SIMPLEX®
Insight Onsite

SATURN

1400KW-3200KW
STATIONARY LOAD BANK

Last Revision Date: June 8, 2021

For the most up-to-date information for this product and others,
please contact Simplex, Inc. at (800) 637-8603 or
visit us on the web at http://www.simplexdirect.com.

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1 WARNINGS AND CAUTIONS

Safety Information Symbols

The following images indicate important safety information:

This **General** warning symbol points out important information that, if not followed, could endanger personal safety and/or property.

This **Explosion** warning symbol points out potential explosion hazards.

This **Fire** warning symbol points out potential fire hazards.

This **Electrical** warning symbol points out potential electrical shock hazards.

Cautions

This load bank is high-powered, technical, industrial equipment operating at dangerous voltages and temperatures. It is capable of damaging itself, property or personnel if improperly used. It is not a consumer product.

It must be installed, connected and operated by personnel properly trained and experienced in its use. An operator's manual is supplied with each load bank and available online at www.simplexdirect.com. The operator must be familiar with its contents and have access to it during operation.

- **High Voltage:** Turn off and disconnect power source before opening this equipment
- **High Temperature:** Allow hardware to cool before servicing or opening this equipment.
- **Rotating Equipment:** Ensure that the fans have stopped before opening this unit.
- **For Operator Safety:** Make sure this equipment is properly grounded when in use.

All compression-type connections on fuse blocks, load blocks, and contactors should be checked for tightness frequently. This check should be established as part of routine maintenance.

The following cautions should be observed before and during operation:

- Check intake and exhaust screens as well as fan and load elements for foreign objects.
- Position and install the load bank with consideration given

to large cubic airflow requirements, exhaust temperature, and velocity. Do not point exhaust at any nearby surface or object that may be adversely affected by high temperature. This includes but is not limited to painted surfaces, tar paper and asphalt roofs, water sprinkler heads, fire alarms, and volatile material.

- Do not use in confined spaces. Do not allow the load bank's feet to sink into soft surfaces thereby cutting off bottom air intake. The load bank may have to compete with cooling air requirements of a nearby running engine generator set where cooling air intake to a confined space may not be adequate for both engine and load bank. Be especially careful not to bounce hot exhaust air off nearby obstructions for re-circulation through the load bank.
- Verify that all control switch positions are set correctly for your intended usage before connecting the load bank to the source to be tested.
- The load cables carry high amperage. Be constantly aware of possibility of inductively heating adjacent ferrous objects to temperatures sufficient to damage cable insulation.
- Always connect the safety ground cable to a proper ground. Do not rely on a possible grounded neutral somewhere else in the system.
- Do not let the load bank run unattended for long periods of time.
- Do not store or operate in rain unless adequate protection is provided.
- Routinely inspect all components and electrical connections for tightness and integrity.
- Repair any damaged or degraded components and wiring without delay.
- If technical assistance, service, or parts are needed, please call 800-837-8603 (24 Hours).
- All hardware covered by this manual have dangerous electrical voltages and can cause fatal electrical shock. Avoid contact with bare wires, terminals, connections, etc. Ensure all appropriate covers, guards, grounds, and barriers are in place before operating the equipment. If work must be done around an operating unit, stand on an insulated dry surface to reduce the risk of electrocution.

- Do not handle any kind of electrical device while standing in water, while barefoot, or while your hands or feet are wet.
- If people must stand on metal or concrete while installing, servicing, adjusting, or repairing this equipment, place insulative mats over a dry wooden platform. Work on the

equipment only while standing on such insulative mats.

- The National Electrical Code (NEC), Article 250 requires the frame to be connected to an approved earth ground and/or grounding rods. This grounding will help prevent dangerous electrical shock that might be caused by a ground fault condition or by static electricity. Never disconnect the ground wire while the load bank is in use.
- Wire gauge sizes of electrical wiring, cables, and cord sets must be adequate to handle the maximum electrical current (ampacity) to which they will be subjected.
- Before installing or servicing this (and related) equipment, ensure that all power voltage supplies are completely turned off at their source. Failure to do so can result in hazardous and possibly fatal electrical shock.
- In case of accident caused by electric shock, immediately shut down the source of electrical power. If this is not possible, attempt to free the victim from the live conductor. AVOID DIRECT CONTACT WITH THE VICTIM. Use a nonconducting implement, such as a dry rope or board, to free the victim from the live conductor. If the victim is unconscious, apply first aid and seek immediate medical attention.
- Never wear jewelry when working on this equipment. Jewelry can conduct electricity resulting in electric shock or may get caught in moving components causing injury.
- Keep a fire extinguisher near the hardware at all times. Do NOT use any carbon tetra-chloride type extinguisher. Its fumes are toxic, and the liquid can deteriorate wiring insulation. Keep the extinguisher properly charged and be familiar with its use. If there are any questions pertaining to fire extinguishers, please consult the local fire department.

- The illustrations in this manual are examples only and may differ from your load bank.

- Load Bank warranty is void if incorrectly cooled.

2 DESCRIPTION AND SPECIFICATION

Overview of Use

Simplex Saturn load banks are precision test instruments designed to apply a selectable load to a power source and measure the source's response. They are used for routine maintenance exercise to ensure the long-term reliability and readiness of the standby generator. Load banks can also eliminate the detrimental effects of unloaded operation of diesel engine generators as well as prevent damage from reverse power generation.

Saturn load banks are available in models ranging from 1400 kilowatts up to 3200 kilowatts. All standard Saturn models have a step resolution of 25 kilowatts.

Control System

Saturn load banks feature a Human-Machine Interface (HMI) touchscreen, which controls load bank operation and displays the unit's status. With the HMI, the operator can apply a desired load and measure the response of the test source.

The load bank can also be integrated into your facility's BMS/BAS system via standard Modbus RS-485 or optional Modbus TCP/IP, as well as a set of dry contacts for status reporting.

Cooling System

Saturn load banks are cooled by forced air, delivered by an aluminum fan blade directly driven by a TEFC motor. The air is brought in on the bottom of the load bank and expelled through the top. Optional equipment allows the exhaust to be driven through a customer-installed duct, providing for indoor installation.

Load System

The load system comprises independently controlled Simplex Powr-Web resistors, which have been designed specifically for use in load bank systems. The load elements are supported by high-temperature, ceramic-clad, stainless-steel rods across their entire length, virtually eliminating element-to-element short circuits. The elements are arrayed in discrete trays, which are independently serviceable.

Safety

The Saturn is protected by sensors to ensure that the load bank is sufficiently cooled and that the exhaust does not exceed a safe temperature, which could damage the load bank or present a safety hazard to the operator. When a failure occurs, the safety system immediately removes the load to protect the equipment from permanent damage.

	1400	1500	1600	1700
416V	1943A	2082A	2221A	2359A
480V	1684A	1804A	1925A	2045A
600V	1347A	1443A	1540A	1636A

	1800	1900	2000	2100	2200
416V	2498A	2637A	2776A	2915A	3053A
480V	2165A	2285A	2406A	2526A	2646A
600V	1732A	1828A	1925A	2021A	2117A

	2300	2400	2500	2600	2700
416V	3192A	3331A	3470A	3608A	3747A
480V	2766A	2887A	3007A	3127A	3248A
600V	2213A	2309A	2406A	2502A	2598A

	2800	2900	3000	3100	3200
416V	N/A	N/A	N/A	N/A	N/A
480V	3368A	3488A	3608A	3729A	3849A
600V	2694A	2791A	2887A	2983A	3079A

These measurements are based on ideal numbers. They do not take into account control power draw, power cable resistance, voltage droop, etc.

3 UNPACKING

Included Components

The following items are included with your load bank. If any of the following are not included, please contact Simplex Direct at 800-637-8603.

