

Advanced DCS Operator's Manual

1. Theory of Operation

1.1. What the AdvDCS offers

The Advanced DCS gives the MEP 1060 and MEP 1070 Advanced Medium Mobile Power Source (AMMPS) generators the capability to automatically start, stop and parallel based on the system load demand. It also provides the ability to remotely start and stop the generator set from an external microprocessor controlled device via CAN messaging.

Auto and Front Face CAN are mutually exclusive. Auto will be used when the generators are in a network configuration to start, stop and parallel the generators to meet system demand. Front Face CAN will be used for a single generator to start and stop using an outside control method. This can be done remotely.

1.2. Tactical Microgrid System

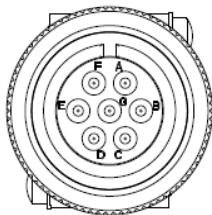
The AMMPS Tactical Microgrid System allows the use of combinations of up to five MEP 1060 and MEP 1070 AMMPS Generators with the capability to automatically start, stop and parallel based on the system load demand. The system is designed to allow for multiple generators to safely parallel and share load. The system is for 50/60 Hz generators only and allows for up to 360 kW of power on the network.

2. REMOTE MODE – FRONT FACE CAN

2.1. Section I. J1939 CAN

All connections will be made with a fully terminated (120 ohms at both ends) cable that meets the SAE J1939 standards. Connection to the AMMPS Control Box will be made at the 7 pin connector labeled NETWORK. Connection will be made with 7 pin MIL-STD connector MS3106F16S-1P. Connections should be made according the following Table:

Function	Pin
CAN HI	D
CAN LO	E
SHIELD	F



Example Layout:



The AMMPS Control will use address **0x20** and will look for messages from address **0x10**. The priority of these messages is always 0x18.

The PGNs will be taken from the group of Cummins internal PGNS and are defined below.

3. PGNS

3.1. Broadcast from the Advanced DCS

PGN	PGN Name	Start Bit	Length	End Bit	Variable Name	Offset	Scaling	Tx Rate
65316	Event Updates	0	16	15	Current Active Warning	0	1	.1 Hz and upon change
		16	16	31	Current Active Fault	0	1	
		32	1	32	E-Stop Fault Status	0	1	
		33	1	33	Battleshort Status	0	1	
		34	1	34	Dead Bus Local	0	1	
		35	1	35	Genset CB Position Status	0	1	

PGN	PGN Name	Start Bit	Length	End Bit	Variable Name	Offset	Scaling	Tx Rate
65315	Operating Hours and Fuel Level	0	16	15	Fuel Level %	0	.1	Every 3 min
		16	16	31	MLD Maintenance Countdown	0	.1	
		32	24	55	MLD Genset Running Time	0	.1	

3.2. Broadcast from Launch Control

PGN	PGN Name	Start Bit	Length	End Bit	Variable Name	Description	Tx Rate
0xFF16	Front Face CAN Commands	0	2	1	E-Stop	00 – Reserved 01 – E-Stop OFF 10 – E-Stop ON 11 - Undefined	Every Second
		2	2	3	BattleShort	00 – Reserved 01 – Battleshort OFF 10 – Battleshort ON 11 - Undefined	
		4	2	5	Run Command	00 – Reserved 01 – Don't Run 10 – Run 11 - Undefined	
		6	2	7	Circuit Interrupter	00 – Reserved 01 – Circuit Interrupter Open 10 – Circuit Interrupter Close 11 - Undefined	
		8		63	Reserved		

All reserved bits should be set to 1.

3.3. Response from Advanced DCS

PGN	PGN Name	Start Bit	Length	End Bit	Variable Name	Description	Tx Rate
0xFF17	Event Updates	0	4	3	Genset Status	0000 – Not Ready to Crank 0001 – Ready to Crank 0010 – Delay to Crank – Wtr Kit 0011 – Delay to Crank- Glw Plg 0100 – Crank 0101 – Running 0110 – Emergency Stop 0111 – Idle Mode 1000 – Powering Down 1001 – Factory Test 1010 – Delay to Crank – Winter Kit Test 1011 – Delay to Crank – Winter Kit Detect 1100 – Delay to Crank – ECM Datasave 1101 – Running – Synchronizing 1110 – Running – Synchronized 1111 – Running - Load Share	This PGN will be transmitted as a response to 0xFF16 so there will be no specific transmit rate
		4	2	5	Control Switch Position	00 – OFF 01 – Prime and Run AUX Fuel 10 – Prime and Run 11 - Start	

3.4. Enable

Front Face CAN can only be enabled when the set is in Ready Mode – visible on the HMI of the generator. In addition to being in Ready Mode, the rotating switch needs to be in Prime and Run or Prime and Run Aux Fuel. Battleshort has to be OFF, and there can be no active faults.

Front Face CAN and auto are mutually exclusive. When using Front Face CAN the generator can be switched to a different mode, but if its in auto then switched to Front Face CAN it will disable auto and there will be a fault.

The Front Face CAN enable screen is accessible from the About screen by holding down the second softkey from the left for 3 seconds.

3.5. Disable

Front Face CAN will be Disabled when any fault becomes active, when battle short becomes active, if the unit is turned OFF from the HMI, if the unit is turned ON from the HMI when it is currently off but Front Face CAN is enabled, when any of the static button on the HMI are used (i.e. AC CIRCUIT INTERRUPT button), if it shares a networks with auto enabled sets, or when E-Stop is activated.

All Faults must be cleared using the HMI to be able to re-Enable Front Face CAN.

3.6. Remote Mode Warnings - Troubleshooting

3.6.1.[Fault 6247: Shared Network]

3.6.1.1. Symptom

Fault 6247: Shared Network is displayed on the screen

3.6.1.2. Malfunction

The network is shared between sets in Remote and sets in Network.

3.6.1.3. Corrective Action

- a. Disconnect Network generators.
- b. Press [Fault Reset] pushbutton on DCS

3.6.2.[Warning 6248: Multiple Remote Sets]

3.6.2.1. Symptom

Warning 6248: Multiple Remote Sets is displayed on the screen

3.6.2.2. Malfunction

The network is shared between multiple sets in Remote.

3.6.2.3. Corrective Action

- a. Disconnect all but one Remote set.
- b. Press [Fault Reset] pushbutton on DCS

3.6.3.Warning 6249: Remote Communication Lost]

3.6.3.1. Symptom

Warning 6249: Remote Communication Lost is displayed on the screen

3.6.3.2. Malfunction

The Remote Control has not communicated for at least 3 seconds.

3.6.3.3. Corrective Action

- a. Verify connection to the remote control.
- b. If connection is present, verify that the remote control is sending the 0xFF16 message at 1 Hz.

4. AUTO MODE

4.1. Connecting Microgrid Paralleling Cables

Paralleling cables are used to establish paralleling communication for the AMMPS Microgrid. Connect parallel cables per WP 0006-2 of the operator's manual (TM 9-6115-752-10 for the MEP 1060 and 9-6115-753-10 for the MEP 1070).

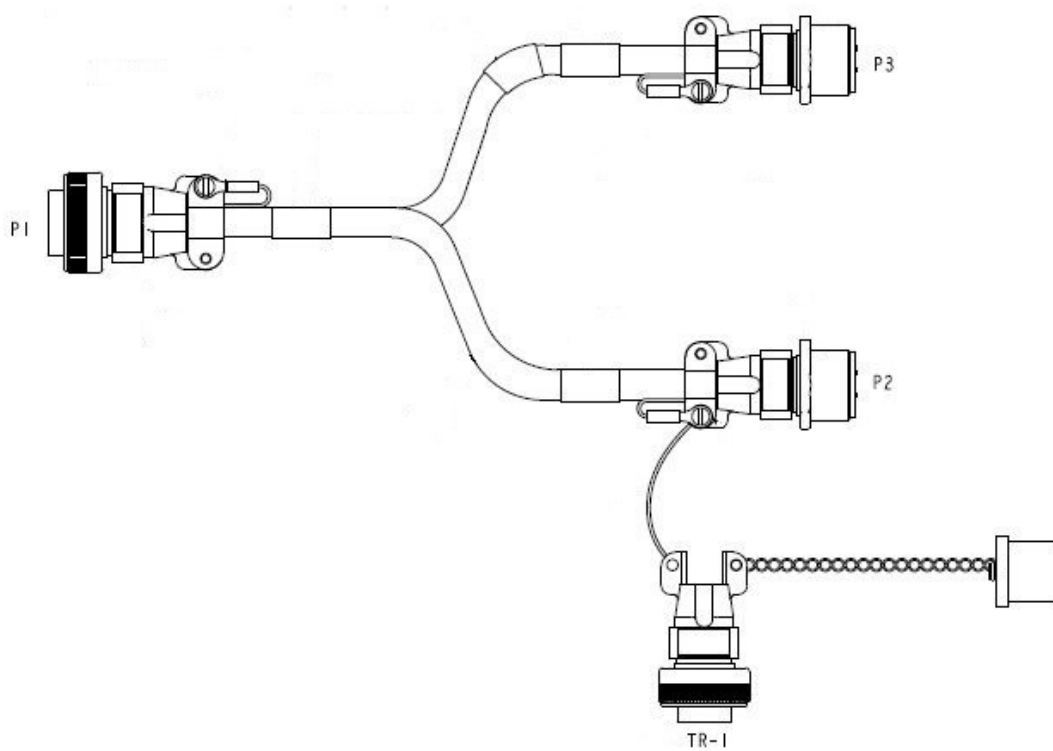
4.2. Connecting Microgrid Communication Cables.

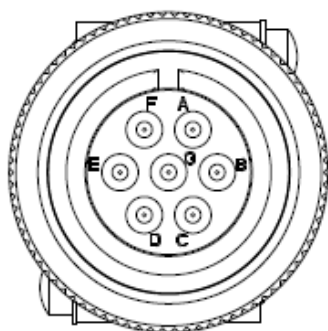
CAN Bus communication cables are used to establish the Microgrid network. To establish the communication network, use the following steps:

- a. Connect P1 of a network cable to the network receptacle on the face of the DCS. Do this on each generator that will be included in the network.
- b. On the first generator, cap plug P-2 with terminating resistor TR-1.

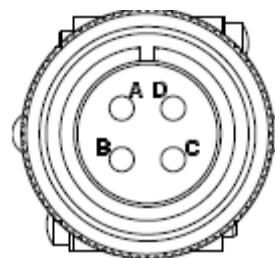
Use the network extension harness to connect plug P3 of the first generator's network cable to plug P2 of the second generator's network cable. Continue this same sequence for each generator in the network. On the last generator connected to the network, cap the unused P3 plug with terminating resistor TR-1.

