+Before reading please note the following:

DANGER

DANGER is used in this manual to warn of a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING is used in this manual to warn of a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION is used in this manual to warn of a hazardous situation which, if not avoided, could result in minor or moderate injury.

Figure 1: (2)-Generator System

All service to this equipment should be provided only by a qualified service technician. No work should be attempted without complete documentation, including but not limited to drawings, manuals, and interconnect information.

For service and support, call 800-800-ASCO (800 800 2726) or email customercare@asco.com

Rating Label

Each ASCO Series 300 Power Control System (PCS) contains a rating label to define the loads and withstand/closing ratings. Refer to the label on the unit for specific values.

For a non-redundant system where the load current is more than one generator's full load current and the generators are paralleled to provide more power to the load, the main bus current rating must be equal to or greater than the sum of the two generator's full load amps.

If the application is a redundant system where the load current is equal to or less than the full load amps of one generator and the generators are being paralleled for redundancy, the rating must be equal to or greater than the full load current of the biggest generator. In addition, the output circuit breaker must have proper overcurrent protection, equal to or less than the main bus rating label.

WARNING

Do not exceed the values on the rating label. Exceeding the rating can cause personal injury and/or serious equipment damage.

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TABLE OF CONTENTS

ASCO Series 300 Product

The ASCO Series 300 PCS is an affordable and feature-rich product for paralleling generators and controlling loads. The ASCO Series 300 PCS control system is an integrated platform that provides sequencing, synchronizing, generator load sharing, protective functions, power management, and many other industry-leading features, all while minimizing costs.

The ASCO Series 300 PCS utilizes the ASCO Power Technologies industry-leading and time-proven dual-contactor based Closed Transition Transfer Switching (CTTS) mechanism to parallel two generators per CTTS unit. A two generator system (refer to Figure 2) consists of a single section, while a three and four generator system consists of two sections. An accessory can be added at the time of ordering of the two generator system for future expansion.

Automatic Control System

The ASCO Series 300 PCS is an automatic control system that may start and/or stop generators and operate the unit at any time to maintain power to the load.

NOTICE

System startup by ASCO Power Technologies is recommended. An experienced electrician must install the system.

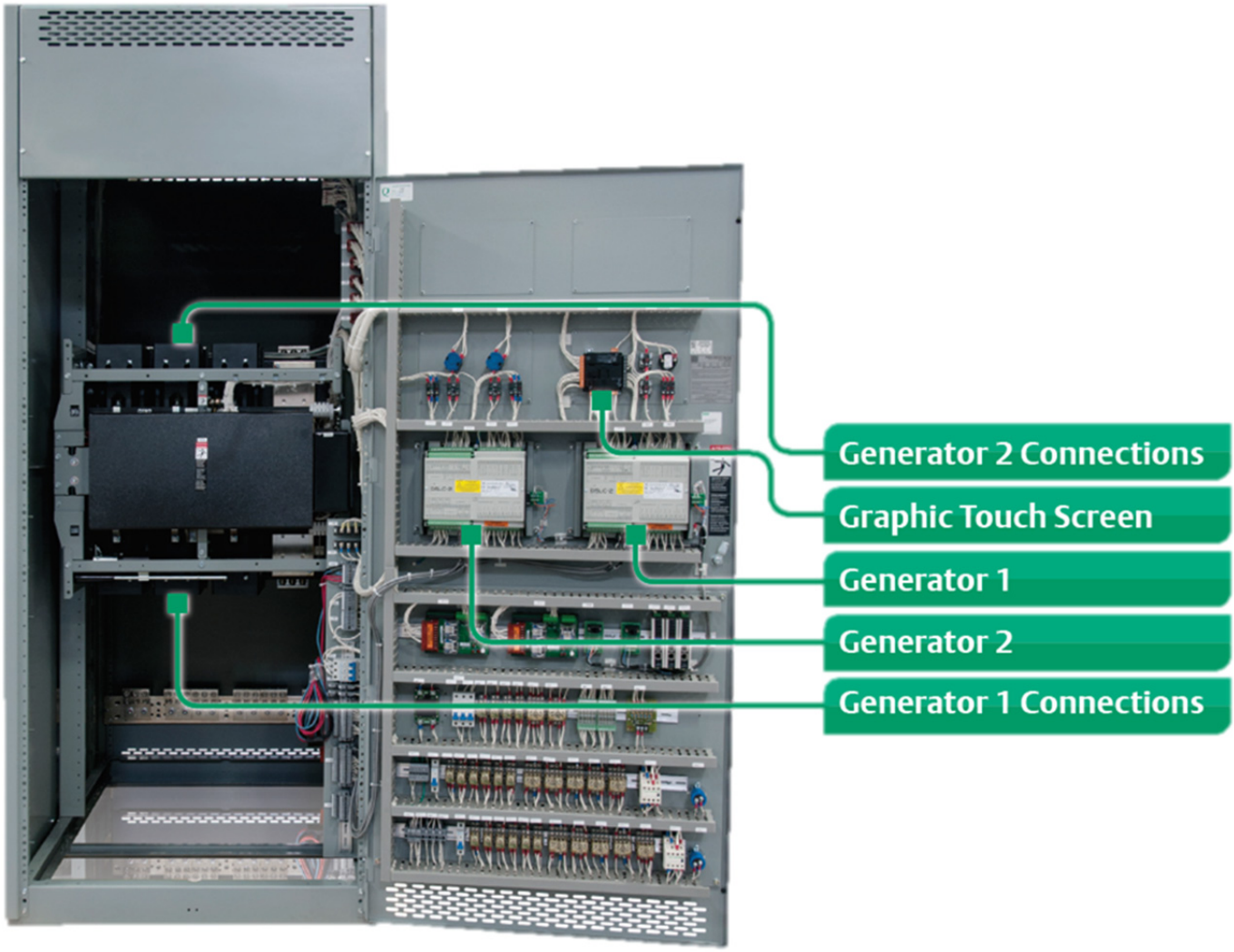

Figure 2: (2)-Generator System

Installation

The system is factory wired and tested. Installation requires mounting, connecting service cables, and connecting generator control and generator circuit breaker control circuits.

Supporting Foundation

The supporting foundation for the enclosure must be level and straight. Refer to the applicable enclosure outline drawing included with the system for all mounting details including door opening space.

If bottom cable entry is used, the foundation must be prepared so that the conduit stubs are located correctly. Refer to the enclosure outline drawing for specified area and location. Provide cable bending space per UL, NEC and local code requirements.

Mounting

Refer to the outline and mounting diagram and mount the enclosure according to details and instructions shown on the diagram.

NOTICE

Protect the equipment from construction debris and metal chips to prevent malfunction or shortened life.

Line Connections

Refer to the wiring diagram provided with the equipment. All wiring must be made in accordance with all applicable codes.

⚠ DANGER

De-energize the conductors before making any line or auxiliary circuit connections. Be sure that the line connections for all generators are in proper phase rotation. Lockout and tag all power sources before working on unit. Make sure engine generators are not in operation.