1. Load bank
2. Controller (remote or local)
3. Manual
4. Drawing package

Optional equipment

1. Additional controllers
2. Exhaust hood
3. Current transformers
4. Other optional equipment

Primary Inspection

Before installing your Saturn, inspect the shipping crate and load bank. Physical or electrical problems could arise from handling and vibration. Never apply power to a load bank before performing this procedure. The following five-point inspection is recommended before installation and as part of a 6-month maintenance schedule or when the load bank is relocated:

If any problems are observed during Primary Inspection, call Simplex 24 hours a day at 800-637-8603

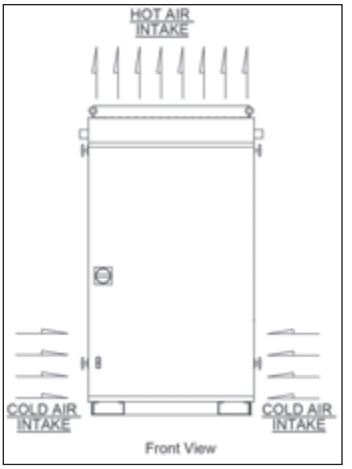
1. If the crate shows any signs of damage, examine the load bank in the corresponding areas for signs of initial problems.
2. Check the entire outside of the cabinet for any visual damage, which could cause internal electrical or mechanical problems due to reduced clearance.
3. Open the control panel door and inspect all relays and control modules. Make sure all components are secure in their bases and safety bails are in place. Spot-check electrical connections for tightness. If any loose connections are found, inspect and tighten all remaining connections.
4. Examine all accessible internal electrical components such as fuses, contactors, and relays. Check lugged wires at these components.
5. Check the load element chamber for foreign objects, broken ceramic insulators, and mechanical damage.

4 INSTALLATION

Load Bank Placement

Normally equipped, Saturn load banks are intended for outdoor installation. A forced air system, which discharges out of the top of the unit, cools the load elements (See **Figure 1 Air Flow**.) Load banks require large quantities of air circulation, so it is essential to install the unit in an area that provides adequate airflow. Before conducting load tests, a review of site conditions by trained personnel is recommended.

Figure 1 Air Flow



Improperly installing this unit may result in damage or destruction of the load bank, adjacent equipment, and the building housing the unit.

The load bank requires at least 20 feet of vertical clearance; 6 feet of clearance on the front, left, and right; and 1.5 feet of clearance in the rear (see **"Figure 2 Clearance requirements" on page 11**).

The load bank should be placed in a secure area accessible by trained personnel only.

Because the unit generates a lot of heat, never operate near sprinkler systems.

Operating the load bank in a confined space will recycle hot exhaust air through the cooling system, which can cause severe damage.

The load bank may compete with nearby generators for cooling air.

Installation Procedure

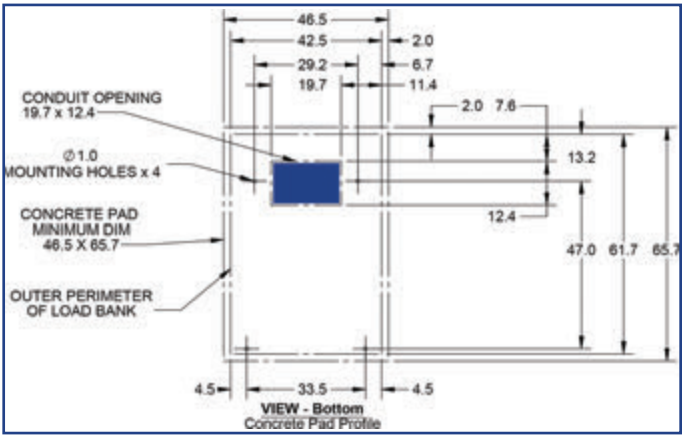
Saturn load banks feature a power outlet in the control panel for your use. This outlet is limited to 2 amps.

1. To bring in the source's power cables, pull holes in the Conduit Opening, located in the bottom of the load bank's control panel enclosure (see Figure 5 Conduit Opening).
2. Confirm the test source is properly grounded.
3. Ground the load bank by connecting the Grounding Bus to an earth ground or grounding rod. See Figure 3 Ground Bus
4. Connect the source's power output to the load bank via the Main Load Bus with appropriately sized cables (see Figure 4 Main Load Bus).

Figure 2 Ground Bus

Figure 3 Main Load Bus

Figure 4 Conduit Opening



SIMPLEX

REMOTE HMI INSTALLATION

If your HMI is installed directly on the load bank, skip to the next section.

1. Mount the HMI where desired.
2. Connect the HMI to the Load Bank by swinging the HMI's screen out to expose the TB-H terminal block (see **Figure 6 HMI TBH**) and wiring it to the Load Bank.

   A. Using a Belden 9841 or equivalent cable, make the following connections between the HMI's TB-H terminals to the Serial Adapter (see **Figure 7 Serial Adapter**).

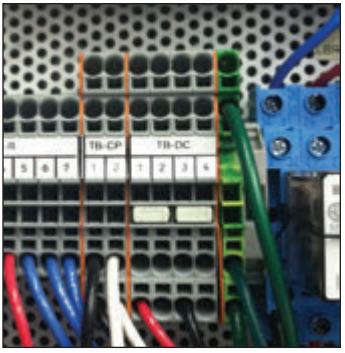
      1. TB-H 4 → TXD+
      2. TB-H 5 → TXD-
      3. Wire shielding → COM B

   B. Using a copper wire, 14AWG or larger, rated at 60C or higher, connect the HMI's TBH 1 to the load bank's TB-DC 1 terminal and the HMI's TBH 2 to the load bank's TB-DC 3 terminal (see **Figure 8 TB-DC**).

Figure 5 HMI TBH

Figure 6 Serial Adapter

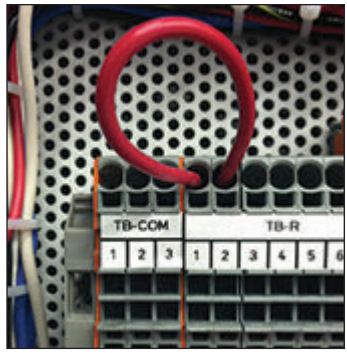
Figure 7 TB-DC



Load Dump Installation

If the Load Dump feature is desired, remove the factory-installed jumper at TB-R 1–2 and connect customer-supplied Load Dump contacts to TB-R 1–2 (See **Figure 9 Load Dump Jumper**). To dump the load, open the customer-supplied contact. To enable load, close the customer-supplied contact.

Figure 8
Load Dump Jumper



Current Transformer Installation

If your load bank is equipped with Metering, Automatic Mode or Regenerative Mode options, you will have to install current transformers on your power cable.

- For metering mode, install the current transformers on the load bank leg of your power system (see "Figure 13 Current Transformer placement for Metering" on page 12.)
- For Automatic/ Regenerative Mode, install the current transformers on the power source leg (see "Figure 14 Current Transformer placement for Auto/ Regen. Mode" on page 12.)

The current transformers must be placed and oriented correctly to ensure they accurately detect the current. The first current transformer must be installed on Phase A, and the second must be installed on Phase C.

Orient the current transformers so that the XI or HI on each ring is facing the power source (see Figure 11 CT Orientation.)

When the current transformers are installed, connect them to the load bank by connecting the white wire of the current transformer on Phase A to TB-CT 1 and the black wire to TB-CT 2. If a second current transformer is installed on Phase C, connect its white wire to TB-CT 3 and its black wire to TB-CT 4 (see Figure 12 TB-CT.)

Figure 9
Current Transformers

Figure 10
CT Orientation

Make sure the XI or HI on the ring faces the power source.

Figure 11 TB-CT

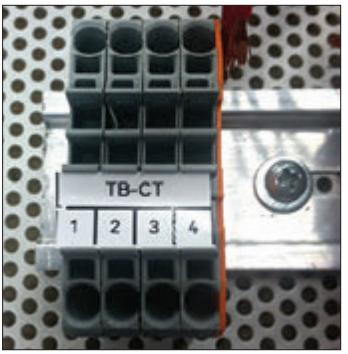


Figure 12 Current Transformer placement for Metering

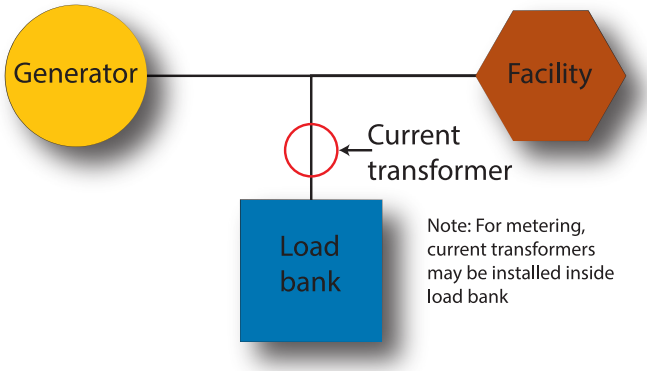
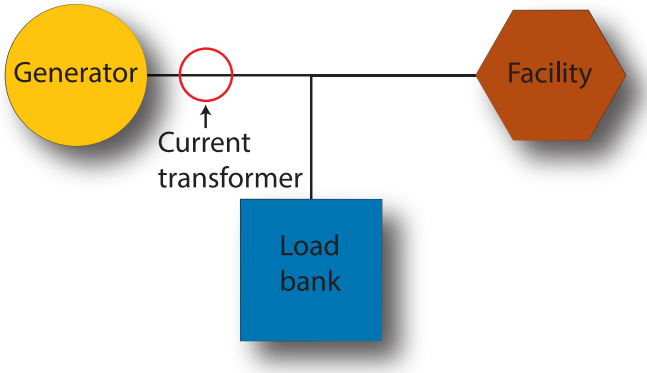


Figure 13 Current Transformer placement for Auto/Regen. Mode



The first current transformer must be installed on Phase A, and the second must be installed on Phase C.

