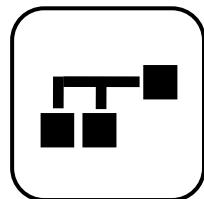


Operation Manual

PLC/HMI Upgrade



Armed Forces Retirement Center

Paralleling Switchgear and Controls

Kohler Project Number: SGP-1297
SO. No. 1019754586
March 28, 2021

RP Power
Contact: Jeff Robichaux

KOHLER
POWER SYSTEMS

ISO 9001
KOHLER
POWER SYSTEMS
NATIONALLY REGISTERED

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

<i>Safety Precautions and Instructions</i>	6
<i>Revisions History.....</i>	8
<i>Section 1 Preparation, Storage, and Installation.....</i>	9
1.1 Introduction	9
1.2 Inspection at Time of Delivery.....	9
1.3 Handling.....	9
1.3.1 Moving Sections.....	9
1.3.2 Lifting Sections	10
1.4 Storage.....	10
1.5 Installation	10
1.5.1 Bus and Power Connections	10
1.5.2 Interconnection Wiring	11
<i>Section 2 Introduction.....</i>	12
2.1 Overview	12
2.2 Interpretation of Sequence Tables	13
2.2.1 System State Symbol Key	13
2.2.2 Automatic / Standby Mode (System Initial State)	14
2.2.3 Normal Operational Sequences.....	14
2.2.4 Responses to Abnormal Conditions	14
2.2.5 First-on Logic.....	14
2.2.6 Additional Notes	14
<i>Section 3 Sequences of Operation - Automatic.....</i>	15
3.1 Utility Source Failure: Loads Transferred to Generators	15
3.1.1 Overview.....	15
3.1.2 Sequence	15
3.1.3 Responses to Abnormal Conditions	16
3.2 Utility Source Restored: Open-transition Load Transfer from Gens.....	18
3.2.1 Overview.....	18
3.2.2 Sequence	18
3.2.3 Responses to Abnormal Conditions	19
3.3 Utility Source Restored: Soft-transition Load Transfer from Gens	21
3.3.1 Overview.....	21
3.3.2 Sequence	21
3.3.3 Responses to Abnormal Conditions	22
3.4 Generator Management Mode	24
3.4.1 Description.....	24
3.4.2 Controls.....	24
3.4.3 Setpoints	24
3.5 Load Management (Load Add/Shed).....	25
3.5.1 Description.....	25
3.5.2 Load Add	25
3.5.3 Load Shed	25
3.5.4 User Adjustable Parameters.....	26

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

3.5.5 User Adjustable Load Priority Levels	26
3.6 Fire Pump Operation Mode.....	27
3.6.1 Preliminary Conditions.....	27
3.6.2 Initiation.....	27
3.6.3 Completion.....	27
Section 4 Sequences of Operation – Manually-initiated	28
4.1 Initiate Isolate Mode: Open-transition Load Transfer, Utility to Gens.....	28
4.1.1 Overview.....	28
4.1.2 Sequence	28
4.1.3 Responses to Abnormal Conditions	29
4.2 Initiate Isolate Mode: Soft-transition Load Transfer, Utility to Gens	30
4.2.1 Overview.....	30
4.2.2 Sequence	30
4.2.3 Responses to Abnormal Conditions	31
4.3 End Isolate Mode: Open-transition Load Transfer, Gens to Utility.....	33
4.3.1 Overview.....	33
4.3.2 Sequence	33
4.3.3 Responses to Abnormal Conditions	34
4.4 End Isolate Mode: Soft-transition Load Transfer, Gens to Utility	36
4.4.1 Overview.....	36
4.4.2 Sequence	36
4.4.3 Responses to Abnormal Conditions	37
4.5 No-load Test	38
4.5.1 Overview.....	38
4.5.2 Sequence - Start.....	38
4.5.3 Responses to Abnormal Conditions	38
4.5.4 Sequence - Stop.....	39
4.6 Generator Synchronization Test	40
4.6.1 Overview.....	40
4.6.2 Sequence – Start.....	40
4.6.3 Responses to Abnormal Conditions	40
4.6.4 Sequence – Stop	41
4.6.5 Responses to Abnormal Conditions	41
Section 5 Manual Controls	42
5.1 Indicating Lights.....	42
5.2 Controls.....	43
Section 6 Human - Machine Interface (HMI).....	44
6.1 Common Screen Features	44
6.1.1 Status and Alarm Banner	45
6.1.2 Navigation.....	47
6.1.3 How to Navigate	48
6.1.4 How to Change a Set point	48
6.1.5 Security.....	49
6.1.6 Security – Auto Logout	50
6.1.7 Circuit Breaker Status.....	51

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.1.8 Bus Status	51
6.1.9 Generator Set Status	52
6.1.10 Source Selection	53
6.1.11 Screenshot.....	53
6.2 Overview	54
6.3 Status	57
6.3.1 Status > Genset > Electrical.....	57
6.3.2 Status > Genset > Mechanical.....	58
6.3.3 Status > Genset > All.....	59
6.3.4 Status > Genset > Run Report.....	61
6.3.5 Status > Utility Electrical.....	62
6.3.6 Status > Tie Electrical	63
6.4 Control	64
6.4.1 Control > Genset > Control	64
6.4.2 Control > Breakers	68
6.4.3 Control > Tests > No Load Test.....	69
6.4.4 Control > Tests > Sync	72
6.4.5 Control > U to G Open Transfer	75
6.4.6 Control > U to G Soft Transfer	79
6.4.7 Control > G to U Open Transfer	83
6.4.8 Control > G to U Soft Transfer	87
6.5 Load Management.....	92
6.5.1 Control.....	92
6.5.2 Setup.....	95
6.6 Generator Management	97
6.6.1 Gen Mgmt	97
6.7 Setup.....	101
6.7.1 Setup > Genset > Relays.....	101
6.7.2 Setup > Genset > Setpoints.....	102
6.7.3 Setup > Genset Sync.....	105
6.7.4 Setup > Genset kW Control.....	108
6.7.5 Setup > Genset kW Share	111
6.7.6 Setup > Genset kVAR Share.....	113
6.7.7 Setup > Utility Sync	115
6.7.8 Setup > Tie Sync	118
6.7.9 Setup > System > Setpoints	121
6.7.10 Setup > Utility Setpoints.....	123
6.7.11 Setup > System > Meter	129
6.7.12 Setup > System > Ranges	130
6.8 Alarms	131
6.8.1 Alarms > Active	131
6.8.2 Alarms > Not in Auto	132
6.8.3 Alarms > History.....	133
6.9 Reports	134
6.9.1 Reports.....	134
6.10 Trend	135
6.10.1 Trend > Genset Electrical	135
6.10.2 Trend > Genset Mechanical	136

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.11 Help.....	137
6.11.1 Help > Legend.....	137
6.11.2 Help > Project Information	137
6.11.3 Help > Load Management State History	138
6.11.4 Help > Generator State History.....	138
6.11.5 Help > Main State History	139
6.11.6 Help > Diagnostics	140
6.11.7 Help > Versions.....	140

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Safety Precautions and Instructions

IMPORTANT SAFETY INSTRUCTIONS. Electromechanical equipment, including generator sets, transfer switches, switchgear, and accessories, can cause bodily harm and pose life-threatening danger when improperly installed, operated, or maintained. To prevent accidents be aware of potential dangers and act safely. Read and follow all safety precautions and instructions. **SAVE THESE INSTRUCTIONS.**

This manual has several types of safety precautions and instructions: Danger, Warning, Caution, and Notice.

⚠ DANGER

Danger indicates the presence of a hazard that will cause severe personal injury, death, or substantial property damage.

⚠ WARNING

Warning indicates the presence of a hazard that can cause severe personal injury, death, or substantial property damage.

⚠ CAUTION

Caution indicates the presence of a hazard that will or can cause minor personal injury or property damage.

NOTICE

Notice communicates installation, operation, or maintenance information that is safety related but not hazard related.

Safety decals affixed to the equipment in prominent places alert the operator or service technician to potential hazards and explain how to act safely. The decals are shown throughout this publication to improve operator recognition. Replace missing or damaged decals.

Battery

⚠ WARNING



Sulfuric acid in batteries.
Can cause severe injury or death.

Wear protective goggles and clothing. Battery acid may cause blindness and burn skin.

⚠ WARNING



Explosion.
Can cause severe injury or death. Relays in the battery charger cause arcs or sparks.

Locate the battery in a well-ventilated area. Isolate the battery charger from explosive fumes.

⚠ DANGER



Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

⚠ DANGER



Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before servicing. Install the barrier after adjustments, maintenance, or servicing.

⚠ DANGER



Hazardous voltage.
Will cause severe injury or death.

Multiple power sources can automatically energize the switchgear. Disconnect all power sources before working inside the enclosure.

Hazardous Voltage/ Moving Parts

DANGER



HIGH VOLTAGE.
Will cause severe injury or death.

Only authorized personnel should open the enclosure.

5 kV and above.

⚠ DANGER



Hazardous voltage.
Will cause severe injury or death.

Only authorized personnel should open the enclosure.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Grounding electrical equipment.

Hazardous voltage can cause severe injury or death.

Electrocution is possible whenever electricity is present. Ensure you comply with all applicable codes and standards. Electrically ground the generator set, transfer switch, and related equipment and electrical circuits. Turn off the main circuit breakers of all power sources before servicing the equipment. Never contact electrical leads or appliances when standing in water or on wet ground because these conditions increase the risk of electrocution.

Short circuits. Hazardous voltage/current can cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage. Do not contact electrical connections with tools or jewelry while making adjustments or repairs. Remove all jewelry before servicing the equipment.

Servicing the switchgear.

Hazardous voltage can cause severe injury or death.

De-energize all power sources before servicing. Turn off the main circuit breakers of all switchgear power sources and disable all generator sets as follows: (1) Move all generator set master controller switches to the OFF position. (2) Disconnect power to all battery chargers. (3) Disconnect all battery cables, negative (-) leads first. Reconnect negative (-) leads last when reconnecting the battery cables after servicing. Follow these precautions to prevent the starting of generator sets by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer. Before servicing any components inside the enclosure: (1) Remove all jewelry. (2) Stand on a dry, approved electrically insulated mat. (3) Test circuits with a voltmeter to verify that they are de-energized.

Testing live electrical circuits.

Hazardous voltage or current can cause severe injury or death.

Have trained and qualified personnel take diagnostic measurements of live circuits. Use adequately rated test equipment with electrically insulated probes and follow the instructions of the test equipment manufacturer when performing voltage tests. Observe the following precautions when performing voltage tests: (1) Remove all jewelry. (2) Stand on a dry, approved electrically insulated mat. (3) Do not touch the enclosure or components inside the enclosure. (4) Be prepared for the system to operate automatically. (600 volts and under)

NOTICE

Foreign material contamination.

Cover the switchgear during installation to keep dirt, grit, metal drill chips, and other debris out of the components. After installation, operate the circuit breaker(s) and/or transfer switch(es) to verify that they operate freely.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Revisions History

Ver	Remarks
-	Initial Submittal for Approval.
1	Updated per startup.
2	Updated per PLC/HMI upgrade.

Notes:

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Section 1 Preparation, Storage, and Installation

1.1 Introduction

This manual contains instructions for the installation, operation, and maintenance of Kohler® Switchgear. Read this instruction book carefully before unpacking, installing, or attempting to operate the equipment.

These instructions apply to Kohler® Switchgear installations. Detailed instructions for other system components are included in the Component Manuals section of the document binder.

Read and follow the safety precautions included with this manual. Pay attention to the decals on the equipment and follow the instructions below.

- All personnel involved in handling, site preparation, installation, testing, operation, and maintenance should be thoroughly familiar with the information in this instruction manuals and customer drawings provided before working on this equipment.
- Never make interlocks inoperative or operate the equipment with any safety barriers removed.
- Always assume that all high-voltage parts are energized until it is certain that they are de-energized.
- Use only test equipment rated for the service intended.
- Check interconnection diagrams and make sure there are no potential backfeed sources.
- Never disconnect the main trip source of energized equipment.
- Do not open a circuit breaker door unless the circuit breaker is tripped.
- Move circuit breakers to the disconnected position before removing rear access panels.
- Use out-of-service tags and padlocks when working on equipment. Leave tags in place until the work is completed and the equipment is ready to be put back into service.
- The complete assembly arrangement determines if the top or bottom contacts are the line side; both can be energized when the circuit breaker is removed from the compartment.
- Disconnect all high voltage to the switchgear before accessing the horizontal bus compartment.
- Do not use liquid fire extinguishers or water on electrical fires. Before extinguishing fires within the assembly, be absolutely certain that the main power source is disconnected and the main and all feeder breakers are tripped.

1.2 Inspection at Time of Delivery

At time of delivery inspect the switchgear and loose parts for signs of shipping damage. If damage and/or rough handling are evident, immediately file a damage claim with the transportation company and promptly notify the factory sales office.

1.3 Handling

To avoid equipment damage, do not turn the switchgear backward or tilt it more than 15 degrees from vertical while handling. Do not lay the switchgear on its back.

1.3.1 Moving Sections

Move sections carefully and keep them upright. Do not drop or bump sections. Mishandling can cause damage to delicate meters and instruments as well as distortion to doors and steel framework.

Secure sections to their shipping skids before moving them. The skid provides extra rigidity to the frame, preventing distortion to the bottom in transit.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

1.3.2 Lifting Sections

Size lifting equipment according to the switchgear weight displayed on the outside of each crate.

Lift the switchgear vertically from the base using spanner or spreader bars to avoid crushing or distorting the frame. Rigging should lift the switchgear upright. Minimize rigging tension and compressive load on sections by maintaining an angle of less than 45 degrees between the lifting cables and vertical.

To allow top lifting with lifting plates, use spanner or spreader bars when lifting vertically as described above.

1.4 Storage

If the assembly is stored prior to installation, keep it in a clean, dry, well-ventilated area with a mean temperature of approximately 21°C (70°F). Place dust covers over circuit breakers. If space heaters are furnished in the assembly, energize them from an external source. Refer to schematic and wiring diagrams for a logical connection point and for voltage and power requirements.

If no space heaters are installed in the assembly, and the area is cold and damp, use a temporary heating source within the assembly. A minimum of 200 watts of heat per cell is recommended. Avoid greasy, smoking heaters that can deposit carbon on insulation, causing tracking and eventual insulation breakdowns.

If the space heaters are normally energized from the assembly control power transformer, open the control power transformer secondary circuit breaker, remove the primary current-limiting fuses, and install and out-of-service tag before energizing the space heaters. This prevents backfeed to the main bus through the control power transformer.

1.5 Installation

After moving the switchgear into its permanent position, level and fasten it securely to either the floor or floor channels.

1.5.1 Bus and Power Connections

Install splice plates and bus pieces removed for shipment.

Refer to the Bus Bar Bolt Torque decal located on the switchgear back panel. There is a decal on either side of the shipping break. The Bus Bar Bolt Torque decal lists torque specifications for connecting the bus bar to the splice plates. Bus bar bolt sizes are 3/8-16 or 1/2-13.

Assemble the bus with the bolt extending toward the back of the switchgear cubicle so the flat washer is against the bus. Then install the spring washer and the nut.

Check the power cables for damage and verify phasing before connecting power cables to the generator(s) and switchgear.

When connecting the cables use the torque values printed on the decal located on the switchgear back panel or use the connector manufacturer's torque specs.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

1.5.2 Interconnection Wiring

Refer to the interconnection drawings for external connections to other equipment.

Use stranded wire with insulated compression lugs when making control interconnects between the switchgear and the generator set(s). Consider the load current and length of the run when sizing wire and cable. Refer to the drawing list in the Wiring Diagrams section of this manual for other drawings pertaining to the switchgear.

Use the instructions provided with test equipment for hi-pot and megger tests of electrical cables and equipment. Check wiring terminations and bus and circuit breaker lug connections for tightness before energizing the equipment.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Section 2 Introduction

2.1 Overview

The Kohler-supplied switchgear is designed to control two (2) Kohler 2250kW generators in parallel with each other.

A 15-inch HMI (touchscreen) at the control section allows operator control of the system. The Kohler-provided PLC-based control system, consisting of one CPU per generator and a master system controller, controls the generators and all breaker operation when selected to Automatic Mode. The system is designed to work with two Kohler DEC-550 genset controllers.

The switchgear has the following modes of operation:

- Emergency Mode (Loss of utility source)
- Isolate Mode (open or closed transition)
- Generator Sync Test
- No Load Test
- Generator Management
- Load Management (through the load shed relay)

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

2.2 Interpretation of Sequence Tables

2.2.1 System State Symbol Key

Dist Bus	Power distribution bus normally fed from utility source.
Gen Bus	Generator paralleling bus fed from gens 1 and 2.
U1	Utility main breaker at switchgear (distribution bus).
T1	Generator source tie breaker that ties the distribution bus ("Dist Bus") and generator bus ("Gen Bus") for the purpose of serving system loads from generators.
X	Indicates breaker closed condition.
O	Indicates breaker open condition.
D	Bus de-energized.
E	Bus energized.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

2.2.2 Automatic / Standby Mode (System Initial State)

Initial State	U1	Dist Bus	T1	Gen Bus			
	X	E	O	D			

2.2.3 Normal Operational Sequences

Tables indicating pre-determined (normal) sequences of operation are provided on the following pages. Each step of each sequence is numbered and each step's triggering event and system response are listed.

2.2.4 Responses to Abnormal Conditions

Note that below each normal sequence of operation, a failure table is provided that describes how the system responds to a failure of any step in the sequence. Should such a failure occur, the horn sounds and an alarm message is displayed on the HMI, and the system responds as described on the failure step. Touching the "Horn Silence" pushbutton silences the horn. The horn is re-activated if new alarms are issued.

2.2.5 First-on Logic

Generator first-on logic prevents multiple generators from simultaneously closing to a dead paralleling bus.

2.2.6 Additional Notes

Timers

All time delays are user-adjustable. Any timer values shown are for illustrative purposes only.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Section 3 Sequences of Operation - Automatic

3.1 Utility Source Failure: Loads Transferred to Generators

3.1.1 Overview

When the utility lost signal is received by the Kohler PLC, the utility source failure timer in the PLC starts. When this timer expires, the loads transfer to generator power.

3.1.2 Sequence

Initial State	U1	Dist Bus	T1	Gen Bus			
	X	E	O	D			

Step	Event	Response	If Fail
1	Utility lost signal received.	Utility source failure timer starts.	A
2	Utility source failure timer expires.	Utility breaker U1 commanded to open. All available generators start.	B
3	Utility breaker U1 opened.	Open-transfer timer starts. Required gens-online-bypass timer starts. <u>Startup Shed Option:</u> Based on the load management settings, loads on Dist Bus are shed (load shed relay energizes).	
4	The first generator reaches rated voltage and frequency.	The first generator breaker commanded to close.	
5	First generator breaker closed successfully. The remaining generator reaches rated voltage and frequency.	The remaining generator synchronizes to the bus and close its circuit breaker.	C, D
6	Required generators are online and the open-transfer timer expired.	Gen source tie breaker T1 commanded to close.	E
7	Gen source tie breaker T1 closed.	Dist Bus is on generator power. Required gens-online-bypass timer stops.	
8	Dist Bus is on generator power.	<u>Startup Shed Option:</u> Based on the load management settings, loads are added to the Dist Bus (load shed relay de-energizes). <u>Generator Management Option:</u> Becomes active if in "auto" and all loads have been added.	F

Final State	U1	Dist Bus	T1	Gen Bus			
	O	E	X	E			

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

3.1.3 Responses to Abnormal Conditions

Step Fail	Event	System Response	Operator Action
A	Utility source power returns before utility source failure timer expires.	Dist Bus remains on utility source power.	No operator action required.
B	Utility breaker U1 fails to open.	<u>Utility source remains failed:</u> Dist Bus is without power. Gen source tie breaker T1 does not close.	<u>Option #1:</u> Reset the fail-to-open alarm. System attempts to open utility breaker U1. When breaker commanded to open, transfer automatically continues. <u>Option #2:</u> 1. Turn U1 Breaker Auto/Manual switch located on door of section 1 to "Manual". 2. Turn U1 Breaker Control switch located on door of section 1 to "Trip" to manually open utility breaker. 3. When breaker opens, transfer automatically continues.
		<u>Utility source returns:</u> Dist Bus remains on utility source. Following the expiration of the utility "source stable" bypass timer, the generators breakers open. The generators shut down after their cooldown timers expire.	No operator action required.
C	Required gens-online-bypass timer expires before required number of generators are online.	<u>At Least One Generator Online:</u> Based on the load management settings, loads on Dist Bus are shed (load shed relay energized). Gen source tie breaker T1 commanded to close. Based on the load management settings, loads are then added to the Dist Bus (load shed relay de-energized).	No operator action required.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Step Fail	Event	System Response	Operator Action
D	Number of generators available is below gens-online requirement.	<u>All Available Generators Online:</u> Based on the load management settings, loads on Dist Bus are shed (load shed relay energized). Gen source tie breaker T1 commanded to close. Based on the load management settings, loads are then added to the Dist Bus (load shed relay de-energized).	No operator action required.
E	Gen source tie breaker T1 fails to close.	<u>Utility source remains failed:</u> Dist Bus is without power. The generators remain running, paralleled on the generator bus.	<u>Option #1:</u> Reset the fail-to-close alarm. System attempts to close gen source tie breaker T1. <u>Option #2:</u> <ol style="list-style-type: none"> 1. Turn T1 Breaker Auto/Manual switch located on door of section 3 to "Manual". 2. Turn T1 Breaker Control switch located on door of section 3 to "Close" to manually close tie breaker.
		<u>Utility source returns:</u> Utility breaker U1 commanded to close following the expiration of the utility "source stable" bypass timer. The online generators open their breakers and shut down after their cooldown timers expire.	No operator action required.
F	One generator fails after being online or Dist Bus becomes overloaded.	Based on the load management settings, loads on Dist Bus are shed (load shed relay energized).	The operator can override the automatic load shed controls.
		<u>Generator Management Option:</u> If offline due to generator management, available offline generator starts.	No operator action required.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

3.2 Utility Source Restored: Open-transition Load Transfer from Gens

3.2.1 Overview

When the utility lost signal going to the Kohler PLC is removed, the utility “return” timer in the PLC starts if the “return control” switch is in “auto”. When this timer expires, loads transfer from generator power back to utility source power. This sequence describes an open transfer between power sources.