Network Cable

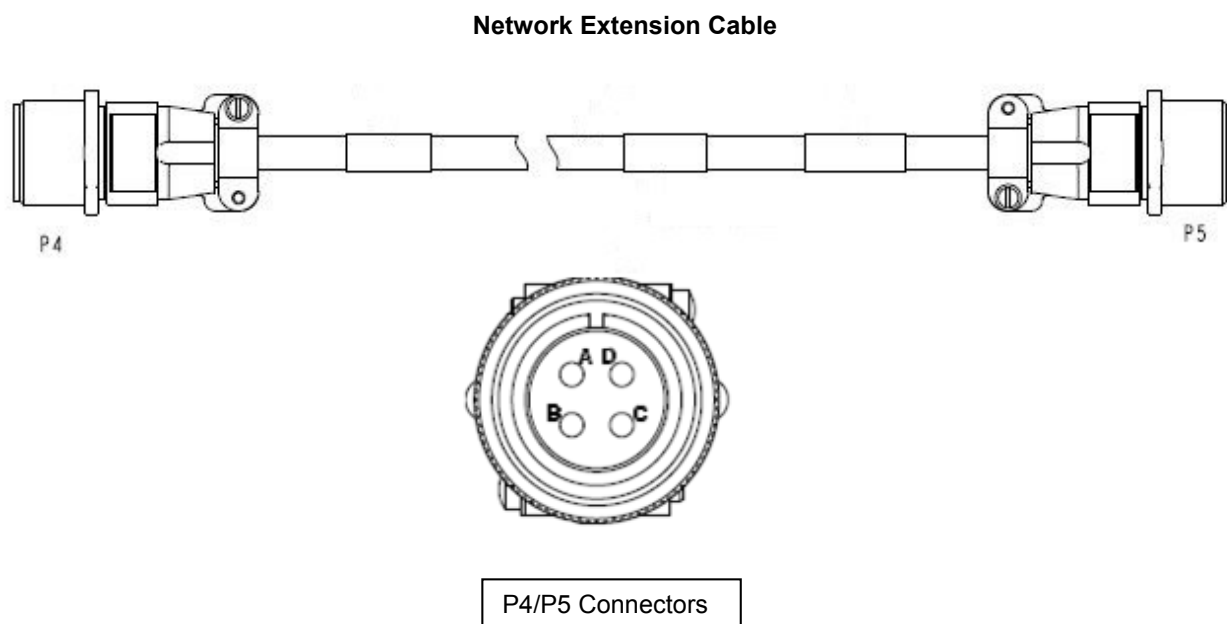




P1 Connector



P2/P3/TR-1 Connector



4.3. INITIAL ADJUSTMENTS, CHECKS, AND SELF TEST.

Refer to TM 9-6115-752-10 (MEP 1060) or 9-6115-753-10 (MEP 1070) for initial adjustments, checks, and self test.

4.4. OPERATING PROCEDURES.

4.4.1. Generator Set Operating Procedures.

Refer to TM 9-6115-752-10 (MEP 1060) or 9-6115-753-10 (MEP 1070) for generator set operating procedures.

4.4.1.1. Operating a Single Generator Set.

For instructions on operating a single generator set, refer to 9-6115-752-10 (MEP 1060) or 9-6115-753-10 (MEP 1070).

WARNING

Do not operate equipment until it is properly grounded and all load terminals are not shorted.
Failure to observe this warning can result in severe personal injury or death.

4.4.1.2. Operating Generator Sets in Parallel.

The generator sets can be operated in parallel through the switch box. When paralleling at the switch box, refer to TM 9-6115-752-10 (MEP 1060) or 9-6115-753-10 (MEP 1070) WP 0006:

WARNING

Prior to making any connections for parallel operation, ensure that there is no input to the load and that the generator sets are shut down. Failure to observe this warning can result in serious injury or death by electrocution.

WARNING

Never attempt to start the generator set if it is not properly grounded. Failure to observe this warning can result in serious injury or death by electrocution.

4.4.1.3. Operating Generator Sets in Auto (Microgrid) Mode.

WARNING

Sets in AUTO mode will start automatically and without warning. Sets in AUTO mode must be removed from the network for maintenance. Failure to comply may cause injury or death to personnel.

WARNING

Direct Current (DC) voltages are present at generator set electrical components even with generator set shut down. Avoid shorting any positive with ground/negative. Do not ground yourself in standing water. Failure to comply may cause injury or death to personnel and damage to equipment.

WARNING

Ensure generator sets are shut down and output terminal board has no voltage prior to making any connections for parallel operation or moving a generator set that has been operating in parallel. Operating generator sets always contain the risk of electrocution. Failure to comply may cause injury or death to personnel.

WARNING

High voltage is produced when generator set is in operation. Do not connect to a load that is not protected with appropriate safety devices. Do not connect from output terminal board to output terminal board unless directed by higher command. Never attempt to start the generator set unless it is properly grounded. Do not ground your-self in standing water. Never attempt to connect or disconnect load cables while the generator set is running. Do not contact output cables when operating this generator set. Make sure that the connection between generator set and load is completely de-energized (safety device opens circuit) prior to disconnecting load cables or performing maintenance on the output terminal board. Failure to comply may cause injury or death to personnel.

WARNING

Exhaust discharge contains deadly gases, including carbon monoxide. Exhaust gases are most dangerous in places with poor ventilation. Do not operate generator set in an enclosed area unless exhaust discharge is properly vented. Failure to comply may cause injury or death to personnel.

WARNING

When operating, generator set engine has hot metal surfaces that will burn flesh on contact. Shut down generator set and allow engine to cool before checks, services, and maintenance. Wear gloves and additional protective clothing as required. Failure to comply may cause injury or death to personnel.

CAUTION

The parallel operation for generator set must be accomplished before AUTO mode procedures can be performed. Failure to comply may cause damage to equipment.

CAUTION

No less than two generators and no more than five generators may be networked together. No more than 360kW may be on the network. Failure to comply may cause damage to equipment.

CAUTION

Removing the parallel cable from any set when in parallel or AUTO configurations may cause damage to equipment.

4.4.1.4. Auto Mode Setup / Add Generator to Network

Note: See 'MLD Parameter Default Settings' section for the factory default settings and values

- a. Before the generators can be placed into Auto Mode, they must first be turned on and put into parallel operation. Follow these steps to put all generators into parallel mode:
 - (1) Place the crank switch into the NORMAL position.
 - (2) Place the main DC circuit breaker into the ON position.
 - (3) Pull the emergency stop switch into the OUT position.
 - (4) Turn the engine control switch to PRIME & RUN position and HOLD until the DCS displays 'Genset Mode: Ready to Crank'.
 - (5) Flip the engine control switch to START and return to PRIME & RUN or PRIME & RUN AUX FUEL position, as required.
 - (6) Allow the generator to idle until the DCS displays 'Genset Mode: Running' and the frequency reaches rated frequency (60Hz)
 - (7) Press the UNIT PARALLEL button and wait for the DCS to display 'Genset Mode: Synchronized'.
 - (8) Press the AC CIRCUIT INTERRUPT button and verify that the DCS displays 'Genset Mode: Load Share'.
 - (9) Repeat steps 1-8 until all sets are running and paralleled.
- b. To place all generators into Auto Mode, use the following steps:
 - (1) At the DCS on any generator in the network, press [About] (Figure 4-1, item 1).

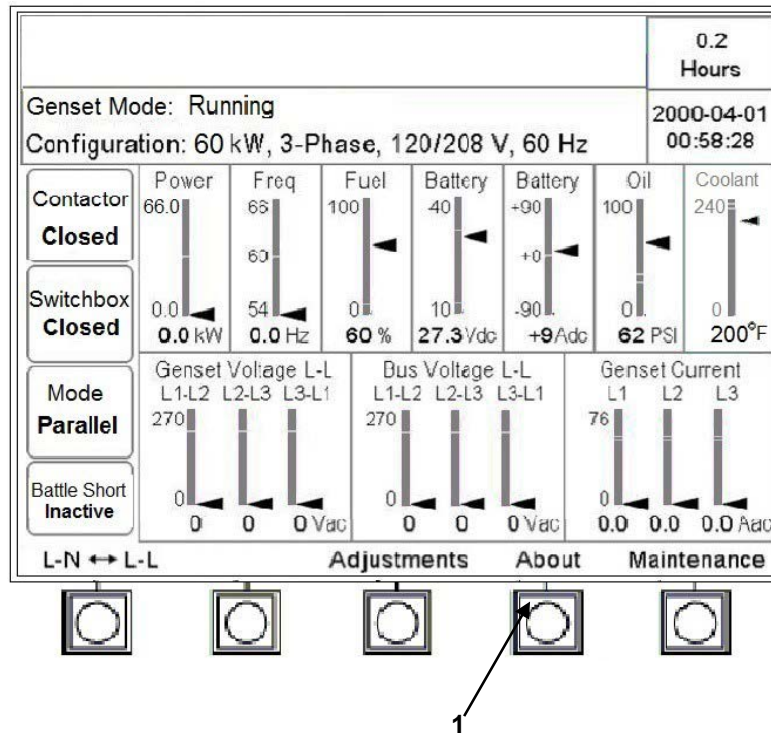


Figure 4-1. Main Screen

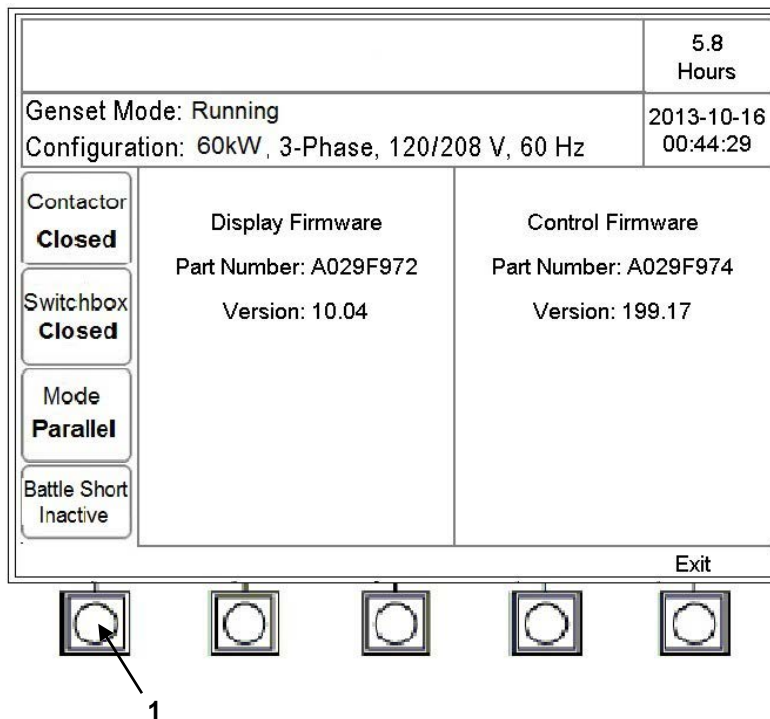


Figure 4-2. About Screen

- (2) Press the [First] soft-key (figure 4-2, item 1) for three (3) seconds to change the display context to the [Auto Mode] screen (figure 4-3).
- (3) If [Auto Mode] (Figure 4-3, item 1) is not highlighted, press [Next] (Figure 4-3, item 2) until it is.
- (4) Press [Select] (Figure 4-3, Item 3).

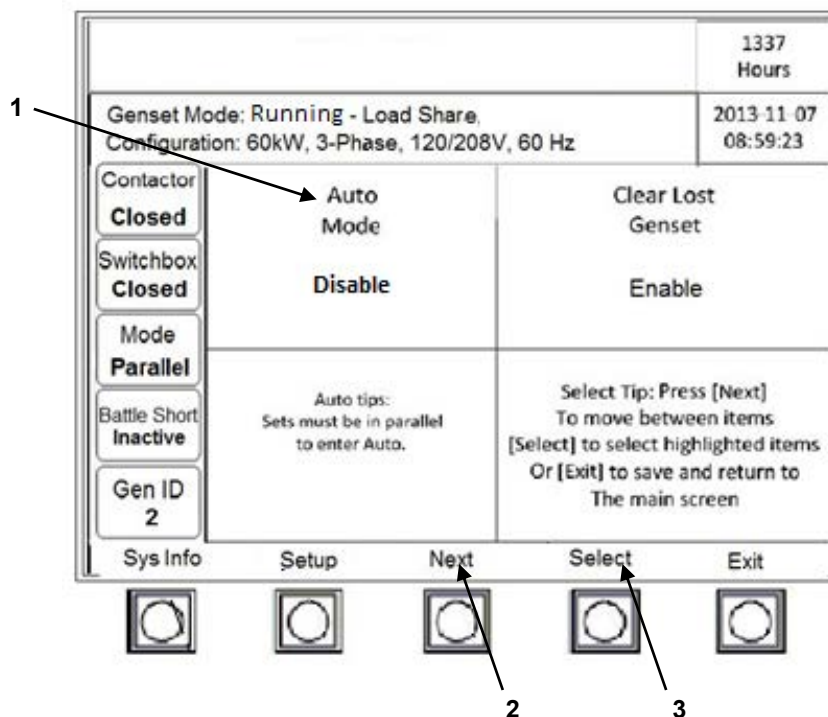


Figure 4-3. Auto Mode Screen

- (5) Press [+] (Figure 4-4, Item 1) to display [Enable].
- (6) Press [Accept] (Figure 4-4, item 2) to enable Auto Mode.
- (7) Press [Exit] (Figure 4-4, item 3) to save settings and return to [Auto Main Screen] screen.
- (8) Repeat steps (1) thru (7) for remaining networked generators until all generators are in Auto mode.