Testing Power Conductors

Do not connect the power conductors to the equipment until they are tested. Installing power cables in conduit, cable troughs, and ceiling-suspended hangers often requires considerable force to maneuver. The pulling of cables can damage insulation and stretch or break the conductor's strands. For this reason, after the cables are pulled into position, and before they are connected, they should be tested to verify that they are not defective or have been damaged during installation.

Connecting Power Cables

After the power cables have been tested, connect them to the appropriate terminal lugs (if provided) on the equipment as shown on the wiring diagram. Make sure that the cables being installed are suitable for use with the lugs.

Generator Circuit Breaker Control Circuits

The generator circuit breaker control connections are located on customer terminal block. Connect signal wires to appropriate terminals as specified on the wiring diagram and interconnect spreadsheet.

Generator Circuit Breaker

The required generator circuit breaker (not included with the ASCO Series 300 System) provides the overcurrent (short circuit) protection for the system. The generator circuit breaker must have DC shunt trip provisions and auxiliary contacts for ASCO use. The control system has a dry contact (rated at 10A, 30VDC or 10A, 240VAC, tripping duty) available for shunt tripping the generator circuit breaker. This contact must be connected during installation.

The ASCO Series 300 controller needs to monitor the position of the generator circuit breakers via an auxiliary contact. Refer to the drawings and the interconnect spreadsheet for further information. If a generator circuit breaker is open, the ASCO Series 300 will consider the generator unavailable and will send a shutdown signal.

If the generator circuit breaker opens for any reason, the ASCO Series 300 contactors will open if AC control power is available from any remaining generator connected to the bus. If no AC power is available, the contactors must be opened manually. The control system will alarm and not be available until the generator circuit breaker is closed again and the alarm is reset.

Grounding Different Generator DC Controls

24 VDC control power is required for this system. Generator batteries should be 24 VDC and negatively grounded. Optional DC to DC isolators can be added to the DC Control Power circuit to prevent circulating currents and/or unintentional grounds. If the generator grounding systems are not negatively grounded or unknown, the optional isolators are required.

Manual Maintenance Operation

⚠ WARNING

Proper precautions must be taken, including Lock Out/Tag Out procedures, to ensure personal safety. Do not manually operate the contacts without de-energizing sources properly, including locking out and tagging every source.

A maintenance handle is provided on the CTTS contactor assembly for maintenance purposes only. Manual operation of the contactors should be checked before it is energized (before it is operated electrically) by a qualified technician.
Do not manually operate the unit until all power sources are disconnected: open both generator circuit breakers and all load circuit breakers.

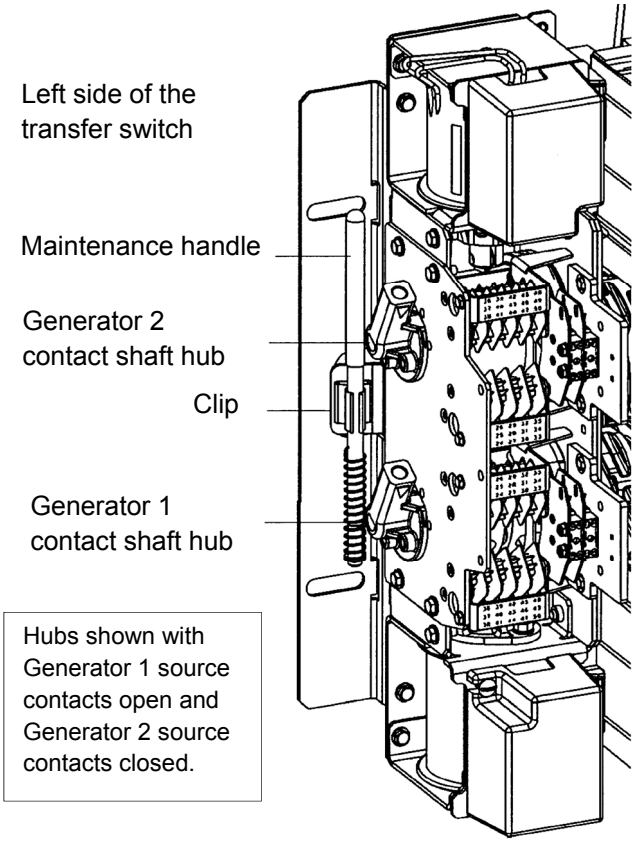

Figure 3a. J-design Transfer Switch Maintenance Handle Operation.

1. After de-energizing both power sources, open the enclosure door. Locate and remove the maintenance handle. Select J-design, H-design or G-design. See Figures 3a, 3b and 3c.

   J-design (Figure 3a) and H-design (Figure 3b)
   The maintenance handle is stored in clips on the left side of the transfer mechanism assembly.
   G-design (Figure 3c)
   The maintenance handle, hub, and pin are stored on the center frame of the transfer mechanism assembly.

2. Install the handle into the hole in the molded hub. Move the handle up or down as shown to manually operate the transfer switch to close and reopen the contacts. It should operate smoothly without any binding. If it does not, check for shipping damage or construction debris.
   J-design (Figure 3a) and H-design (Figure 3b)
   The transfer switch has two contact shaft hubs. Install the maintenance handle into the hole in the molded hub. The upper hub operates the Generator 2 contacts. The lower hub operates the Generator 1 contacts.
   G-design (Figure 3c).
   Install the hub (with pin) onto the shaft. Insert the maintenance handle into the side hole in the hub. Push in the shaft to operate the Generator 1 contacts. Pull out the shaft to operate the Generator 2 contacts.

3. After checking manual operation, return all transfer switch contacts to the open position. Generator 1 and Generator 2 contacts must be open. Check contact position indicators.

4. Remove the maintenance handle and store it on the transfer switch in the place provided.
   J-design (Figure 3a) and H-design (Figure 3b)
   Store the maintenance handle in the clips on the left side of the transfer.
   G-design (Figure 3c).
   Store the maintenance handle, hub, and pin on the center frame of the transfer.

Note: If Generator 1 and Generator 2 connections are reversed this operation is also reversed.

⚠ WARNING

Verify that the maintenance handle has been stored properly before electrically operating the transfer switch.