Note: There will be a loss of power to the load bus during the open transfer time delay.

3.2.2 Sequence

Initial State	U1	Dist Bus	T1	Gen Bus			
	O	E	X	E			

Step	Event	Response	If Fail
1	Utility lost signal is removed.	Utility “return” timer starts.	A
2	Utility “return” timer expires.	Gen source tie breaker T1 commanded to open.	B
3	Gen source tie breaker T1 opened.	Open-transfer timer starts.	
4	Open-transfer timer expires.	Utility breaker U1 commanded to close.	C
5	Utility breaker U1 closed.	Dist Bus is on utility source power.	
6	Dist Bus is on utility source power.	The generator breakers open and the generators shut down after their cooldown timers expire. <u>Load Management Option:</u> If shed, loads add back on (load shed relay de-energizes).	D

Final State	U1	Dist Bus	T1	Gen Bus			
	X	E	O	D			

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

3.2.3 Responses to Abnormal Conditions

Step Fail	Event	System Response	Operator Action
A	Utility source power is lost before utility “return” timer expires.	Dist Bus remains on generator power.	No operator action required.
B	Gen source tie breaker T1 fails to open.	Utility breaker U1 does not close. The transfer is cancelled. Dist Bus remains on generator power.	<u>Option #1:</u> Reset the fail-to-open alarm. Utility “return” timer restarts. <u>Option #2:</u> <ol style="list-style-type: none"> 1. Turn T1 Breaker Auto/Manual switch located on door of section 3 to “Manual”. 2. Turn T1 Breaker Control switch located on door of section 3 to “Trip” to manually open tie breaker. 3. Utility breaker U1 automatically closes following the open transfer time delay. 4. Generator breakers automatically open. Generators shut down once their cooldown timers expire.
C	Utility breaker U1 fails to close.	Based on the load management settings, loads on Dist Bus are shed (load shed relay energizes). Any offline generators are signaled to start. After the required number of generators are online, gen source tie breaker T1 commanded to close. Dist Bus is back on generator power. Based on the load management settings, loads are added to the Dist Bus (load shed relay de-energizes).	Reset the fail-to-close alarm. Utility “return” timer restarts when Dist Bus is on generator power.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Step Fail	Event	System Response	Operator Action
D	One or more generator breakers fail to open.	The generator continues to run on the generator bus.	<p><u>Option #1:</u> Reset the fail-to-open alarm. System attempts to open generator breaker.</p> <p><u>Option #2:</u></p> <ol style="list-style-type: none"> 1. Turn Breaker Auto/Manual switch located on door to “Manual”. 2. Turn Breaker Control switch located on door to “Trip” to manually open generator breaker.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

3.3 Utility Source Restored: Soft-transition Load Transfer from Gens

3.3.1 Overview

When utility source voltage and frequency return within tolerance, the utility “return” timer in the PLC starts if the “return control” switch is in “auto”. When this timer expires, loads transfer from generator power back to utility source power. This sequence describes a soft transfer between power sources.

3.3.2 Sequence

Initial State	U1	Dist Bus	T1	Gen Bus			
	O	E	X	E			

Step	Event	Response	If Fail
1	Utility source within tolerance.	Utility “return” timer starts.	A
2	Utility “return” timer expires.	The generators synchronize to utility source across utility breaker U1.	B
3	Generators synchronized to utility source.	Utility breaker U1 commanded to close.	C
4	Utility breaker U1 closed.	The generators unload at a preset kW/sec rate. Load-transfer timer starts.	D/E
5	The power flow through the gen source tie breaker T1 reaches the disconnect setpoint.	Gen source tie breaker T1 commanded to open.	F
6	Gen source tie breaker T1 opened.	Dist Bus is on utility source power. Load-transfer timer stops.	
7	Dist Bus is on utility source power.	The generator breakers open and the generators shut down after their cooldown timers expire. <u>Load Management Option:</u> If shed, loads add back on (load shed relay de-energizes).	G

Final State	U1	Dist Bus	T1	Gen Bus			
	X	E	O	D			

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

3.3.3 Responses to Abnormal Conditions

Step Fail	Event	System Response	Operator Action
A	Utility source power is lost before utility “return” timer expires.	Dist Bus remains on generator power.	No operator action required.
B	Generators fail to synchronize to utility source.	Dist Bus remains on generator power.	<u>Option #1:</u> Reset the “fail to synchronize” alarm. Utility “return” timer restarts.
			<u>Option #2:</u> Place the Return Control switch in the “Manual” position. Then perform an open transfer to utility as described in Section 4.3.
C	Utility breaker U1 fails to close.	Dist Bus remains on generator power.	Reset the fail-to-close alarm. Utility “return” timer restarts.
D	The load-transfer timer expires.	The gen source tie breaker T1 commanded to open.	No operator action required.
E	Intertie protection relay trips.	Utility breaker U1 trips. Dist Bus remains on generator power.	Reset the lockout relay located on the utility section door. Place the utility breaker back in Auto on the HMI.
F	Gen source tie breaker T1 fails to open.	The generator breakers open.	<u>Option #1:</u> Reset the fail-to-open alarm. System attempts to open gen source tie breaker T1.
			<u>Option #2:</u> 1. Turn T1 Breaker Auto/Manual switch located on door of section 3 to “Manual”. 2. Turn T1 Breaker Control switch located on door of section 3 to “Trip” to manually open tie breaker.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Step Fail	Event	System Response	Operator Action
G	One or more generator breakers fail to open.	The generator continues to run on the generator bus.	<p><u>Option #1:</u> Reset the fail-to-open alarm. System attempts to open generator breaker.</p> <p><u>Option #2:</u></p> <ol style="list-style-type: none"> 1. Turn Breaker Auto/Manual switch located on door to “Manual”. 2. Turn Breaker Control switch located on door to “Trip” to manually open generator breaker.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

3.4 Generator Management Mode

3.4.1 Description

When all generators are on-line and paralleled due to a loss of utility or Isolate Mode and total load falls below an operator preset percent of online capacity, generator management optimizes the number of on-line gensets based on the system load level (total load)/(number of on-line generators). Generator management starts and stops gensets as required. The order in which the generators start and stop can be based on generator run time or operator selectable.

Higher priority units are sequenced on in the order of their priority and taken off in reverse priority. A genset goes off-line by decreasing its load at a preset kW/sec rate until it reaches its disconnect setpoint. When it reaches its disconnect setpoint, its circuit breaker opens. A genset goes back on-line by synchronizing and closing its breaker, then loading at a preset kW/sec rate until it is sharing the on-line load with the running generators. Operator defined set points determine percent load level and the time delay at which genset will be brought on or taken offline.

If an on-line genset fails or has a prealarm, Generator Management is aborted and all off-line generator sets start and go on-line.

3.4.2 Controls

The HMI has the following control switches for generator management:

Generator Management Control

Auto	Touch to enable generator management
Off	Touch to turn off generator management. If a generator was shut down due to light load, it restarts and goes back online

Order Selection

Runtime	Touch to prioritize gensets based on run time. The generator with the lowest run time is the lead unit
Manual	Touch to prioritize gensets based on operator selected order

3.4.3 Setpoints

The HMI has the following setpoints for generator management:

Start		
	%System Load	The start delay timer starts when the generator percent loaded exceeds this setpoint.
	Delay	The length of time that the generators must be loaded above the start percent system load before the system starts the next generator.
Stop		
	% System Load	The stop timer starts when the generator percent loaded falls below this setpoint.
	Delay	The length of time that the generators must be below stop percent system load before the system stops a generator.
Overload		
	% System Load	The overload delay timer starts when the generator percent loaded exceeds this setpoint.
	Delay	The length of time that the generators must be loaded above the overload percent system load before the system starts the next generator.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

3.5 Load Management (Load Add/Shed)

3.5.1 Description

Load management (load add/shed) provides control of customers loads. There is one load shed relay used for controlling non-priority 1 loads. When the relay is energized, loads are shed. When the relay is de-energized, loads are added.

Load add is based on the number of gensets on-line and/or kW capacity. The method of load add is user configurable.

3.5.2 Load Add

If kW Capacity and Number of Generators are enabled, the system will first enter Generator on-line load add and then enter kW capacity if all the loads are not on-line.

kW Capacity

After a preset time (the timer starts after one generator is on-line) expires which allows all available generators to come on-line, the system will enter kW capacity load add. The system will add the load step if the current system load, plus the kW setpoint of the load priority is less than the kW overload setpoint.

Number of Generators On-Line

The loads are added based on the number of generators on-line.

3.5.3 Load Shed

When the system is on the generator power and all loads have been added, the loads can be configured to shed based on one or more of the following methods:

Load Shed Methods		
	Generator Failure	Loads are shed based on the number of gensets failed. Priority loads are configured to shed based on the receipt of a generator failure.
	kW Overload	Lower priority loads are shed based on the generator capacity (% loaded) exceeding the generator overload setpoint for a preset amount of time.
	Under Frequency	Lower priority loads are shed if the generator bus drops below the under frequency shed setpoint for a preset amount of time. There will only be one level of under frequency load shedding.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

3.5.4 User Adjustable Parameters

The HMI will have the following user adjustable parameters for load add/shed:

Adjustable Load Add/Shed Parameters	
kW Capacity Load Add Startup Delay Timer (Sec)	Sets the length of time between when the generator circuit breaker is closed and the kW capacity-based load add starts.
Expected Load (kW)	Sets the anticipated kW of the load connected to the load shed relay.
kW Overload Setpoint (% Load)	Sets the percent load on the generators that, when exceeded, starts the kW overload shed timer. Load will sequentially shed until the overload condition no longer exists.
kW Overload Shed Timer (Sec)	Sets the length of time after an overload before the next priority load sheds.
Under Frequency Load Shed Setpoint (Hz)	Sets the frequency of the generator bus that, when below, starts the load shed timers.
Under Frequency Load Shed Timer (Sec)	Sets the length of time the generator bus must be below its under frequency load shed setpoint before it signals lower priority loads to shed.

3.5.5 User Adjustable Load Priority Levels

The HMI will have the following user adjustable parameters for setting the load priority levels to shed or add:

Load Shed Priority Level		
Deadbus	Upon a Utility Lost signal, the system will energize the load shed relay.	
EF Shed	Upon a generator failure, the system will energize the load shed relay.	
UF Shed	Upon the generator bus reaching the under frequency setpoint, the system will energize the load shed relay.	
Overload Shed	Upon a generator reaching the overload setpoint, the system will energize the load shed relay.	

Load Add Priority Level		
1 GOL Add	Upon one generator on-line, the system will add each priority equal to and less than this setpoint.	
2 GOL Add	Upon two generators on-line, the system will add each priority equal to and less than this setpoint.	

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

3.6 Fire Pump Operation Mode

The Fire Pump Operation Mode starts and parallels the generators for the purpose of supplying power to the customer's fire pump controller.

Note: If a utility failure is sensed during this mode, the utility main breaker (U1) is opened and the bus tie breaker (T1) closed, and the system automatically continues in Emergency Mode.

3.6.1 Preliminary Conditions

All generator controls must be selected to "Auto".

3.6.2 Initiation

Receipt of a dry contact input from the customer's equipment initiates Fire Pump Operation Mode according to the following sequence:

1. All generators start.
2. The first generator to produce rated voltage and frequency is connected to the dead generator bus via closure of its respective breaker, energizing the bus and the fire pump load takeoff.
3. The remaining generator synchronizes to the energized generator bus. Once synchronized, its circuit breaker closes, and the generators share the fire pump load for the duration of fire pump operation.

Note: Load-shed relaying is not required in Fire Pump Operation Mode.

3.6.3 Completion

Removal of the dry contact input from the customer's equipment causes the system to return to Normal Mode from Fire Pump Operation Mode according to the following:

1. All generator breakers open, de-energizing the fire-pump load takeoff.
2. All generators run for a preset time to cool down.
3. All generators shut down.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Section 4 Sequences of Operation – Manually-initiated

4.1 Initiate Isolate Mode: Open-transition Load Transfer, Utility to Gens

4.1.1 Overview

This sequence describes an operator-initiated open transfer of the loads from utility source power to generator power.

Note: There will be a loss of power to the loads during the open transfer time delay.

4.1.2 Sequence

Initial State	U1	Dist Bus	T1	Gen Bus			
	X	E	O	D			

Step	Event	Response	If Fail
1	Operator touches the “start” button.	All available generators start.	
2	The first generator reaches rated voltage and frequency.	The first generator breaker commanded to close.	
3	The remaining generator reaches rated voltage and frequency.	The remaining generator synchronizes to the bus and closes its circuit breaker.	A
4	Required generators are online.	Utility breaker U1 commanded to open.	B
5	Utility breaker U1 opened.	Open-transfer timer starts. <u>Startup Shed Option:</u> Based on the load management settings, loads on Dist Bus are shed (load shed relay energizes).	
6	Open-transfer timer expires.	Gen source tie breaker T1 commanded to close.	C
7	Gen source tie breaker T1 closed.	Dist Bus is on generator power.	
8	Dist Bus is on generator power.	<u>Startup Shed Option:</u> Based on the load management settings, loads are added to the Dist Bus (load shed relay de-energizes). <u>Generator Management Option:</u> Becomes active if in “auto” and all loads have been added.	D

Final State	U1	Dist Bus	T1	Gen Bus			
	O	E	X	E			

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

4.1.3 Responses to Abnormal Conditions

Step Fail	Event	System Response	Operator Action
A	Number of generators available is below gens-online requirement.	The available online generators run in parallel on the generator bus.	<p><u>Option #1:</u> Reset the generator failure and/or alarm. System attempts to bring the generator online.</p> <p><u>Option #2:</u> Touch the “continue” button to continue the transfer with the remaining available generators. Based on load management settings, loads on Dist Bus are shed (load shed relay energizes).</p> <p><u>Option #3:</u> Touch the “cancel” button to end the transfer and remain on utility source power. The online generators open their breakers and shut down after their cooldown timers expire.</p>
B	Utility breaker U1 fails to open.	Dist Bus remains on utility source power. The transfer is cancelled. The online generators open their breakers and shut down after their cooldown timers expire.	Reset the fail-to-open alarm. Touch the “start” button to re-initiate the transfer to generator power.
C	Gen source tie breaker T1 fails to close.	Utility breaker U1 commanded to close. Dist Bus is back on utility source power. The transfer is cancelled. The online generators open their breakers and shut down after their cooldown timers expire.	Reset the fail-to-close alarm. Touch the “start” button to re-initiate the transfer.
D	One or more generators fail after being online or Dist Bus becomes overloaded.	<p>Based on the load management settings, loads on Dist Bus are shed (load shed relay energizes). If all generators fail, gen source tie breaker T1 commanded to open. Utility breaker U1 commanded to close after the open-transfer timer expires.</p> <p><u>Generator Management Option:</u> If offline due to generator management, available offline generator starts.</p>	<p>The operator can override the automatic load shed controls.</p> <p>No operator action required.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

4.2 Initiate Isolate Mode: Soft-transition Load Transfer, Utility to Gens

4.2.1 Overview

This sequence describes an operator-initiated soft transfer of the loads from utility source power to generator power.

4.2.2 Sequence

Initial State	U1	Dist Bus	T1	Gen Bus			
	X	E	O	D			

Step	Event	Response	If Fail
1	Operator touches “start” button.	All available generators start.	
2	The first generator reaches rated voltage and frequency.	The first generator breaker commanded to close.	
3	The remaining generator reaches rated voltage and frequency.	The remaining generator synchronizes to the bus and closes its circuit breaker.	A
4	Required generators are online.	Generators synchronize to utility source across gen source tie breaker T1.	B
5	Generators synchronized to utility source.	Gen source tie breaker T1 commanded to close.	C
6	Gen source tie breaker T1 closed.	The generators load at a preset kW/sec rate. Load-transfer timer starts.	D/E
7	The power flow through utility breaker U1 reaches the disconnect setpoint.	Utility breaker U1 commanded to open.	F
8	Utility breaker U1 opened.	Dist Bus is on generator power. Load-transfer timer stops.	
9	Dist Bus is on generator power.	<u>Generator Management Option:</u> Becomes active if in “auto” and all loads have been added.	G

Final State	U1	Dist Bus	T1	Gen Bus			
	O	E	X	E			

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

4.2.3 Responses to Abnormal Conditions

Step Fail	Event	System Response	Operator Action
A	Number of generators available is below gens-online requirement.	The available online generators run in parallel on the generator bus.	<u>Option #1:</u> Reset the generator failure and/or alarm. System attempts to bring the generator online.
			<u>Option #2:</u> Touch the “continue” button to continue the transfer with the remaining available generators. Based on load management settings, loads on Dist Bus are shed (load shed relay energizes).
			<u>Option #3:</u> Touch the “cancel” button to end the transfer and remain on utility source power. The online generators open their breakers and shut down after their cooldown timers expire.
B	Generators fail to synchronize to utility.	The online generators run in parallel on the generator bus.	<u>Option #1:</u> Reset the “fail to synchronize” alarm. System restarts the synchronization process.
			<u>Option #2:</u> Touch the “cancel” button to end the transfer and remain on utility source power. The online generators open their breakers and shut down after their cooldown timers expire.
			<u>Option #3:</u> Perform an open transfer to generators as described in Section 4.1.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Step Fail	Event	System Response	Operator Action
C	Gen source tie breaker T1 fails to close.	The online generators run in parallel on the generator bus.	<u>Option #1:</u> Reset the fail-to-close alarm. System restarts the synchronization process. <u>Option #2:</u> Touch the “cancel” button to end the transfer and remain on utility source power. The online generators open their breakers and shut down after their cooldown timers expire.
D	The load-transfer timer expires.	Utility breaker U1 commanded to open.	No operator action required.
E	Intertie protection relay trips.	Utility breaker U1 trips. Dist Bus on generator power.	Reset the lockout relay located on the utility section door. Place the utility breaker back in Auto on the HMI.
F	Utility breaker U1 fails to open.	Gen source tie breaker T1 commanded to open after the power flow through it reaches the disconnect setpoint, or after the load-transfer timer expires. Dist Bus remains on utility source power. The transfer is cancelled. The online generators open their breakers and shut down after their cooldown timers expire.	Reset the fail-to-open alarm. Touch the “start” button to re-initiate the transfer to generator power.
G	One or more generators fail after being online or Dist Bus becomes overloaded.	Based on the load management settings, loads on Dist Bus are shed (load shed relay energizes). If all generators fail, gen source tie breaker T1 commanded to open. Utility breaker U1 commanded to close after the open-transfer timer expires.	The operator can override the automatic load shed controls.
		<u>Generator Management Option:</u> If offline due to generator management, available offline generator starts.	No operator action required.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

4.3 End Isolate Mode: Open-transition Load Transfer, Gens to Utility

4.3.1 Overview

This sequence describes an operator-initiated open transfer of the loads from generator power to utility source power.

Note: There will be a loss of power to the load bus during the open transfer time delay.

