
15. Reinstall all covers ensuring all materials are well in place and all hardware is properly tightened.
16. Verify Airflow protection circuit. This can be done when unit is powered up for operation with all access panels closed and in place and blocking off the cold-air intake and/or hot-air exhaust.
17. Check all indicator lamps on Operator Control unit (replace as necessary).
18. Blower motor should be lubricated per manufacturer's requirements as noted on motor nameplate.

CAUTION



Do not pressure wash the inside component terminal compartment (relay panel) as damage may occur to electro-mechanical load step relays, motor and control circuits, safety circuits, and terminal strip wiring. If splashed, ensure entire compartment is dry before covering.

WARNING

Pressure washing terminal compartment (relay panel) may lead to condensation and promote internal arching.

Additional Preventative Maintenance Measures (as required)

1. The outside surface of the unit should be wiped or blown free of dust and dirt. Careful consideration to controls, metering and relay compartment must be taken into account when pressure washing the exterior of the enclosure. Ensure air intake and exhaust areas are

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clean and debris free. Blast or sand any noticeable corrosion areas and cover with a suitable paint or coating.

2. Remove both side access panels and ensure all resistor terminal connections including wire, bus jumper are tightened to 15 in-lb and ceramic tubes spring bushings are tightened to 9 in-lb. Inspect all ceramic bushings and insulators for cracks. Replace all broken or cracked ceramic insulators. Ensure all fan and safety component connections are tight. If required, it is safe to blow any dust from this compartment using 40 PSI or less of clean, dry, compressed air. Replace any broken or failed components. Reinstall access panel cover before proceeding with any enclosure maintenance.
3. If resistor elements are extremely dirty, elements can be pressure washed. Pressures up to 40 PSI at a distance of two feet or greater may be used when cleaning the resistor elements. Pressure should be reduced for the connection points and the distance from the nozzle to any insulator should not be closer than four feet to prevent damage.

WARNING

- Disconnect all sources of power to the unit (Main input Cam-lok, external Blower Power, External Control Power) prior to any inspection, service, or cleaning. Electric Shock Hazard exists while connected.
- For corrections requiring repair or replacement of components, contact the factory immediately for further instruction.
- Only those functions within the scope of normal maintenance are listed. This manual cannot list all malfunctions that may occur, or corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify the factory.

Note: When checking fuses for continuity, remove all fuses from fuse blocks, bus bars, fuse holders, and disconnect switch. Test each fuse individually and out of circuit. A blown fuse left in the circuit may check out OK with false reading of continuity due to feedback and return paths within the circuit.

Troubleshooting

- 1) No Main Power to 120 VAC Control Circuits.
 - Emergency Stop / “E-STOP” push button is in the pressed position.
 - Terminals damaged during shipment.
 - External Control Power Main Switch or circuit breaker is not closed.
 - Control Power Transformer failure primary or secondary control power fuse is blown (check and replace as required).
 - Control Circuit Fuse is blown (check and replace as required).
 - Dirty or loose connections or faulty Main Power Switch.
- 2) Blower Motor Not Operating.
 - No External Power to Motor Circuits.
 - Main Power switch is in the off position.
 - Emergency Stop / “E-STOP” push button is in the pressed position.
 - External Blower/Control Power Main Switch or circuit breaker is not closed or power source is disconnected.

- Blower Motor is internally wired to main input Cam-lock with no main input Cam-lock voltage applied.
- Check blower motor power selection switch and blower motor power selection switch are in correct position.
- External power source is inadequate.
- Loose or broken connection at terminal block, motor starter, motor starting coil or on operator control unit (main power, blower start/stop pushbuttons)
- Blower Motor fuse is blown (check and replace as required).
- Motor Over-Load relay is tripped.
- Motor starting relay failed.
- Fan blade obstruction, motor winding failure, or shaft does not turn to improper lubrication.

3) Blower Motor Circuit energized but Fan Blade is not turning.

- Fan blade motion is obstructed or broken.
- Fan blade is loose at hub or is not keyed properly.

4) Air Failure fault indication on HMI display.

- Obstruction or restriction of air flow at Load Bank cold-air intake or hot-air exhaust.
- Blower motor phasing is incorrect causing rotation of fan blade and wrong direction of cooling air flow. Check motor power connections for proper phase sequence.
- Exhaust over-temperature switch is activated. Sign of resistor over temperature. Verify and ensure air intake and exhaust openings are clear of any debris, blockage or obstruction. Check for proper -blower operation and proper direction of airflow.
- Air switch or Air failure auxiliary relay is malfunctioning or not operating correctly.
- Air switch high pressure intake tubing obstruction. Remove, clean, and replace tubing as necessary.

5) Over-Temp fault indication on HMI Display.