MODBUS INSTALLATION

The Saturn load bank supports the Modbus protocol, implemented either as RS485 or TCP/IP (which is an optional upgrade).

To implement Modbus control and monitoring, connect the load bank to your facility's systems as follows:

For RS485:

1. Connect the RS485+ line to TB-COM 1
2. Connect the RS485- line to TB-COM 2
3. Connect the wire shielding to TB-COM Terminal 3

For Optional Modbus TCP/IP

1. Plug a CAT5e cable into the ethernet jack on the MODBUS Serial Converter (see **Figure 16 Modbus Serial Converter**.)

Figure 14 TB-COM

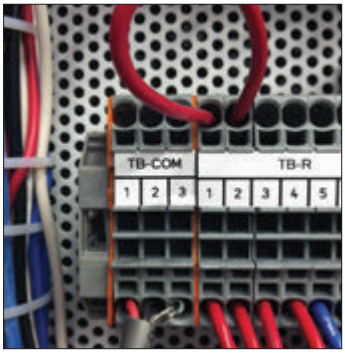
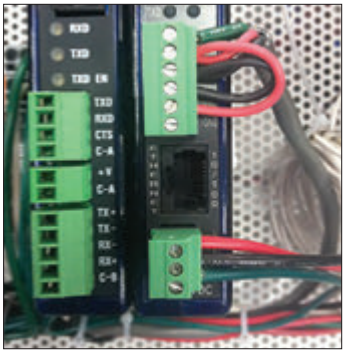


Figure 15 Modbus Serial Converter



The Polaris Modbus control set is implemented as detailed in **"Appendix B — Modbus controls" on page 41**

Heater Installation

Saturn load banks are equipped with space heaters for cold weather operation and to prevent condensation, which can damage the unit. The heaters require a dedicated power source independent of control power at all times to prevent startup failure due to cold environments.

Figure 16 TB-SH

To run power to the heaters:

1. Run a 120V, 15A, 1-phase power cable into the control panel.
2. Connect the Line leg of the power cable to SH-1
3. Connect the Neutral leg of the power cable to SH-2
4. Connect the Ground leg of the power cable to SH-3

The heaters are set at 50 degrees Fahrenheit. If a different temperature is required, adjust the red thermostat on the front of the heater.

BMS/BAS Installation

The Polaris provides a set of Remote Signal Dry Contacts, which allow you to integrate the load bank into your Building Management System (BMS) or Building Automation System (BAS) The dry contacts provide an alarm message, letting you know if the load bank has failed.

Figure 17 TBR

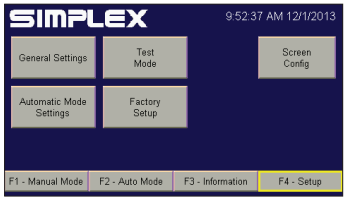
To enable BMS/BAS functionality, wire three cables to TBR 5-7. Continuity between TBR 5 and TBR 6 indicate normal load bank operation, and continuity between TBR 5 and TBR 7 indicate load bank failure.

5 SETUP

Saturn load banks feature a power outlet in the control panel for your use. This outlet is limited to 2 amps.

The Saturn load bank offers a number of configuration options through its setup screens. You can access the setup screens by pressing "F4 - Setup" or the F4 function key.

Figure 18 Setup Screen



At the main setup screen, you are presented with four options:

1. General Settings
2. Automatic Mode Settings
3. Test Mode (Intended only for Simplex engineers)
4. Factory Setup (Intended only for Simplex engineers)

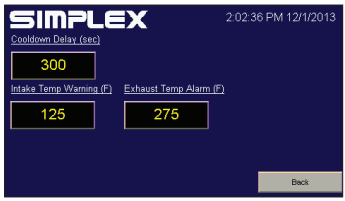
You can access General Settings and Automatic Mode Settings by pressing their respective buttons.

General Settings

General Settings presents three fields:

1. Cooldown Delay (sec)
2. Intake Temp Warning (F)
3. Exhaust Temp Alarm (F)

Figure 19 General Settings



Cooldown Delay should not normally be changed.

Cooldown Delay determines how long the load bank fans will continue running after an operation has been concluded. Intake Temp Warning determines at what temperature the load bank will present a warning that the air being used for the forced air cooling system is too hot.

Exhaust Temp Alarm determines how hot the exhaust must be before the load bank will trigger an Exhaust Temp High alarm and remove the load. This and Intake Temp Warning may need to be changed at installation, depending on the climate.

Automatic Mode

Automatic Mode Settings specify the operation of Automatic/Regenerative Mode. For information about how to set them up, see "Setting Up Automatic Mode" on page 20.

6 OPERATING INSTRUCTIONS

Pre-operation checks

Saturn load banks feature a power outlet in the control panel for your use. This outlet is limited to 2 amps.

1. Start the generator or source being tested.
2. Ensure the load bank's Fan/Control Power Disconnect Switch, located on the unit's door, is in the on position (see **Figure 21 Fan/Control Power Disconnect Switch**.)
3. Check the load bank's intake areas, located on the bottom of the unit, to ensure that the vents are not blocked by paper or other debris that would prevent the cooling fan from pulling in air.
4. On the HMI, turn on the load bank by pressing the Control Power button in the upper left corner of the screen (see **Figure 22 Control Power Button**.)
5. Listen to the load bank's fan to ensure it is operating normally.

Setting up the test

When the fan is running properly, you are ready to begin testing.

Press the F1 function key or "F1 - Manual Mode" on the screen to bring up Manual Mode (See **Figure 23 HMI - Manual Mode**). In the upper right area of this screen is a display indicating the load to be applied, measured in kilowatts. To change this value, touch the

Figure 20 Fan/Control Power Disconnect Switch

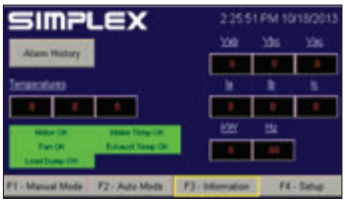
Figure 21 Control Power Button

Figure 22 HMI - Manual Mode

Figure 23 HMI - Numeric keypad

number and enter the new value on the numeric keypad that appears (see Figure 24 on page 17). Enter the desired value and press the ↵ button to return to the previous screen, or press "Esc" to return to the main screen without changing the value.

Figure 24 HMI Information



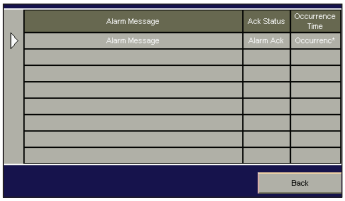
In the lower right quadrant of the screen is the KW Jog value. This indicates by how many kilowatts you will increase or decrease the load by pressing the "-" and "+" buttons, respectively. To change this value, press the number and enter your choice using the numeric keypad.

Testing Operation

To begin testing, press the "Master Load" button. This will activate the load bank and begin applying the load displayed in the upper right area of the screen. To quickly decrease or increase the load, press the "-" and "+" buttons.

Metering (if equipped)

Figure 25 Alarm History



If you have purchased the metering upgrade, pressing the F3 function key or "F3 - Information" on the screen while the test is running will bring up the metering screen (see Figure 26). Here you can monitor the voltage, current, load applied to the source, and the frequency of the electricity. This screen also displays the temperatures registered by the load bank's three sensors.