4.3.2 Sequence

Initial State	U1	Dist Bus	T1	Gen Bus			
	O	E	X	E			

Step	Event	Response	If Fail
1	Operator touches the “start” button.	Gen source tie breaker T1 commanded to open.	A
2	Gen source tie breaker T1 opened.	Open-transfer timer starts.	
3	Open-transfer timer expires.	Utility breaker U1 commanded to close.	B
4	Utility breaker U1 closed.	Dist Bus is on utility source power.	
5	Dist Bus is on utility source power.	The generator breakers open and the generators shut down after their cooldown timers expire. <u>Load Management Option:</u> If shed, loads add back on (load shed relay de-energizes).	C

Final State	U1	Dist Bus	T1	Gen Bus			
	X	E	O	D			

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

4.3.3 Responses to Abnormal Conditions

Step Fail	Event	System Response	Operator Action
A	Gen source tie breaker T1 fails to open.	Utility breaker U1 does not close. The transfer is cancelled. Dist Bus remains on generator power.	<p><u>Option #1:</u> Reset the fail-to-open alarm. Touch the “start” button to re-initiate the transfer to utility power.</p> <p><u>Option #2:</u></p> <ol style="list-style-type: none"> 1. Turn T1 Breaker Auto/Manual switch located on door of section 3 to “Manual”. 2. Turn T1 Breaker Control switch located on door of section 3 to “Trip” to manually open tie breaker. 3. Utility breaker U1 automatically closes following the open transfer time delay. 4. Generator breakers automatically open. Generators shut down once their cooldown timers expire.
B	Utility breaker U1 fails to close.	<p>Based on the load management settings, loads on Dist Bus are shed (load shed relay energizes).</p> <p>Any offline generators are signaled to start. After the required number of generators are online, gen source tie breaker T1 commanded to close. Dist Bus is back on generator power. Based on the load management settings, loads are added to the Dist Bus (load shed relay de-energizes).</p>	Reset the fail-to-close alarm. Touch the “start” button to re-initiate the transfer to utility power.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Step Fail	Event	System Response	Operator Action
C	One or more generator breakers fail to open.	The generator continues to run on the generator bus.	<p><u>Option #1:</u> Reset the fail-to-open alarm. System attempts to open generator breaker.</p> <p><u>Option #2:</u></p> <ol style="list-style-type: none"> 1. Turn Breaker Auto/Manual switch located on door to “Manual”. 2. Turn Breaker Control switch located on door to “Trip” to manually open generator breaker.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

4.4 End Isolate Mode: Soft-transition Load Transfer, Gens to Utility

4.4.1 Overview

This sequence describes an operator-initiated soft transfer of the loads from generator power to utility source power.

4.4.2 Sequence

Initial State	U1	Dist Bus	T1	Gen Bus			
	O	E	X	E			

Step	Event	Response	If Fail
1	Operator touches the “start” button.	The generators synchronize to utility source across utility breaker U1.	A
2	Generators synchronized to utility source.	Utility breaker U1 commanded to close.	B
3	Utility breaker U1 closed.	The generators unload at a preset kW/sec rate.	C/D
		Load-transfer timer starts.	
4	The power flow through the gen source tie breaker T1 reaches the disconnect setpoint.	Gen source tie breaker T1 commanded to open.	E
5	Gen source tie breaker T1 opened.	Dist Bus is on utility source power.	
		Load-transfer timer stops.	
6	Dist Bus is on utility source power.	The generator breakers open and the generators shut down after their cooldown timers expire.	F
		<u>Load Management Option:</u> If shed, loads add back on (load shed relay de-energizes).	

Final State	U1	Dist Bus	T1	Gen Bus			
	X	E	O	D			

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

4.4.3 Responses to Abnormal Conditions

Step Fail	Event	System Response	Operator Action
A	Generators fail to synchronize to utility source.	Transfer is cancelled. Dist Bus remains on generator power.	<u>Option #1:</u> Reset the “fail to synchronize” alarm. Touch the “start” button to reinitiate the transfer to utility power. <u>Option #2:</u> Perform an open transfer to utility as described in Section 4.3.
B	Utility breaker U1 fails to close.	Transfer is cancelled. Dist Bus remains on generator power.	Reset the fail-to-close alarm. Touch the “start” button to reinitiate the transfer to utility power.
C	The load-transfer timer expires.	The gen source tie breaker T1 commanded to open.	No operator action required.
D	Intertie protection relay trips.	Utility breaker U1 trips. Dist Bus remains on generator power.	Reset the lockout relay located on the utility section door. Place the utility breaker back in Auto on the HMI.
E	Gen source tie breaker T1 fails to open.	The generator breakers open.	<u>Option #1:</u> Reset the fail-to-open alarm. System attempts to open gen source tie breaker T1. <u>Option #2:</u> 1. Turn T1 Breaker Auto/Manual switch located on door of section 3 to “Manual”. 2. Turn T1 Breaker Control switch located on door of section 3 to “Trip” to manually open tie breaker.
F	One or more generator breakers fail to open.	The generator continues to run on the generator bus.	<u>Option #1:</u> Reset the fail-to-open alarm. System attempts to open generator breaker. <u>Option #2:</u> 1. Turn Breaker Auto/Manual switch located on door to “Manual”. 2. Turn Breaker Control switch located on door to “Trip” to manually open generator breaker.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

4.5 No-load Test

4.5.1 Overview

This test starts the selected generators without closing to Gen Bus for the purpose of verifying engine-generator operation.

Operator may select individual or all generators for the test. Only the selected generators start for the test.

Operator may set the duration of the run to a preset time. Upon expiration of that timer, the no-load test ends.

Note: If utility power is lost, the no-load test is cancelled and the system goes into emergency mode.

4.5.2 Sequence - Start

Initial State	U1	Dist Bus	T1	Gen Bus			
	X	E	O	D			

Step	Event	Response	If Fail
1	Operator touches the “start” button.	All selected generators start.	A
2	Each generator reaches rated voltage and frequency.	Generator breakers do not close. Test-duration timer starts when its setpoint is greater than zero.	

Final State	U1	Dist Bus	T1	Gen Bus			
	X	E	O	D			

4.5.3 Responses to Abnormal Conditions

Step Fail	Event	System Response	Operator Action
A	One or more generators fail to start.	All other generators remain running. No-load test is cancelled if all generators are unavailable.	Reset the generator failure. System attempts to start failed generator once generator is selected for the test.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

4.5.4 Sequence - Stop

Initial State	U1	Dist Bus	T1	Gen Bus			
	X	E	O	D			

Step	Event	Response	If Fail
1	Operator touches the “stop” button or the Test Duration timer expires.	The generators shut down after their cooldown timers expire.	

Final State	U1	Dist Bus	T1	Gen Bus			
	X	E	O	D			

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

4.6 Generator Synchronization Test

4.6.1 Overview

This test starts and parallels the selected generators to the generator bus for the purpose of verifying generator operation. No load transfer occurs during this test. Gen source tie breaker T1 remains open.

Operator may select individual or all generators for the test. Only the selected generators start for the test.

Operator may set the duration of the run to a preset time. Upon expiration of that timer, the gen sync test ends.

Note: If utility power is lost, the gen sync test is cancelled and the system goes into emergency mode.

4.6.2 Sequence – Start

Initial State	U1	Dist Bus	T1	Gen Bus			
	X	E	O	D			

Step	Event	Response	If Fail
1	Operator touches the Start button.	All selected generators start.	A
2	The first generator reaches rated voltage and frequency.	The first generator breaker closes.	A
3	The remaining generator reaches rated voltage and frequency.	The remaining generator synchronizes to the generator bus and closes its breaker.	A
4	All selected generator breakers are closed.	Test Duration timer starts when its setpoint is greater than zero.	B

Final State	U1	Dist Bus	T1	Gen Bus			
	X	E	O	E			

4.6.3 Responses to Abnormal Conditions

Step Fail	Event	System Response	Operator Action
A	One or both generators fail to start or go online.	Other generator remains running if both were selected. Gen Sync Test is cancelled if both generators are unavailable.	Reset the generator failure and/or alarm. System attempts to bring the generator online once generator is selected for the test.
B	One or more generators fail after being on-line.	Other generator remains running if both were selected. Gen Sync Test is cancelled if all generators are unavailable.	Reset the generator failure. System attempts to bring the generator online once generator is selected for the test.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

4.6.4 Sequence – Stop

Initial State	U1	Dist Bus	T1	Gen Bus			
	X	E	O	E			

Step	Event	Response	If Fail
1	Operator touches the “stop” button or the Test Duration timer expires.	The generator breakers open and the generators shut down after their cooldown timers expire.	A

Final State	U1	Dist Bus	T1	Gen Bus			
	X	E	O	D			

4.6.5 Responses to Abnormal Conditions

Step Fail	Event	System Response	Operator Action
A	One or more generator breakers fail to open.	The generator remains running.	<u>Option #1:</u> Reset the fail-to-open alarm. System attempts to open generator breaker. <u>Option #2:</u> Turn Breaker Control switch located on door of section 4 or 5 to “Trip” to manually open gen breaker.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Section 5 Manual Controls

5.1 Indicating Lights

Refer to drawing SGP-1297, sheets M1 thru M5 for indicator light locations.

Light	Indication
Engine Running (White)	The generator is running.
Breaker Closed (Red)	The circuit breaker closed.
Breaker Open (Green)	The circuit breaker opened.
GPR Tripped (Amber)	The generator circuit breaker opened due to a protective relay fault. The generator continues to run.
GPR Shutdown (Amber)	The generator circuit breaker opened due to a protective relay fault. The generator shuts down and is locked out.
TPR Tripped (Amber)	The tie circuit breaker opened due to an Overcurrent protective relay fault.
Setting Group 1 Tripped (Amber)	The utility circuit breaker opened due to a protective relay fault (Utility was not in parallel with the generators when the fault occurred).
Setting Group 2 Tripped (Amber)	The utility circuit breaker opened due to an intertie protective relay fault (Utility was in parallel with the generators when the fault occurred).
FPR Tripped (Amber)	The feeder circuit breaker opened due to an Overcurrent protective relay fault.
UBDR Tripped (Amber)	The utility, feeder, and tie circuit breakers opened due to a utility bus differential protective relay fault.
GBDR Tripped (Amber)	The generator and tie circuit breakers opened due to a generator bus differential protective relay fault.
PLC Failure (Red)	One of the PLC's has failed or lost communications.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

5.2 Controls

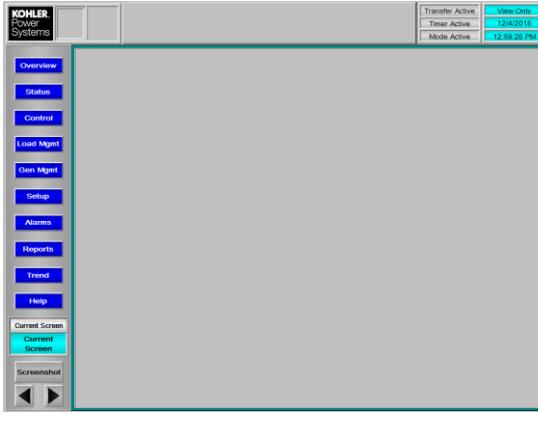
Control Switch	Operation
Emergency Stop	Causes the generator to immediately shut down (without cooldown cycle) and the generator breaker to open.
Horn Silence	Press to silence the horn.
Circuit Breaker Auto/Manual Switch	Auto: Enables control from the HMI/PLC.
	Manual: Disables PLC control. Allows manual Open/Close functionality of breaker control switch.
Breaker Control Switch	Trip: Opens the breaker. Circuit Breaker Switch must be in Manual.
	Close: Closes the breaker. Circuit Breaker Switch must be in Manual.
Lockout Relay	Trip: The protective relay tripped. The circuit breaker opened.
	Reset: Permissive to close the circuit breaker.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Section 6 Human - Machine Interface (HMI)

The HMI is a color touchscreen that allows the operator to monitor, configure, and control the switchgear system.

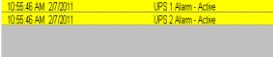
6.1 Common Screen Features

Screen Template	Overview:
	<p>Overview:</p> <p>The screen template is applied to all screens used on the HMI. It includes features such as navigation menus, alarm banner, security, and current screen information.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

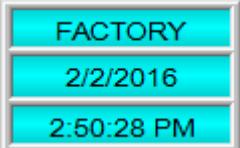
6.1.1 Status and Alarm Banner

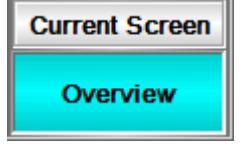
Alarm Icons	
Not in Auto:   Alarm Active:  	<p>Status:</p> <p>Not in Auto Icon: When any control switch is not in the auto position, the words “Not in Auto” will be displayed with a yellow background in the icon box. When all control switches are in the auto position, an empty box is displayed.</p> <p>Alarm Active Icon: When an alarm or shutdown condition is active and not acknowledged, a flashing red triangle is displayed. Once acknowledged the flashing triangle becomes solid. When there are no active alarms or shutdowns, an empty box is displayed.</p> <p>Control:</p> <p>Not in Auto Icon: Touching the icon will navigate the user to the Alarms Not in Auto screen.</p> <p>Alarm Active Icon: Touching the icon will navigate the user to the Alarms Active screen.</p>

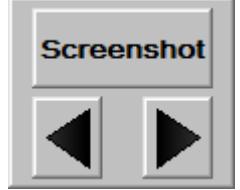
Alarm Banner	
	<p>Status:</p> <p>Alarm Banner: Shows active alarms and shutdowns with the time and date when the associated alarm or shutdown became active.</p>

System Status	
	<p>Status:</p> <p>Transfer Active: Illuminated when loads are transferring from one source to another.</p> <p>Timer Active: Illuminated when any transfer related timer is active. (i.e. Utility Failure, Utility Return, Open Transfer)</p> <p>Mode Active: Illuminated while the generators are running under a test or mode. (Emergency Mode, Isolate Mode)</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Security / Date and Time	
	Status:
	User Name: Currently logged in user is displayed. “View Only” is displayed when no user is logged in. Date: The current date is displayed in the format, MM/DD/YYYY. Time: The current time is displayed in the format, HH:MM:SS AM or PM.
	Control: Login: By touching the date, time or user ID, the Security Login popup appears for the user to input desired login information including username and password with the ability to change passwords with correct data input.

Current Screen View	
	Status: Current Screen: Displays the HMI Screen name.

Quick Navigation	
	Control: Screenshot Button: Touching the Screenshot button will take a screenshot of the current display and store it on the hard drive. Viewing and exporting of screenshots can be accomplished on the Reports screen. Forward Arrow Button: Touching the forward arrow button will navigate to the screen that was displayed before touching the back arrow button. Back Arrow Button: Touching the back arrow button will navigate to the previously displayed screen.

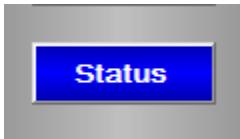
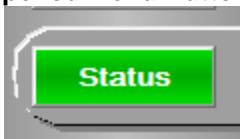
Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.1.2 Navigation

Main Menu Buttons	
	<p>Control</p> <p>Overview Button: Touching the Overview button will navigate to the Overview Screen. The Overview Screen displays a one-line of the system and a summary of the system's current state.</p> <p>Status Button: Touching the Status button will popup the Status Menu which displays the screens available to view status information.</p> <p>Control Button: Touching the Control button will pop up the Control Menu which displays the screens available to control the system including generators, circuit breakers, and transfers.</p> <p>Load Mgmt Button: Touching the Load Mgmt button will pop up the Load Mgmt Menu which displays the screens available to setup and control loads.</p> <p>Gen Mgmt Button: Touching the Gen Mgmt button will navigate to the Generator Management screen. The user can configure the controls and settings for generator management.</p> <p>Setup Button: Touching the Setup button will pop up the Setup Menu which displays the screens available to setup the system including generator setpoints, timers, and HMI calibration.</p> <p>Alarms Button: Touching the Alarm button will pop up the Alarms Menu which displays the screens available to view the system alarms, shutdowns, event history and switches that are Not In Auto.</p> <p>Reports Button: Touching the Reports button will navigate to the Reports screen. The user can export system settings, screen shots and other system data to an external jump-drive.</p> <p>Trend Button: Touching the Trend button will pop up the Trend Menu which displays the screens available to view generator electrical and mechanical data in a graph format over a selected period of time.</p> <p>Help Button: Touching the Help button will pop up the Help Menu which displays the screens available to view a legend and specific project information.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.1.3 How to Navigate

Menu Navigation	
Closed Menu Button: 	Status: Menus: Closed menu buttons are illuminated blue while open menu buttons are illuminated green.
Opened Menu Button: 	Control: Menu Buttons: Touching a blue main menu button will display a submenu that lists screens associated with the menu category name. Touching a blue button within the submenu will navigate the user to the selected screen. Touching a green open main menu button will close the associated submenu display.
Submenu View: 	NOTE: Only one submenu can be open at one time. NOTE: Overview / Load Mgmt / Reports Menu Buttons do not contain a submenu and will navigate the user directly to the screen.

6.1.4 How to Change a Set point

Change a Setpoint	
Setpoint Button: 	Status: Setpoint Button: If sufficient security clearance is attained, the setpoint will react to touch and display a number pad. If the setpoint is password protected, the button will not react when pressed.
Number Pad: 	Control: Setpoint Button: To change a setpoint, touch the setpoint area to access the numeric keypad. Using the numeric keypad, enter the new value. Then touch Enter to save. The keypad will close and the new value will be shown in the setting area.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.1.5 Security

Security	
Security / Date and Time	<p>Status:</p> <p>View Only: Can view all status, control, and setpoint information.</p> <p>User: Allows access to controls.</p> <p>Setup: Allows access to controls, customer-configurable setpoints, and system setup/tuning setpoints.</p>
Login / Logout	<p>Login Procedure:</p> <ol style="list-style-type: none"> 1. Touch Security / Date and Time Status Indication. 2. Touch User Name field dropdown arrow to select the User. 3. Touch the Password entry field. 4. Touch Keyboard to enter password, touch enter when done. 5. Touch Log In <p>Logout Procedure:</p> <ol style="list-style-type: none"> 1. Touch Security / Date and Time Status Indication. 2. Touch Log Out. <p>Change Password Procedure:</p> <ol style="list-style-type: none"> 1. Touch Security / Date and Time Status Indication. 2. Touch Change Password... 3. Touch User Name field dropdown arrow to select the User. 4. Touch Current Password field. 5. Touch Keyboard to enter Current Password, touch enter when done. 6. Touch New Password entry field. 7. Touch Keyboard to enter New Password, touch enter when done. 8. Touch Retype Password entry field. 9. Touch Keyboard to reconfirm New Password, touch enter when done. 10. Touch ok to update password.
Change Password	

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

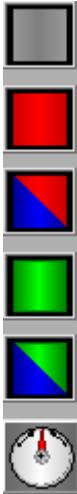
6.1.6 Security – Auto Logout

When an operator is logged in, after 30 mins they will be logged out automatically. A prompt will display to allow the operator to login or postpone the auto logout.

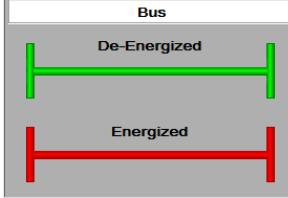
Auto Logout	
	<p>Control:</p> <p>Dismiss: Touch dismiss to clear the dialog box, the system will automatically log the user out.</p> <p>Postpone: Touch to postpone the auto logout for 1 to 5 minutes.</p> <p>Login Now: Touch to access the Security Login dialog.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.1.7 Circuit Breaker Status

Circuit Breaker	
	<p>Status:</p> <p>Gray Breaker: Indicates the circuit breaker is racked out or not installed.</p> <p>Red Breaker: Indicates the circuit breaker is closed and in automatic operation mode.</p> <p>Red and Blue Breaker: Indicates the circuit breaker is closed and in manual operation mode.</p> <p>Green Breaker: Indicates the circuit breaker is open and in automatic operation mode.</p> <p>Green and Blue Breaker: Indicates the circuit breaker is open and in manual operation mode.</p> <p>Synchroscope Breaker: Indicates the circuit breaker is open and actively synchronizing; the breaker will close when in sync.</p>

6.1.8 Bus Status

Bus	
	<p>Status:</p> <p>Green Bus: Indicates the bus is de-energized.</p> <p>Red Bus: Indicates the bus is energized.</p>

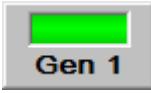
Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.1.9 Generator Set Status

Generator Graphic	
  	Status:
	<p>Green Generator: Indicates the genset is not running and available.</p> <p>Red Generator: Indicates the genset is in a shutdown condition.</p> <p>Yellow Generator: Indicates the genset is not running and in an alarm or not in auto condition. The generator will be available to be run if controls are in auto.</p>
  	<p>Blue Generator with Air Flow: Indicates the genset is running in cooldown.</p> <p>Green Generator with Air Flow: Indicates the genset is running.</p> <p>Yellow Generator with Air Flow: Indicates the genset is running in a not in auto or alarm condition.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.1.10 Source Selection

Source Selection	
Selected 	Status: The annunciator above the source name illuminates to indicate the data on the screen is associated with the corresponding source.
Not Selected 	Control: Touch to change the displayed data to the selected source.