- Obstruction or restriction of air flow at Load Bank cold-air intake or hot-air exhaust.
- Blower motor phasing is incorrect causing rotation of fan blade and wrong direction of cooling air flow. Check motor power connections for proper phase sequence.
- Airflow switch is activated indicating a loss of cooling airflow. Sign of resistor over-temperature.
- Verify and ensure air intake and exhaust openings are clear of any debris, blockage or obstruction.
- Check for proper blower operation and proper direction of airflow.
- Over-Temp switch or Over-Temp auxiliary relay is malfunctioning or not operating correctly.
- Air switch high pressure intake tubing obstruction. Remove, clean and replace tubing as necessary.

6) Wrong Voltage Lamp Illuminated (dual voltage units).

- Over voltage fault indication on HMI screen: Input power voltage is higher than allowed tolerances.
- Under Voltage fault indication on HMI display: Input power voltage is lower than allowed tolerances or one phase is missing or input phase is reversed.

7) Load Dump On indication on HMI screen.

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- Indicates that all load steps are removed because load dump toggle switch is operated.
- 8) Resistor Open or Phase Imbalance.
- Blown load step fuse in branch load circuit (check and replace as necessary).
 - Loose bus bar or loose connection at resistor terminal or fuse (tighten all bus bar and connection points as required).
 - Resistor element failure and burned open (replace as necessary).
- 9) Load Step or Load step application circuit cannot be energized.
- Blower Failure, Air failure, Over-Temp, Wrong Voltage, Motor Overload, Load Dump, (see item 2 thru 8 above).
 - Load Dump switch is operated. One or more of the branch circuit load step fuses for the load step in question is blown (check and replace as necessary).
 - One or more of the load step resistors for the load step in question has failed or burned open (check and replace as necessary).
 - Load step contactor has failed or is inoperative due to loose connection or failed-open coil.
- 10) Load Step energized without rated load, or un-balanced load.
- Applied main input bus voltage from power source under test is de-rated, low, imbalanced or inadequate.
 - Contactor failure or not closing properly. Loose connection.
 - One or more of the branch circuit load step fuses for the load step in question is blown (check and replace as necessary).
 - One or more of the load step resistor for the load step in question has failed or burned open (check and replace as necessary).
- 11) Load Step contactor or relay chattering.
- Contacts are pitted or oxidized.
 - Magnetic core and coil are dirty or corroded.
 - Coil connections to the contactor are loose.
 - 120 VAC control circuit line voltage is low and/or inadequate.
- 12) Switchgear Circuit Breaker trips or Main Disconnect fuses are blown.
- Fuses and/or circuit breaker trip settings are undersized.
 - A short circuit exists at the Load Bank Resistor (main input Cam-lok or blower circuit).
 - A short exists in the power conductors feeding the Load Bank Resistor. Note: When checking fuses for continuity, remove all fuses from fuse blocks, bus bars, fuse holders, and disconnect switch. Test each fuse individually and out of circuit. A blown fuse left in the circuit may check out OK with false reading of continuity due to feedback and return paths within the circuit.

LOAD BANK LIFTING

- Weight of load bank is 520KG (1146 Pound).
- Use forklift which have capacity of 2 ton with fork length of 42" (minimum).
- Slide the fork to the desired location on the crossbar. Lift the fork slightly until it drops

into the slots on the load bank.

- Now move forklift to forward side to position fork inside slots on the load bank. Make sure load banks doors do not get touch to the forklift.
- Now, lift load bank @ 1 ft distance above floor and move forklift to the desired location.
- Below Picture for reference only (See figure 13),



Fig.13 Load bank lifting with Forklift

Storage

- It is recommended that the unit be stored Indoor/Outdoor in a dry enclosed area. There is no special preparation required.

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- If the unit is to be unused or stored for any length of time Indoor/Outdoors, cover the unit to prevent any accumulation or buildup of dust or dirt. If stored outdoors, do not cover with plastic that may create condensation and enclosure corrosion or staining (keep exhaust hood in place).
- Storage temperatures should remain -4°F to +122°F [- 20°C to +50°C].

Shipping

- Attach the enclosure to a skid constructed with minimum board thickness of two inches (2") to properly support the unit's weight. Use (4) or more lag bolts in the mounting base holes provided at the entrance to the integrated fork lift tine receptacles, and properly secure the load bank to the mounting skid.
- Secure all loose parts in the bottom of the enclosure and reinstall cover.
- Pack, seal securely in a sturdy wooden crate or equivalent, with sufficient padding to avoid shock damage.
- Ship Operator Control Unit separately.
- If returning to the factory, a factory Return Merchandise Authorization (RMA) Number will be required prior to shipment or may be refused at the dock.

Customer Service

Any maintenance or service procedure beyond scope of those provided in this manual should be referred to a factory engineer. All units returned for service must be shipped prepaid and to the attention of the factory engineer in which return and service were discussed with RMA number noted.

Contact Information

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Email: service@universalloadbanks.com

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APPENDIX A: ELECTRICAL SCHEMATICS

See PDF file provided separately.

APPENDIX B: BILL OF MATERIAL

Provided upon request.

APPENDIX C: DIMENSIONAL DRAWINGS

See PDF file provided separately.