If any of three voltage or current values are significantly different from the other two, check the load bank for a blown fuse. If no blown fuse is found, contact Simplex service at 800-637-8603, ext. 4.

Pressing "Alarm History" on this screen will bring up a list of registered alarms (See Figure 27.)

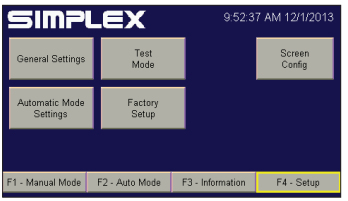
Shutdown and Cooling

When the test is complete, press the Master Load button then the Control Power button to remove the load from the test source. The load bank's fan will continue running for the duration of the cooldown delay (see page 16 for more information).

7 AUTOMATIC MODE

The Saturn load bank can be equipped with an optional automatic mode, which will extend your generator's life by protecting it against wet-stacking and reverse current.

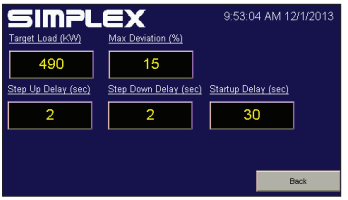
Figure 26 Setup Screen



OVERVIEW

Automatic Mode adds load when the load bank detects that your generator isn't operating in its optimal range.

Figure 27 Automatic Mode Setup



When your load bank is installed, a set of current transformers will be installed on your generator's power lines to monitor the load on your system. When the load bank detects that the power draw has fallen below a preset range, it begins adding load until the draw on the generator is within the designated range. Should the load bank determine that the power draw has increased beyond

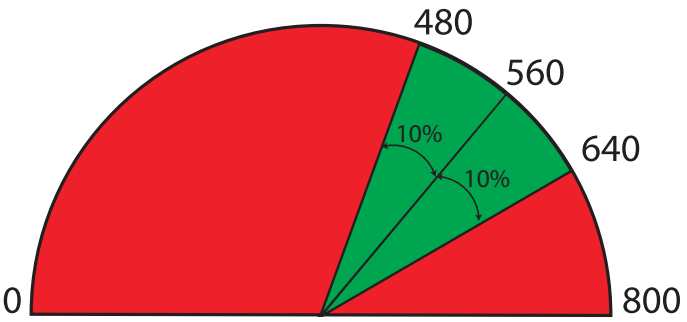
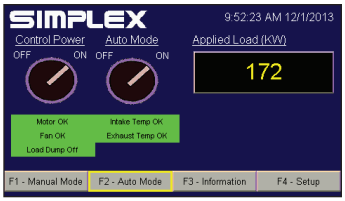


Figure 28 Automatic/Regenerative Mode

In this illustration, the load bank has been set up for an 800KW generator. The Target Load is set at 560KW, with 10% Max Deviation. So long as the load remains in the green area, the load bank will not add or drop load. But if the load moves into the red area, the load bank will adjust the load to move it back into the green.

the preset maximum value, it begins removing load until the draw is back within the designated range.

Figure 29 Automatic Mode Running



Setting Up Automatic Mode

The values you will need to set up this mode are specific to your generator. For example, if you have an 800 kilowatt generator with a 60% to 80% optimal operating range, you might set Target Load to 560 (which is 70% of its capacity) and Max Deviation to 10%.

Before you activate Automatic Mode, you must configure the load bank to interact with your generator. Enter the Automatic mode setup screen by pressing the "F4 Setup" button on the screen or the F4 function key to reach the Setup Screen, then pressing the Automatic Mode Settings button (see **"Figure 28 Setup Screen" on page 19**.)

On the setup screen will be five options specific to Automatic Mode. (See **"Figure 29 Automatic Mode Setup" on page 19**.)

- **Target load (KW):** Sets the target load you want on your generator, measured in whole kilowatts.
- **Max Deviation (%):** Determines how far above and below your target load is acceptable, measured in whole percentage points.
- **Step Up Delay (sec):** Determines how fast the load bank will add sequential load steps, measured in whole seconds.
- **Step Down Delay (sec):** Determines how fast the load bank will remove sequential load steps, measured in whole seconds.
- **Startup Delay (sec):** Determines how long the load bank will wait before adding load once the power draw has dropped below the lower limits established by Target Load and Max Deviation, measured in whole seconds.

To change any of the values, press the value and a numeric keypad will come up. Use it to enter a new value the same way you would enter a load to apply. (See **page 17** for more information about using the numeric keypad.)

Entering Automatic Mode

When your load bank is configured, return to the main screen by pressing the "Back" button. From the Main screen, press the "F2 - Auto" button or the F2 function key to enter the Automatic Mode screen (See **Figure 31 Automatic Mode Running**.)

On the Automatic Mode screen, press the "Auto Mode" switch. Once this mode is enabled, the load bank will monitor your generator and step the load up or down as necessary.

Once configured and enabled, your load bank can remain in Automatic Mode indefinitely.

8 MAINTENANCE/TROUBLESHOOTING

General Maintenance

The load bank has been designed to require minimum maintenance. All components have been chosen for a long, reliable life. Two basic intervals of maintenance are required: each operation and every 6 months.

Each Operation

Remove all power from the load bank before servicing the unit.

- Check the air intake screens and louvers, fan and cooling chamber, and exhaust openings for any obstructions or foreign objects.
- Check fan blades for stress fractures.
- Check the exhaust vent for obstructions
- Check the load branches for blown fuses or opened load resistors.

To check the fuses or load resistors, operate the load bank from a balanced 3-phase source and check the three line currents. The three current readings should be essentially the same. If a sizable difference is noted, one or more load fuses or load resistors may have malfunctioned.

Every 6 Months

Check the tightness of the electrical connections. The expansion and contraction caused by load bank operation may cause loose connections. For a detailed inspection guide, see **"Primary Inspection" on page 6**.

Trouble Shooting

Although Saturn load banks are designed with trouble-free operation in mind, some problems can arise. Please consult the following table for solutions to the most common issues before contacting a Simplex service representative.

Table 1 Troubleshooting

Problem	Solution
Load bank wired to source but won't turn on	Ensure load bank is wired to source correctly Check for and replace any blown fuses Tighten any loose relays, contactors, lugged wires, etc.
Load bank overheating	Clear intake and exhaust vents of any debris Ensure load bank was not installed too close to generator or any other source of exhaust Ensure load bank was installed in a location that allows sufficient cool air intake Make sure ambient temperature isn't too high to allow for cool air flow
HMI not displaying data	Ensure HMI power connections are wired correctly Check HMI serial cable connections

9 ALARMS AND WARNINGS

Saturn load banks are protected by four types of sensors.

1. Intake temperature, which checks the incoming air to ensure the load elements can be adequately cooled.
2. Exhaust temperature, which checks the air temperature coming out the load bank.
3. Fan pressure, when ensures the fan blades are forcing air into the load element chamber.
4. Fan current, which ensures the fan motor isn't overloaded or jammed.

ALARMS

The Saturn load bank's HMI features five status areas:

Unresolved cooling issues may result in damage to the load bank.

- **Motor:** Indicates the status of the cooling fan motor
- **Fan:** Indicates whether the fan is blowing air into the element chamber
- **Intake Temp:** Indicates status of incoming cooling air
- **Exhaust Temp:** Indicates status of load bank's exhaust
- **Load Dump:** Indicates whether the load dump feature has been activated

With the exception of Intake Temp, any failure state will cause the unit to dump the load until the problem is fixed.

The load bank will alert you to alarms by turning the status areas for the alarm on the home screen from green to red and displaying the alarm signal in white text.