6.1.11 Screenshot

Screenshots	
Screenshot 	<p>Status:</p> <p>Screenshot Complete: A message box will display “Screenshot taken successfully” in the middle of the HMI.</p> <p>Creating Screenshot Procedure:</p> <ol style="list-style-type: none"> 1. Navigate to desired HMI screen. 2. Touch Screenshot. 3. Message displays “Screenshot taken successfully”, touch ok. <p>Exporting Screenshot Procedure:</p> <ol style="list-style-type: none"> 1. Insert flash drive to USB port. 2. Navigate to Reports HMI screen. 3. Touch Export to Flash Drive. 4. Message displays “Would you like to transfer the screenshots to D:\Removable Disk”, touch yes to transfer files. Touch no to cancel the transfer. 5. Message displays “Would you like to permanently remove the files from the HMI”, touch yes to remove files, touch no to keep files on hard drive.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.2 Overview

Overview Screen	Overview: <p>The Overview screen includes features such as system summary annunciators, utility metering and status, generator metering and status, and a one-line dynamic representation of the system.</p>
------------------------	--

Annunciators	<p>Status:</p> <p>Emergency Mode: Illuminates green when the Dist Bus has transferred to generator power, due to a utility failure.</p> <p>Isolate Mode: Illuminates green when the Dist Bus transfers to generator power, due to an operator initiated transfer.</p> <p>No Load Test: Illuminates green when the generators are running during a No Load Test. Reference section 4.5.</p> <p>Sync Test: Illuminates green when the generators are synchronized and running on the generator bus during a Sync Test. Reference section 4.6.</p> <p>Generator Management: Illuminates green when a generator is online and Generator Management is active. Reference section 3.4.</p> <p>Load Shed: Illuminates yellow when a load is automatically shed due to an engine failure, under frequency, or overload condition. See section 3.5.</p> <p>Soft Transfer Mode: Illuminates green when the Soft Transfer Type is selected. All automatic or manually initiated transfer from the HMI will be a soft transfer between sources. This excludes a loss of utility power.</p> <p>Open Transfer Mode: Illuminates yellow when the Open Transfer Type is selected. All automatic or manually initiated transfer from the HMI will be an open transfer between sources.</p> <p>Fire Pump Start: Illuminates green when the generators are running due to a fire pump start signal.</p>
---------------------	--

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

	<p>Return to Utility in Auto: Illuminates green when the Return to Utility switch on the HMI is in the Auto position. Allows the system to automatically return to utility power from generator power during emergency mode.</p> <p>Return to Utility in Manual: Illuminates yellow when the Return to Utility switch on the HMI is in the Manual position. Automatic return to utility power from generator power during emergency mode is disabled.</p>
Utility Status	
	<p>Status:</p> <p>Volts: Displays the average voltage for the associated utility.</p> <p>Amps: Displays the average current for the associated utility.</p> <p>kW: Displays the power in kilowatts for the associated utility.</p> <p>Status: Indicates if the associated utility is available or failed.</p> <p>Failure Tmr: Displays the remaining time the utility must remain failed before the bus will transfer to generator power.</p> <p>Return Tmr: Displays the remaining time for the associated utility to return to utility power.</p> <p>Open Xfer Tmr: Displays the remaining time for the associated bus to be de-energized before a source will close to that bus.</p> <p>Sync Tmr: Displays the remaining time for the running generator(s) to synchronize to the associated utility.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

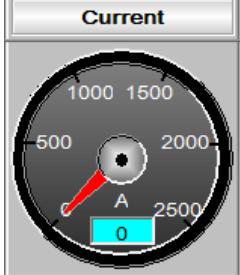
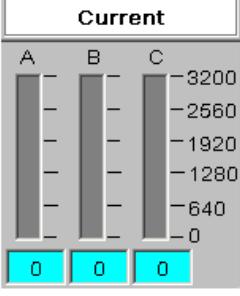
Generator Status	
	<p>Status:</p> <p>Volts: Displays the average voltage for the associated generator.</p> <p>Amps: Displays the average current for the associated generator.</p> <p>kW: Displays the power in kilowatts for the associated generator.</p> <p>Freq: Displays the frequency in hertz for the associated generator.</p> <p>PF: Displays the power factor for the associated generator.</p> <p>Status: Displays the state of the associated generator such as Available, Running, Demand Off, Warning, Shutdown, or Cooldown.</p> <p>Coldown: Displays the remaining time for the associated generator's Cooldown timer if active.</p> <p>Sync Tmr: Displays the remaining time for the associated Sync timer if active. When this timer expires a Failure to Synchronize alarm is issued.</p> <p>GOL Bypass Tmr: During Emergency Mode, displays the remaining time before tie breaker closes if active.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.3 Status

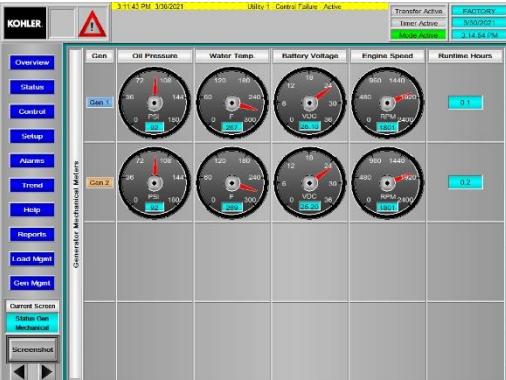
6.3.1 Status > Genset > Electrical

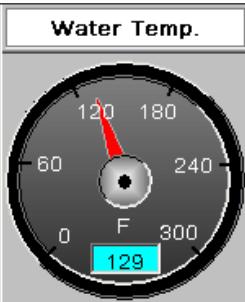
	<p>Overview: The Electrical screen displays meters with voltage, current, frequency, power, reactive power, and power factor information for the generators.</p>
---	---

Meters	
<p>Typical View:</p>  <p>Alternate View:</p> 	<p>Status:</p> <p>Gen: Indicates the generator that is associated with each row.</p> <p>Voltage: Meter displays the average voltage for the associated generator.</p> <p>Current: Meter displays the average amperage for the associated generator.</p> <p>Frequency: Meter displays the frequency in hertz for the associated generator.</p> <p>Power: Meter displays the power in kilowatts (kW) for the associated generator.</p> <p>Reactive Power: Meter displays the reactive power in kilovars (kVAR) for the associated generator.</p> <p>Power Factor: Meter displays the power factor for the associated generator and if its leading or lagging.</p> <p>Control:</p> <p>Voltage: Touching the voltage meter will toggle the view to show per phase values in a bar graphic.</p> <p>Current: Touching the current meter will toggle the view to show per phase values in a bar graphic.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.3.2 Status > Genset > Mechanical

	<p>Overview: The Genset Mechanical screen displays meters with oil pressure, coolant temperature, battery voltage, engine speed, and runtime information for the generators.</p>
---	---

Meters	
	<p>Status:</p> <p>Gen: Indicates the generator that is associated with each row.</p> <p>Oil Pressure: Meter displays the oil pressure level for the associated generator.</p> <p>Water Temp.: Meter displays the coolant temperature for the associated generator.</p> <p>Battery Voltage: Meter displays the battery voltage level in volts for the associated generator.</p> <p>Engine Speed: Meter displays the speed of the engine in RPM for the associated generator.</p> <p>Runtime: Displays the run time hours for the associated generator.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.3.3 Status > Genset > All

	<p>Overview: The Status Genset All screen displays mechanical and electrical metering data for installed generators.</p>
---	---

	Status:
	Oil Press.: Displays the oil pressure level for the associated generator.
	Water Temp.: Displays the coolant temperature for the associated generator.
	Batt Volt: Displays the battery voltage level in volts for the associated generator.
	Eng Spd: Displays the speed of the engine in RPM for the associated generator.
	Run Time: Displays the run time hours for the associated generator.
	Voltage: Displays the average voltage for the associated generator.
	Current: Displays the average amperage for the associated generator.
	Frequency: Displays the frequency in hertz for the associated generator.
	Power: Displays the power in kilowatts (kW) for the associated generator.
	Power Factor: Displays the power factor for the associated generator and if its leading or lagging.
	Percent Ld: Displays the percent loading level for the associated generator.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

	Reactive Power: Displays the reactive power in kilovars (kVAR) for the associated generator.
--	---

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.3.4 Status > Genset > Run Report

Run Report

Overview:

The Status Run Report screen displays generator metering values at various intervals while a selected generator is running. Data can be exported as a CSV file for later use.

Export

Control:

Export to File: Copies the data for the selected gen to a CSV file on the hard drive for later evaluation.

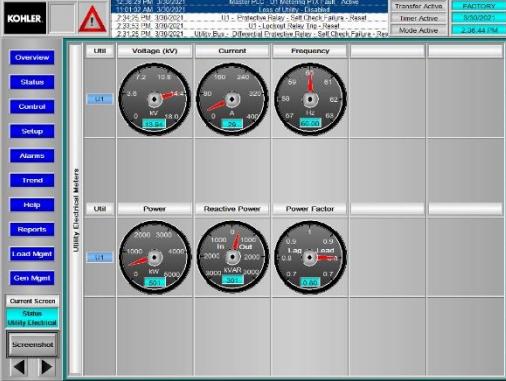
NOTE: Button is disabled while the test is active or data isn't populated.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

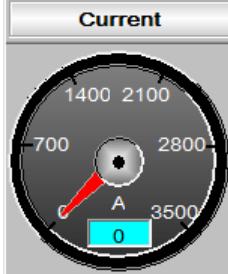
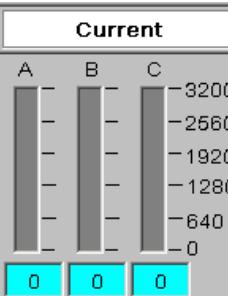
6.3.5 Status > Utility Electrical

Overview:

The Status Utility Electrical screen displays meters with voltage, current, frequency, power, reactive power, and power factor information.

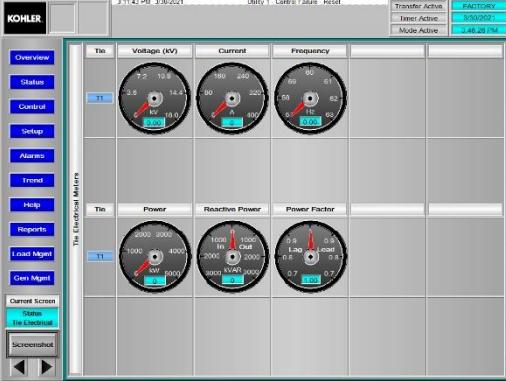


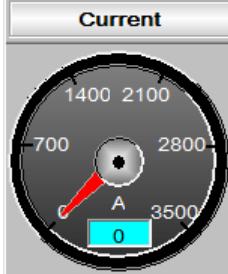
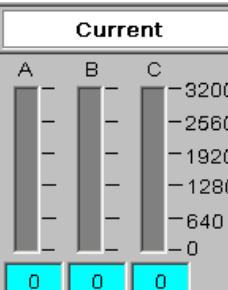
Meters

Typical View: 	Status: Utility: Indicates the Utility that is associated with each row. Voltage: Meter displays the average voltage for the utility. Current: Meter displays the average amperage for the utility. Frequency: Meter displays the frequency in hertz for the utility. Power: Meter displays the power in kilowatts (kW) for the utility. Reactive Power: Meter displays the reactive power in kilovars (kVAR) for the utility.
Alternate View: 	Control: Voltage: Touching the voltage meter will toggle the view to show per phase values in a bar graphic. Current: Touching the current meter will toggle the view to show per phase values in a bar graphic.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.3.6 Status > Tie Electrical

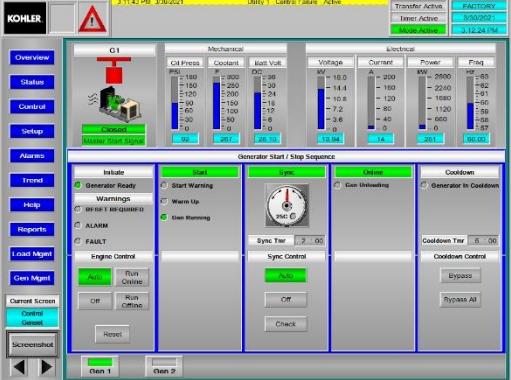
	<p>Overview:</p> <p>The Status Tie Electrical screen displays meters with voltage, current, frequency, power, reactive power, and power factor information.</p>
---	--

Meters	
<p>Typical View:</p>  <p>Alternate View:</p> 	<p>Status:</p> <p>Tie: Indicates the tie that is associated with each row.</p> <p>Voltage: Meter displays the average voltage for the tie.</p> <p>Current: Meter displays the average amperage for the tie.</p> <p>Frequency: Meter displays the frequency in hertz for the tie.</p> <p>Power: Meter displays the power in kilowatts (kW) for the tie.</p> <p>Reactive Power: Meter displays the reactive power in kilovars (kVAR) for the tie.</p> <p>Power Factor: Meter displays the power factor for the tie and if its leading or lagging.</p> <p>Control:</p> <p>Voltage: Touching the voltage meter will toggle the view to show per phase values in a bar graphic.</p> <p>Current: Touching the current meter will toggle the view to show per phase values in a bar graphic.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.4 Control

6.4.1 Control > Genset > Control



Overview:

The Control Genset screen displays individual metering and status information for a selected generator as well as control aspects to reset, shutdown, and run.

Sequence Requirements



Status:

Generator Ready: Light will illuminate green when the generator has all control switches in auto and no faults that will prevent the generator from closing to the bus.

Reset Required: Light will illuminate yellow when the generator controller needs to be reset after a fault shutdown, fail to open, fail to close, fail to synchronize, or fail to acquire.

Alarm: Light will illuminate yellow when a generator has an alarm condition.

Fault: Light will illuminate red when a generator has a shutdown condition.

Engine Control: Follows the position of the engine control switch that is on the generator control door. While the engine control switch on the door is in HMI, this allows the operator to control the generator from the HMI.

Control:

NOTE: Engine Control Switch on the door must be in HMI, in order to use the HMI Engine Control.

Auto: Touch to place the generator engine control in Auto. While the engine control is in auto on the Door and HMI, the generator is under control of the PLC.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

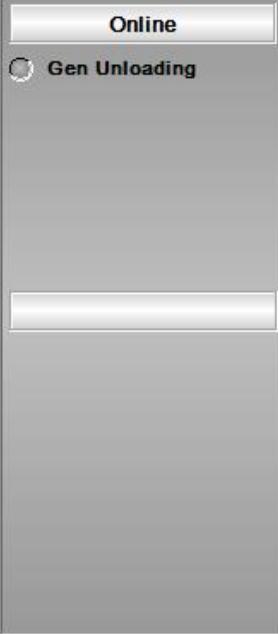
	<p>Run Offline: Touch to place the generator engine control in Run Offline. The generator will run at rated voltage and frequency until a generator fault or operator action. The generator breaker does not close.</p> <p>Run Online: Touch to place the generator engine control in Run Online. The generator will run at rated voltage and frequency. The generator will synchronize and close its breaker onto the generator bus.</p> <p>The generator will not synchronize if the utility source is on the generator bus, use the sync check functionality to synchronize the generator to utility source. The generator will remain running on the bus until a generator fault or operator action.</p> <p>Off: Touch to place the generator engine control in Off. If generator was running online, the generator circuit breaker immediately opens and the generator stops.</p> <p>Reset: Touching the Reset button, resets the generator faults if they are no longer active. To reset shutdown faults, the Engine Control must be in Off.</p>
--	--

Start	
<p>Status:</p> <p>Start: Illuminates green when the generator has progressed to the start stage of the sequence or has completed the step.</p> <p>Start Warning: Light will illuminate green when the Start Warning timer is active.</p> <p>Warm Up: Light will illuminate green when the generator Warm Up timer is active.</p> <p>Gen Running: Light will illuminate green when the generator is running.</p>	

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Sync	
	Status: Sync: Illuminates green when the generator has progressed to the synchronizing stage of the sequence or has completed the step. Sync Timer: Displays the remaining time for the associated generator's Fail to Sync timer. If the timer is active, the background of the remaining time will be colored. 25C: Illuminates green to indicate the sync check Ok To Close is active.
	Control: Auto Button: Touch to place synchronization in Auto. This allows the PLC to control when the generator will synchronize to the running bus. Off Button: Touch to place synchronization in Off. Disables generator synchronization and the generator will not close to the bus when signaled to start. Check Button: Touch to place synchronization in Check, the generator must be running and the bus must be energized. Proper use of this feature is to place the sync control in off, run the generator. Once the generator is running at rated voltage and frequency and the bus is energized, place the sync control in check. The generator will synchronize to the bus but will not issue a circuit breaker close command. If the bus becomes de-energized or the generator fails the sync control is removed from check and placed in auto.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Online	
 <p>The HMI screen displays the 'Online' status. A radio button labeled 'Gen Unloading' is selected. Below the status bar, there is a large gray area.</p>	<p>Status:</p> <p>Online: Illuminates green when the generator has closed and is not unloading to go offline.</p> <p>Control:</p> <p>Gen Unloading: Illuminates green while the generator is unloading before being removed from the bus.</p>

Cooldown	
 <p>The HMI screen displays the 'Cooldown' status. A radio button labeled 'Generator In Cooldown' is selected. Below the status bar, there is a digital timer labeled 'Cooldown Tmr' showing '0 : 53'. Under 'Cooldown Control', there are two buttons: 'Bypass' and 'Bypass All'.</p>	<p>Status:</p> <p>Cooldown: Illuminates green when the generator is running in cooldown.</p> <p>Generator in Cooldown: Light will illuminate green when the generator is in cooldown mode.</p> <p>Cooldown Tmr: Displays the remaining time for the associated generator's cooldown timer. If the timer is active, the background of the remaining time will be illuminated.</p> <p>Control:</p> <p>Bypass Button: Touch to end the cooldown, the generator shuts off.</p> <p>Bypass All Button: Touch to end the cooldown for all generators, all generators shut off.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

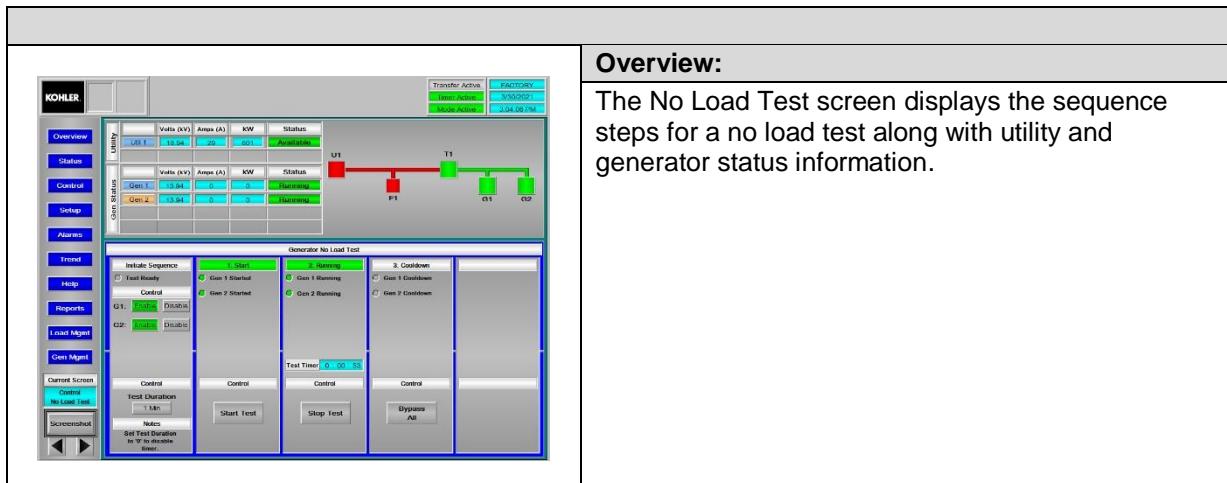
6.4.2 Control > Breakers

	<p>Overview:</p> <p>The Control Breakers screen displays the breaker control for the utility, tie, and feeder breakers along with generator and utility status information.</p>
--	--

Circuit Breaker	
	<p>Status:</p> <p>25C Ok: Illuminates green to indicate the sync check relay Ok To Close is active.</p> <p>Ok to Close: Illuminates green after the breaker is permitted to be closed from the HMI.</p> <p>Lockout Trip: Illuminates yellow to indicate the breaker's protective relay or the bus differential protective relay has tripped.</p> <p>PR Self Check Fail: Illuminates yellow to indicate the breaker's protective relay or the bus differential protective relay is not operational.</p> <p>Auto: Illuminates green to indicate the circuit breaker is in automatic mode and will be controlled automatically by the PLC.</p> <p>Manual: Illuminates yellow to indicate the circuit breaker is in manual mode and will not be controlled automatically by the PLC.</p>
	<p>Control:</p> <p>Auto Button: The Auto button places the circuit breaker in automatic mode and will be controlled by the PLC.</p> <p>Manual Button: The Manual button places the circuit breaker in Manual mode and will not be controlled by the PLC.</p> <p>Open Button: The Open button places the circuit breaker in Manual mode and trips the circuit breaker open.</p> <p>Close Button: The Close button closes the circuit breaker after its in Manual mode and the Ok to Close Breaker indication is illuminated.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.4.3 Control > Tests > No Load Test



Initiate Sequence	
	<p>Status: Test Ready: Illuminates green when the test is ready. Requirements for the test to be ready are as follows:</p> <ol style="list-style-type: none"> At least one generator is enabled. At least one generator that is enabled is available (all control switches in auto and no active shutdown/alarms that will prevent the generator from running at rated voltage or frequency). No Modes are active: <ul style="list-style-type: none"> Emergency Mode Isolate Mode Sync Test <p>Control: Enable/Disable: Select which generators will run for the Test.</p> <p>Setup: Test Duration: Sets the duration of the Test. If the test duration is set to zero, the timer is disabled and the test will run until the operator touches the Stop Test or the enabled generator(s) fails.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Start

Status:

1: Start: Illuminates green when the sequence has progressed to the start gens stage of the sequence or has completed the step.