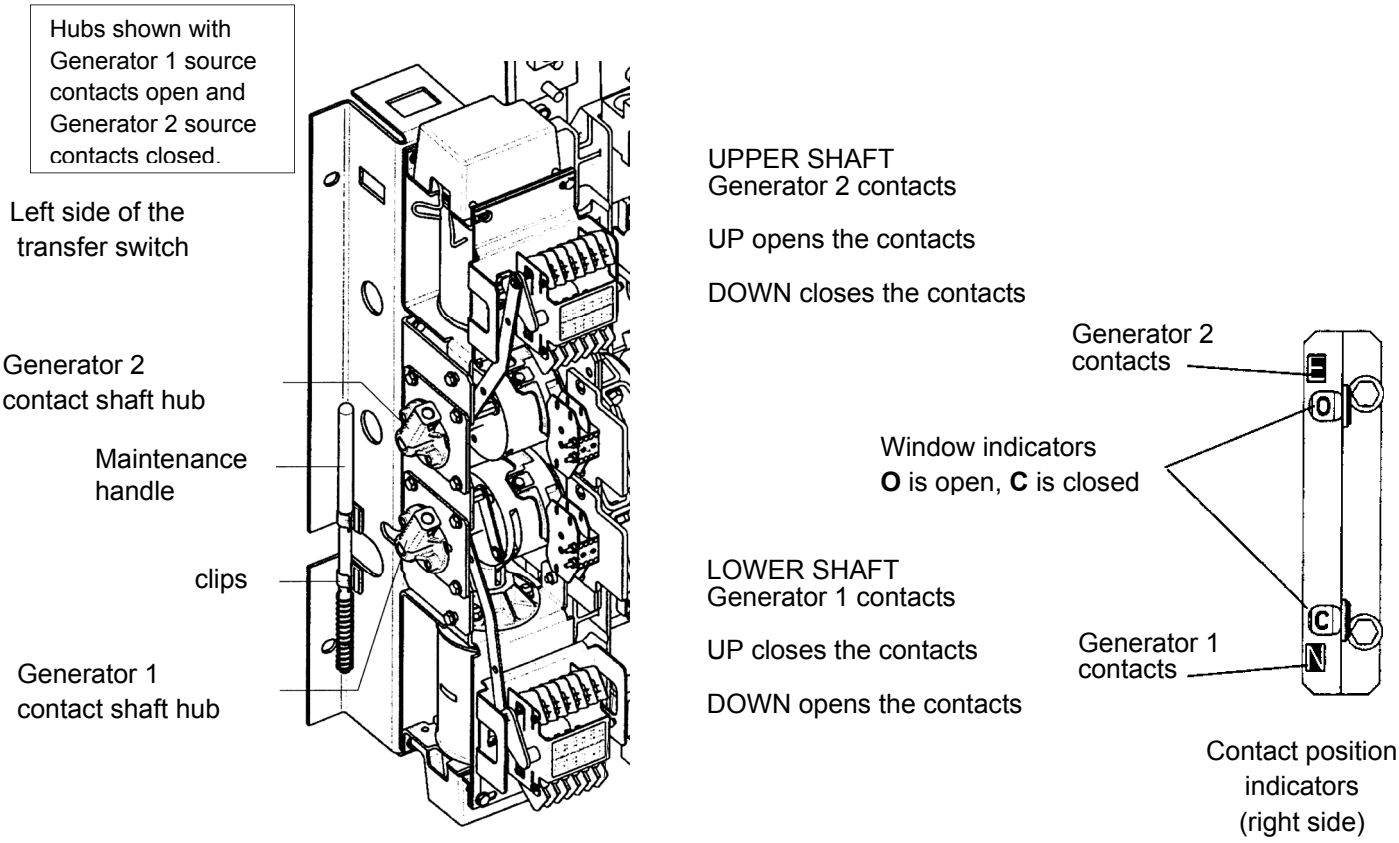

Figure 3b. H-design Transfer Switch Maintenance Handle Operation.

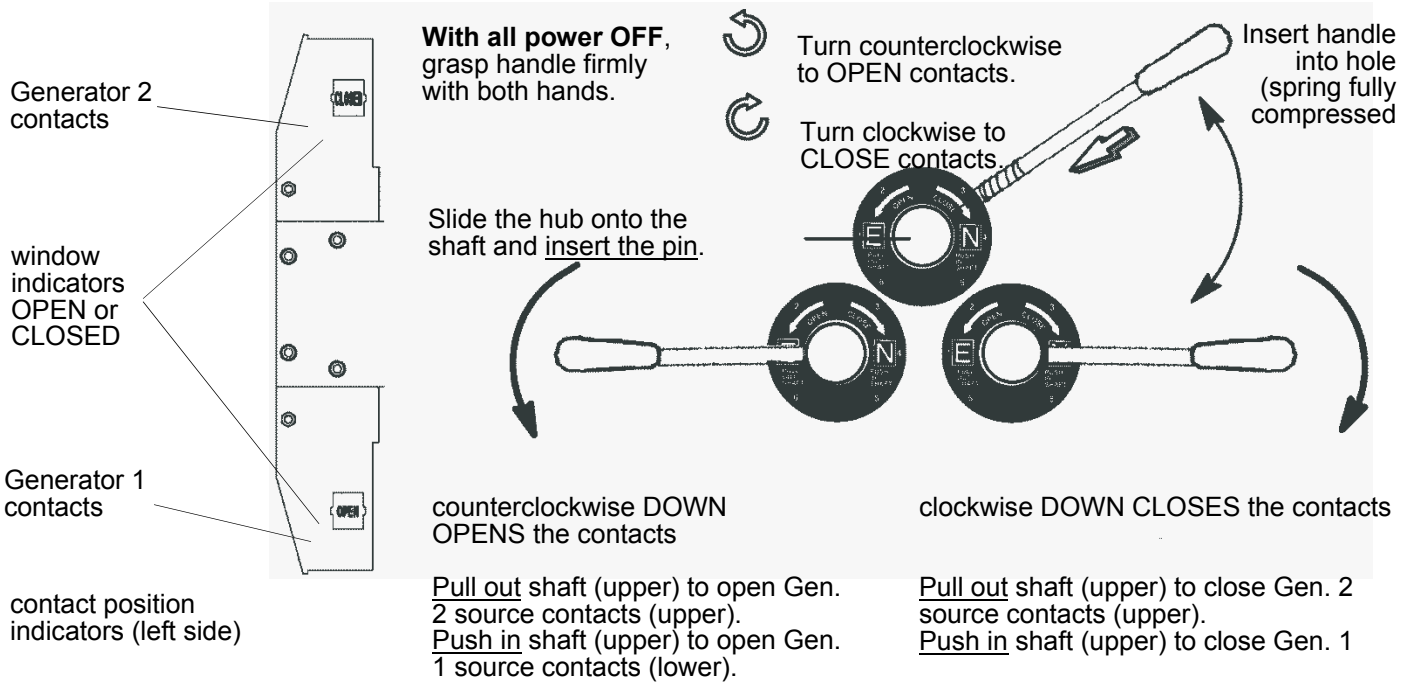

Figure 3c. G-design Transfer Switch Maintenance Handle Operation.

Operating Mode(s)

This ASCO Series 300 PCS is designed to start up to 4 engine-generator sets upon receipt of a signal that emergency power is required from any of the automatic transfer switches (ATS).

Emergency Mode

Whenever the individual engine generator control switches are placed in their automatic position, the engine generator system is on standby in readiness for automatic starting and synchronization in the event of a power failure signal.