WARNINGS

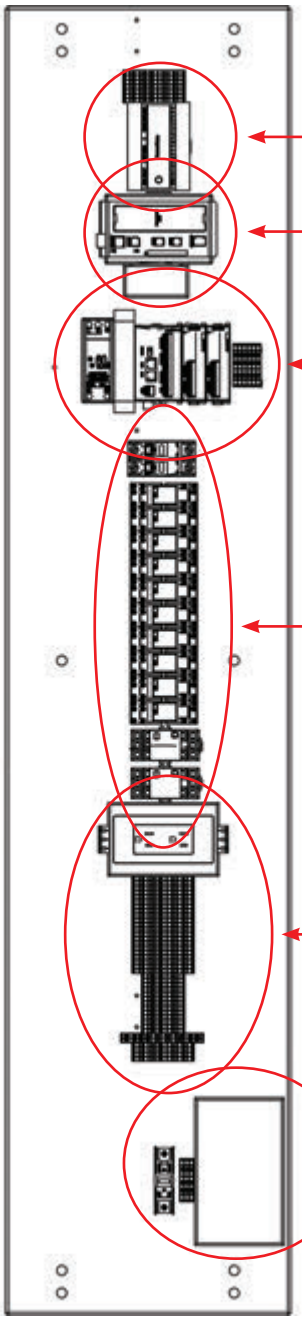
The Saturn features one warning: Intake Temp High. When this warning is triggered, the Intake Temp status area will turn yellow.

Saturn load banks do not dump load when a warning is triggered, but the problem should be investigated as soon as possible.

Table 2 Troubleshooting alarms

Alarm	Cause	Solution
Motor	Fan blades blocked	Clear obstruction
Fan	Intake vents blocked by debris, paper, etc	Clear intake vents
	Fan blades have come loose from shaft	Tighten fan blade hub.
Intake Temp	Intake vents blocked by debris, paper, etc	Clear intake vents
	Load bank pulling in exhaust from generator, etc.	Ensure load bank was not installed too close source of exhaust
	Insufficient airflow	Ensure load bank has access to sufficient cool air intake
	Ambient temperature too high	Conduct operation on cooler day, if possible
Exhaust Temp	Air not being forced over load elements	Ensure fan and fan motor are working correctly and rotating in correct direction
Load Dump	Load dump switch activated	Deactivate load dump switch
	Load dump jumper fell out of TB-LD 1-2	Replace load dump jumper

Figure 30 Right Subpanel Layout



Option D - Automation/ Metering **page 26**

Option E - Communication (TCP/IP Data Logging) **page 27**

PLC **page 28**

Control Relays **page 30**

Terminal blocks/Service Outlet **page 32**

Option 010 - Space Heaters **page 34**

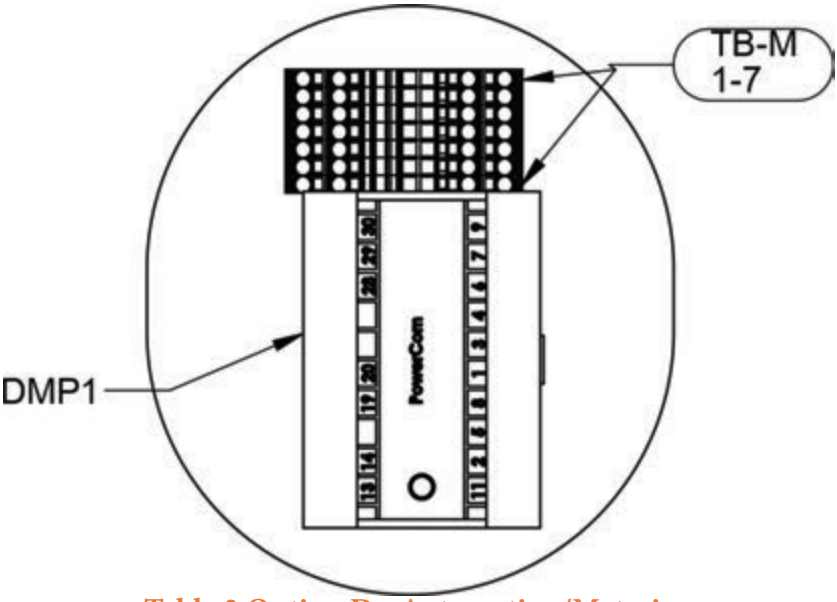


Table 3 Option D - Automation/Metering

Label	Description	Part Number
TB-M 1	Terminal Block, 4 Connections, Black	25678547
TB-M 2	Terminal Block, 4 Connections, Red	25678546
TB-M 3	Terminal Block, 4 Connections, Blue	25678557
TB-M 4, 6	Terminal Block, 4 Connections, Grey	25678536
TB-M 5, 7	Terminal Block, 4 Connections, Green	25678537
DMP1	Digital Metering Package, RS232	24345050

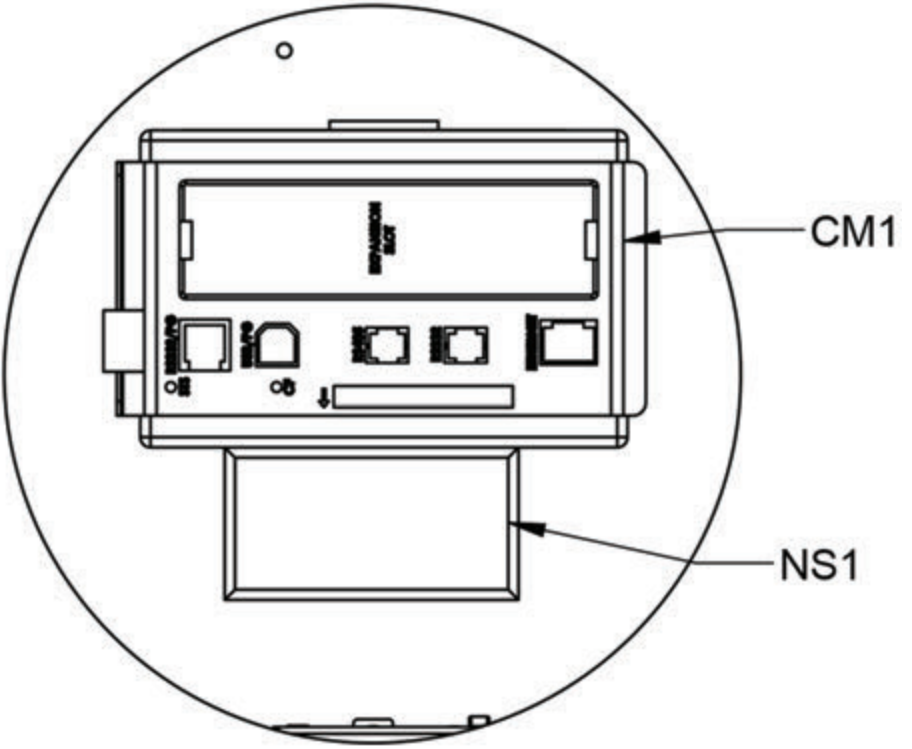


Table 4 Option B - Communication (TCP/IP Data Logging)

Label	Description	Part Number
CM1	Modular Controller and Protocol Converter	24955043
NS1	Ethernet Switch, 5 Port, Unmanaged	24955074

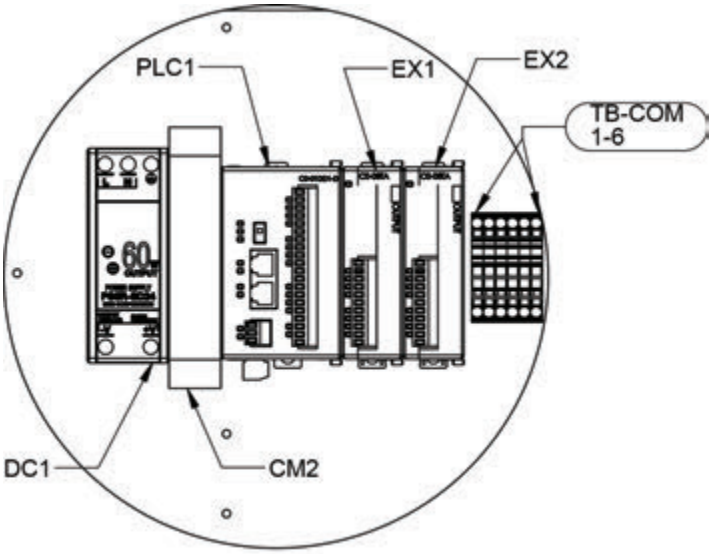


Table 5 PLC Component list

Label	Description	Part Number
PLC1	PLC	24955113
EX1	8PT Relay Output Module	24955008
EX2	4PT Thermocouple Input Module	24955023
DC1	DC Power Supply, 60W, 24VDC	25457900
CM2	RS232/RS485 Converter, RJ12 Port	24953500
TB-COM1-6	Terminal Block, Spring Type, 20A, 600Vac, 2 Connections, Grey	25678532