Gen Started: Illuminates green when a generator has started.

Control:

Start Test: Touch to start the test.

Online

Status:

2: Running: Illuminates green when the generators have progressed to the stage of the sequence where the generators are running at rated voltage / frequency.

Gen Running: Illuminates green when a generator is running.

Test Timer: Displays the remaining time for the Test Timer. If the timer is active, the background of the remaining time will illuminate.

Control:

Stop Test: Touch to end the test.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Cooldown	
	<p>Status:</p> <p>3: Cooldown: Illuminates green when the test is ended and the generators have entered cooldown.</p> <p>Gen Cooldown: Illuminates green when a generator is running in cooldown.</p> <p>Control:</p> <p>Bypass All: Touch to end the cooldown of all generators, all generators shut off.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.4.4 Control > Tests > Sync

Overview:

The Generator Sync Test screen displays the sequence steps for a test along with utility and generator status information.

Initiate Sequence

Status:	Test Ready: Illuminates green when the test is ready. Requirements for the test to be ready are as follows: <ol style="list-style-type: none"> At least one generator is enabled. At least one generator that is enabled is available (all control switches in auto and no active shutdown/alarms that will prevent the generator from running at rated voltage or frequency). No Modes are active: <ul style="list-style-type: none"> Emergency Mode Isolate Mode No Load Test
Control:	Enable/Disable: Select which generators will run for the Test.
Setup:	Test Duration: Sets the duration of the Test. If the test duration is set to zero, the timer is disabled and the test will run until the operator touches the Stop Test or the enabled generator(s) fails.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Start

Status:

1: Start: Illuminates green when the sequence has progressed to the start gens stage of the sequence or has completed the step.

Gen Started: Illuminates green when a generator has started.

Control:

Start Test: Touch to start the test.

Online

Status:

2: Online: Illuminates green when the generators have progressed to the stage of the sequence where the generators have synchronized to the generator bus and closed their breakers.

Gen Online: Illuminates green when a generator circuit breaker is closed.

Test Timer: Displays the remaining time for the Test Timer. If the timer is active, the background of the remaining time will illuminate.

Control:

Stop Test: Touch to stop the test.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Cooldown	
	Status: 3: Cooldown: Illuminates green when the test is ended and the generators have entered cooldown.
	Control: Bypass All: Touch to end the cooldown of all generators, all generators shut off.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.4.5 Control > U to G Open Transfer

Transfer Screen Summary	
	<p>Overview:</p> <p>The Transfer screen displays the sequence of events that will take place to complete a specific change in configuration.</p>

Initiate Sequence	
	<p>Status:</p> <p>Ready: The Transfer Ready annunciator will illuminate green to indicate the sequence requirements have been achieved. If the requirements have not been met for the specific transfer, the annunciator will remain gray. Typical reasons the transfer is not ready are: controls not in auto or circuit breaker involved in transfer have a failure of the circuit breaker to open or close.</p> <p>Control:</p> <p>Start: If transfer is ready, touch Start to initiate the transfer.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

1: Start Generators	
	Status:
	Start Generators: Illuminates green when generators are signaled to start.
	Required Gens Online: Illuminates green when all generators are online and the transfer is ready to continue.
Control:	
Cancel: Touch Cancel to end the transfer to generator power. The system will remain on utility power. Cancel button can't be pressed once the open transfer to generator power has started.	
Continue: Touch Continue to continue the transfer to generator power with not all generators available. Based on load management settings, loads are shed.	

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

2: Open U1 CB

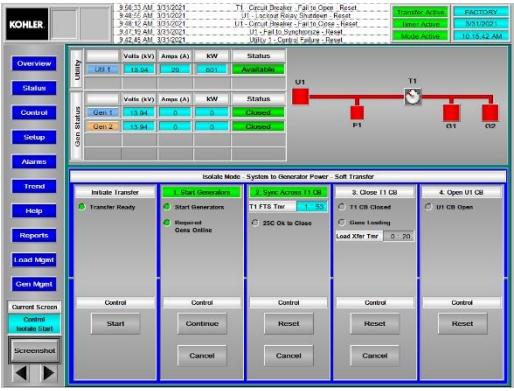
 <p>The HMI screen displays the following information:</p> <ul style="list-style-type: none"> U1 CB Open: A green circular indicator. Load Shed Relay Energized: A green circular indicator. Open Xfer Tmr: Displays "0 : 01". Control: A button labeled "Reset". 	<p>Status:</p> <p>U1 CB Open: Illuminates green while the Utility circuit breaker is open.</p> <p>Load Shed Relay Energized: Illuminates green while the load shed relay is energized.</p> <p>Open Transfer Timer: Displays the remaining time for the Open Transfer timer. If the timer is active, the background of the remaining time will illuminate.</p> <p>Control:</p> <p>Reset: Touch to reset the U1 Fail to Open alarm.</p>
---	---

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

3: Close T1 CB	
 <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> Control <input type="button" value="Reset"/> </div>	Status:
	T1 CB Closed: Illuminates green when T1 breaker is closed.
4: Load Add/Shed	
 <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <input type="button" value="Load Shed"/> <input type="button" value="Load Add Tmr 0 : 05"/> <input type="button" value="KW Cap Start 0 : 15"/> <input checked="" type="radio"/> Load Shed Relay De-Energized </div>	Status:
	Load Status: Indicates the state of the load management sequence. Load Add Timer: Displays the time remaining before the next priority is set to add. KW Cap Start: Displays the time remaining before load management will add loads based off of the generator capacity. Load Shed Relay De-Energized: Illuminates green while the load shed relay is de-energized.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.4.6 Control > U to G Soft Transfer

Transfer Screen Summary	
	<p>Overview:</p> <p>The Transfer screen displays the sequence of events that will take place to complete a specific change in configuration.</p>

Initiate Sequence	
	<p>Status:</p> <p>Ready: The Transfer Ready annunciator will illuminate green to indicate the sequence requirements have been achieved. If the requirements have not been met for the specific transfer, the annunciator will remain gray. Typical reasons the transfer is not ready are: controls not in auto or circuit breaker involved in transfer have a failure of the circuit breaker to open or close.</p> <p>Control:</p> <p>Start: If transfer is ready, touch Start to initiate the transfer.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

1: Start Generators	
	Status:
	Start Generators: Illuminates green when generators are signaled to start.
	Required Gens Online: Illuminates green when all generators are online and the transfer is ready to continue.
	Control:
<p>Cancel: Touch Cancel to end the transfer to generator power. The system will remain on utility power.</p> <p>Continue: Touch Continue to continue the transfer to generator power with not all generators available. Based on load management settings, loads are shed.</p>	

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

2: Sync Across T1 CB



Status:

Fail to Sync Timer: Displays the remaining time for the Tie Fail to Sync timer. If the timer is active, the background of the remaining time will illuminate.

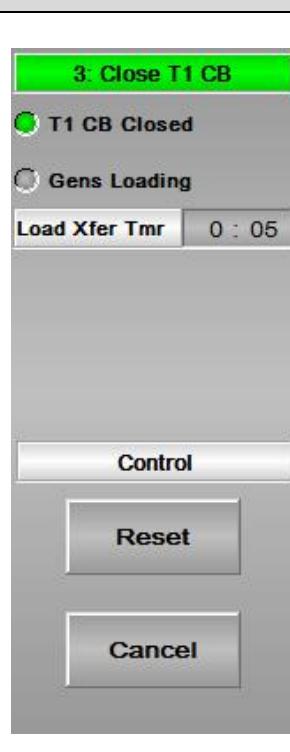
25C Ok to Close: Illuminates green when the Tie Sync Check Relay close enable is active.

Control:

Reset: Touch to reset the Fail to Synchronize alarm and restart the synchronization process.

Cancel: Touch Cancel to end the transfer to generator power. The system will remain on utility power.

3: Close T1 CB



Status:

T1 CB Closed: Illuminates green while T1 circuit breaker is closed.

Gens Loading: Illuminates green while the utility and generator sources are paralleled and the generators are taking the load.

Load Transfer Timer: Displays the remaining time for the utility and generator sources to remain paralleled before U1 breaker is opened. If the timer is active, the background of the remaining time will illuminate.

Control:

Reset: Touch to reset the Fail to Close alarm and restart the synchronization process.

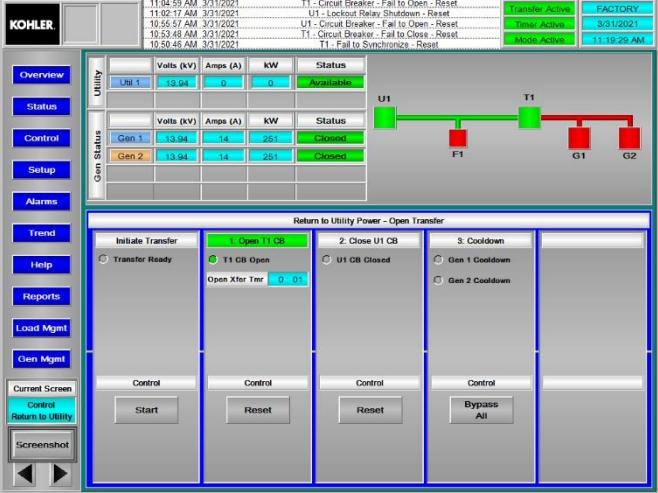
Cancel: Touch Cancel to end the transfer to generator power. The system will remain on utility power.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

4: Open U1 CB	Status:
	U1 CB Open: Illuminates green while U1 circuit breaker is open.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.4.7 Control > G to U Open Transfer

Transfer Screen Summary		Overview:
 <p>The Transfer screen summary shows the current status of the power system. It includes a timeline of events, a utility and generator status table, and a power system diagram. The sequence of events for the 'Return to Utility Power - Open Transfer' is displayed, showing steps 1, 2, and 3.</p>	<p>The Transfer screen displays the sequence of events that will take place to complete a specific change in configuration.</p>	

Initiate Sequence	
 <p>The 'Initiate Transfer' screen provides control for the transfer process. It includes a 'Transfer Ready' indicator and a 'Control' button with a 'Start' sub-button.</p>	<p>Status: Ready: The Transfer Ready annunciator will illuminate green to indicate the sequence requirements have been achieved. If the requirements have not been met for the specific transfer, the annunciator will remain gray. Typical reasons the transfer is not ready are: controls not in auto or circuit breaker involved in transfer have a failure of the circuit breaker to open or close.</p> <p>Control: Start: If transfer is ready, touch Start to initiate the transfer.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

1: Open T1 CB

	<p>Status:</p> <p>T1 CB Open: Illuminates green while the T1 circuit breaker is open.</p> <p>Open Transfer Timer: Displays the remaining time for the Open Transfer timer. If the timer is active, the background of the remaining time will illuminate.</p> <p>Control:</p> <p>Reset: Touch to reset the Fail to Open alarm.</p>
---	--

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

2: Close U1 CB



The HMI control panel for the U1 circuit breaker. It features a title bar "2: Close U1 CB", a status indicator "U1 CB Closed" with a green circle icon, a "Control" button, and a "Reset" button.

Status:

U1 CB Closed: Illuminates green while the U1 circuit breaker is closed.

Control:

Reset: Touch to reset the Fail to Close alarm.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

3: Gens in Cooldown

3: Cooldown

Gen 1 Cooldown

Gen 2 Cooldown

Control

Bypass All

Status:

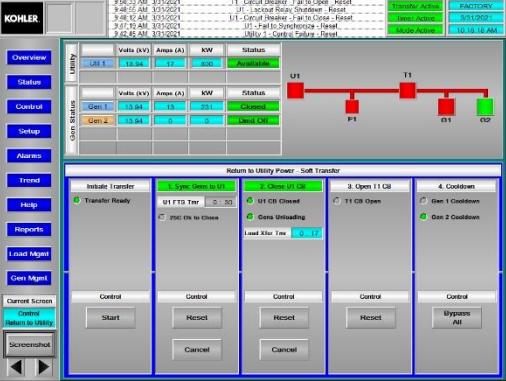
Cooldown: Illuminates green when the transfer has ended and the generators have entered cooldown.

Control:

Bypass All: Touch to end the cooldowns of all generators, all generators shut off.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.4.8 Control > G to U Soft Transfer

Transfer Screen Summary	
	<p>Overview:</p> <p>The Transfer screen displays the sequence of events that will take place to complete a specific change in configuration.</p>

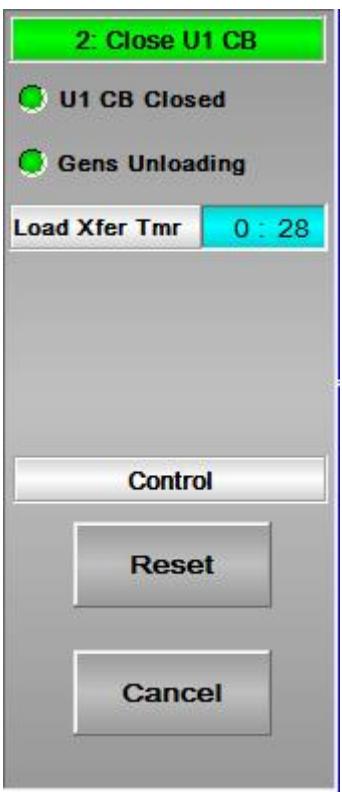
Initiate Sequence	
	<p>Status:</p> <p>Ready: The Transfer Ready annunciator will illuminate green to indicate the sequence requirements have been achieved. If the requirements have not been met for the specific transfer, the annunciator will remain gray. Typical reasons the transfer is not ready are: controls not in auto or circuit breaker involved in transfer have a failure of the circuit breaker to open or close.</p> <p>Control:</p> <p>Start: If transfer is ready, touch Start to initiate the transfer.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

1: Sync Gens to Utility

	<p>Status:</p> <p>Fail to Sync Timer: Displays the remaining time for the Fail to Sync timer. If the timer is active, the background of the remaining time will illuminate.</p> <p>25C Ok to Close: Illuminates green while the sync check ok to close is true.</p> <p>Control:</p> <p>Cancel: Touch Cancel to end the transfer to utility power. The system will remain on generator power.</p> <p>Reset: Touch to reset the fail to sync alarm.</p>
--	---

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

2: Close U1 CB	
	<p>Status:</p> <p>U1 CB Closed: Illuminates green while U1 circuit breaker is closed.</p> <p>Gens Unloading: Illuminates green while the utility and generator sources are paralleled and the generators are unloading.</p> <p>Load Transfer Timer: Displays the remaining time for the utility and generator sources to remain paralleled before T1 breaker is opened. If the timer is active, the background of the remaining time will illuminate.</p> <p>Control:</p> <p>Cancel: Touch Cancel to end the transfer to utility power. The system will remain on generator power.</p> <p>Reset: Touch to reset the fail to close alarm.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

3: Open T1 CB

	Status: T1 CB Open: Illuminates green when T1 breaker has opened.
	Control: Reset: Touch to reset the fail to open alarm.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

4: Gens in Cooldown

3: Cooldown

Gen 1 Cooldown

Gen 2 Cooldown

Control

Bypass All

Status:

Cooldown: Illuminates green when the transfer has ended and the generators have entered cooldown.

Control:

Bypass All: Touch to end the cooldowns of all generators, all generators shut off.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.5 Load Management

6.5.1 Control

	<p>Overview:</p> <p>The Control Load Management screen allows the operator to setup load specific parameters and manually add or remove loads while on generator power.</p>
--	--

Annunciator Bar	
	<p>Status:</p> <p>kW Capacity Add: Illuminates green when the system is adding loads based on the KW capacity of the generators.</p> <p>GOL Add: Illuminates green when the system is adding loads based on the number of generators online.</p> <p>Under Freq Shed: Light will illuminate yellow when the system is shedding loads because the load bus frequency has dropped below the under frequency set point.</p> <p>Eng Fail Shed: Light will illuminate yellow when the system is shedding loads because a generator has failed.</p> <p>Overload Shed: Light will illuminate yellow when the system is shedding loads because the load bus kW has risen above the overload set point.</p> <p>Deadbus Shed: Light will illuminate yellow when the system is shedding loads because the system is doing an open transfer from utility to generator power.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

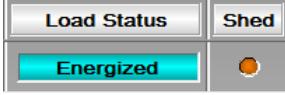
Status	
	<p>Status:</p> <p>Online Capacity: Indicates the total generator capacity for loading in kW and also percent load.</p> <p>Actual Total Load: Indicates the total load on the load bus in kW and also percent load.</p> <p>Remaining Capacity: Indicates the remaining load capacity in kW and also percent load. Online Capacity – Actual Total Load = Remaining Capacity</p> <p>Load Status: Indicates the state of the load management sequence.</p> <p>Load Add Timer: Displays the time remaining before the next priority is set to add.</p> <p>KW Cap Start: Displays the time remaining before load management will add loads based off of the generator capacity.</p>

Load Shed Reset	
	<p>Control:</p> <p>Reset Button: Touching the Reset button will reset the load shed condition if they are no longer active.</p>

Load Component	
	<p>Status:</p> <p>Load: Indicates the component name associated with a particular row.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Load Management	
	<p>Setup:</p> <p>Expected KW: Touch to enter the expected KW associated with the load component. This set point is used during the KW capacity load add. The system adds the total load with the priorities expected load, if this expected load exceeds the online capacity the system will not add any more load until more generators are on the bus.</p>

Load Status	
	<p>Status:</p> <p>Load Status: Indicates if the load shed relay is energized or de-energized.</p> <p>Shed: Illuminates orange while the load component's priority is included in the current load shed condition.</p>

Load Control	
	<p>Status:</p> <p>Auto: Illuminates green while the load control component is in automatic mode and under the control of the PLC.</p> <p>Bypass: Illuminates light blue when the load control component is in bypass.</p> <p>Shed: Illuminates orange when the load control component is in shed.</p> <p>Control:</p> <p>Auto: Touch to place the Load Control in auto. This load will be under control of the PLC and will be signaled to add or shed based on the system conditions.</p> <p>Bypass: Touch to manually add the load after a shed. Cannot bypass an underfrequency load shed, if in bypass and an underfrequency load shed occurs, the load component is placed in Auto.</p> <p>Shed: Touch to manually remove the load.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.5.2 Setup

Overview:

The Setup Load Management screen allows the operator to configure the load add/shed parameters based on different conditions for protection of the system.



Load Shed Setup

Status:	
Enabled: Light illuminates green to indicate Shed feature is enabled.	
Disabled: Light illuminates yellow to indicate Shed feature is disabled.	

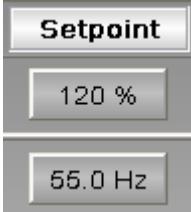
Load Add Setup Graph

Status:	
Setpoint: Indicates value level of priority.	
Enabled: Light illuminates green to indicate Add feature is enabled.	
Disabled: Light illuminates yellow to indicate Add feature is disabled.	
Setup:	
Add Setpoints: Used to determine what priorities will add when a particular number of generators are online. All priorities above the setpoint will also add.	



Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Load Shed Time Delay	
	Setup: Delay: Used to set the amount of time a condition needs to occur before the associated shed condition will occur.

Shed Level Set point	
	Setup: Set point: Used to set the level that the shed condition will occur.

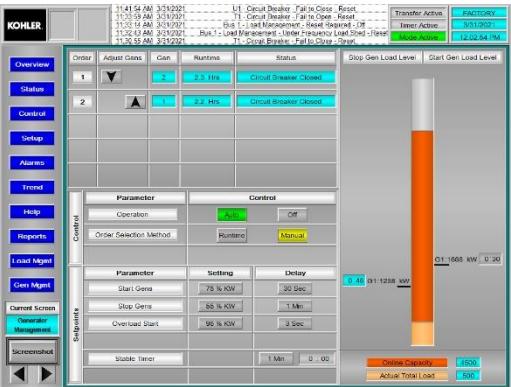
Add Time Delay	
	Setup: Add Delay: Sets the time delay between one priority load add and before the next priority is added.