In the event of a power failure, all generator(s) automatically start and come up to speed. The first generator set to achieve 90% of nominal voltage and frequency shall be connected to the bus. Electronic interlocks permit the connection of only one engine generator to the dead generator bus in the event of simultaneous generator relay operation. Upon sensing the availability of emergency power, the priority-1 load block will be able to transfer to the emergency bus. Priority 1 loads cannot be shed from the emergency bus and are always allowed to transfer**.**

(Note: If priority 1 loads are not calling for an engine start because they have not lost normal power, a priority-pass along feature will be activated.

Generally, if no loads in any priority block are calling for an engine start, all loads in lower priority blocks will be shifted up to a higher priority for block load add/shed purposes.)

The synchronizer will automatically adjust the frequency of the on-coming generator to synchronize with the bus. When synchronism is achieved, the on-coming generator is paralleled to the bus. When the second generator's paralleling contactor is closed the priority-2 load block will be allowed to transfer their loads to the emergency bus. As each generator parallels to the bus, another block of load is allowed to add, until all generators and all loads are online.

Upon sensing that normal utility power has been restored to acceptable limits, a sequence shall begin to transfer the load back to the utility source. The re-transfer shall be initiated after the retransfer to utility time delay has expired (adjustable at each ATS from 0 minute to 30 minutes) allowing an open transition transfer return to utility. After all the transfer switches have re-transferred their loads to the normal source, the generator circuit paralleling contactors are simultaneously opened and the engine generators run for an adjustable no-load cool-down period (adjustable at the local generator controls if provided by the generator controller manufacturer). The controls are released and the generators placed in readiness for the next power failure.

Block Load Control

Each load (except priority 1) has an estimated KW value and step time delay associated with it. As each block of load is allowed to transfer to emergency power, the individual loads will begin their step time delay. As the time delay for each load completes, the load will receive a permissive signal to transfer to emergency power. If no delay is desired, the individual step times can be set to zero seconds, and the loads will transfer immediately when the load block is permitted to transfer to emergency.

Note: Any automatic transfer switch without the 30B accessory (Load Shed) will automatically transfer to emergency on its own regardless of the permissive signal. *Priority 1 loads must not have a 30B accessory.*

If a generator fails while operating in the automatic mode, it is disconnected from the bus and shutdown. Audible and visual alarms will be activated to indicate the condition. System loads will not shed unless a bus overload or a bus under frequency occurs. This feature is referred to as "Load-Latch".

A soft push-button on the operator interface terminal (OIT) permits override of the load-shed circuits for supervised operation (one for each priority except priority 1) refer to (Figure 9). Loads that have been block shed can be manually re-added using the priority-# Load Shed Bypass/Reset push-button located on the Master control section OIT. By pressing the Load Shed Bypass/Reset push-button, the system will transfer the selected load block to the emergency bus. By pressing the Load Shed Bypass/Reset push-button a second time, the ENTIRE selected load block will shed. The OIT System Status screen will annunciate the status of each Priority load block, indicating if it is shed or manually bypassed. Refer to (Figure 8). If the operator inadvertently bypasses the load shed and overloads the Generator(s) resulting in a bus under-frequency, all manually bypassed loads will be automatically shed along with blocks of load such that the remaining load blocks shall be one less than the number of generators remaining on the bus. The "Bus Under Frequency" annunciator light will indicate this condition.

If the online load exceeds 105% of rated generator capacity, unsupported load blocks (load block priorities greater than the number of generators online) will be step shed in reverse priority at one second intervals. No load blocks equal to or less than the number of generators online will be shed. (Ex. If you have two generators online, load blocks 1 and 2 will stay online, priority 3 and above will be shed). The Bus Overload light will light to indicate that the bus is overloaded automatically reset as the overload is corrected. When the online load no longer exceeds 105% of the generator capacity, step shedding will cease, and the system will continue to power the loads that are left online. Indicating lights will annunciate the status of each Priority load block, indicating if any loads in that block are shed or if the load block is manually bypassed. If the operator bypasses the load shed to bring those shed loads back online, and the online load exceeds 105% of capacity again, the system will again step shed loads in reverse priority until the load no longer exceeds 105% of capacity.

Note: Block loading can be disabled so all loads (except priority 1) can be added to the emergency bus only through the bus optimization feature.

Features

Bus Optimization

Each load priority is determined by which load block wiring an ATS is connected to. Priority wiring is included for priorities 1 to 4 (2-gen system) or priorities 1 to 8 (3- and 4-gen systems). To change a priority, an ATS engine start signal and load shed signal need to be moved to a different priority block wiring.

Should a Priority Block fail to be added to the bus while operating in the Emergency Mode, loads may be added manually by the operator as described in Block Load Control or automatically through "Bus Optimization". Bus Optimization is provided to re-add shed loads one block at a time based on predetermined kW loading values up 95% (adjustable via OIT) of the capacity of the on-line power. This percentage value is referred to as the Bus Optimization KW de-rating value.

With the Bus Optimization switch in the "on" position during emergency mode and with loads shed (loads requiring power but are not connected to the emergency bus), after a stabilization time delay (Bus Opt stable delay) the optimization feature is activated and a Bus Optimize Active light illuminates. The Bus Optimize Active light flashes through the duration of the stabilization time delay (default 30 seconds, adjustable via OIT). At this time, the Bus Optimization loading control will determine if there is enough room to add the next load block by checking the pre-set Load Value (field adjustable, accessible via the OIT) assigned to the highest priority block that is shed and compare it to the excess generator bus capacity (also known as Headroom).

If it is determined that the load can be added without exceeding the Bus Optimization KW de-rating value, the load is signaled to add. The real time kW output of the generator bus is constantly measured and the next load block priority is evaluated. Loads are evaluated at a preset time interval defined via the OIT (Bus Opt Step Time). When the bus has been loaded to a level such that the next load would exceed the de-rating value, the Next Load Exceeds Headroom light (on OIT) will activate and load adding will pause. The system will continuously monitor the generator load and evaluate if the next load step can fit on the bus. If building load decreases and the next load can fit (for the duration of the step time delay), the system will add it and continue the evaluation process until as many loads as possible are added to the bus. Refer to (Figure 11).

If the load has already been added, there is no reason to compare it to see if it will fit; the program will skip to the next available load.

If the load is not calling for an engine start (load still fed from normal power), it will be skipped.

If at any time, the online load exceeds 105% of available rated capacity, the system will remove the last load block that was added. If the online load does not decrease to less than 105% of rated capacity, load blocks will be shed one at a time, every second in reverse order until the overload is corrected or until the number of load blocks online equals the number of generators online. Load blocks with associated generators online will not be shed. The Bus Overload light will light to indicate that the bus is overloaded automatically reset as the overload is corrected. In this event, the system will begin a 30 second overload stabilization delay time (fixed) before evaluating additional load to be added to the bus.

If a generator fails, it will be removed from the bus. If the remaining loads online exceed 105% of the remaining online generator capacity, the load blocks will step shed as described in the previous paragraph. If the load does not exceed the online capacity, no loads will shed. The Bus Overload light will light to indicate that the bus is overloaded automatically reset as the overload is corrected.