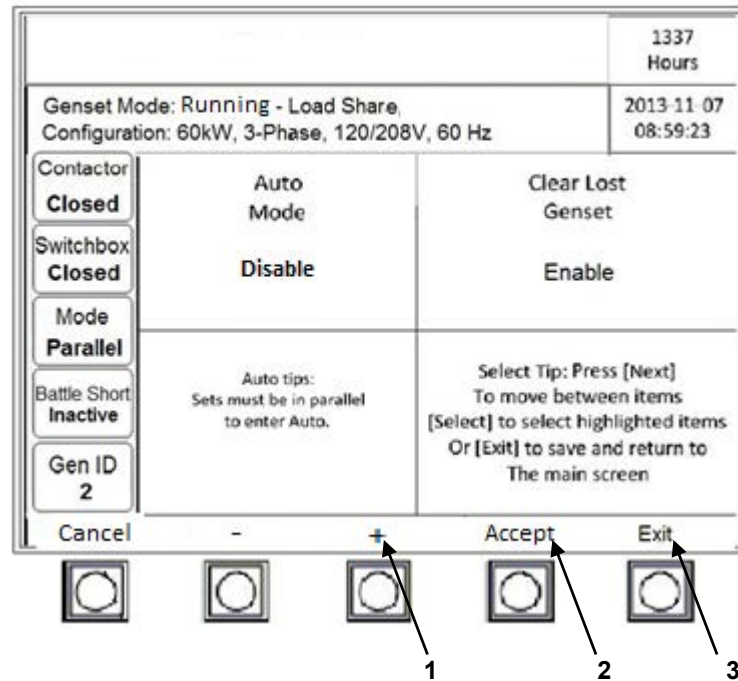


Figure 4-4. Auto Mode Select Screen

4.4.1.5. Adjust Auto Mode Settings.

NOTE

Press [Exit] from any screen to return to the [Auto Mode Main] screen when in Auto Mode.

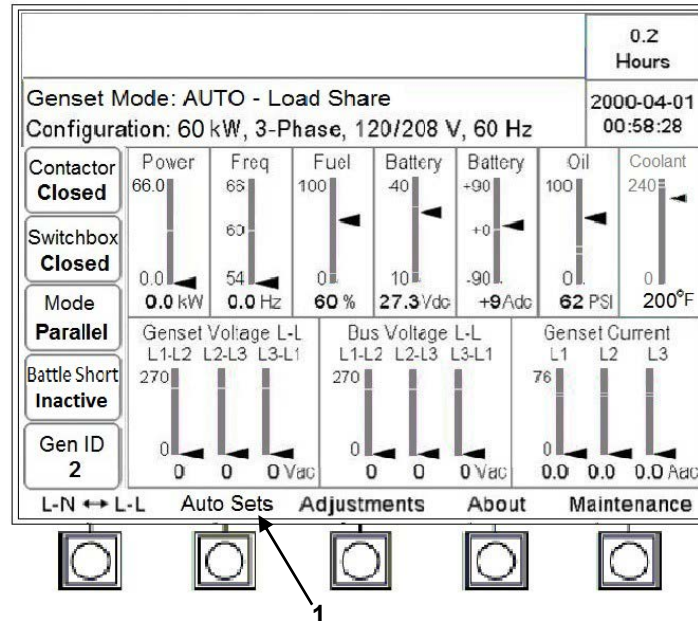


Figure 4-5. Auto Mode Main Screen

- Press [Auto Sets] (figure 4-5, item 1).
- Press [Setup] (figure 4-6, item 1).

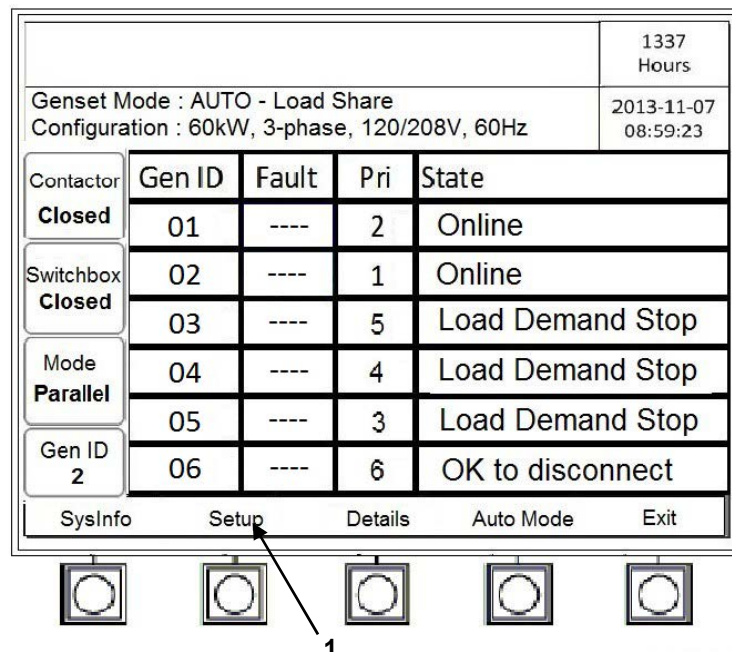


Figure 4-6. Auto Sets Screen

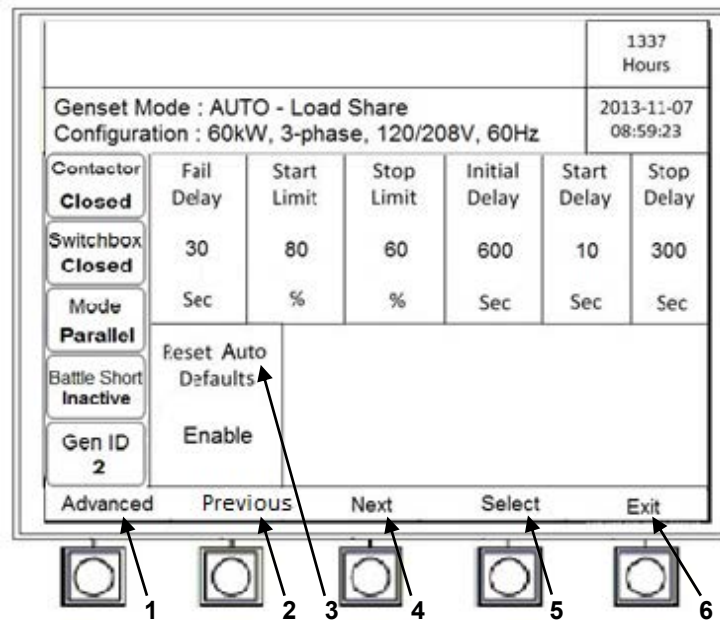


Figure 4-7. System Setup Screen

- c. Verify settings on [System Setup] screen (figure 4-7). If no adjustments are desired, proceed to step k.
- d. Press [Next] (figure 4-7, item 4) or [Previous] (figure 4-7, item 2) to highlight areas for selection.
- e. Once desired area is highlighted, press [Select].

CAUTION

If [Restore Auto Defaults] is highlighted and selected, pressing [Accept] immediately restores calibration default settings. These settings may not be suitable for application the network is providing power for. Restoring default settings may result in generator or equipment shutdown or damage. Verify application requirements prior to restoring factory defaults.

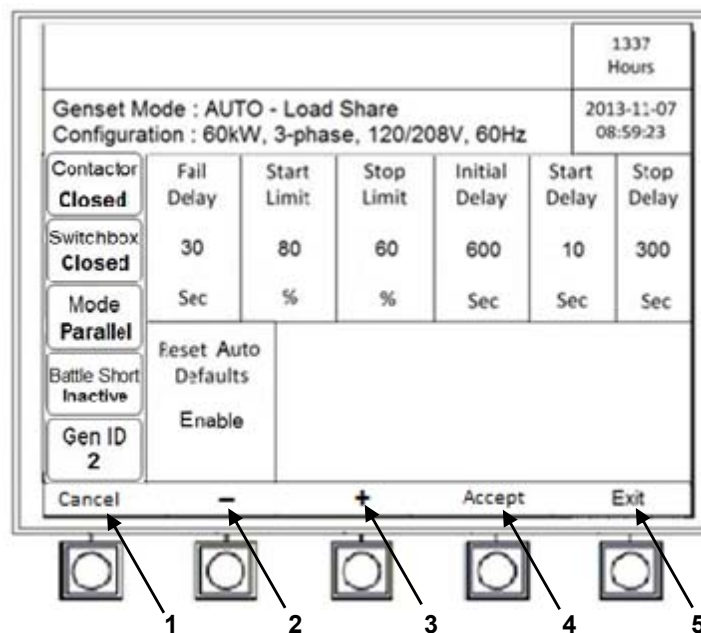


Figure 4-8. System Setup Select Screen

- f. If [Reset Auto Defaults] was selected and restoring defaults is desired, press [Accept] (figure 4-8, item 4). If restoring defaults is not desired, press [Cancel] (figure 4-8, item 1).
- g. Press [+] (Figure 4-8, Item 3) or [-] (figure 4-8, item 2) and [Next] to adjust parameter.
- h. Once parameter is adjusted, press [Accept] (figure 4-8, item 4).
- i. Repeat steps d thru h for remaining parameters.
- j. Press [Exit] (figure 4-8, item 5) to sync Auto mode settings and return to the [Auto Mode Main] screen.
- k. Repeat steps 1 and 2 to return to the [System Setup] screen (figure 4-7).
- l. Press [Advanced] (figure 4-7, item 1).

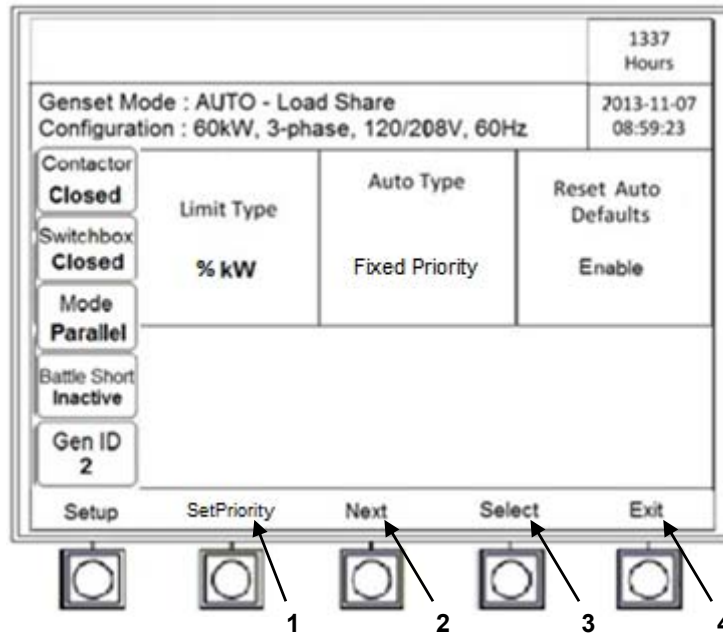


Figure 4-9. Advanced Setup Screen [Fixed Priority]

- m. Verify settings displayed on [Advanced Setup] screen (figure 4-9). If no adjustments are desired, proceed to step p.