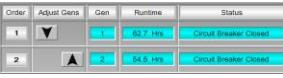
Startup Delay	
	Setup: Startup Delay: Sets the delay Load Management will enter KW Capacity after GOL Add is enabled. Time delay only applicable if Gen Online and KW Capacity Add are enabled.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.6 Generator Management

6.6.1 Gen Mgmt

Generator Management		Overview:
 <p>The screenshot shows the Generator Management interface. On the left is a vertical menu with options like Overview, Status, Control, Setup, Alarms, Trend, Help, Reports, Load Mgt, Gen Mgmt, Current Screen, Generator Management, and Screenshot. The main area has tabs for Order, Adjust Gens, Gen, Runtime, and Status. Under Order, there are two rows for generators. Row 1: Order 1, Gen 1, Runtime 2.0 Hrs, Status Circuit Breaker Closed. Row 2: Order 2, Gen 2, Runtime 2.0 Hrs, Status Circuit Breaker Closed. Below this is a table for Control parameters: Operation (Auto, Off), Order Selection Method (Runtime, Manual), Start Gens (75 % KW, 30 Sec), Stop Gens (65 % KW, 1 Min), Overload Start (95 % KW, 3 Sec), and a Stability Timer (1 Min, 0.00). To the right is a large orange bar chart titled "Stop Gen Load Level" and "Start Gen Load Level" with a value of "01 1600 KW". At the bottom are buttons for "Delete Capacity" (4000) and "Actual Total Load" (900).</p>	<p>The Gen Management screen allows the operator to setup operational parameters and view status information of the system.</p>	

Generator Adjustment	
 <p>The screenshot shows the Generator Adjustment interface. It has tabs for Order, Adjust Gens, Gen, Runtime, and Status. The Order tab shows two rows: Order 1 (Gen 1, 62.7 Hrs, Circuit Breaker Closed) and Order 2 (Gen 2, 64.5 Hrs, Circuit Breaker Closed). The Adjust Gens tab shows up and down arrows for changing generator assignments between orders.</p>	<p>Status:</p> <p>Order: Indicates the priority associated with a generator. An order level of one refers to a generator that will remain on while generator management is operating. An order greater than one will be subject to being shut off depending on load demands.</p> <p>Gen: Indicates the generator associated with the order level.</p> <p>Runtime: Indicates the associated generator's runtime hours.</p> <p>Status: Indicates the associated generator's status such as available, not available, Running, Demand Off, Warning, Shutdown, Synching, and Closed.</p> <p>Control:</p> <p>Adjust Gens: Press the up or down arrow to change the generator assigned to the corresponding order. The lower generator will be re-assigned to the higher order, while the higher generator will be re-assigned to the lower order.</p> <p>NOTE: Adjust Gens is disabled while Order Selection Method is in Runtime</p>

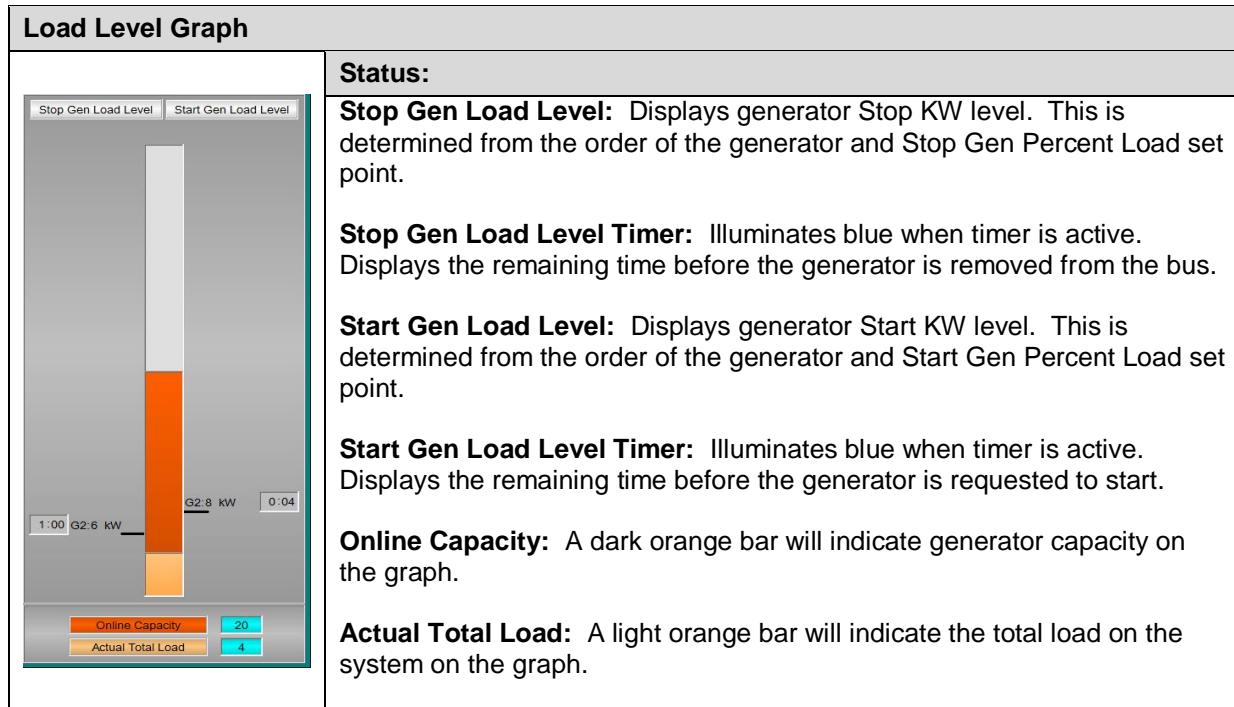
Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Control	
<p>The screenshot shows a control panel with three main sections: 'Parameter' (left), 'Control' (center), and 'Order Selection Method' (right). In the 'Control' section, the 'Mode' button is set to 'Auto' (green), 'Order Selection Method' is set to 'Runtime' (green), and 'Control' is set to 'Off' (yellow).</p>	<p>Operation Control:</p> <p>Auto: Generator Management is in automatic mode when illuminated green. The system will not enter generator management until the stable delay timer expires.</p> <p>Off: Generator Management is off when illuminated yellow. The system will not enter generator management.</p> <p>Order Selection Method Control:</p> <p>Runtime: The order of the generators is determined by the generator runtime hours. The genset with the most runtime hours will be the last order. The generator with the least amount of runtime hours will be the first order. The order will reset when all generator starts are removed and no generators are online, or the difference in runtime hours is greater than or equal to the Runtime Difference set point.</p> <p>Manual: The order of the generators is determined by the operator. Use the Adjust Gen buttons to change the order of the generators.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Setpoints																			
 <table border="1" style="margin-top: 10px; width: 100%;"> <thead> <tr> <th>Parameter</th> <th>Setting</th> <th>Delay</th> </tr> </thead> <tbody> <tr> <td>Start Gens</td> <td>75 % KW</td> <td>30 Sec</td> </tr> <tr> <td>Stop Gens</td> <td>55 % KW</td> <td>1 Min</td> </tr> <tr> <td>Overload Start</td> <td>95 % KW</td> <td>3 Sec</td> </tr> <tr> <td>Minimum Generators Online</td> <td>1 GOL</td> <td></td> </tr> <tr> <td>Stable Timer</td> <td></td> <td>4 Min 4:00</td> </tr> </tbody> </table>	Parameter	Setting	Delay	Start Gens	75 % KW	30 Sec	Stop Gens	55 % KW	1 Min	Overload Start	95 % KW	3 Sec	Minimum Generators Online	1 GOL		Stable Timer		4 Min 4:00	<p>Setup:</p> <p>Start Gens % Load: Sets the percent load that the generators must be loaded above before the system starts the next start time-delay for a generator to come on-line.</p> <p>Start Gens Delay: Sets the length of time that the generators must be loaded above the start percent load set point before the system starts the next generator.</p> <p>Stop Gens % Load: Sets the percent load that the generators will be loaded if generator management shuts down a generator. The generators that will remain online after the next generator goes offline must be at or below this set point for the next stop delay to time.</p> <p>Stop Gens Delay: Sets the length of time that the generators must be loaded below the Stop Percent Load set point before the system shuts off a generator.</p> <p>Overload Start % Load: Sets the percent load that the generators must be loaded above before the system starts the overload start time-delay.</p> <p>Overload Start Delay: Sets the length of time that the generators must be loaded above the Overload Start Percent Load set point before the system starts all available generators.</p> <p>Stable Timer Delay: Sets the length of time the system must be on generator power with no generator shutdown or load shed conditions active before the system will enter Generator Management. (Generator Management control must be in Auto.) Indicates the remaining time before the system will enter Generator Management mode. Timer is active when the background is light blue.</p> <p>Minimum Generators Online: Sets the minimum number of generators that will remain online during generator management. This number of generators will remain online regardless of the system load level (kW).</p>
Parameter	Setting	Delay																	
Start Gens	75 % KW	30 Sec																	
Stop Gens	55 % KW	1 Min																	
Overload Start	95 % KW	3 Sec																	
Minimum Generators Online	1 GOL																		
Stable Timer		4 Min 4:00																	

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021



Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.7 Setup

6.7.1 Setup > Genset > Relays

Genset Relays

Overview:

The Setup Genset Relays screen allows the operator to monitor protective relay parameters for the engine controller.

Relay Values

	<p>Status:</p> <p>Calc.: Shows the value read from the engine controller converted to a unit rather than a percentage.</p> <p>Actual: Shows the value read from the engine controller as a percentage.</p> <p>Actual Time Delay: Shows the time delay read from the engine controller.</p>
--	--

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.7.2 Setup > Genset > Setpoints

Overview:

The Setup Genset Setpoints screen allows the operator to setup rated specs, timers, and bias information.

Generator	Calculated Voltfreq	Rated Volts	Rated Freq	Rated kW		
G1	12400 V	18800 V	60.0 Hz	90.0 Hz	1 Sec	2200 kW
G2	12400 V	18800 V	60.0 Hz	90.0 Hz	1 Sec	2200 kW

Generator	Fail to Acquire	Cooldown	Start Delay	Warm-Up	Fail to Sync
G1	120 Sec	5 Min	0 Sec	0 Min	120 Sec
G2	120 Sec	5 Min	0 Sec	0 Min	120 Sec

Generator	Status	Control	Center Volts	Adj Range	Error Level	Nominal
G1	Freq: 60.0 % Bias: 2.000	Direct Indirect	2.50	2	0.0240	0
G2	Freq: 60.0 % Bias: 2.000	Direct Indirect	2.50	2	0.0240	0

Generator	Status	Control	Center Volts	Adj Range	Error Level	Nominal
G1	Volts: 0.0 % Bias: 0.000	Direct Indirect	0.000	5	0.0000	0
G2	Volts: 0.0 % Bias: 0.000	Direct Indirect	0.000	5	0.0000	0

Gen Specs

Setup:

Rated Volts: Set the rated voltage, tolerance range, and the time required for the associated generator to be in tolerance before it can close on-line.

Rated Freq: Set the rated frequency, tolerance range, and the time required for the associated generator to be in tolerance before it can close on-line.

Rated kW: Set the rated kW for the associated generator.

Gen Timers

Setup:

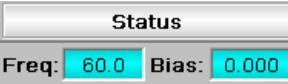
Fail to Acquire: Sets the maximum amount of time the generator is given to achieve stable voltage and frequency after being issued a start signal. If no rated voltage or frequency is met the generator is shutdown due to a Fail to Acquire fault.

Cooldown: Sets the amount of time the generator run in cooldown mode.

Start Delay: Sets the amount of time the generator will wait before starting after a start signal is received.

Warm-up: Sets the amount of time the generator will run before synchronizing or closing to a dead bus.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

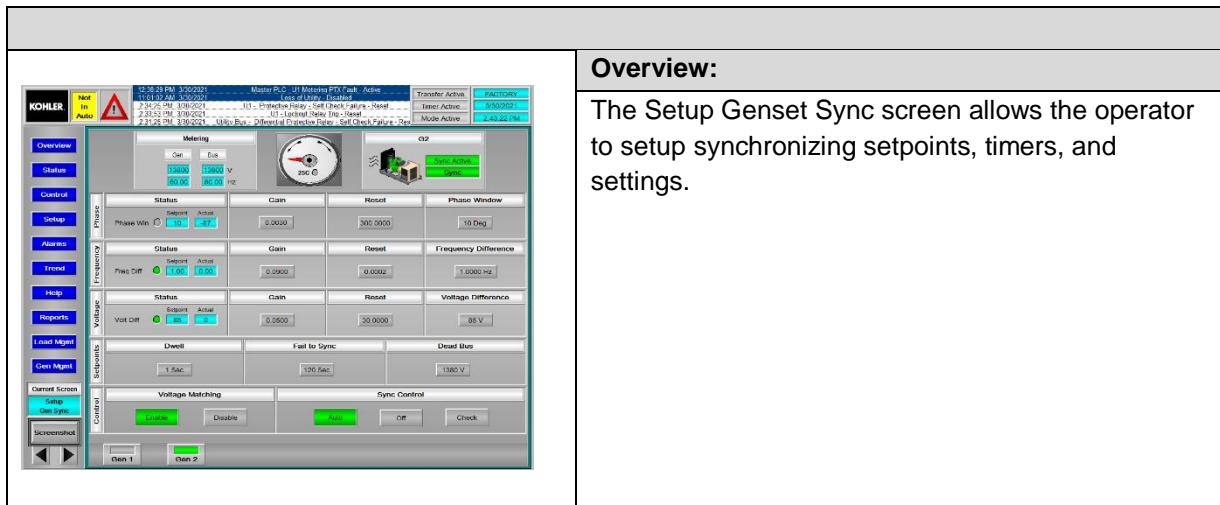
Speed Bias	
	Status:
	Freq: Displays the associated generator frequency. Bias: Displays the speed bias output to the engine controller, in volts.
	Control:
	Direct: Touch Direct to place bias control in Direct mode. While in direct an increase in bias will result in an increase in speed. Indirect: Touch Indirect to place bias control in Indirect mode. Indirect control indicates an increase in bias will result in a decrease in speed.
	Setup:
	Center Volts: Sets the center voltage for the analog speed bias output. Adj Range: Sets the maximum adjustment range for the analog speed bias output. Error Level: Scales the analog output for speed bias to normalize the output level for the speed control type installed on the generator. Nominal: Adjust with breaker open to make generator run at 60Hz (Adjust speed control to get generator to run as close to 60Hz as possible. Use this setting to fine tune the frequency to 60Hz). Adjust while paralleled to another gen. or more to make generators share load equally based on kW rating.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Voltage Bias	
  	Status:
	Volts: Displays the associated generator average voltage.
	Bias: Displays the voltage bias output to the engine controller, in volts.
Control: <p>Direct: Touch Direct to place bias control in Direct mode. While in direct an increase in bias will result in an increase in voltage.</p> <p>Indirect: Touch Indirect to place bias control in Indirect mode. Indirect control indicates an increase in bias will result in a decrease in voltage.</p>	
	Setup:
	<p>Center Volts: Sets the center voltage for the analog speed bias output.</p> <p>Adj Range: Sets the maximum adjustment range for the analog speed bias output.</p> <p>Error Level: Scales the analog output for speed bias to normalize the output level for the speed control type installed on the generator.</p> <p>Nominal: Adjust with breaker open to make generator voltage rated voltage (Adjust voltage regulator to get generator as close to rated voltage as possible. Use this setting to fine tune the voltage to rated voltage). Adjust while paralleled to another gen. or more to make generators share load equally based on kVAR rating.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.7.3 Setup > Genset Sync

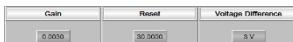


Metering	
	<p>Status:</p> <p>Gen: Displays the generator voltage and frequency.</p> <p>Bus: Displays the reference voltage and frequency.</p> <p>25C: Displays the external sync check Ok to Close.</p>

Phase							
<table border="1"> <tr> <td>Gain</td> <td>Reset</td> <td>Phase Window</td> </tr> <tr> <td>0.0000</td> <td>30.0000</td> <td>10 Deg</td> </tr> </table>	Gain	Reset	Phase Window	0.0000	30.0000	10 Deg	<p>Status:</p> <p>Phase Win: Illuminates green while synchronization is active and the source phase angle is within the phase window for the duration of the dwell timer.</p> <p>Setpoint: Displays the phase angle window setpoint.</p> <p>Actual: Displays the source phase angle.</p> <p>Setup:</p> <p>Gain: Sets the synchronizer's phase angle proportional gain.</p> <p>Reset: Sets the synchronizer's phase angle integral gain.</p> <p>Phase Window: Sets the maximum phase angle difference between the source and bus. While the source is within this setpoint the dwell timer will start.</p>
Gain	Reset	Phase Window					
0.0000	30.0000	10 Deg					

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Frequency	
 <p>Freq Diff: Illuminates green while synchronization is active and the source frequency is within the difference for the duration of the dwell timer.</p> <p>Setpoint: Displays the frequency difference setpoint.</p> <p>Actual: Displays the source frequency.</p>  <p>Gain: Sets the synchronizer's frequency match proportional gain.</p> <p>Reset: Sets the synchronizer's frequency match integral gain.</p> <p>Frequency Difference: Sets the maximum frequency difference between the source and bus. While the source is within this setpoint the dwell timer will start.</p>	<p>Status:</p> <p>Freq Diff: Illuminates green while synchronization is active and the source frequency is within the difference for the duration of the dwell timer.</p> <p>Setpoint: Displays the frequency difference setpoint.</p> <p>Actual: Displays the source frequency.</p> <p>Setup:</p> <p>Gain: Sets the synchronizer's frequency match proportional gain.</p> <p>Reset: Sets the synchronizer's frequency match integral gain.</p> <p>Frequency Difference: Sets the maximum frequency difference between the source and bus. While the source is within this setpoint the dwell timer will start.</p>

Voltage	
 <p>Volt Diff: Illuminates green while synchronization is active and the source voltage is within the difference for the duration of the dwell timer.</p> <p>Setpoint: Displays the frequency difference setpoint.</p> <p>Actual: Displays the source frequency.</p>  <p>Gain: Sets the synchronizer's frequency match proportional gain.</p> <p>Reset: Sets the synchronizer's frequency match integral gain.</p> <p>Voltage Difference: Sets the maximum voltage difference between the source and bus. While the source is within this setpoint the dwell timer will start.</p>	<p>Status:</p> <p>Volt Diff: Illuminates green while synchronization is active and the source voltage is within the difference for the duration of the dwell timer.</p> <p>Setpoint: Displays the frequency difference setpoint.</p> <p>Actual: Displays the source frequency.</p> <p>Setup:</p> <p>Gain: Sets the synchronizer's frequency match proportional gain.</p> <p>Reset: Sets the synchronizer's frequency match integral gain.</p> <p>Voltage Difference: Sets the maximum voltage difference between the source and bus. While the source is within this setpoint the dwell timer will start.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

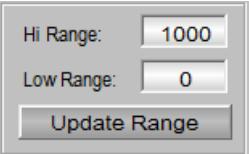
Setpoints	
	<p>Status:</p> <p>Dwell: Sets the duration each synchronization component must be within the setpoint. When all components are within their windows for the duration of the timer, and external 25C Ok to Close is active, the source is signaled to close.</p> <p>Fail to Sync: Sets the duration a source is given to synchronize. If this timer expires a Fail to Synchronize alarm is give and the synchronization is stopped.</p> <p>Dead Bus: Sets the dead bus level for the source. If the bus voltage is below this setpoint, sync will be disabled.</p>

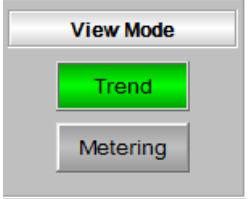
Control	
	<p>Control:</p> <p>Voltage Matching Enable: Touch Enable to activate the voltage synchronizing component.</p> <p>Voltage Matching Disable: Touch Disable to turn off the voltage synchronizing component. The system will determine synchronization based on phase angle and frequency.</p> <p>Sync Control Auto: Touch to place synchronization in Auto. This allows the PLC to control when the generator will synchronize to the running bus.</p> <p>Sync Control Off: Touch to place synchronization in Off. Disables source synchronization and the source will not close to the bus.</p> <p>Sync Control Check: Touch to place synchronization in Check, the source must be at rated voltage and frequency and the bus energized.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

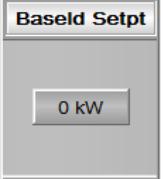
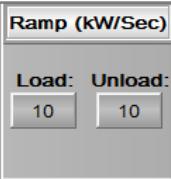
6.7.4 Setup > Genset kW Control

Generator kW Control		Overview:
 <p>The screenshot shows the 'Generator kW Control' screen. On the left is a vertical menu bar with items like Overview, Status, Control, Setup, Alarms, Trend, Help, Diagnostic, Load Mgmt, Gen Mgmt, Current Screen, and Screenshot. The main area has two sections: a top section with a chart showing power levels from 0 to 1000 kW and a bottom section with a table for 'Gen 1' and 'Gen 2'. The table columns include Status, Mode Ctrl, CB Ctrl, Baseload Setpt, Ramp (kW/Sec), Load Control, and kW Setpts. It also includes sub-tables for 'Load' and 'Gen' under 'Load Control'.</p>	<p>The Setup Genset kW Control screen allows the operator to setup ramp rates, load control, and baseload setpoints.</p>	