In the event of a bus Under-frequency, all optimized load blocks will be shed as well as any additional unsupported blocks of load. Load blocks will be shed such that the remaining load blocks shall be one less than the number of generators remaining on the bus. The "Bus Under Frequency" annunciator light will indicate this condition. Refer to (Figure 4).

No loads can be manually added while a bus under frequency alarm indication is active. The operator must acknowledge the alarm by pressing the Alarm Reset pushbutton via the OIT (provided bus under frequency is still not active). After the operator acknowledges the alarm, the system will again be block loaded. Each priority block for which there is a generator online will be added to the system, one load block per generator online. While the load block is adding to the bus, if bus optimization is enabled, the bus optimization will start adding loads after a bus optimization start time delay and in the same manner as described previously for bus optimization in the preceding paragraphs.

If a load block is manually bypassed, it will add subject to its individual step timer. If a load block was already optimized on, it will remain on. If the load block is then manually shed, it will shed immediately. Only load blocks in excess of the number of generators can be shed manually.

Once a priority load block has been added to the bus, the LOAD SHED light in OIT for the associated priority will turn off. Refer to (Figure 8).

Load Demand

The Load Demand logic controls the number of generating sets to remove excess generator capacity and add additional capacity when needed, thus keeping the optimum number of generators online at all times. Generator load demand saves fuel and wear by running fewer generators at a more efficient load level.

Entering Load Demand Mode

After all generators sets have been paralleled to the bus and all loads connected that require power, a stabilization time delay (0-300 seconds) factory sets at 30 seconds will be initiated while a Load Demand Mode light (in OIT) flashes. At the expiration of the time delay period, the system will operate in load demand mode at which time the mode light remains illuminated.

Removal of Generator Sets from the Bus

The number of generators a system requires at any time is defined as N. Load demand seeks to remove the lowest priority generators (priority value set at OIT) that are in excess of N. When the system is operating with more generators online than the system needs and the system load falls below the drop out load value (default setting of 80% KW rating of N generators) a 20 second time delay (field adjustable from 0 - 300 seconds) is initiated and a "Gen Stop TD Active" light start flashing. If the load stays below the dropout value for the duration of the time delay, the generator(s) with the lowest priority that are excess capacity will be taken offline. The engine(s) will run for their cool down period (based on the local genset controls), then shutdown.

Determining Dropout Value

(KW Capacity of Online Generators – KW Capacity Value of Lowest Priority Generator Online) x (Drop out %)

If while operating in the load demand mode, an engine-generator set malfunction occurs and the generator goes offline, Load Demand mode will momentarily reset and all remaining generators will be brought online.

If the online load exceeds 105%, load demand will be canceled and all generators will be started, load blocks not equal to the number of generators online will be step shed based on priority, one every second, until the system load falls to not more than 105%.

Addition of Generator Sets to the Bus

If the bus kW (system load), is equal to or greater than the generator load demand pickup value for the duration of the load demand start td (default 5 seconds), the controls will initiate the starting and paralleling of the next set in sequence. If, during the time delay period, the online load exceeds 105% of the online generator capacity (signifying bus overload), the time delay will be bypassed and all generators will be immediately started and paralleled (load demand canceled). Any loads blocks not equal to the number of generators online will be shed. If the online load exceeds 105%, load blocks not equal to the number of generators online will be step shed based on priority, one every second, until the system load falls to not more than 105%.

Note**:** Load priorities can be manually entered or automatically set by the system based on generator run-time values. The auto-gen priority feature can be disabled or enabled. If enabled, the run-time hours must be manually retrieved by an operator from the gen-set controls and programmed into the OIT screen. Once set, the system will add to the run-time hours when the generators are run. Refer to Figure 4 for the Master Control Station layout, including the OIT screen.

Test Facilities: Single Engine Test

Each engine can be started for test purposes by placing its generator control switch to the off-line position. In this mode, the generator circuit paralleling contactor will remain open. Should a normal source outage occur during this mode of operation, the paralleling contactor will close and the remaining units will be started. Upon restoration of normal power, the system will revert to single engine test mode until the switch is returned to the AUTOMATIC position. For on-line test, placing of the generator control switch to the on-line position will present a similar operation except that the generator paralleling contactor will close when the generator achieves nominal voltage and frequency. Refer to (Figure 5) for the Generator Control Station layout.