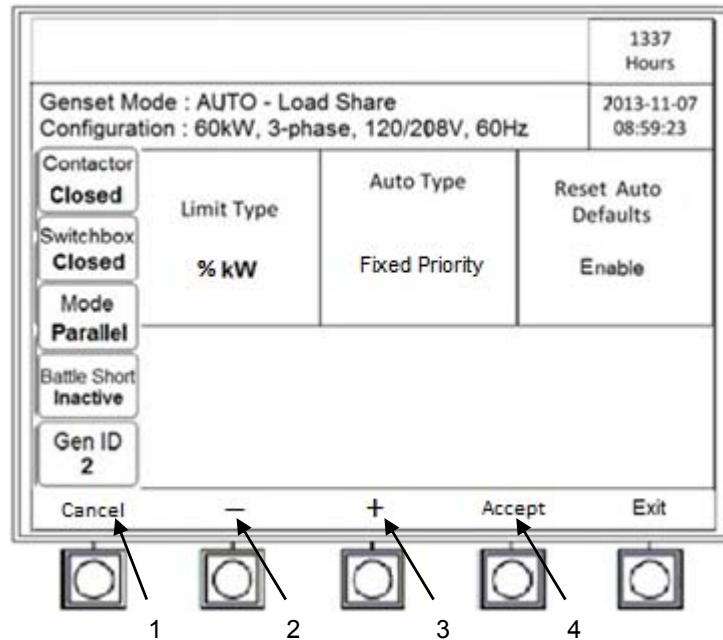


Figure 4-10. Advanced Setup Select Screen

- n. Press [Next] (figure 4-9, item 2) to highlight areas for selection.
- o. Once desired area is highlighted, press [Select] (figure 4-9, item 3).
- p. If [Reset Auto Defaults] was selected and restoring defaults is desired, press [Accept] (figure 4-10, item 4). If restoring defaults is not desired, press [Cancel] (figure 4-10, item 1).
- q. Press [+] (Figure 4-10, Item 3) or [-] (figure 4-10, item 2) to adjust parameter.
- r. Once parameter is adjusted, press [Accept] (figure 4-10, item 4).
- s. Repeat steps n thru r for remaining parameters.
- t. If [Auto Type] on [Advanced Setup] screen is [Run Hours], proceed to step v.
- u. Press [Set Priority] (figure 4-9, item 1) to access [Fixed Priority] screen (figure 4-11).
- v. If run hour priority is desired, press [Advanced] (figure 4-11, item 1) and proceed to step n.
- w. Verify settings on [Fixed Priority] screen (figure 4-11). If no adjustments are desired, proceed to step dd.

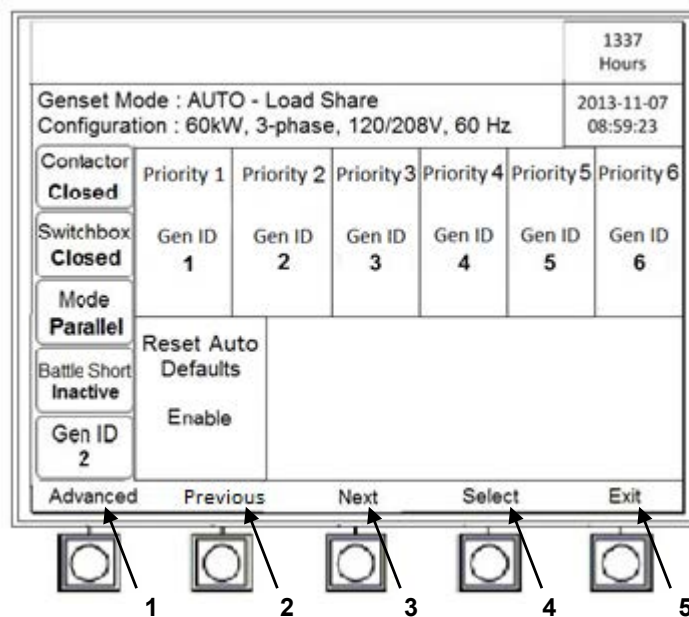


Figure 4-11. Fixed Priority Screen

- x. Press [Previous] (figure 4-11, item 2) or [Next] (figure 4-11, item 3) to highlight areas for selection.
- y. Once desired area is highlighted, press [Select] (figure 4-11, item 4).

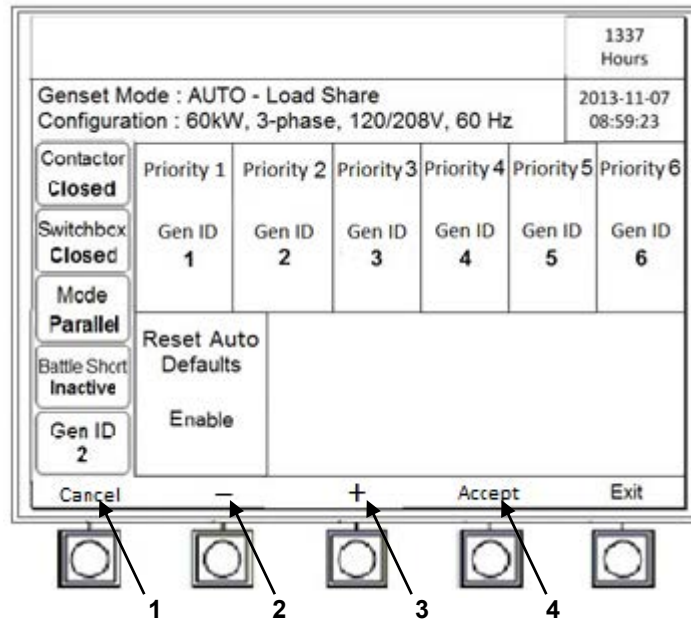


Figure 4-12. Fixed Priority Select Screen

- z. If [Reset Auto Defaults] was selected and restoring defaults is desired, press [Accept] (figure 4-12, item 4). If restoring defaults is not desired, press [Cancel] (figure 4-12, item 1).
- aa. Press [+] (Figure 4-12, Item 3) or [-] (figure 4-12, item 2) to adjust parameter.
- bb. Once parameter is adjusted, press [Accept] (figure 4-12, item 4).
- cc. Repeat steps x thru bb for remaining parameters.
- dd. Press [Exit] (figure 4-12, item 5) to return to [Auto Mode Main Screen] screen.
- ee. If network setup based on fixed priority is desired, proceed to step n.

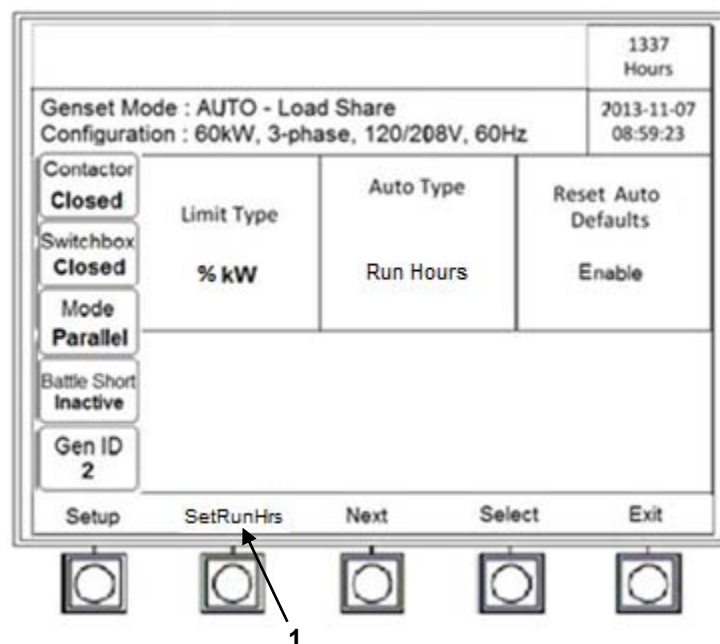


Figure 4-13. Advanced Setup Screen (Run Hours)

ff. Press [SetRunHrs] (figure 4-13, item 1)

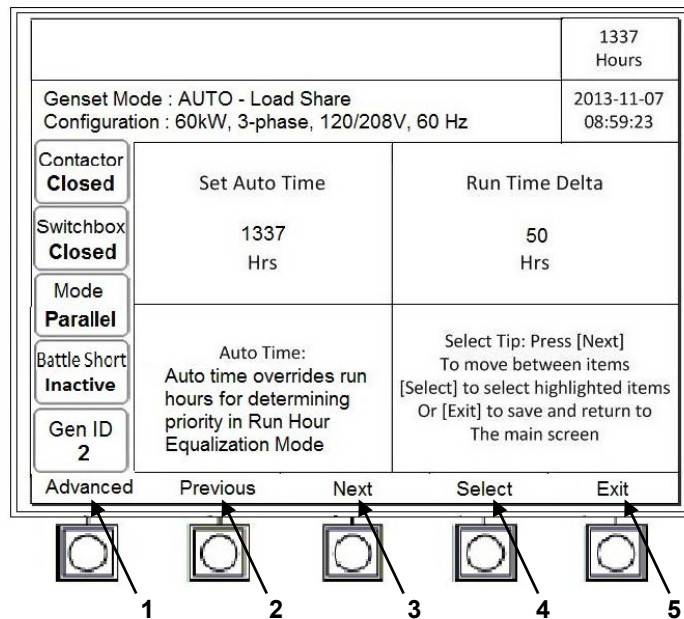


Figure 4-14. Run Hours Priority Screen

gg. Verify settings displayed on [Run Hours Priority] screen (figure 4-14). If no adjustments are desired, proceed to step mm.

hh. Press [Previous] (figure 4-14, item 2) or [Next] (figure 4-14, item 3) to highlight areas for selection.

ii. Once desired area is highlighted, press [Select] (figure 4-14, item 4).

jj. Press [+] (Figure 4-15, Item 3) or [-] (figure 4-15, item 2) and [Next] to adjust parameter.

kk. Once parameter is adjusted, press [Accept] (figure 4-15, item 4).

ll. Repeat steps hh thru kk for remaining parameters.

mm. Press [Exit] (figure 4-14, item 5) to return to [Auto Mode Main Screen] screen (figure 4-15).

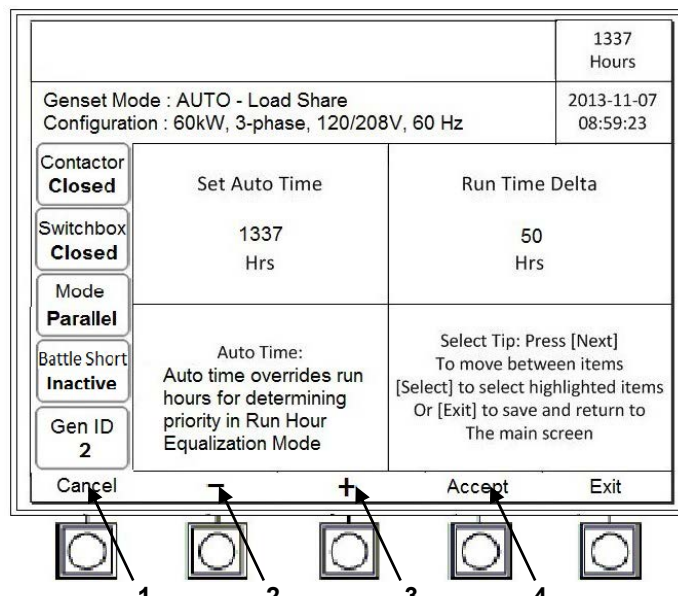


Figure 4-15. Run Hours Priority Select Screen

4.4.1.6. Remove a Generator from Network Configuration

NOTE

Press [Exit] from any screen to return to the [Auto Mode Main Screen] screen when in Auto Mode.

NOTE

If only one Generator on the network is running, removing it from Auto Mode will cause all other generators on the network to start.