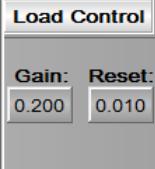
Chart Range		Setup:
 <p>The screenshot shows the 'Chart Range' setup screen. It features three input fields: 'Hi Range' (set to 1000), 'Low Range' (set to 0), and a 'Update Range' button. The 'Update Range' button is highlighted in red.</p>	<p>Hi range: Sets the top range of the trending chart.</p> <p>Low Range: Sets the bottom range of the trending chart.</p> <p>Update Range: Touching Update Range adjusts the trending chart for the new ranges.</p>	

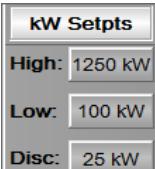
View Mode		Control:
 <p>The screenshot shows the 'View Mode' control screen. It has three buttons: 'View Mode' (highlighted in green), 'Trend' (highlighted in red), and 'Metering'.</p>	<p>Trend: Changes the top view of the screen to a strip chart trending the kW levels of the installed generators.</p> <p>Metering: Changes the top view of the screen to a table view of multiple metering quantities of the installed generators such as voltage, current, frequency, kW, and power factor.</p>	

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Mode Control	
	<p>Control:</p> <p>kW Share: Places the associated generator in kW Share operation mode.</p> <p>Baseload: Places the associated generator in Baseload operation mode.</p>
CB Control	
	<p>Control:</p> <p>Run Online: Starts the generator, synchronizes to the generator bus, and closes online.</p> <p>Run Offline: Starts the generator but keeps the circuit breaker open.</p>
Baseload Setpoint	
	<p>Setup:</p> <p>Baseload Setpt: Sets the load level to which the generator will be loaded when Baseload is selected for load control.</p>
Ramp Rates	
	<p>Setup:</p> <p>Load Ramp (kW/Sec): Sets the rate at which load will be applied to the generator.</p> <p>Unload Ramp (kW/Sec): Sets the rate at which load will be removed from the generator.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Load Control	
	<p>Setup:</p> <p>Gain: Sets the load control's proportional gain.</p> <p>Reset: Sets the load control's integral gain.</p>

kW Setpoints	
	<p>Setup:</p> <p>High: Sets the highest load level that the generator will be driven to while in baseload control.</p> <p>Low: Sets the lowest load level that the generator will be driven to while in baseload control.</p> <p>Disc.: Sets the disconnect load level at which the generator will be tripped offline when unloading to go offline.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.7.5 Setup > Genset kW Share

Generator kW Share

Generator	Metering	CB Ctrl	Speed Bias	PID
Gen 1	kW 251 Bias 2.600	CB Vts Run Online Run Offline	CB Vts Range 2.60 Err Lvl 0	0.000 kg 0.000 kg 0.000 kg
Gen 2	kW 251 Bias 2.600	CB Vts Run Online Run Offline	CB Vts Range 2.60 Err Lvl 0	0.000 kg 0.000 kg 0.000 kg

Overview:
The Setup Genset kW Share screen allows the operator to setup gain and bias setpoints for generator kW sharing.

Chart Range

Setup:	<input type="text" value="Hi Range: 1000"/> <input type="text" value="Low Range: 0"/> <input type="button" value="Update Range"/>
---------------	---

Hi range: Sets the top range of the trending chart.
Low Range: Sets the bottom range of the trending chart.
Update Range: Touching Update Range adjusts the trending chart for the new ranges.

View Mode

Control:	<input type="button" value="View Mode"/> <input style="background-color: green; color: white; border: none; padding: 2px 10px; margin-right: 10px;" type="button" value="Trend"/> <input type="button" value="Metering"/>
-----------------	---

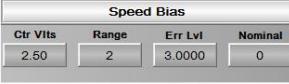
Trend: Changes the top view of the screen to a strip chart trending the kW levels of the installed generators.
Metering: Changes the top view of the screen to a table view of multiple metering quantities of the installed generators such as voltage, current, frequency, kW, and power factor.

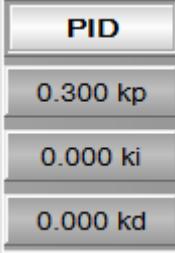
CB Control

Control:	<input type="button" value="CB Ctrl"/> <input type="button" value="Run Online"/> <input type="button" value="Run Offline"/>
-----------------	---

Run Online: Starts the generator, synchronizes to the generator bus, and closes online.
Run Offline: Starts the generator but keeps the circuit breaker open.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Speed Bias	
	<p>Setup:</p> <p>Center Volts: Sets the center voltage for the analog speed bias output.</p> <p>Adj Range: Sets the maximum adjustment range for the analog speed bias output.</p> <p>Error Level: Scales the analog output for speed bias to normalize the output level for the speed control type installed on the engine-generator.</p> <p>Nominal: Adjust with breaker open to make generator run at 60Hz (Adjust speed control to get generator to run as close to 60Hz as possible. Use this setting to fine tune the frequency to 60Hz). Adjust while paralleled to another gen. or more to make generators share load equally based on kW rating.</p>

PID	
	<p>Setup:</p> <p>kp: Sets the kW load sharing proportional gain.</p> <p>ki: Sets the kW load sharing integral gain.</p> <p>kd: Sets the kW load sharing derivative gain.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.7.6 Setup > Genset kVAR Share

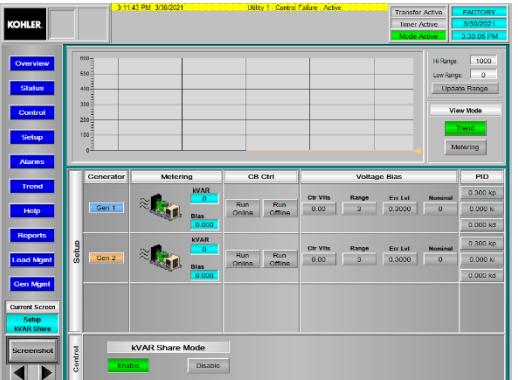
Generator kVAR Share		Overview:
	<p>The Setup Genset kVAR Share screen allows the operator to setup gain and bias setpoints for generator kVAR sharing.</p>	

Chart Range		Setup:
<div style="border: 1px solid #ccc; padding: 10px; width: 150px;"> Hi Range: <input type="text" value="1000"/> Low Range: <input type="text" value="0"/> <input type="button" value="Update Range"/> </div>	<p>Hi range: Sets the top range of the trending chart.</p> <p>Low Range: Sets the bottom range of the trending chart.</p> <p>Update Range: Touching Update Range adjusts the trending chart for the new ranges.</p>	

View Mode		Control:
<div style="border: 1px solid #ccc; padding: 10px; width: 150px;"> <input type="button" value="View Mode"/> <input style="background-color: green; color: white; border: none; font-weight: bold; margin-top: 5px;" type="button" value="Trend"/> <input type="button" value="Metering"/> </div>	<p>Trend: Changes the top view of the screen to a strip chart trending the kW levels of the installed generators.</p> <p>Metering: Changes the top view of the screen to a table view of multiple metering quantities of the installed generators such as voltage, current, frequency, kW, and power factor.</p>	

CB Control		Control:
<div style="border: 1px solid #ccc; padding: 10px; width: 150px;"> <input type="button" value="CB Ctrl"/> <input type="button" value="Run Online"/> <input type="button" value="Run Offline"/> </div>	<p>Run Online: Starts the generator, synchronizes to the generator bus, and closes online.</p> <p>Run Offline: Starts the generator but keeps the circuit breaker open.</p>	

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Voltage Bias	
	<p>Setup:</p> <p>Center Volts: Sets the center voltage for the analog voltage bias output.</p> <p>Adj Range: Sets the maximum adjustment range for the analog voltage bias output.</p> <p>Error Level: Scales the analog output for voltage bias to normalize the output level for the voltage control type installed on the engine-generator.</p> <p>Nominal: Adjust with breaker open to make generator voltage rated voltage (Adjust voltage regulator to get generator as close to rated voltage as possible. Use this setting to fine tune the voltage to rated voltage). Adjust while paralleled to another gen. or more to make generators share load equally based on kVAR rating.</p>

PID	
	<p>Setup:</p> <p>kp: Sets the kVAR load sharing proportional gain.</p> <p>ki: Sets the kVAR load sharing integral gain.</p> <p>kd: Sets the kVAR load sharing derivative gain.</p>

VAR Share Mode	
	<p>Setup:</p> <p>Enable/Disable: Sets the reactive load sharing control within the PLC or the voltage regulator. On allows the PLC to control kVARs and Off allows the voltage regulator to control kVARs.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.7.7 Setup > Utility Sync

Overview:

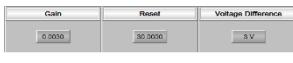
The Setup Utility Sync screen allows the operator to setup synchronizing setpoints, timers, and settings.

Metering	
	<p>Status:</p> <p>Gen: Displays the Utility voltage and frequency.</p> <p>Bus: Displays the reference voltage and frequency.</p> <p>25C: Displays the external sync check Ok to Close.</p>

Phase	
	<p>Status:</p> <p>Phase Win: Illuminates green while synchronization is active and the source phase angle is within the phase window for the duration of the dwell timer.</p> <p>Setpoint: Displays the phase angle window setpoint.</p> <p>Actual: Displays the source phase angle.</p> <p>Setup:</p> <p>Gain: Sets the synchronizer's phase angle proportional gain.</p> <p>Reset: Sets the synchronizer's phase angle integral gain.</p> <p>Phase Window: Sets the maximum phase angle difference between the source and bus. While the source is within this setpoint the dwell timer will start.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Frequency	
 <p>Freq Diff Setpoint 1.00 Actual 0.00</p>  <p>Gain 0.0000 Reset 0.0002 Frequency Difference 1.0000 Hz</p>	<p>Status:</p> <p>Freq Diff: Illuminates green while synchronization is active and the source frequency is within the difference for the duration of the dwell timer.</p> <p>Setpoint: Displays the frequency difference setpoint.</p> <p>Actual: Displays the source frequency.</p> <p>Setup:</p> <p>Gain: Sets the synchronizer's frequency match proportional gain.</p> <p>Reset: Sets the synchronizer's frequency match integral gain.</p> <p>Frequency Difference: Sets the maximum frequency difference between the source and bus. While the source is within this setpoint the dwell timer will start.</p>

Voltage	
 <p>Volt Diff Setpoint 0 Actual 0</p>  <p>Gain 0.0010 Reset 30.0000 Voltage Difference 5 V</p>	<p>Status:</p> <p>Volt Diff: Illuminates green while synchronization is active and the source voltage is within the difference for the duration of the dwell timer.</p> <p>Setpoint: Displays the frequency difference setpoint.</p> <p>Actual: Displays the source frequency.</p> <p>Setup:</p> <p>Gain: Sets the synchronizer's frequency match proportional gain.</p> <p>Reset: Sets the synchronizer's frequency match integral gain.</p> <p>Voltage Difference: Sets the maximum voltage difference between the source and bus. While the source is within this setpoint the dwell timer will start.</p>

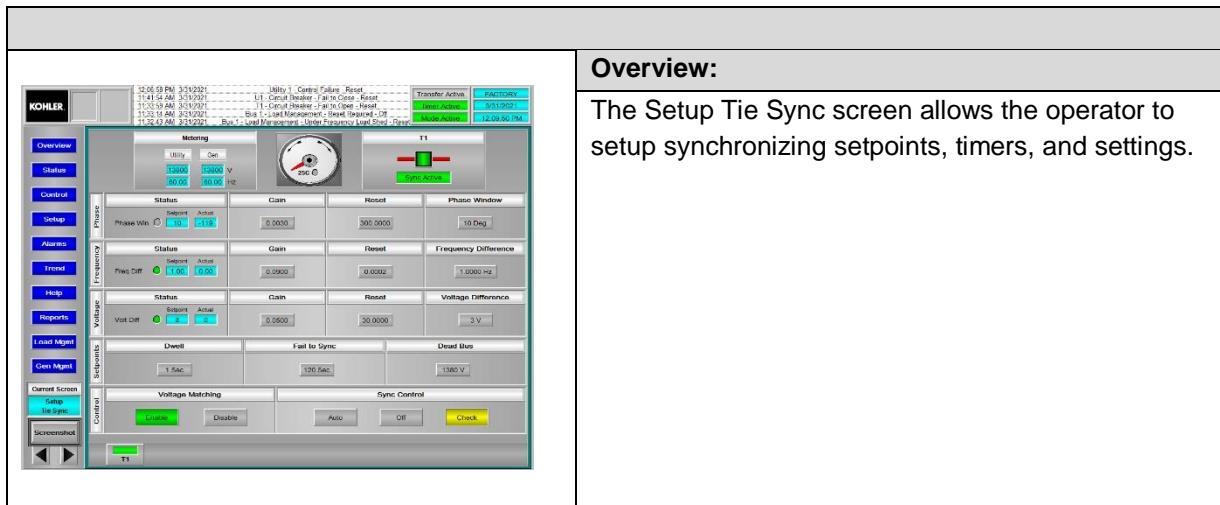
Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Setpoints	
	<p>Status:</p> <p>Dwell: Sets the duration each synchronization component must be within the setpoint. When all components are within their windows for the duration of the timer, and external 25C Ok to Close is active, the source is signaled to close.</p> <p>Fail to Sync: Sets the duration a source is given to synchronize. If this timer expires a Fail to Synchronize alarm is give and the synchronization is stopped.</p>

Control	
	<p>Control:</p> <p>Voltage Matching Enable: Touch Enable to activate the voltage synchronizing component.</p> <p>Voltage Matching Disable: Touch Disable to turn off the voltage synchronizing component. The system will determine synchronization based on phase angle and frequency.</p> <p>Sync Control Auto: Touch to place synchronization in Auto. This allows the PLC to control when the generator will synchronize to the running bus.</p> <p>Sync Control Off: Touch to place synchronization in Off. Disables source synchronization and the source will not close to the bus.</p> <p>Sync Control Check: Touch to place synchronization in Check, the source must be at rated voltage and frequency and the bus energized.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.7.8 Setup > Tie Sync

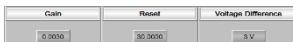


Metering	
	<p>Status:</p> <p>Gen: Displays the Utility voltage and frequency.</p> <p>Bus: Displays the reference voltage and frequency.</p> <p>25C: Displays the external sync check Ok to Close.</p>

Phase							
<table border="1"> <tr> <td>Gain</td> <td>Reset</td> <td>Phase Window</td> </tr> <tr> <td>0.0000</td> <td>30.0000</td> <td>10 Deg</td> </tr> </table>	Gain	Reset	Phase Window	0.0000	30.0000	10 Deg	<p>Status:</p> <p>Phase Win: Illuminates green while synchronization is active and the source phase angle is within the phase window for the duration of the dwell timer.</p> <p>Setpoint: Displays the phase angle window setpoint.</p> <p>Actual: Displays the source phase angle.</p> <p>Setup:</p> <p>Gain: Sets the synchronizer's phase angle proportional gain.</p> <p>Reset: Sets the synchronizer's phase angle integral gain.</p> <p>Phase Window: Sets the maximum phase angle difference between the source and bus. While the source is within this setpoint the dwell timer will start.</p>
Gain	Reset	Phase Window					
0.0000	30.0000	10 Deg					

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Frequency	
 <p>Freq Diff: Illuminates green while synchronization is active and the source frequency is within the difference for the duration of the dwell timer.</p> <p>Setpoint: Displays the frequency difference setpoint.</p> <p>Actual: Displays the source frequency.</p>  <p>Gain: Sets the synchronizer's frequency match proportional gain.</p> <p>Reset: Sets the synchronizer's frequency match integral gain.</p> <p>Frequency Difference: Sets the maximum frequency difference between the source and bus. While the source is within this setpoint the dwell timer will start.</p>	<p>Status:</p> <p>Freq Diff: Illuminates green while synchronization is active and the source frequency is within the difference for the duration of the dwell timer.</p> <p>Setpoint: Displays the frequency difference setpoint.</p> <p>Actual: Displays the source frequency.</p> <p>Setup:</p> <p>Gain: Sets the synchronizer's frequency match proportional gain.</p> <p>Reset: Sets the synchronizer's frequency match integral gain.</p> <p>Frequency Difference: Sets the maximum frequency difference between the source and bus. While the source is within this setpoint the dwell timer will start.</p>

Voltage	
 <p>Volt Diff: Illuminates green while synchronization is active and the source voltage is within the difference for the duration of the dwell timer.</p> <p>Setpoint: Displays the frequency difference setpoint.</p> <p>Actual: Displays the source frequency.</p>  <p>Gain: Sets the synchronizer's frequency match proportional gain.</p> <p>Reset: Sets the synchronizer's frequency match integral gain.</p> <p>Voltage Difference: Sets the maximum voltage difference between the source and bus. While the source is within this setpoint the dwell timer will start.</p>	<p>Status:</p> <p>Volt Diff: Illuminates green while synchronization is active and the source voltage is within the difference for the duration of the dwell timer.</p> <p>Setpoint: Displays the frequency difference setpoint.</p> <p>Actual: Displays the source frequency.</p> <p>Setup:</p> <p>Gain: Sets the synchronizer's frequency match proportional gain.</p> <p>Reset: Sets the synchronizer's frequency match integral gain.</p> <p>Voltage Difference: Sets the maximum voltage difference between the source and bus. While the source is within this setpoint the dwell timer will start.</p>

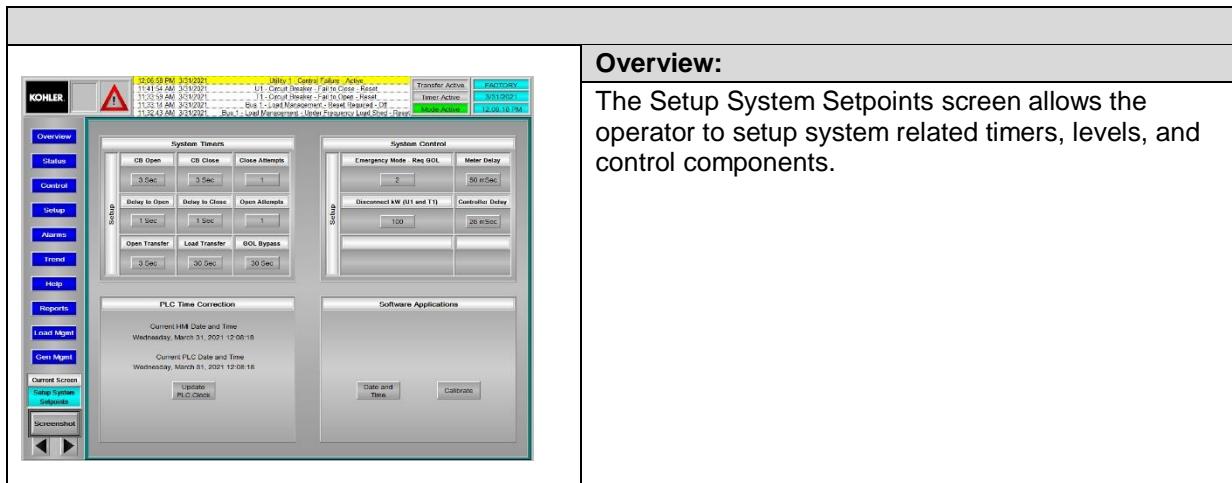
Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Setpoints	
	<p>Status:</p> <p>Dwell: Sets the duration each synchronization component must be within the setpoint. When all components are within their windows for the duration of the timer, and external 25C Ok to Close is active, the source is signaled to close.</p> <p>Fail to Sync: Sets the duration a source is given to synchronize. If this timer expires a Fail to Synchronize alarm is give and the synchronization is stopped.</p>

Control	
	<p>Control:</p> <p>Voltage Matching Enable: Touch Enable to activate the voltage synchronizing component.</p> <p>Voltage Matching Disable: Touch Disable to turn off the voltage synchronizing component. The system will determine synchronization based on phase angle and frequency.</p> <p>Sync Control Auto: Touch to place synchronization in Auto. This allows the PLC to control when the generator will synchronize to the running bus.</p> <p>Sync Control Off: Touch to place synchronization in Off. Disables source synchronization and the source will not close to the bus.</p> <p>Sync Control Check: Touch to place synchronization in Check, the source must be at rated voltage and frequency and the bus energized.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.7.9 Setup > System > Setpoints



Overview:

The Setup System Setpoints screen allows the operator to setup system related timers, levels, and control components.