Operator Controls

A. Master Control Station

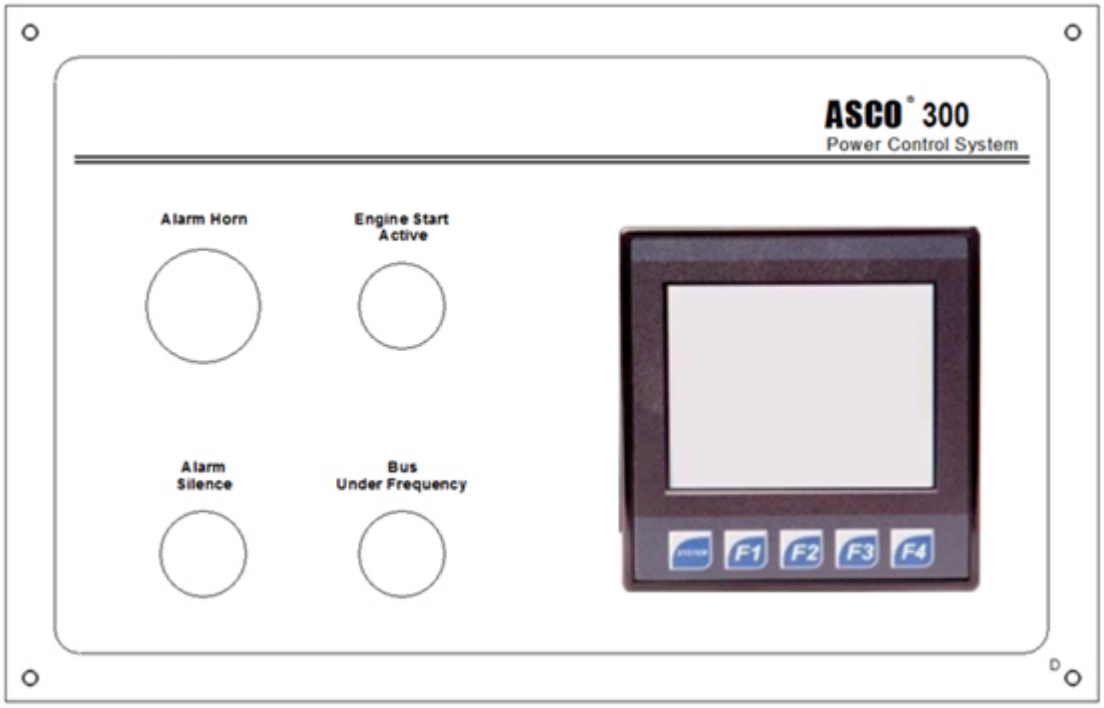

Figure 4 – Master Control Station

B. Generator Control Station

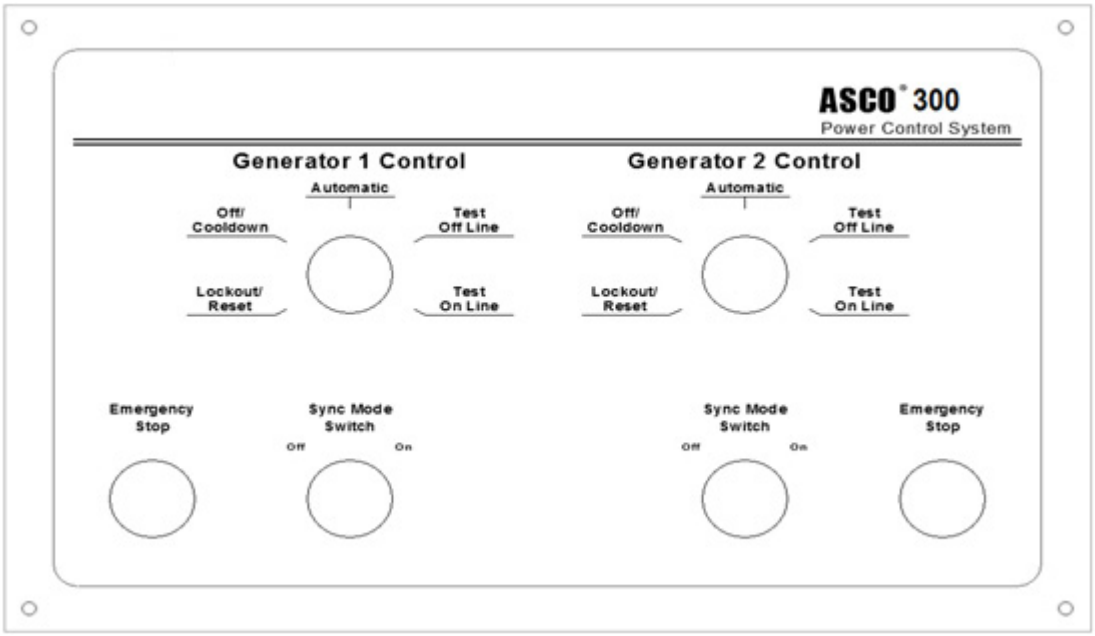

Figure 5 – Generator Control Station (Shown Typical for Gen 1 & 2)

Generator Control Station (Figure 5)

An Engine/Generator can be manually started and stopped via the **Engine/Generator Control Switch** and **Synchronizing Mode Switch**.

The control switch functions are as follows:

Engine/Generator Control Switch

LOCKOUT/RESET - When placed in this position, the Engine Generator set is locked out from start operation. If the Engine Generator set was shut down due to an Engine malfunction, the shutdown malfunction will be reset. If the Engine is running when the switch is moved to this position, it shall be immediately shut down without a cool down period. If the Generator circuit paralleling contactor was closed, it will immediately be tripped open.

OFF/COOLDOWN - If the Engine Generator is running and output circuit paralleling contactor is closed, when the switch is placed in this position the circuit paralleling contactor will immediately trip open and the Engine Generator set shall run for a cool down period as set at the gen-set controls. If the Engine is running and the output circuit paralleling contactor is not closed, when the switch is placed in this position, the cool down timer is bypassed and the Engine is turned off immediately. If the Generator controls are already receiving an automatic start signal from the Master Controls or subsequently receive an automatic start signal, an alarm will sound and the Generator is considered to be shut down and locked out. An Engine Generator set cannot be started when the switch is in this position.

AUTOMATIC - With the switch in this position, the Engine Generator set controls shall be in the readiness for automatic operation upon receipt of an Automatic start signal from the master controls. The Engine Generator will start and run, and the Generator circuit paralleling contactor will be closed to the Generator Paralleling Bus. When an Automatic start signal from the master controls is removed, the Generator circuit paralleling contactor will be tripped open and the Engine Generator will run for cool down period.

TEST OFF-LINE - With the switch placed in this position, the Engine Generator set shall immediately start and run. In this mode, the Generator circuit paralleling contactor will remain open and shall not be connected to the Generator Paralleling Bus unless an Automatic start signal is received from the master controls. If an Automatic start signal is received, automatic operation will be initiated as described in "Automatic". If the Automatic start signal is removed, the Generator circuit paralleling contactor will be tripped open but the Engine Generator will continue to run as long as **Test Off-Line** is selected.

TEST ON-LINE - When placed in this position, the Engine Generator set shall immediately start, run and close the Generator circuit paralleling contactor to a de-energized Generator Paralleling Bus or synchronize to and close to an energized bus according to the selected synchronizing mode. If an Automatic start signal is received, the Generator circuit paralleling contactor will remain closed. If the Automatic start signal is removed, the Generator circuit paralleling contactor will remain closed and the Engine will continue to run as long as **Test On-Line** is selected.

Synchronizing Mode Switch (SMS)

ON - With the switch in this position the Automatic Synchronizer is fully automatic and will send Raise/Lower speed signals to the governor to control the Generators frequency, or synchronize, with the energized Bus. When the phase differential is less than ±5 electrical degrees, the synchronizer will initiate a signal to the controls to close the Generator circuit paralleling contactor.

OFF - With the switch in this position, the Automatic Synchronizer is turned off. The Automatic Synchronizer should be turned to **OFF** while attempting to manually parallel the Generator to an energized Bus.

Engine Malfunction Indication

Upon initiation of a malfunction, the generator set will be removed from the bus and shutdown.

Shutdown and lockout conditions are annunciated by a Common Shutdown indication.

Audible and visual alarm signals are activated for Common Alarm and Common Shutdown.

Alarms need to be reset by pressing the alarm reset push button on the generator control station. Shutdowns are reset by placing the Engine/Generator Control Switch to the lockout/reset position. Refer to (Figure 5).

An audible alarm silence circuit is provided. The audible alarm silence is reset upon reset of the malfunction or upon the occurrence of a malfunction after the alarm has been silenced. The audible alarm will annunciate each malfunction and pre-alarm.

Emergency Stop

Upon initiation this will open the generator source and shutdown the affected generator. The emergency stop button must be reset and the generator control switch must be taken to lockout/reset then back to automatic to have the system back to a readiness state.

Master Control Station (Figure 4)

Alarm Silence

This button will light red when an audible alarm horn is sounding. Pushing and releasing the button will silence an audible alarm horn. When depressed, this button also serves as an alarm horn test circuit.

Bus Alarm Reset (via OIT)

The bus alarm reset push button is used to reset non-active systems alarms such as bus under frequency, bus over frequency, bus under voltage, and bus over voltage.

Priority # Load Shed Bypass/Reset (via OIT)

The priority load shed bypass/reset button is used to add or shed load that is in addition to the load blocks that can currently be supported by the system (1 load block per generator online). If only a single generator were to come online, pressing this button (for priority 2) will allow the priority 2 load block to be added to the bus. Pressing this button (for priority 2) again will shed the priority 2 load block. Priority buttons are also available for priority 3 and 4. If the system includes the gen 3-4 design, then priority buttons 5-8 will also be available. Refer to (Figure 9).