- a. Press [Auto Sets] (figure 4-5, item 1).
- b. Press [AutoMode] (figure A-3, item 8).
- c. If [Auto Mode] (Figure 4-3, item 1) is not highlighted, press [Next] (Figure 4-3, item 2) until it is.
- d. Press [Select] (Figure 4-3, Item 3)
- e. Press [+] (Figure 4-8, Item 3) to display [Disable].
- f. Press [Accept] (Figure 4-8, item 4) to disable Auto Mode.
- g. Press [Exit] (Figure 4-8, item 5) to save settings and return to [Main Screen] screen.
- h. If set is not running:
 - (1) Turn engine control switch to OFF.
 - (2) Push in emergency stop.
 - (3) Place main DC circuit breaker into the OFF position.
 - (4) Place the dead crank switch into the OFF position.
- i. If set is running:
 - (1) Push AC circuit interrupt switch to place generator contactor in [CONTACTOR OPEN] position.
 - (2) Press the [Unload] soft key to exit from parallel operation.
 - (3) Allow set to idle with no load for 5 minutes.
 - (4) Turn engine control switch to OFF.
 - (5) Push in emergency stop.
 - (6) Place main DC circuit breaker into the OFF position.
 - (7) Place the dead crank switch into the OFF position.

4.4.1.7. Clear Lost Generator from Network

- a. Press [Auto Sets] (figure 4-5, item 1)
- b. Press [AutoMode] (figure A-3, item 8).
- c. Press [Next] (Figure 4-3, item 2) until [Clear Lost Genset] is highlighted.
- d. Press [Select] (Figure 4-3, Item 3)
- e. Press [Accept] (Figure 4-8, item 4) to clear lost generators.
- f. Press [Exit] (Figure 4-8, item 5) to return to [Main Screen] screen

Note: See 'MLD Parameter Default Settings' section for the factory default settings and values

5. Network Troubleshooting Index.

5.1. NETWORK WARNINGS

5.1.1.[WARNING 4872: AUTO CAN COMM FAILED]

5.1.1.1. Symptom

[Warning 4872: Auto CAN Comm Failed] displayed on DCS screen.

5.1.1.2. Malfunction

NOTE

When this Warning reports, the network will enter HALT mode and all connected generators will start.

No network communication is detected by generator displaying this indication.

5.1.1.3. Corrective Action

NOTE

If this warning is reporting with other network faults, troubleshoot this warning first. Network communication warnings may cause other network warnings to report.

If Warning 4872 reports on all connected network generators, proceed to step b.

- a. Attempt to clear warning by pressing [Fault Reset] switch on DCS. If fault returns within ~5 seconds, continue troubleshooting. Otherwise, network communication has returned to normal and no further action is necessary.
- b. Check network cable and terminating resistors for proper installation per TM 9-6115-752-10 or TM 9-6115-753-10.
- c. Check and repair network cables per (WP0101, General Maintenance) step d. If network cable assembly checked good, re-establish network per TM 9-6115-752-10 or 9-6115-753-10. If fault recurs, attempt to isolate malfunctioning generator by connecting one generator at a time to the network. Fault should recur once suspect generator is reconnected to the network.
- d. Once suspected generator is determined, replace DCS per TM 9-6115-752-24&P or 9-6115-752-24&P, WP 0017, REMOVE/REPLACE DCS

5.1.2.[WARNING 4873: GEN FAILED TO COME ONLINE]

5.1.2.1. Symptom

[Warning 4873: Gen Failed to Come Online] displayed on DCS screen.

5.1.2.2. Malfunction

Generator detects another network generator's transition-to-online has failed

5.1.2.3. Corrective Action

NOTE

If warnings 4872, 4876, or 4878 are reporting anywhere on network, troubleshoot those warnings prior to this symptom. Network communication warnings may cause other network warnings to report.

This warning is shown by all network generators except the one causing that failed to come online.

- a. Check generators and determine which generator failed to come online
- b. At generator that did not come online, check for FAULTS and WARNINGS. If FAULTS or WARNINGS are present, troubleshoot and repair them prior to reestablishing network communication and testing AUTO operation.

NOTE

Generators may take several seconds to stabilize and synchronize with network after starting, especially during cold weather.

- c. Check, and if necessary, adjust [Fail Delay] parameter in basic setup screen. The default setting is 60 seconds.

5.1.3.[WARNING 4874: LOAD DEMAND VERSION INCOMPATIBILITY]

5.1.3.1. Symptom

[Warning 4874: Load Demand Version incompatibility] displayed on DCS screen.

NOTE

When this Warning reports, the network will enter HALT mode and all connected generators will start.

5.1.3.2. Malfunction

Two or more network generators have different versions of MLD feature. MLD features are significantly different and are incompatible may be either hardware or software differences.

5.1.3.3. Corrective Action

NOTE

If Warning 4872, 4876, or 4878 are reporting anywhere on network, troubleshoot those Warnings prior to this symptom. Network communication warnings may cause other network warnings to report.

- a. Perform Initial calibration per (WP101, General Maintenance) on all generators
- b. Replace DCS(s) or generator(s) until all network sets are compatible with each other.

5.1.4.[WARNING 4875: GENSET INELIGIBLE FOR AUTO]

5.1.4.1. Symptom

[Warning 4875: Genset Ineligible for Auto] displayed on DCS screen.

5.1.4.2. Malfunction

Network generator rendered ineligible for MLD.

5.1.4.3. Corrective Action

NOTE

If Warning 4872, 4876, or 4878 are reporting anywhere on network, troubleshoot those Warnings prior to this symptom. Network communication warnings may cause other network warnings to report.

This warning reports on all generator sets except the ineligible one.

- a. Check all network generators and determine which one(s) is ineligible.
- b. Check for faults on ineligible set. If faults are present, troubleshoot faults per TM 9-6115-752-24&P (MEP 1060) or TM 9-6115-753-24&P (MEP 1070).
- c. Check to see if ineligible generator is in AUTO mode. If not, attempt to re-establish AUTO mode per TM 9-6115-752-10 or 9-6115-753-10.
- d. Check master control switch is not set to OFF. If OFF, turn switch back to appropriate run mode and reestablish network communication per TM 9-6115-752-10 or 9-6115- 753-10.
- e. Check generator mode. Generator should be in parallel mode. If in unit mode, press [UNIT/PARALLEL] switch to enter parallel mode. Re-establish network communication per TM 9-6115-752-10 or 9-6115-753-10.

5.1.5.[WARNING 4876: AUTO GENSET LOST]

5.1.5.1. Symptom

[Warning 4876: Auto Genset Lost] displayed on DCS screen.

5.1.5.2. Malfunction

NOTE

When this Warning reports, the network will enter HALT mode and all connected generators will start.

Communication lost with one or more network generators. Warning displays on generators detecting the lost generator(s).

5.1.5.3. Corrective Action

NOTE

If Warning 4872, 4876, or 4878 are reporting anywhere on network, troubleshoot those Warnings prior to this symptom. Network communication warnings may cause other network warnings to report.

- a. Check all generators and determine which generator(s) is lost. (on any genset, go to home screen and then auto sets.
- b. Remove lost generator from AUTO mode per TM 9-6115-752-10 or 9-6115-753-10, and then re-establish AUTO mode.
- c. From the DCS auto mode screen on all generators showing Warning 4876, clear lost gensets. If warning remains clear, no further action is necessary.
- d. If warning remains present on one generator only, replace its DCS per TM 6115-752-24&P (MEP 1060) or TM 6115-753-24&P (MEP 1070), WP 0017, REMOVE/REPLACE DCS. Otherwise, replace DCS on lost generator.

5.1.6.[WARNING 4877: SYSTEM SETTING DISCREPANCY]

5.1.6.1. Symptom

[Warning 4877: System Setting Discrepancy] displayed on DCS screen.

5.1.6.2. Malfunction

NOTE

When this Warning reports, the network will enter HALT mode and all connected generators will start.

Two or more network gensets are operating with different system settings. Settings were changed on one generator and were not broadcast to entire network for inclusion.

5.1.6.3. Corrective Action

NOTE

If Warning 4872, 4876, or 4878 are reporting anywhere on network, troubleshoot those Warnings prior to this symptom. Network communication warnings may cause other network warnings to report.

- a. Press [Fault Reset] pushbutton on DCS on all generators reporting Warning 4877. If warning remains clear, no further action is necessary.
- b. On any generator, set desired system settings. Upon completion press [EXIT] soft-key. Settings are then broadcast to all network generators.
- c. Press [Fault Reset] pushbutton on DCS on all generators reporting Warning 4877. If warning remains clear, no further action is necessary.
- d. If warning recurs, find generator with settings different from the rest. Then, replace its DCS per WP0017, REMOVE/REPLACE DCS.
- e. Press [Fault Reset] pushbutton on all generators reporting network warnings. If any warnings or faults recur, troubleshooting per applicable procedure.

5.1.7.[WARNING 4878: AUTO NETWORK WIRING ERROR]

5.1.7.1. Symptom

[Warning 4878: Auto Network Wiring Error] displayed on DCS screen.

5.1.7.2. Malfunction

NOTE

When this Warning reports, the network will enter HALT mode and all connected generators will start.

CAN data-link degraded due to wiring or hardware issues.

5.1.7.3. Corrective Action

NOTE

If Warning 4872, 4876, or 4878 are reporting anywhere on network, troubleshoot those Warnings prior to this symptom. Network communication warnings may cause other network warnings to report.

- a. Press [Fault Reset] pushbutton on DCS on all generators reporting Warning 4878. If warning remains clear, no further action is necessary.
- b. Check all network cable connections and the two terminating resistors for tightness. Tighten connections as necessary. Then, attempt to clear Warning 4878. If fault clears, no further action is necessary
- c. If Warning 4878 recurs on all generators except one, remove generator from network by performing Wpxxx. generator not reporting 4878. Otherwise, proceed to step e.
- d. Check condition of DCS network plug and clean connection.
- e. Restart generator and attempt to establish network communication per TM 9-6115-752-10 or 9-6115-753-10. If fault recurs, perform network cable assembly checkout per WP0101, General Maintenance
- f. Restart generator and attempt to establish network communication per TM 9-6115-752-10 or 9-6115-753-10. If fault recurs, replace DCS per TM 9-6115-752-24&P (MEP 1060) or 9-6115-753-24&P (MEP 1070), WP 0017, REMOVE/REPLACE DCS.

5.1.8.[WARNING 4879: AUTO SETUP ERROR]

5.1.8.1. Symptom

[Warning 4879: Auto Setup Error] displayed on DCS screen.

5.1.8.2. Malfunction

NOTE

When this Warning reports, the network will enter HALT mode and all connected generators will start.

Difference between start threshold and stop threshold is too low.

5.1.8.3. Corrective Action

NOTE

If Warning 4872, 4876, or 4878 are reporting anywhere on network, troubleshoot those Warnings prior to this symptom. Network communication warnings may cause other network warnings to report.

- a. Check to see if generator is in %kW or absolute kW mode.
- b. If generator is in %kW mode, adjust thresholds so that start is at least 5% higher than stop.
- c. If generator is in absolute kW mode, adjust thresholds so that start is greater than stop threshold
- d. Press [Fault Reset] pushbutton on all generators reporting network warnings. If any warnings or faults recur, troubleshooting per applicable procedure.

5.1.9. [WARNING 4881: ADDRESS CONFLICT]

5.1.9.1. Symptom

[Warning 4881: Address Conflict] displayed on DCS screen.

5.1.9.2. Malfunction

Two or more generators have claimed the same network address. Automatic re-arbitration is triggered.

5.1.9.3. Corrective Action

NOTE

If Warning 4872, 4876, or 4878 are reporting anywhere on network, troubleshoot those Warnings prior to this symptom. Network communication warnings may cause other network warnings to report.

If Warning 5371 is reporting proceed to troubleshooting it first.

- a. Press [Fault Reset] pushbutton on DCS on all generators reporting Warning 4881. If warning remains clear, no further action is necessary.
- b. Check network status on DCS snapshot screen. If network reflects proper number of generators and no other warnings or faults, turn off networking and re-establish per TM 9-6115-752-10 (MEP 1060) or and 9-6115-753-10 (MEP 1070). If other faults or warnings are present, proceed to troubleshooting them first.