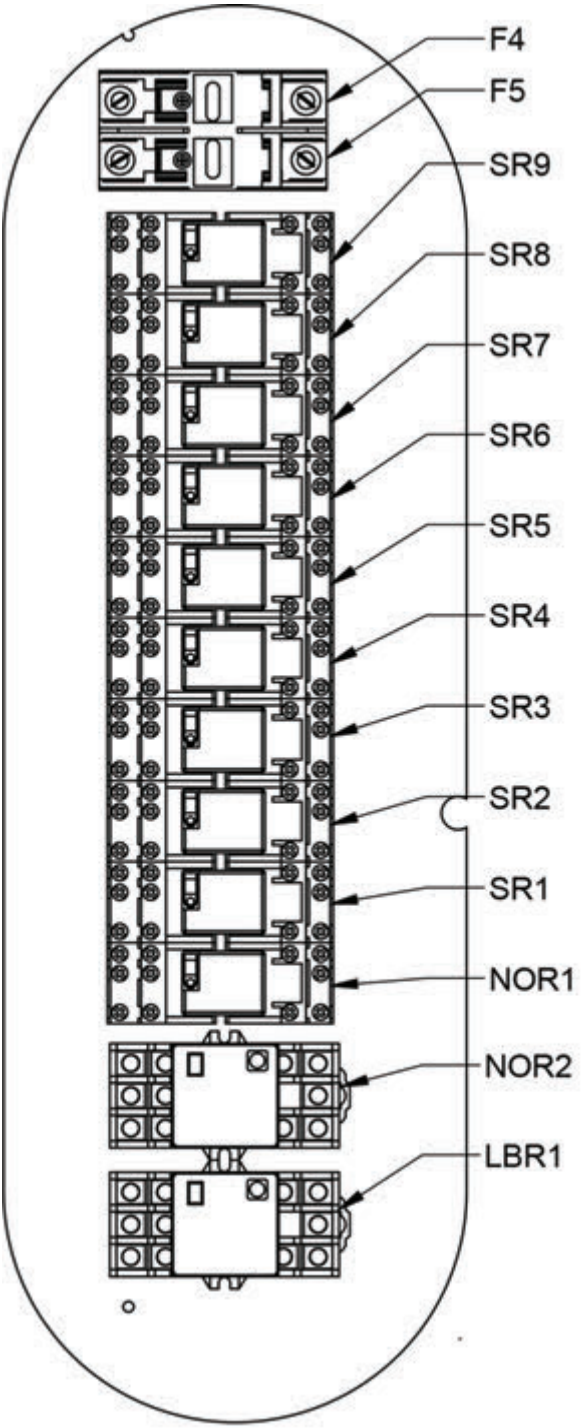

F4
F5
SR9
SR8
SR7
SR6
SR5
SR4
SR3
SR2
SR1
NOR1
NOR2
LBR1

Table 6 Control Relays

Label	Description	Part Number
F4	Fuse, 2A, 600V, Instantaneous	14014500
F5	Fuse, 2A, 600V, Time Delay	14012000
SR9	Relay, 24VDC Coil, 3PDT	24827045
SR8	Relay, 24VDC Coil, 3PDT	24827045
SR7	Relay, 24VDC Coil, 3PDT	24827045
SR6	Relay, 24VDC Coil, 3PDT	24827045
SR5	Relay, 24VDC Coil, 3PDT	24827045
SR4	Relay, 24VDC Coil, 3PDT	24827045
SR3	Relay, 24VDC Coil, 3PDT	24827045
SR2	Relay, 24VDC Coil, 3PDT	24827045
SR2	Relay, 24VDC Coil, 3PDT	24827045
NOR1	Relay, 24VDC Coil, 3PDT	24827045
NOR2	Relay, Large, 24VDC Coil	24816000
LBR1	Relay, Large, 24VDC Coil	24816000

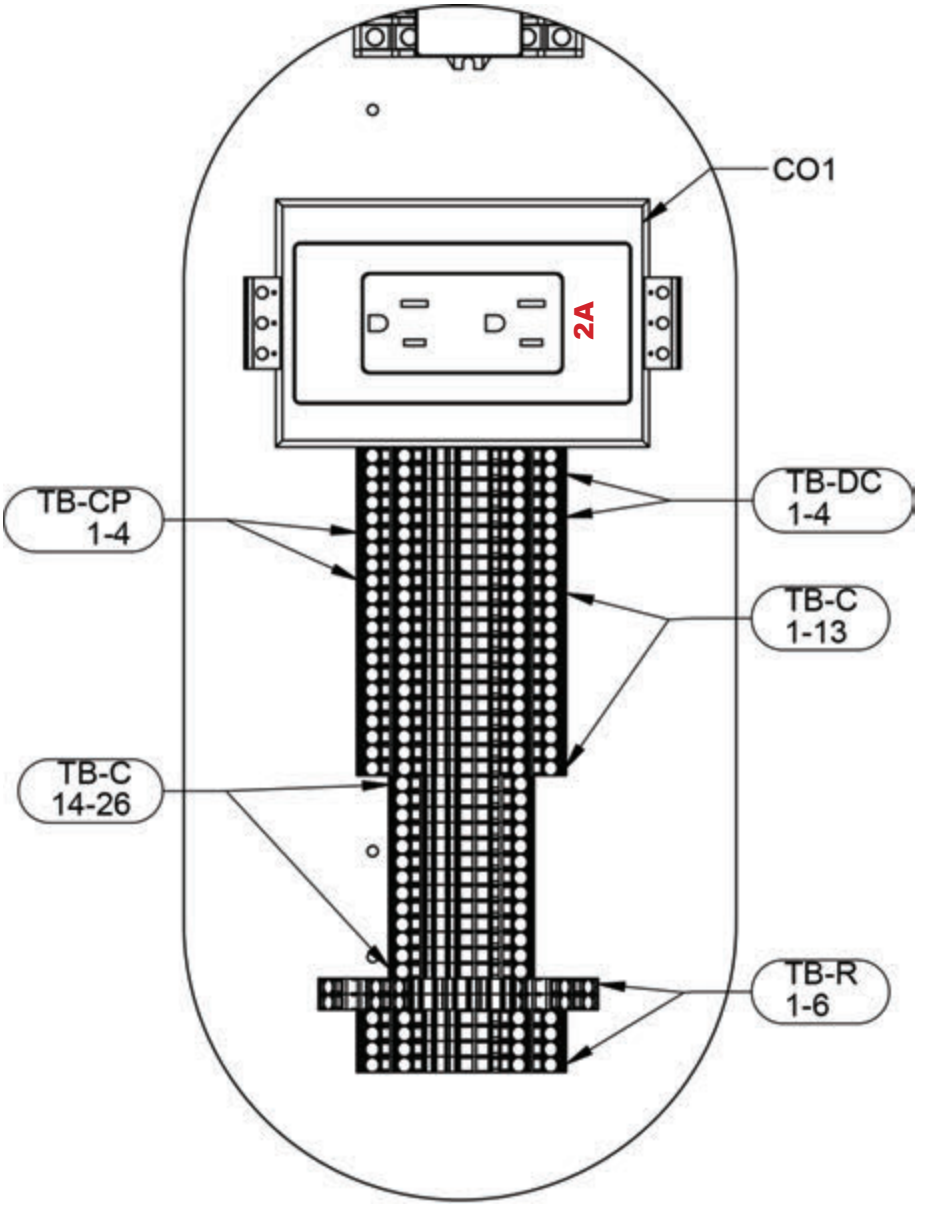

CO1
2A
TB-CP
1-4
TB-DC
1-4
TB-C
1-13
TB-C
14-26
TB-R
1-6

Table 7 Terminal Blocks

Label	Description	Part Number
TB-CP 1-4	Terminal Block, Spring Type, 20A, 600Vac, 4 Connections, Grey	25678536
TB-C 14-26	Terminal Block, Spring Type, 20A, 600Vac, 2 Connections, Grey	25678532
TB-DC 1-2	Terminal Block, Spring Type, 20A, 600Vac, 4 Connections, Red	25678546
TB-DC 3-4	Terminal Block, Spring Type, 20A, 600Vac, 4 Connections, Black	25678547
TB-C 1-13	Terminal Block, Spring Type, 20A, 600Vac, 4 Connections, Grey	25678536
TB-R 1-2	Triple Deck Terminal Block, Spring Type, 24A, Blue	25678550
TB-R 3-6	Terminal Block, Spring Type, 20A, 600Vac, 4 Connections, Grey	25678536
CO1	Outlet, 120Vac, DIN Rail Mount, 15A	25629900