Load Demand Mode (via OIT)

This switch will enable/disable/reset load demand functionality. If in load demand mode, if load demand is disabled or reset, all previously shutdown generators will parallel again to the bus. Refer to (Figure 9).

Bus Optimization (via OIT)

This switch will enable/disable bus optimization mode. Refer to (Figure 9 & 11).

Manually Initiated Parallel (via OIT)

The system includes a Manually Initiated Paralleling feature. Refer to (Figure 12).

Set the Sync mode switch on the door to ON.

From the OIT, go to the manually initiated parallel screen. If the generator is selected to manually initiated parallel, the Automatic Synchronizer will send Raise/Lower speed signals to the governor to control the Generators frequency which will match frequency, or synchronize, with the energized Bus. The Generator will hold synchronism, or phase lock, with the Bus but will not issue a signal to the controls to close the Generator circuit paralleling contactor. The operator can then select the "close circuit paralleling contactor" button to issue a close command to the Generator circuit paralleling contactor if the generator is in sync with the bus. This mode can be used for calibration and troubleshooting of the Synchronizer and Speed Control system.

Operator Interface Terminal (OIT)

An OIT operator interface terminal is accessible via the master control section door. This operator interface allows for priority settings, time delay settings and system monitoring features.

User settings may be modified by selecting the MENU button on any screen. Once in the menu screen, you have to use the up and down arrows to select Login/Logout and hit the enter button. At the login screen, select the enter password prompt. Enter your password [default is 2726]. Select the login button. The banner will indicate if the user is Logged In or Logged Out. Passwords can be changed after login and may be set to any valid number from -2,147,483,648 to +2,147,483,647 by selecting the Set Password box.

After login, select the menu button. Select "Configure Settings" using the arrow keys. Select enter to go to the settings menu. Three sub menus are available, Generator Settings, Load Settings, and General Settings.

You may select any sub menu using the arrow keys and pressing the enter key to go into that menu. To go back to a previous menu, press the ESC key. To change any setting, use the arrow keys to choose the specific set point and press enter. The keypad will pop up to allow you to change the value. Load Demand and Bus Optimization can be enabled/disabled through the "System Control Station" screen (Figure 9). This screen is accessed from the main menu. Additionally, buttons for priority load shed/bypassed are accessed on this same screen. Make sure to go back to the login/logout screen and press the logout button once all set point changes are complete. Selecting "View Settings" from the menu will allow the user to view settings without implementing any set point changes.

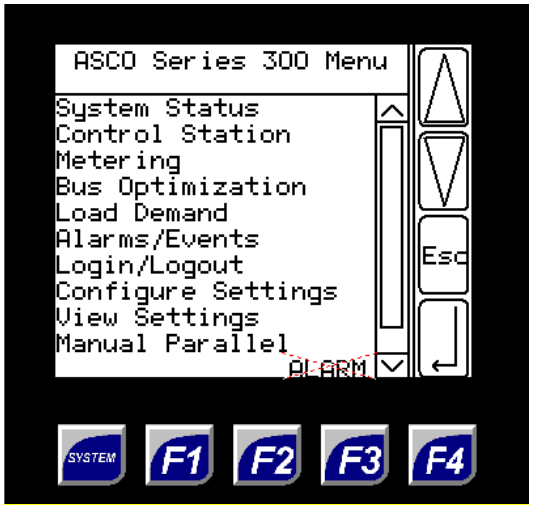

Figure 6 – Main Menu

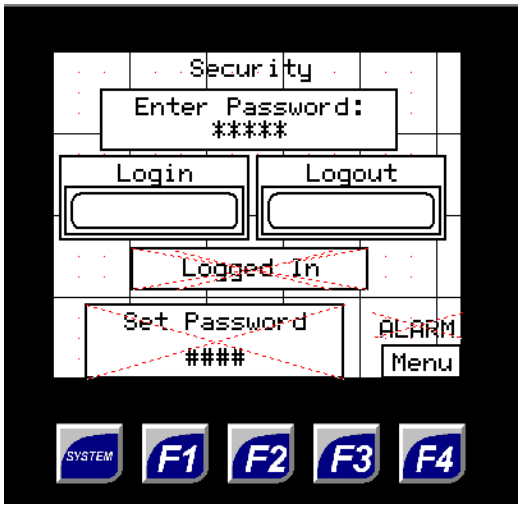

Figure 7 – Login Screen

Note: After logging in, setting changes must be made within 15 minutes. The OIT screen will automatically log the user out after 15 minutes. This feature is to prevent an operator from leaving the OIT screen logged in and unsupervised.

The graphic touch screen provides status information, alarms, controls and setpoint configuration screens. The main menu includes links to the following screens: system status, control station, metering, bus optimization, load demand, alarms and events, account login and logout, configuration and viewing settings, and manual paralleling.

Operator Interface Terminal (OIT)

A description of operator screens appears below Settings and configuration screens, reserved for technicians, are not described.

Figure 8 – System Status

The system status screen includes block priority status information as well as generator status information. Other status information includes emergency power active status for standby systems, bus under-frequency status, and the status of the applications for load demand and bus optimization.

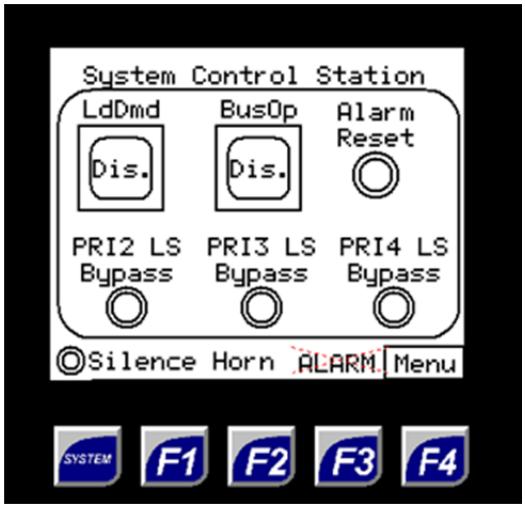

Figure 9 – System Control

The status indicators and controls for the system control station include control for the load demand and bus optimization applications, alarm reset, and block priority bypass control.

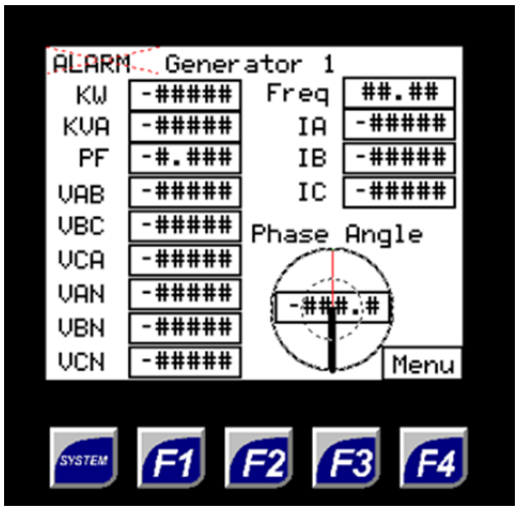

Figure 10 - Metering

The metering screen shows metering for a generator, including real and total power, the power factor, phase-to-phase voltages, phase-to-ground voltages, phase current, frequency and phase angle, including a graphic display. Additional metering options include a summation page with a brief overview of multiple generators.