5.1.10. [WARNING 4882: GENSET BUS OVERLOAD IN AUTO]

5.1.10.1. Symptom

[Warning 4882:: Genset Bus Overload in Auto] displayed on DCS screen.

5.1.10.2. Malfunction

NOTE

When Warning 4882 occurs, network will start all network generators. The network will then adjust number of sets running based on start and stop settings as compared to load requirements.

One or more network generators are overloaded. This occurs when load increment exceeds spinning reserve capacity of the network. This can also occur concurrently with a genset that's ineligible for auto or a shutdown fault on the network as a result of a generator shutting off on a fault..

5.1.10.3. **Corrective Action**

NOTE

If Warning 4872, 4876, or 4878 are reporting anywhere on network, troubleshoot those Warnings prior to this symptom. Network communication warnings may cause other network warnings to report.

- a. Verify no abnormal load was attempted to be connected to network generators.
- b. On generator set DCS, check and record network start threshold. STEP 3. Calculate size of largest load increment desired for network.
- c. If network is in %kW mode, calculate spinning reserve by subtracting start threshold percentage from 100% and then multiplying by generator capacity. If generator set sizes are mixed on the network, use the smallest generator capacity present.
- d. If network is in absolute kW mode, calculate spinning reserve by subtracting start threshold value from generator capacity.
- e. Subtract largest load increment from spinning reserve capacity. If result is a negative number, start threshold should be adjusted. If block load exceeds threshold limits or adjustment of thresholds is not desired, load increment size must be decreased or warning 4882 will report every time largest increment is applied to generator.

5.1.11. **[WARNING 5371: TOO MANY GENSETS ON BUS]**

5.1.11.1. **Symptom**

[Warning 5371: Too many gensets on bus] displayed on DCS screen.

5.1.11.2. **Malfunction**

More than six generators detected in the network

5.1.11.3. **Corrective Action**

NOTE

If Warning 4872, 4876, or 4878 are reporting anywhere on network, troubleshoot those Warnings prior to this symptom. Network communication warnings may cause other network warnings to report.

- a. Determine number of generators connected to network. For the purpose of this exercise, no more than six generators should be connected to the network at any time.
- b. Determine or obtain operational network capacity required.
- c. Calculate proper mix of generators to meet capacity requirement. No more than 6 generators can be connected to the network.
- d. Set up newly determined network per Chapter 2, Section III, Microgrid Operations Under Normal Conditions.

5.1.12. [WARNING 5373: AUTO GEN ID CONFLICT]

5.1.12.1. **Symptom**

[Warning 5373: Auto Gen ID conflict] displayed on DCS screen.

5.1.12.2. **Malfunction**

Network generator receives same name as another network generator. Automatic re- arbitration for both generators is initiated.

5.1.12.3. **Corrective Action**

NOTE

If Warning 4872, 4876, or 4878 are reporting anywhere on network, troubleshoot those Warnings prior to this symptom. Network communication warnings may cause other network warnings to report.

- a. Press [Fault Reset] pushbutton on DCS on all generators reporting Warning 5373. If warning recurs, remove affected generators from network by performing Remove Network Generator procedure WP0008, Parallel Operations.
- b. Re-establish Auto mode on generators that reported Warning 5373. If Warning 5373 recurs, remove affected generators from network and shut them down by performing TM 9-6115-752-10 or 9-6115-753-10 procedures.
- c. Open DC main circuit breakers on shut down generators and then reclose.
- d. Startup generators and re-establish Auto mode.

5.1.13. [WARNING 5688: Battery Fail to Charge]

5.1.13.1. **Symptom**

[Warning 5688: Battery Fail to Charge] displayed on DCS screen.

5.1.13.2. **Malfunction**

Start assurance has started the set and after six hours the battery has failed to reach 98 percent state of charge.

5.1.13.3. **Corrective Action**

- a. Press [Fault Reset] pushbutton on DCS on generator reporting Warning 5688.
- b. If warning recurs, verify that there is nothing connected to the NATO plug. If there is, battery charging will take longer because the alternator is charging more than just the batteries on the set.
- c. If not, replace the batteries per TM 9-6115-752-24&P (MEP 1060) or 9-6115-753-24&P (MEP 1070)

5.1.14. [WARNING 5869: Shutdown Fault on Network]

5.1.14.1. **Symptom**

[Warning 5869: Shutdown Fault on Network] displayed on DCS screen.

5.1.14.2. Malfunction

Start assurance has started the set and after six hours the battery has failed to reach 98 percent state of charge.

5.1.14.3. Corrective Action

- a. Check all network generators and determine which one(s) is ineligible.
- b. Check for faults on ineligible set. If faults are present, troubleshoot faults per TM 9-6115-752-24&P (MEP 1060) or 9-6115-753-24&P (MEP 1070).
- c. Press [Fault Reset] pushbutton on DCS on generator reporting Warning 5869.

5.2. HALTED MODE

5.2.1.Symptom

All network generators are running and each shows HALT mode

5.2.2.Malfunction

Network has entered halt mode due to network abnormalities.

5.2.3.Corrective Action

NOTE

If Warning 4872, 4876, or 4878 are reporting anywhere on network, troubleshoot those Warnings prior to this symptom. Network communication warnings may cause other network warnings to report.

- a. Check all network generators for fault or warning conditions. If present, repair faults and warnings.
- b. Press [Fault Reset] pushbutton on DCS on all generators
- c. Turn off networking and re-establish per TM 9-6115-752-10 or 9-6115-753-10. If fault recurs, attempt to isolate malfunctioning generator by connecting one generator at a time to the network. Fault should recur once suspect generator is reconnected to the network.
- d. Once suspect generator is determined, replace DCS per TM 9-6115-752-24&P (MEP 1060) and 9-6115-753-24&P (MEP 1070), WP 0017, REMOVE/REPLACE DCS.

5.3. CABLE CHECKOUT

5.3.1. Network Cable Assembly Checkout

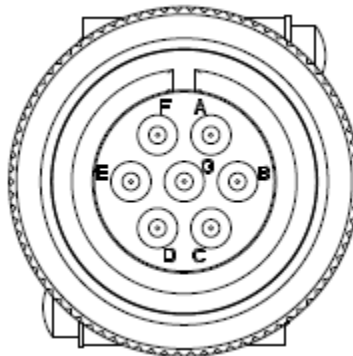


Figure 5-1. P1 Connector

NOTE

This procedure is intended to checkout a completely assembled network cable system. If individual cables and components are required to be checked, proceed to applicable section in this work package.

If network cable assembly to be checked is still installed on network generators, proceed to step a, otherwise proceed to step e.

- a. If network cable assembly to be checked is still installed on network generators, remove all generators from Auto mode.

NOTE

Complete generator shutdown prior to network cable assembly removal is the preferred method. However, if power must be provided by connected generators due to operational requirements, generators can be operated in standard parallel mode. The network cable assembly can be safely removed once all connected generators are taken out of Auto mode.

- b. If power is still needed on the output bus due to operational requirements, proceed to step 6; otherwise, proceed to step c.
- c. Disconnect connector P1 from all network generator DCSs.
- d. Set DCS master control switch to OFF on each connected generator.
- e. Open Main DC circuit breaker on each connected generator.
- f. Disconnect connector P1 from all network generator DCSs.
- g. At connector P1, check resistance across P1-D and P1-E. Resistance value should be 50-70Ω. If resistance is out of tolerance, proceed to step j.
- h. Check resistance between P1-D and P1 backshell. Resistance should be greater than 1MΩ.
- i. Check resistance between P1-E and P1 backshell. Resistance should be greater than 1MΩ.
- j. If resistances in steps e thru g are out of tolerance, discontinue this procedure and proceed to individual network cable assembly component checkouts.
- k. Repeat steps e thru h for each remaining P1 connector

- I. If resistances in steps e thru i are within tolerance, network cable is intact and no further checks are necessary

5.3.2. Network Cable Assembly Checkout

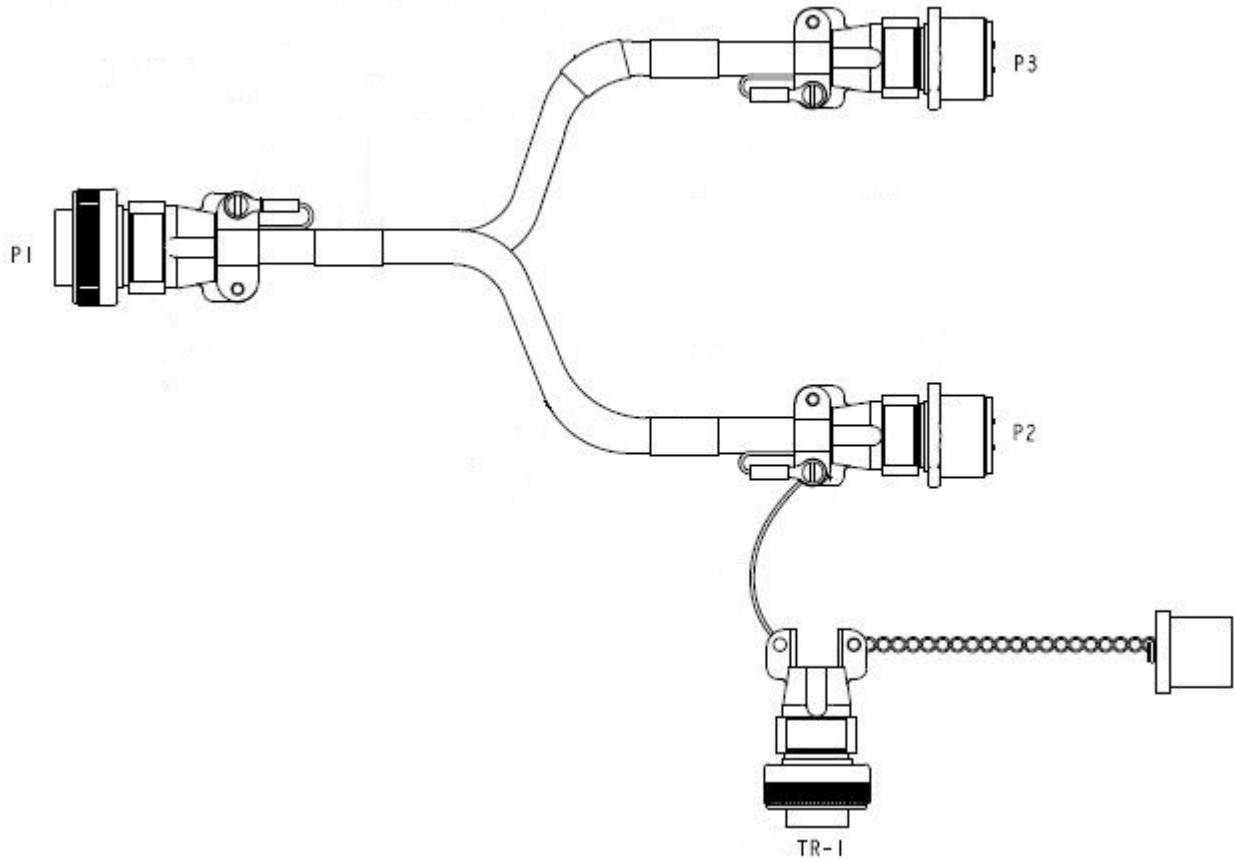


Figure 5-2. Network Cable

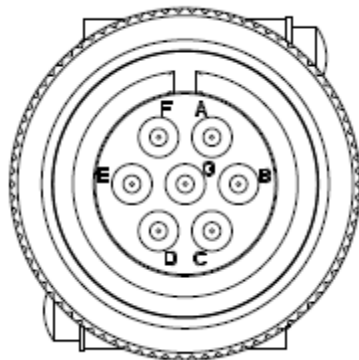


Figure 5-4. P1 Connector

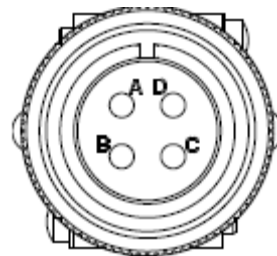


Figure 5-3. P2/P3/TR-1 Connector

Using a multimeter set to resistance, check test points listed in Table 1. If any value is out of tolerance, discontinue procedure and replace cable.