System Setpoints	
	<p>Setup:</p> <p>CB Open: Sets the duration the PLC Output to open the circuit breaker is active.</p> <p>CB Close: Sets the duration the PLC Output to close the circuit breaker is active.</p> <p>Delay to Open: Sets the duration the PLC will wait before issuing an open command. This timer is not applicable during the first attempt to open the circuit breaker.</p> <p>Delay to Close: Sets the duration the PLC will wait before issuing a close command. This timer is not applicable during the first attempt to close the circuit breaker.</p> <p>Open Transfer: Sets the duration the bus will be de-energized before a source will close to the bus during an open transfer.</p> <p>GOL Bypass: Sets the duration the system will wait for all available generators to come online before closing the tie breaker.</p> <p>Load Transfer: Sets the duration the system will allow the utility and generators to be in parallel until one of the source breakers will be forced open.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Source Setpoints	
	Setup:
	EM – Req GOL: Sets the number of generators required online during Emergency Mode before closing the tie breaker.
	CB Open Attempts: Sets the number of times the system will try to open the breaker before issuing a Fail to Open alarm.
	CB Close Attempts: Sets the number of times the system will try to close the breaker before issuing a Fail to Close alarm.
	Disconnect kW: Sets the disconnect load level at which the utility or tie breaker will be tripped during a soft transfer between sources.

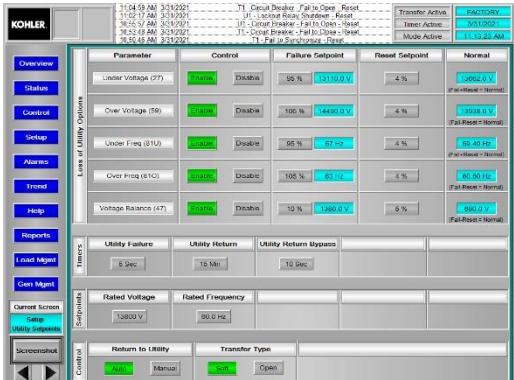
PLC Time Correction	
	Setup:
	Update PLC Clock: Touch to update the PLC time and date with the HMI date and time.

HMI Clock	
	Setup:
	Adjust Date and Time: Touch to change the HMI date and time.

Calibrate	
	Setup:
	Calibrate Touchscreen: Touch to run the application to calibrate the touch accuracy of the HMI.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.7.10 Setup > Utility Setpoints

Utility Setpoints		Overview:
	<p>The Setup Utility Setpoints screen allows the operator to set the conditions that will trigger a loss of utility, timers, setpoints, and control components regarding the utility.</p>	

Under Voltage (27)	
	Control:
	Enable: Touch to enable the associated loss of utility parameter.
	Disable: Touch to disable the associated loss of utility parameter. If all parameters are disabled an alarm is activated.
	Setup:
	Failure Setpoint: Sets the under voltage failure level. When a line to line voltage reading is less than or equal to this calculation and the control is enabled, the loss of utility timer will start.
	Reset Setpoint: Sets the under voltage reset level. When all line to line voltage readings are greater than or equal to the Normal calculation or the control is disabled, the failure is removed.
Status:	
Failure Setpoint: Displays the calculated failure level. Failure Setpoint * Rated Voltage = Failure Setpoint.	
Normal: Displays the calculated restoration level. (Failure Setpoint + Reset Setpoint) * Rated Voltage = Normal.	

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Over Voltage (59)	
	Control:
	<p>Enable: Touch to enable the associated loss of utility parameter.</p> <p>Disable: Touch to disable the associated loss of utility parameter. If all parameters are disabled an alarm is activated.</p>
	Setup:
	<p>Failure Setpoint: Sets the over voltage failure level. When a line to line voltage reading is greater than or equal to this calculation and the control is enabled, the loss of utility timer will start.</p> <p>Reset Setpoint: Sets the over voltage reset level. When all line to line voltage readings are less than or equal to the Normal calculation or the control is disabled, the failure is removed.</p>
	Status:
	<p>Failure Setpoint: Displays the calculated failure level. $\text{Failure Setpoint} * \text{Rated Voltage} = \text{Failure Setpoint}$.</p> <p>Normal: Displays the calculated restoration level. $(\text{Failure Setpoint} - \text{Reset Setpoint}) * \text{Rated Voltage} = \text{Normal}$.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Under Freq (81U)	
	Control:
	<p>Enable: Touch to enable the associated loss of utility parameter.</p> <p>Disable: Touch to disable the associated loss of utility parameter. If all parameters are disabled an alarm is activated.</p>
	Setup:
	<p>Failure Setpoint: Sets the under frequency failure level. When the frequency is less than or equal to this calculation and the control is enabled, the loss of utility timer will start.</p> <p>Reset Setpoint: Sets the under frequency reset level. When the frequency is greater than or equal to the Normal calculation or the control is disabled, the under frequency failure is removed.</p>
	Status:
	<p>Failure Setpoint: Displays the calculated failure level. $\text{Failure Setpoint} * \text{Rated Voltage} = \text{Failure Setpoint}$.</p> <p>Normal: Displays the calculated restoration level. $(\text{Failure Setpoint} + \text{Reset Setpoint}) * \text{Rated Voltage} = \text{Normal}$.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Over Frequency (81O)	
	Control:
	<p>Enable: Touch to enable the associated loss of utility parameter.</p> <p>Disable: Touch to disable the associated loss of utility parameter. If all parameters are disabled an alarm is activated.</p>
	Setup:
	<p>Failure Setpoint: Sets the over frequency failure level. When the frequency is greater than or equal to this calculation and the control is enabled, the loss of utility timer will start.</p> <p>Reset Setpoint: Sets the over frequency reset level. When the frequency is less than or equal to the Normal calculation or the control is disabled, the failure is removed.</p>
	Status:
	<p>Failure Setpoint: Displays the calculated failure level. $\text{Failure Setpoint} * \text{Rated Voltage} = \text{Failure Setpoint}$.</p> <p>Normal: Displays the calculated restoration level. $(\text{Failure Setpoint} - \text{Reset Setpoint}) * \text{Rated Voltage} = \text{Normal}$.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Voltage Imbalance (47)	
	Control:
	<p>Enable: Touch to enable the associated loss of utility parameter.</p> <p>Disable: Touch to disable the associated loss of utility parameter. If all parameters are disabled an alarm is activated.</p>
	Setup:
	<p>Failure Setpoint: Sets the voltage imbalance failure level. When two line to line voltage reads difference is greater than or equal to this calculation and the control is enabled, the loss of utility timer will start.</p> <p>Reset Setpoint: Sets the voltage imbalance reset level. When all line to line voltage reading differences are below than or equal to the Normal calculation or the control is disabled, the failure is removed.</p>
	Status:
	<p>Failure Setpoint: Displays the calculated failure level. $\text{Failure Setpoint} * \text{Rated Voltage} = \text{Failure Setpoint}$.</p> <p>Normal: Displays the calculated restoration level. $(\text{Failure Setpoint} - \text{Reset Setpoint}) * \text{Rated Voltage} = \text{Normal}$.</p>

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

Timers	
	Setup:
	Utility Failure: Sets the duration a utility parameter is out of tolerance before the system will commit a transfer to a stable source, while on utility power.
	Utility Return: Sets the duration all utility parameters are within tolerance and all conditions are active to return to utility power from emergency mode.
	Utility Return Bypass: Sets the minimum duration all utility parameters are within tolerance to allow the system to transfer to the utility source if all generators are failed.

Setpoint	
	Setup:
	Rated Voltage: Sets the rated voltage of the utility source.
	Rated Frequency: Sets the rated frequency of the utility source.

Control	
	Return to Utility:
	Auto: Touch Auto to place Return to Utility Control in Auto. This setting will allow the system to automatically return to utility power from generator power during emergency mode.
	Manual: Touch Manual to disable an automatic return to utility power from generator power during emergency mode.
	Return to Utility:
	Open: Touch to place the Transfer Type in Open. All operator initiated or automatic return to utility power transfers will be open transfer. There will be a loss of power to loads during these transfers for the duration of the open transfer timer.
	Soft: Touch to place the Transfer Type in Soft. All operator initiated or automatic return to utility power transfers will be soft transfer.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.7.11 Setup > System > Meter

System Meter

Overview:

The Setup System Meter screen allows the operator to set up for any source electrical properties being read from a power transducer.

Voltage Calibration

Setup:	Phase Voltage and Bus Voltage: Adjustable factors used to calibrate displayed voltage to measured voltage.
<input type="button" value="A Phase"/> <input type="button" value="B Phase"/> <input type="button" value="C Phase"/> <input type="button" value="Bus"/> 1.0000 1.0000 1.0000 1.0000	

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.7.12 Setup > System > Ranges

System Ranges		Overview:	
	<p>The Setup System Ranges screen sets the high limit for the respective gauges on the HMI.</p>		

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.8 Alarms

6.8.1 Alarms > Active

Alarms Active

Overview:

The Alarms Active screen displays active and acknowledged alarms and shutdowns. It also features reset and acknowledge control.

Alarm Display

Status:

Active Shutdowns: Shutdown alarms that have not been acknowledged are displayed in red.

Acknowledged Shutdowns: Shutdown alarms that are active and have been acknowledged are displayed in blue.

Active Alarms: Alarms that have not been acknowledged are displayed in yellow.

Acknowledged Alarms: Alarms that are active and have been acknowledged are displayed in blue.

Alarm Control

Control:

Ack Alarms: After an alarm has been reset, press Ack to clear the alarm or shutdown from this screen or the alarm banner.

NOTE: When Ack Alarms is touched, alarms are acknowledged on both the HMI and Desktop.

Reset: Press to reset a fail to close, fail to open, and fail to synchronize alarms.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.8.2 Alarms > Not in Auto

Alarms Not in Auto		Overview:
<p>The Alarms Not in Auto screen displays components that are currently not in automatic operation.</p>	<p>The Alarms Not in Auto screen displays components that are currently not in automatic operation.</p>	

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.8.3 Alarms > History

Alarms History		Overview:
	<p>The Alarms History screen displays past alarms, shutdowns, events, and operator actions of the system.</p>	

Time Period		Control:
<div style="text-align: center;"> <input type="button" value="Today"/> <input type="button" value="All"/> <input type="button" value="Custom"/> </div>	<p>Today: Filters the events, alarms, and shutdowns to show only the most recent data from the current day.</p> <p>All: Filters the events, alarms, and shutdowns to show all data recorded.</p> <p>Custom: Filters the events, alarms, and shutdowns to show only the data within a certain user defined date range.</p>	

Export		Control:
	<p>Export to File: Copies the data to a CSV file on the hard drive for later evaluation.</p> <p>File Name: The User can specify a unique file name before exporting the data to a CSV file.</p>	

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.9 Reports

6.9.1 Reports

Reports

Overview:

The Reports screen allows the user to view folders and export data to flash drives for the Settings Report, screenshots taken, Event Log, and Run Reports.

Generator Run Report

	Control:
	Export to Flash Drive: Touch to transfer run reports taken from the Status Run Report screen to a flash drive for external use.
	View Run Reports: Touch to view the folder on the hard drive that stores the created run reports.

Screenshots

	Control:
	Export to Flash Drive: Touch to transfer the screenshots folder to a flash drive for external use.
	View Screenshots: Touch to view the folder on the hard drive that stores the screenshots that have been taken.

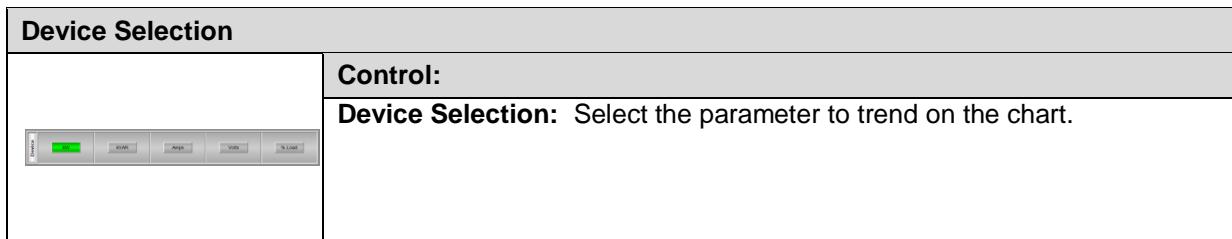
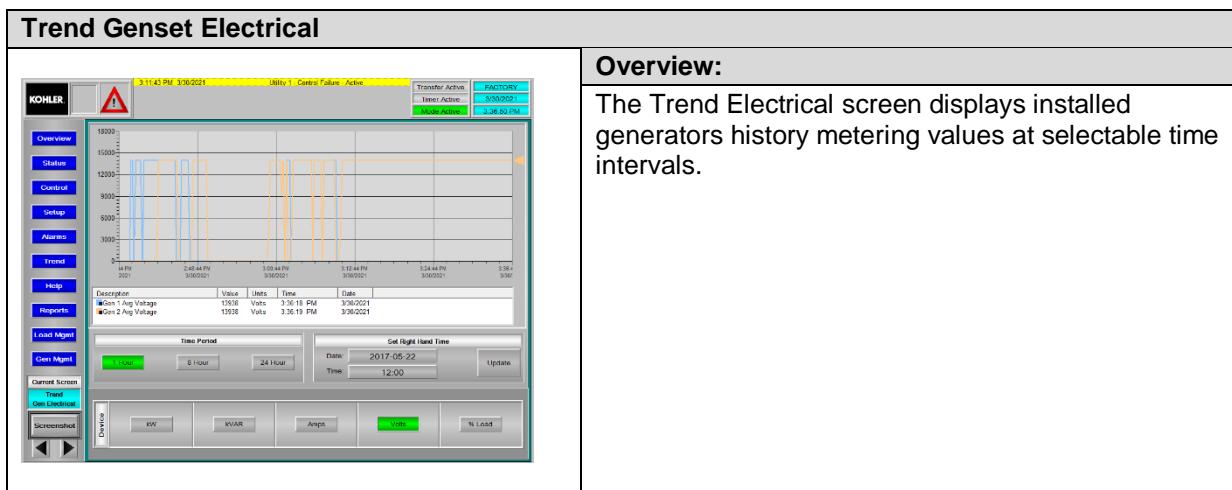
Event Log

	Control:
	Export to Flash Drive: Touch to transfer event log reports taken from the Alarm History screen to a flash drive for external use.
	View Event Logs: Touch to view the folder on the hard drive that stores the created event logs.

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

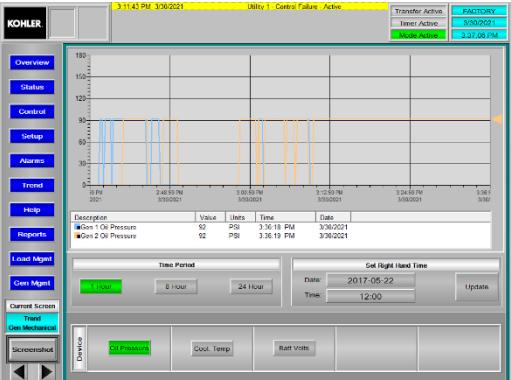
6.10 Trend

6.10.1 Trend > Genset Electrical



Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.10.2 Trend > Genset Mechanical

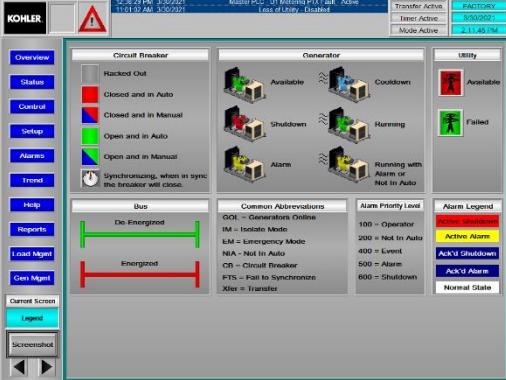
Trend Genset Mechanical																
 <p>The screenshot shows a historical data chart for two generators. The Y-axis represents a value from 0 to 180, and the X-axis shows time intervals from 2:45 PM to 3:30 PM on 3/30/2021. Two series are plotted: Gen 1 Oil Pressure (blue) and Gen 2 Oil Pressure (orange). Below the chart is a table with the following data:</p> <table border="1"> <thead> <tr> <th>Description</th> <th>Value</th> <th>Units</th> <th>Time</th> <th>Date</th> </tr> </thead> <tbody> <tr> <td>Gen 1 Oil Pressure</td> <td>92</td> <td>PSI</td> <td>3:16:19 PM</td> <td>3/30/2021</td> </tr> <tr> <td>Gen 2 Oil Pressure</td> <td>92</td> <td>PSI</td> <td>3:36:19 PM</td> <td>3/30/2021</td> </tr> </tbody> </table> <p>At the bottom, there are buttons for '1 Hour', '0 Hour', '24 Hour', 'Set Right Hand Time' (Date: 2017-05-22, Time: 12:00), and 'Update'. On the left, a vertical menu lists: Overview, Status, Control, Setup, Alarms, Trend (highlighted in blue), Help, Reports, Load Mgmt, Gen Model, Current Screen, Trend Genset Mechanical (highlighted in blue), and Screenshot.</p>	Description	Value	Units	Time	Date	Gen 1 Oil Pressure	92	PSI	3:16:19 PM	3/30/2021	Gen 2 Oil Pressure	92	PSI	3:36:19 PM	3/30/2021	Overview: <p>The Trend Mechanical screen displays installed generators history metering values at selectable time intervals.</p>
Description	Value	Units	Time	Date												
Gen 1 Oil Pressure	92	PSI	3:16:19 PM	3/30/2021												
Gen 2 Oil Pressure	92	PSI	3:36:19 PM	3/30/2021												

Device Selection	
 <p>The screenshot shows a list of parameters for selection:</p> <ul style="list-style-type: none"> Gen 1 Oil Pressure Cool. Temp Batt Volts 	Control: <p>Device Selection: Select the parameter to trend on the chart.</p>

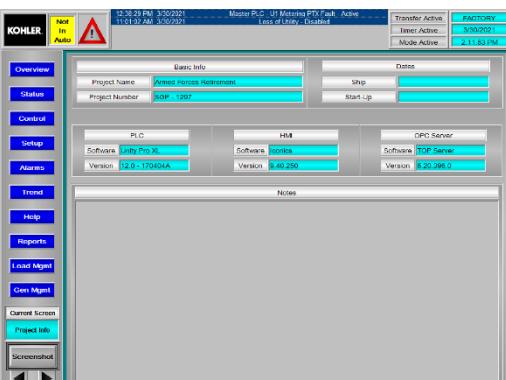
Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.11 Help

6.11.1 Help > Legend

<p>Legend</p> 	<p>Overview:</p> <p>The Help Legend screen displays information about abbreviations, symbols, and color schemes commonly used throughout the HMI.</p>
--	--

6.11.2 Help > Project Information

<p>Project Information</p> 	<p>Overview:</p> <p>The Help Project Information screen displays information about the project including software versions used and project number.</p>
---	--

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.11.3 Help > Load Management State History

Project Information			
	Overview: The Help Load Management State History screens displays the current state of the Load Management State Machine and a history of past states for trouble shooting proposes. Touch Reset to reset the state history.		

6.11.4 Help > Generator State History

Project Information			
	Overview: The Help Gen State History screen displays the current state of the associated generator's Engine Sequencer State Machine and a history of past states for trouble shooting proposes. Touch Reset to reset the state history.		

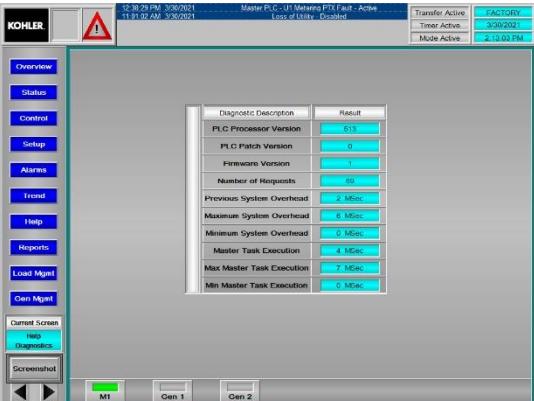
Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.11.5 Help > Main State History

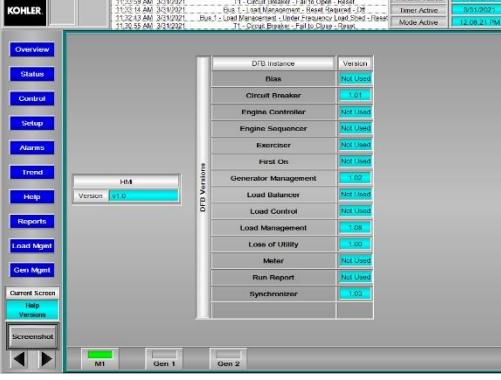
Overview:			
<p>The Help Gen State History screens display the current Main State Machine's history for troubleshooting proposes.</p> <p>Touch Reset to reset the state history.</p>			

Operation Manual – PLC/HMI Upgrade	SGP#	SO#	Date
Armed Forces Retirement Center	1297	1019754586	3/28/2021

6.11.6 Help > Diagnostics

Diagnostics		Overview:
 <p>The Diagnostic screen displays information used for trouble shooting proposes.</p>		

6.11.7 Help > Versions

Versions		Overview:
 <p>The Diagnostic Versions screen displays information used for troubleshooting purposes.</p>		