Operator Interface Terminal (OIT)

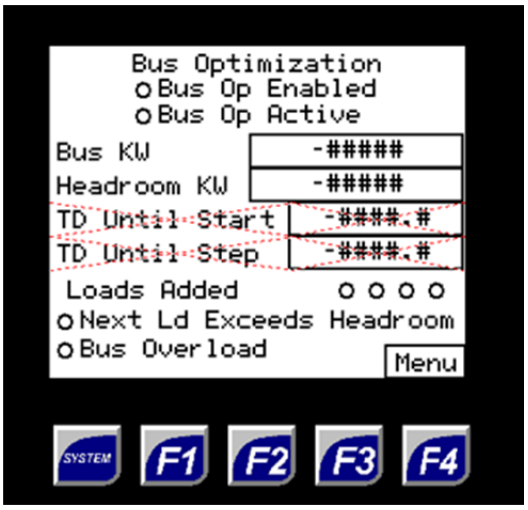

Figure 11 – Bus Optimization

The bus optimization screen shows details of the bus optimization application, including status information regarding available power, headroom, delay timer values when active, and added loads.

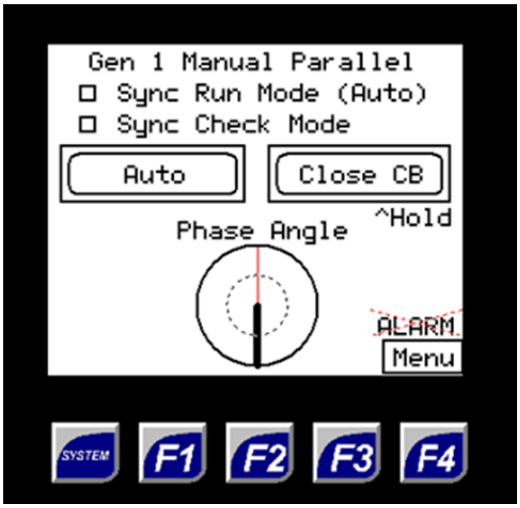

Figure 12 – Manual Paralleling

The manual paralleling screen includes a graphic synchroscope and controls to either manually or automatically close the paralleling circuit breaker once the generator is synchronized with the bus.

Factory Default Settings

The following is a table of all the parameter settings, which can be changed via the operator interface terminal (OIT).

Label	Description	Range	Factory Settings
Load Demand	Load Demand Feature Enabled	Enabled/Disabled	Enabled
Load Demand TD	Load Demand Start Time Delay	(0 - 1800 sec)	30 sec
Gen Start TD	Start EG Time Delay	(0 - 1800 sec)	5 sec
Gen Stop TD	Stop EG Time Delay	(0 - 1800 sec)	20 sec
Pickup Percent	Load Demand Gen Pickup Percentage	(60-100%)	90%*
Dropout Percent	Load Demand Gen Dropout Percentage	(40-90%)	80%*
Bus Optimization	Bus Optimization Feature Enabled	Enabled/Disabled	Enabled
Bus Op Start TD	Bus Optimization Start Time Delay	(0 - 1800 sec)	30 sec
Bus Op Step TD	Bus Optimization Step Time Delay	(0 - 1800 sec)	5 sec
Derated Bus Capacity	Derated Bus Capacity for Bus Op	(60-100%)	95%
UF Setpoint	Bus Under Frequency Setpoint	(45-65Hz)	58Hz
Auto Gen Priority	Automatic Generator Priority Based on Runtime	1=Enabled/0=Disabled	0
Block Load Disable	Block Load Disable	0=Block Loading Enabled/1=Block Loading Disabled	0
Ext. Modbus	Modbus Slave Feature (BMS/CPMS access)	1=Enabled/0=Disabled	0
Generator 1 Pri.	Generator 1 Load Demand Pri. #	(1,2,3,4)	1
Generator 2 Pri.	Generator 2 Load Demand Pri. #	(1,2,3,4)	2
Generator 3 Pri.	Generator 3 Load Demand Pri. #	(1,2,3,4)	3
Generator 4 Pri.	Generator 4 Load Demand Pri. #	(1,2,3,4)	4
Priority 2	Priority 2 Step TD	(0 - 1800)	0
Priority 3	Priority 3 Step TD	(0 - 1800)	0
Priority 4	Priority 4 Step TD	(0 - 1800)	0
Priority 5	Priority 5 Step TD	(0 - 1800)	0
Priority 6	Priority 6 Step TD	(0 - 1800)	0
Priority 7	Priority 7 Step TD	(0 - 1800)	0
Priority 8	Priority 8 Step TD	(0 - 1800)	0
Priority 2	Priority 2 Block Typical kW Rating	(1 - 1000)	99
Priority 3	Priority 3 Block Typical kW Rating	(1 - 1000)	99

Factory Default Settings (continued)

Label	Description	Range	Factory Settings
Priority 4	Priority 4 Block Typical kW Rating	(1 - 1000)	99
Priority 5	Priority 5 Block Typical kW Rating	(1 - 1000)	99
Priority 6	Priority 6 Block Typical kW Rating	(1 - 1000)	99
Priority 7	Priority 7 Block Typical kW Rating	(1 - 1000)	99
Priority 8	Priority 8 Block Typical kW Rating	(1 - 1000)	99
Gen 1 Sec.	Gen 1 Run-Time Seconds	(0-59)	0
Gen 2 Sec.	Gen 2 Run-Time Seconds	(0-59)	0
Gen 3 Sec.	Gen 4 Run-Time Seconds	(0-59)	0
Gen 4 Sec.	Gen 4 Run-Time Seconds	(0-59)	0
Gen 1 Min.	Gen 1 Run-Time Minutes	(0-59)	0
Gen 2 Min.	Gen 2 Run-Time Minutes	(0-59)	0
Gen 3 Min.	Gen 3 Run-Time Minutes	(0-59)	0
Gen 4 Min.	Gen 4 Run-Time Minutes	(0-59)	0
Gen 1 Hr.	Gen 1 Run-Time Hours	(0-9999999)	0
Gen 2 Hr.	Gen 2 Run-Time Hours	(0-9999999)	0
Gen 3 Hr.	Gen 3 Run-Time Hours	(0-9999999)	0
Gen 4 Hr.	Gen 4 Run-Time Hours	(0-9999999)	0

*The Load Demand Gen Pickup Percentage setting must be greater than the Dropout Percentage setting.

TD = Time Delay Pri = Priority

Note:

Priority 5-8 options are only available on a three or four generator system.

Correct coordination of parameter settings and interconnect wiring is required for proper operation.

INDEX

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