Table 5-1. Network Cable Test Points

Test Point A	Test Point B	Value
P1-D	P2-A	<1Ω
P1-D	P3-A	<1Ω
P1-E	P2-C	<1Ω
P1-E	P3-C	<1Ω
P1-F	P1 Backshell	<1Ω
P1-F	P2-B	<1Ω
P1-F	P3-B	<1Ω
P1-F	P1-D	>1MΩ
P1-F	P1-E	>1MΩ
P1-D	P1-E	>1MΩ
P2-B	P3-B	<1Ω
P2-B	P2 Backshell	<1Ω
P2-A	P3-A	<1Ω
P2-C	P3-C	<1Ω
P3-B	P3 Backshell	<1Ω
TR-1 A	TR-1C	110-130Ω

5.3.3. Network Extension Cable Checkout

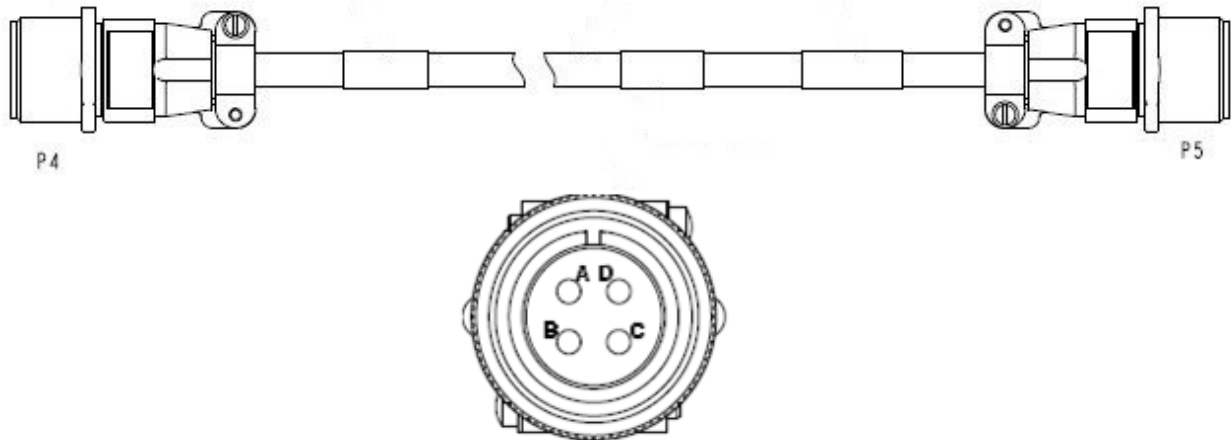


Figure 5-5. P4/P5 Connectors

Using a multimeter set to resistance, check test points listed in Table 1. If any value is out of tolerance, discontinue procedure and replace cable.

Table 5-2. Network Extension Test Points

Test Point A	Test Point B	Value
P4-A	P5-A	<1Ω
P4-B	P5-B	<1Ω
P4-C	P5-C	<1Ω
P4-A	P4-B	>1MΩ
P4-A	P4-C	>1MΩ
P5-A	P5-B	>1MΩ
P5-A	P5-C	>1MΩ

Appendix A AUTO MODE SCREEN REFERENCE

A.1 AUTO MODE SCREEN

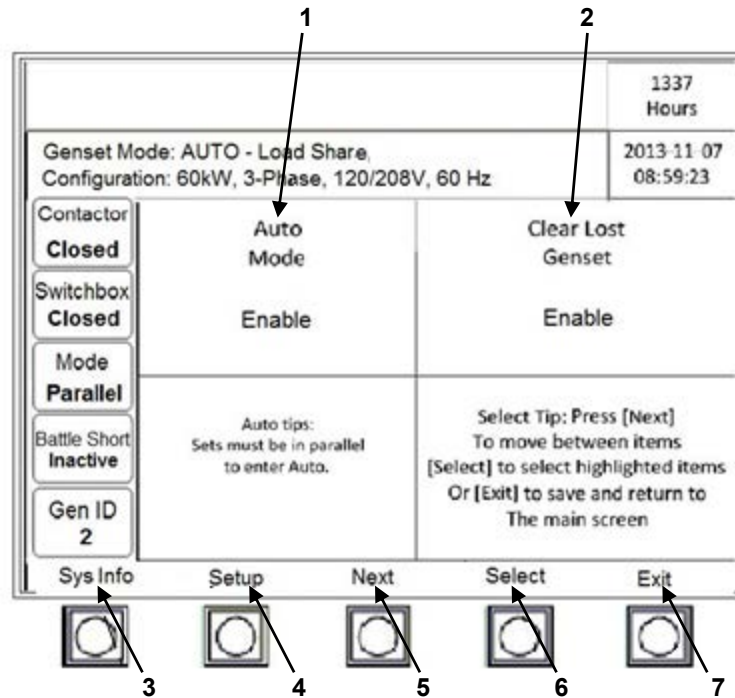


Figure A-1. Auto Mode Screen

Table A-1. Auto Mode Screen

KEY	CONTROL/INDICATOR	FUNCTION
1	[Auto Mode]	The current status of AUTO mode is displayed. When selected, the mode can be changed. The possible modes are:
	[Enabled]	AUTO mode is currently enabled and set will automatically start and stop and stop based on load demand requirements.
	[Disabled]	AUTO is currently disabled.
2	[Clear Lost Genset]	When selected, lost generators are cleared from the network.
3	[SysInfo]	Changes the display context to the system info screen.
4	[Setup]	Changes the display context to the system setup screen.
5	[Next]	Moves the display area to the next block.
6	[Select]	Selects the highlighted area.
7	[Exit]	Changes the display context to the auto mode main screen.

A.2 AUTO MODE MAIN SCREEN

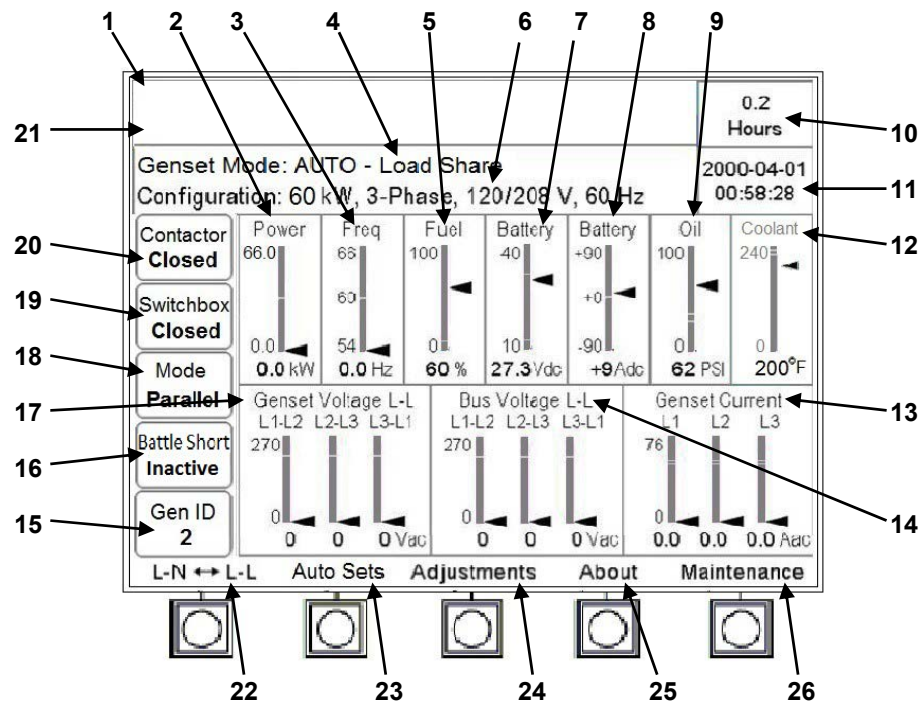


Figure A-2. Auto Mode Main Screen

Table A-2. Auto Mode Main Screen

KEY	CONTROL/INDICATOR	FUNCTION
1	[Fault XXX:]	Displays when fault condition exists. Fault codes and descriptions are found in WP 0011, DCS Fault& Warning Codes and Descriptions.
2	[Power][kW]	Indicates total load of unit in kilowatts.
3	[Freq][Hz]	Indicates the output frequency in hertz.
4	[Genset Mode:]	Displays the operational readiness and status of the unit:
	[Delay to Crank – Glw Plg xx sec]	Intake Air Heater (Glw Plg) activated, xx seconds until engine is ready to start.
	[Auto - Not Ready to Crank]	Engine is not ready to start.
	[Auto - Ready to Crank]	Engine is ready to start.
	[Auto - Crank]	Engine is cranking and attempting to start.
	[Auto – Running]	Engine has successfully started and is operational.
	[Auto – Emergency Stop]	Unit emergency stop is active.
	[Auto – Idle Mode]	Engine has started and is operating at reduced speed. Generator has no output in this mode. Engine will idle for timing based upon coolant temperature.
	[Auto – Synchronizing]	Unit is attempting to synchronize with power on network bus.

	[Auto – Synchronized]	Unit has synchronized with power on network bus but is not supplying power.
	[Auto – Load Share]	Unit is supplying power to network bus.
5	Fuel Level	Indicates fuel level as percentage of total system capacity:
	Green	Fuel level is satisfactory.
	Yellow	Fuel level low, in warning area.
	Red	Fuel level very low, fault indicated.
6	[Configuration]	Displays capacity in kW, generator [Phase], [Voltage (V)], and [Frequency (Hz)] settings:
	[kW]	Max generator load in kW.
	[3-phase]	Indicates three phase operation.
	[120/208V]	Indicates 120V line-to-neutral, 208V line-to-line voltage.
	[-Hz]	Frequency: [50] or [60].
7	[Battery][Vdc]	Indicates battery voltage in [Vdc].
	Green	Voltage level satisfactory.
	Yellow	Voltage level low, in warning area.
	Red	Voltage level very low, fault indicated.
8	[Battery][Adc]	Indicates charge level of the batteries in [Adc]:
	Green	Amperage satisfactory.
	Yellow	Amperage draw higher than normal, in warning area.
	Red	Amperage draw very high, fault indicated.
9	[Oil][PSI][kPa]	Indicates engine oil pressure during operation. Can display metric or standard units of measure:
	Green	Oil pressure is satisfactory.
	Yellow	Oil pressure low, in warning area.
	Red	Oil pressure very low, fault indicated.
10	[xxxx.x hours]	Indicates cumulative engine hours.
11	[Date/Time]	Indicates current date and time.
12	[Coolant][°F][°C]	Indicates engine water temperature. Can display metric or standard units of display.
13	[Current][A]	Indicates generator set output in amperes by line.
14	[Bus Voltage L-L][Vac]	Indicates voltage generated at output terminal board from Line-to-Line (L-L).
	[Bus Voltage L-N][Vac]	Indicates voltage generated at output terminal board from Line-to- Neutral (L-N).
15	[Gen ID][1-6]	Indicates current generator network ID number. Gen ID is assigned during network communication arbitration.
16	[Battleshort]	Indicates position of the Battleshort switch.
	[Active]	Battleshort operational. Unit will only stop on EMERGENCY STOP, short circuit, or overspeed fault.
	[Inactive]	Battleshort not operational. All fault functions enabled.
17	[Genset Voltage L-L][Vac]	Displays the L-L voltage for each phase simultaneously from the generator set to the generator [Contactor] output bus.