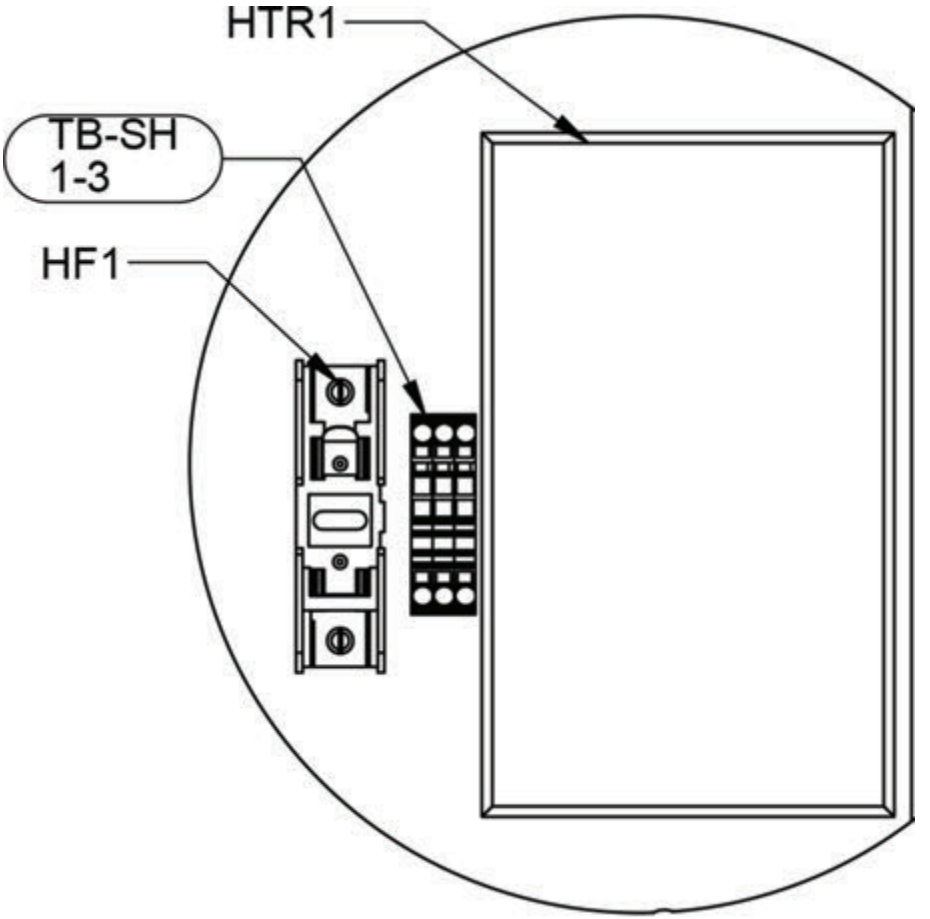

HTR1
TB-SH
1-3
HF1

Table 8 Option 010 - Space Heaters

Label	Description	Part Number
TB-SH 1-3	Terminal Block, 2 Connections, Grey	25678532
HF1	Fuse, 7A, Time Delay	14039000
HTR1	Enclosure Heater, 120Vac, 550W w/ Thermostat	25309211

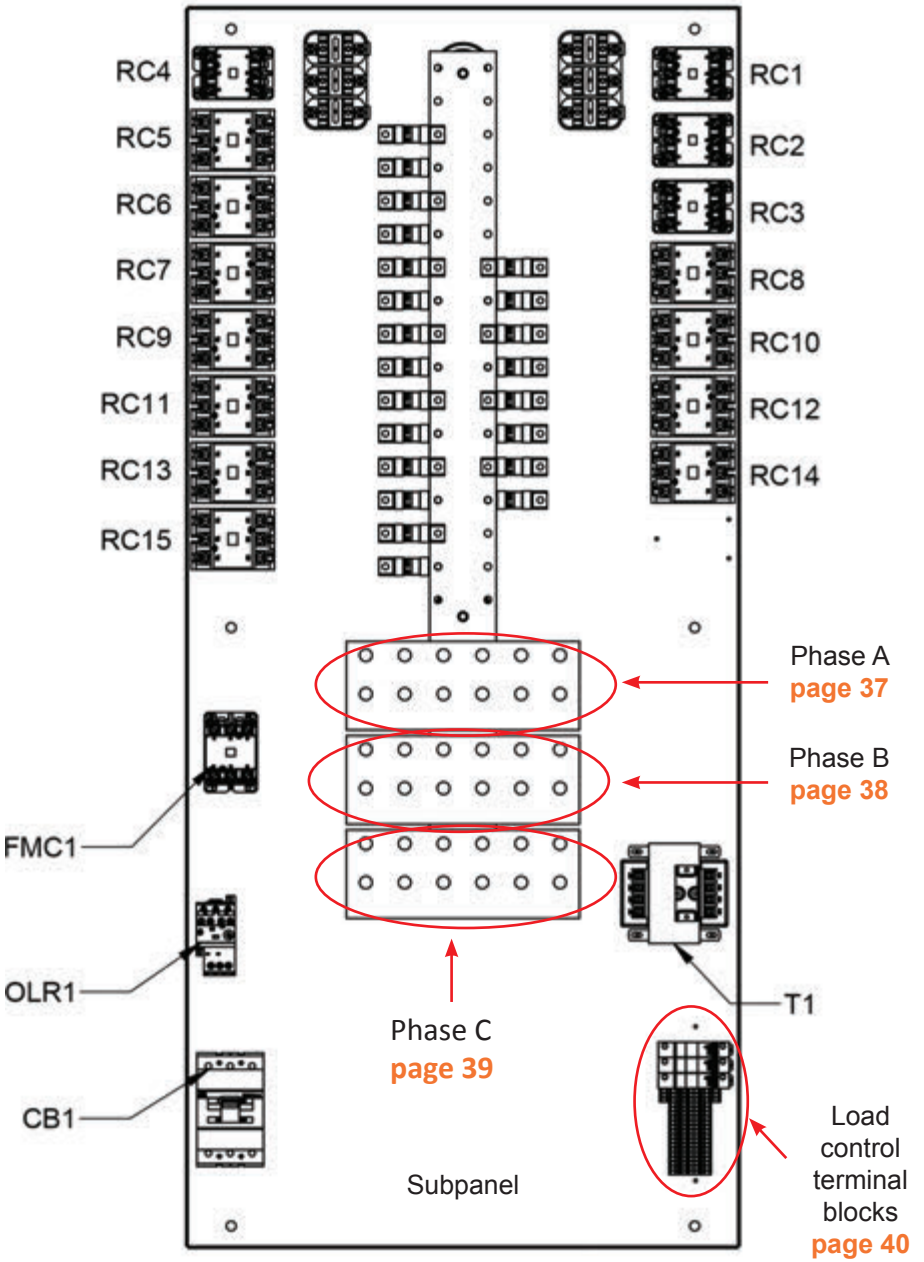

RC4
RC5
RC6
RC7
RC9
RC11
RC13
RC15
RC1
RC2
RC3
RC8
RC10
RC12
RC14
Phase A
page 37
Phase B
page 38
FMC1
OLR1
CB1
Phase C
page 39
T1
Subpanel
Load
control
terminal
blocks
page 40

Table 9 Center Subpanel

Label	Description	Part Number
RC 1-6	Contactor, 40A Resistive	13011040
RC5-15	Contactor, 65A Resistive	13011065
FMC1	Contactor, 40A Resistive	13011040
OLR1	Overload Relay, 5.7-18.9A	24827710
CB1	Circuit Breaker, 15A Trip	12046615
T1	Transformer, 300VA, 480/240:240/120Vac	25457650
Subpanel	Subpanel, Saturn, Rear	PRT-00025390

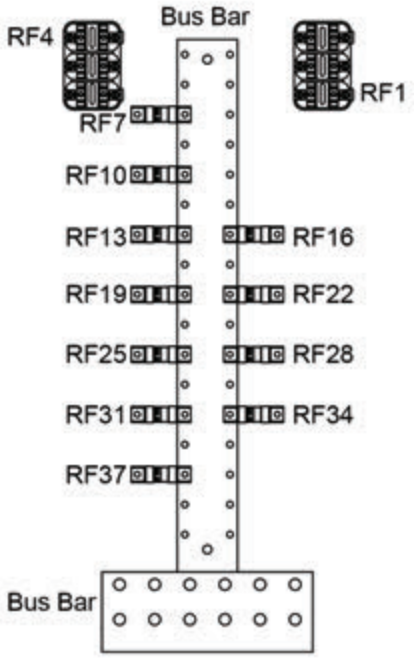


Table 10 Phase A Detail

Label	Description	Part Number
Bus Bar (vertical)	Bus Bar, Single Pole, 750A, Phase A	60044465G
RF4	Fuse, 35A, Class T, Fast Acting	14074000
RF7-34	Fuse, 70A, Class T, Fast Acting	14087000
Bus Bar (horizontal)	Bus Bar, Nept/Mars, 0.250” x 4.00” x10.50”	60063693
RF1	Fuse, 35A, Class T, Fast Acting	14074000

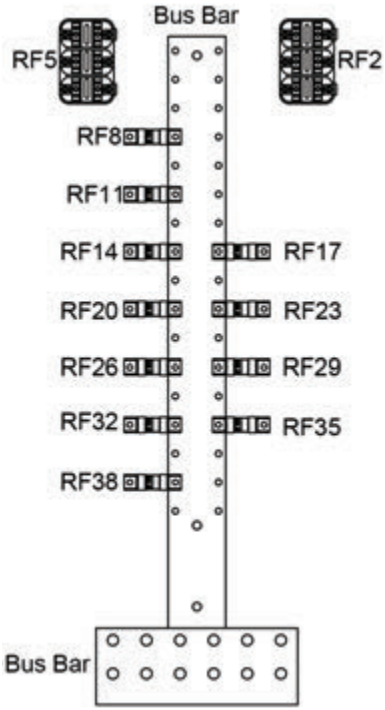


Table 11 Phase B Detail

Label	Description	Part Number
Bus Bar (vertical)	Bus Bar, Single Pole, 750A, Phase B	60044466E
RF5	Fuse, 35A, Class T, Fast Acting	14074000
RF8-35	Fuse, 70A, Class T, Fast Acting	14087000
Bus Bar (horizontal)	Bus Bar, Nept/Mars, 0.250” x 4.00” x10.50”	60063693
RF2	Fuse, 35A, Class T, Fast Acting	14074000

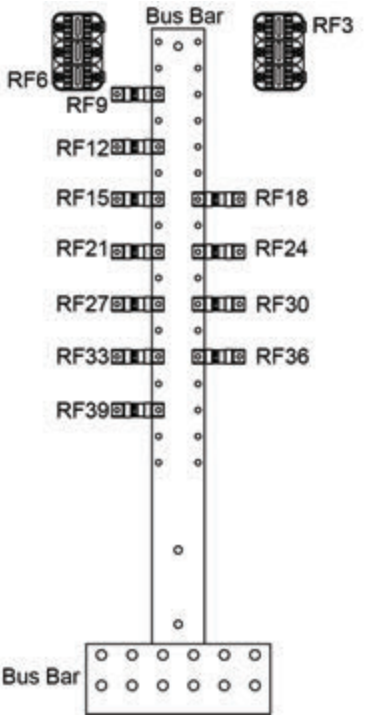


Table 12 Phase C Detail

Label	Description	Part Number
Bus Bar (vertical)	Bus Bar, Single Pole, 750A, Phase C	660044467G
RF6	Fuse, 35A, Class T, Fast Acting	14074000
RF9-36	Fuse, 70A, Class T, Fast Acting	14087000
Bus Bar (horizontal)	Bus Bar, Nept/Mars, 0.250" x 4.00" x10.50"	60063693
RF3	Fuse, 35A, Class T, Fast Acting	14074000

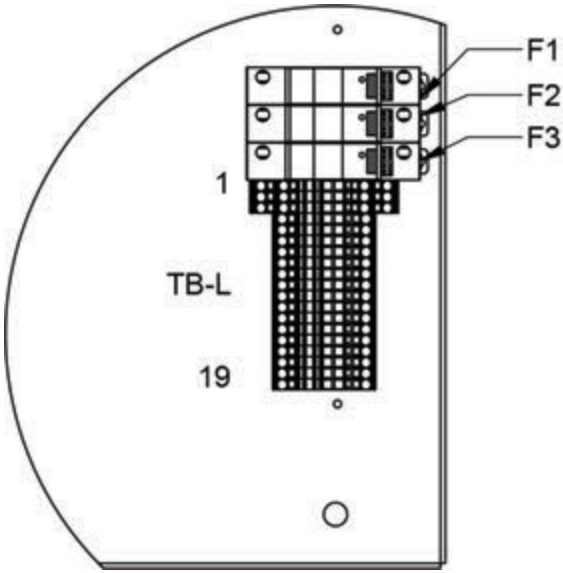


Table 13 Load Control Terminal Blocks

Label	Description	Part Number
F1-2	Fuse, 1.5A, Time Delay	14009500
F3	Fuse, 3.5A, Time Delay	14019775
TB-L 1	Terminal Block, 4 Connections, Black	25678547
TB-L 2	Terminal Block, 4 Connections, Red	25678546
TB-L 3	Terminal Block, 4 Connections, Blue	25678557
TB-L 4-19	Terminal Block, 2 Connections, Grey	25678532

APPENDIX B — MODBUS CONTROLS

Table 14 Modbus Controls (Read/Write)

Name	Type	Function Code	Address
Activate Fan	Coil	01	16586
Apply Load	Coil	01	16704
Cancel Cooldown	Coil	01	16487
KW To Apply	Floating Point	03	28911

Table 15 Modbus Indications (Read only)

Name	Type	Function Code	Address	Notes
Exhaust Alarm	Coil	01	16484	
Fan Failure Alarm	Coil	01	16485	
Load Dump Activated	Coil	01	16486	
Fan Running	Coil	01	8193	
Applied Load	Floating Point	03	29077	
Regulate Mode Active	Coil	01	16705	(a)
Regenerative Sensing Mode Active	Coil	01	16706	(b)
Vab	Floating Point	03	28673	(c)
Vbc	Floating Point	03	28675	(c)
Vac	Floating Point	03	28677	(c)

(a) Load Banks with Automatic Load Regulation Only

(b) Load Banks with Regenerative Power Sensing Only

(c) Load Banks with Any Automation Option Only

Table 15 Modbus Indications (Cont.)

Name	Type	Function Code	Address	Notes
Va	Floating Point	03	28679	(c)
Vbc	Floating Point	03	28681	(c)
Vc	Floating Point	03	28683	(c)
Ia	Floating Point	03	28685	(c)

(a) Load Banks with Automatic Load Regulation Only

(b) Load Banks with Regenerative Power Sensing Only

(c) Load Banks with Any Automation Option Only

Modbus Control Directions

1. Ensure that "Regulate Mode Active" (16705) and "Regenerative Sensing Mode Active" (16706) are OFF, indicating that the load bank is ready for Modbus Control
2. Turn "Activate Fan" (16586) ON to energize the cooling fan
3. Verify fan is running by checking that "Fan Running" (8193 is ON
4. Write the desired amount of KW to apply to "KW To Apply" (28911)
5. Turn "Apply Load" (16704) ON to energize the desired amount of load
6. Verify applied load by reading value at "Applied Load" 29077. The load bank will apply as much load as possible to reach the "KW To Apply" value, without exceeding it.
7. Monitor other values as desired.
8. Turn "Apply Load" off to de-energize the load
9. Turn "Activate Fan" OFF to stop the cooling fan. Load bank will continue to operate cooling fan for Cooldown Time set on HMI.
10. Cooldown mode has ended and cooling fan has stopped when "Fan Running" is OFF
11. Cooldown mode can be stopped by writing ON then OFF to "Cancel Cooldown" (16487)

Contact Simplex
for all your Load Bank and Fuel Supply needs.

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