	[Genset Voltage L-N][Vac]	Displays the L-N voltage for each phase simultaneously from the generator set to the generator [Contactor] output bus.
18	[Mode]	Indicates generator set configuration (unit or parallel).
	[Unit]	Operating as a PU.
	[Parallel]	Operation as a PP with one or more other generators.
19	[Switchbox]	Indicates switchbox contactor is connection status between generator output box and network bus is established.
	[Closed]	Connected.
	[Open]	Not connected.
20	[Contactor]	Indicates position of generator contactor.
	[Closed]	Contactor is closed.
	[Open]	Contactor is open.
21	[Warning XXX:]	This line displays only when the unit is in a pre-failure condition or has a defect (WP0011, DCS Fault & Warning Codes and Descriptions).
22	[L-L ↔ L-N]	Toggles the voltage display from Line-to-Line [L-L] to Line-to-Neutral [L-N] and back.
23	[AutoSets]	Switches the display context to the auto sets screen.
24	[Adjustments]	Changes the display context to the first adjustments screen.
25	[About]	Displays the software versions that are installed for both the main controller and display controller.
26	[Maintenance]	Changes the display context to the first maintenance screen.

A.3 AUTO SETS SCREEN

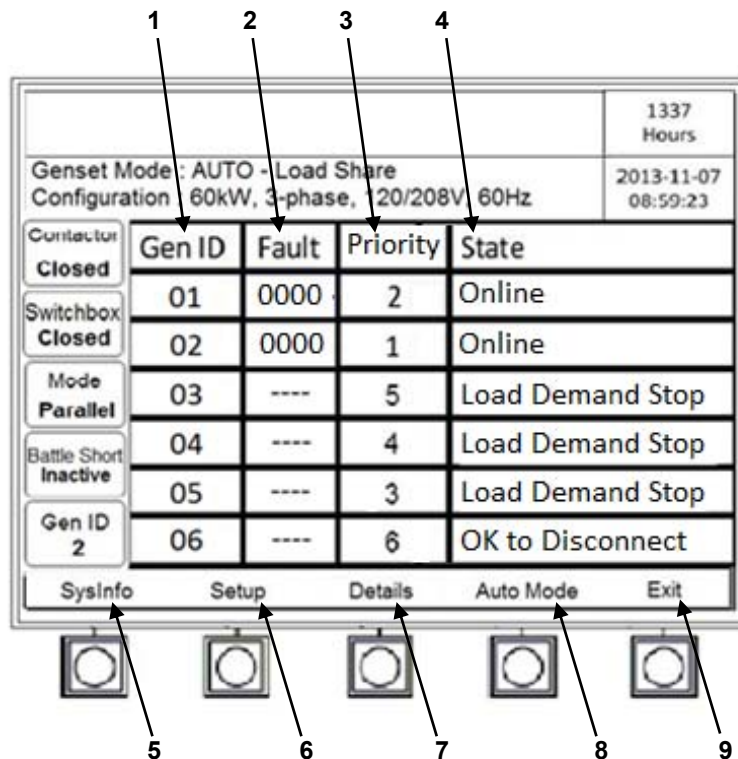


Figure A-3. Auto Sets Screen

Table A-3. Auto Sets Screen

KEY	CONTROL/INDICATOR	FUNCTION
1	[Gen ID] [1-6]	Indicates network generator ID.
2	[Fault]	Displays one fault or warning on indicated network generator. If both a fault and warning appear on network generator, the fault will display.
3	[Priority][1-6]	Indicates current priority of each network generator according to network setup.
4	[State]	Indicates current state of indicated network generator. States possible are:
	[Load Demand Stop]	Network generator is not running. Generator will start when load demand requirements and priority dictate it is necessary.
	[Online Pending]	Generator is running and is in the process of connecting to network power.
	[Online]	Generator is running and supplying power to the network power bus.
	[Failed]	Generator attempted to start based on load demand and failed but is still communicating with the network.
	[Ineligible]	Generator set is communicating with the network but is ineligible due to its current status.
	[OK To Disconnect]	Generator was removed from Auto mode and remaining network generators indicate it is now ready for disconnection.

	[Lost]	Generator is no longer communicating with the network properly and will not provide power to the network bus.
	[Gen Does Not Exist]	No generator has been connected to the network and been assumed this Gen ID.
5	[SysInfo]	Changes the display to the system info screen.
6	[Setup]	Changes the display to the system setup screen.
7	[Details]	Changes the display to the set details screen.
8	[Auto Mode]	Changes the display to the auto mode screen.
9	[Exit]	Changes the display to the auto mode main screen.

A.4 SET DETAILS SCREEN

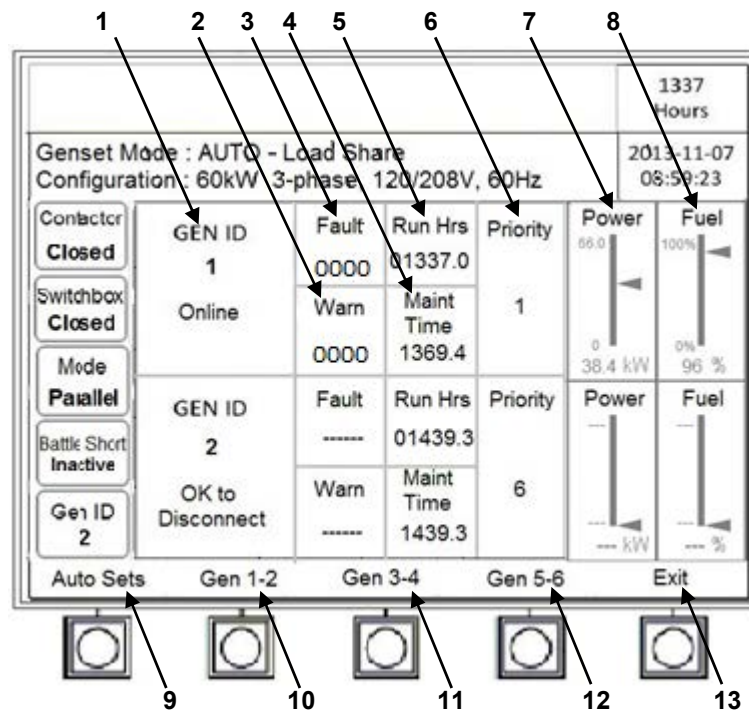


Figure A-4. Set Details Screen

Table A-4. Set Details Screen

KEY	CONTROL/INDICATOR	FUNCTION
1	[Gen ID][State]	Shows which network generator details are displayed for and the current state the generator is in. States possible are:
	[Set State]	Shows the current state of the indicated network generator.
	[Load Demand Stop]	Network generator is not running. Generator will start when load demand requirements and priority dictate it is necessary.
	[Online Pending]	Generator is running and is in the process of connecting to network.
	[Online]	Generator is running and supplying power to the network power bus.
	[Failed]	Generator attempted to start based on load demand and failed but is still communicating with the network.
	[Ineligible]	Generator set is communicating with the network but is ineligible due to its current status.
	[OK To Disconnect]	Generator was removed from Auto mode and remaining network generators indicate it is now ready for disconnection.
	[Lost]	Generator is no longer communicating with the network properly and will not provide power to the network bus.
	[Gen Does Not Exist]	No generator has been connected to the network and been assumed this Gen ID.
2	[Warn][xxxx]	Displays one warning on indicated generator, if present.
3	[Fault][xxxx]	Displays one fault on indicated generator, if present.
4	[Maint Hrs][xxxx.x]	Displays the hour at which the next scheduled PMCS is due.

5	[Run Hrs][xxxxx.x]	Shows cumulative run hours on the displayed generator.
6	[Priority][1-6]	Current priority of network generator.
7	[Power][xx.x kW]	Displays power indicated is providing to the network.
8	[Fuel][xx.x%]	Displays fuel level as a percentage of max capacity for indicated generator.
9	[AutoSets]	Selecting this displays the auto sets screen.
10	[Gen 1-2]	Selecting this displays the set details for Gen IDs 1 and 2.
11	[Gen 3-4]	Selecting this displays the set details for Gen IDs 3 and 4.
12	[Gen 5-6]	Selecting this displays the set details for Gen IDs 5 and 6.
13	[Exit]	Selecting this displays the auto mode main screen.

A.5 SYSTEM INFORMATION SCREEN

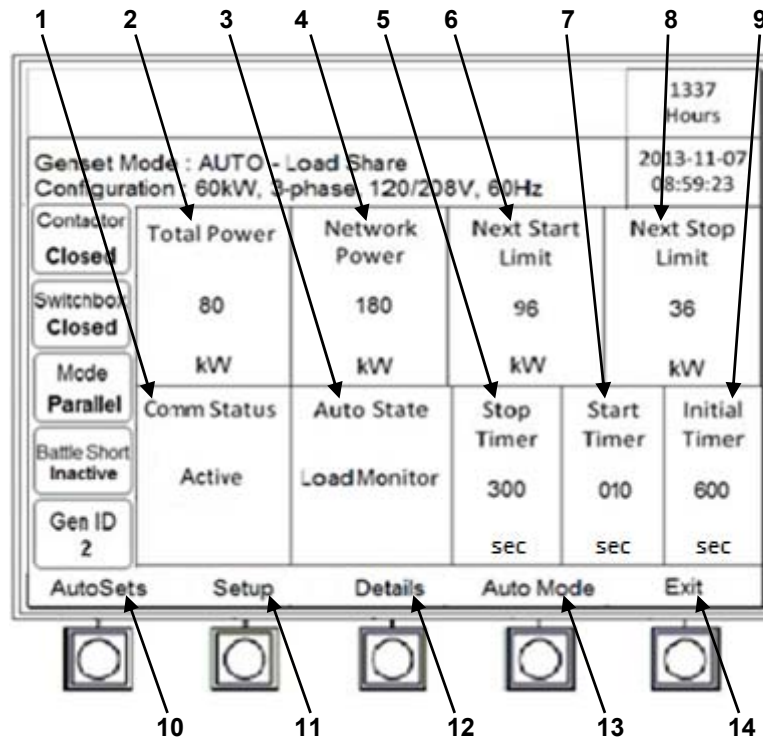


Figure A-5. System Information Screen

Table A-5. System Information Screen

KEY	CONTROL/INDICATOR	FUNCTION
1	[Comm Status]	Displays the network communication status. Possible displays are:
	[Active]	Displayed when network first becomes active or normal network communication has been recently restored.
	[Stable]	Network is communicating normally and is considered stable.
	[Inactive]	Network is not communicating.
	[Failed]	Network is unstable and not communicating normally, communication. Warnings may occur.
2	[Total Power]	Displays the total power the network is currently providing.
3	[Auto State]	Displays the overall status of the load demand network. Possible states are:
	[Load Monitor]	The network is operating in load demand mode and will start and stop generators as required.
	[Initial Delay]	The network has recently been established and load demand is being delayed until it is stable.
	[Halted]	The network has been halted due to abnormal conditions. All network generators will start and provide power to the network bus.
	[Off]	No generators are in Auto mode and network has not been established.

4	[Network Power]	Shows the total capacity of all network generators combined.
5	[Stop Timer]	Displays the timer for stopping a generator due to demand being lower than network stop limit.
6	[Next Start Limit]	Displays the threshold for the next load demand generator start.
7	[Start Timer]	Displays the timer for starting a generator when load demand exceeds start limit.
8	[Next Stop Limit]	Displays the threshold for the next load demand generator stop.
9	[Initial Timer]	Countdown timer after network has been established before network enters load demand monitoring. Allows network power demand to stabilize.
10	[Auto Sets]	Changes the display context to the auto sets screen.
11	[Setup]	Changes the display context to the system setup screen.
12	[Details]	Changes the display context to the set details screen.
13	[AutoMode]	Changes the display context to the auto mode screen.
14	[Exit]	Changes the display context to the auto mode main screen.

A.6 SYSTEM SETUP SCREEN

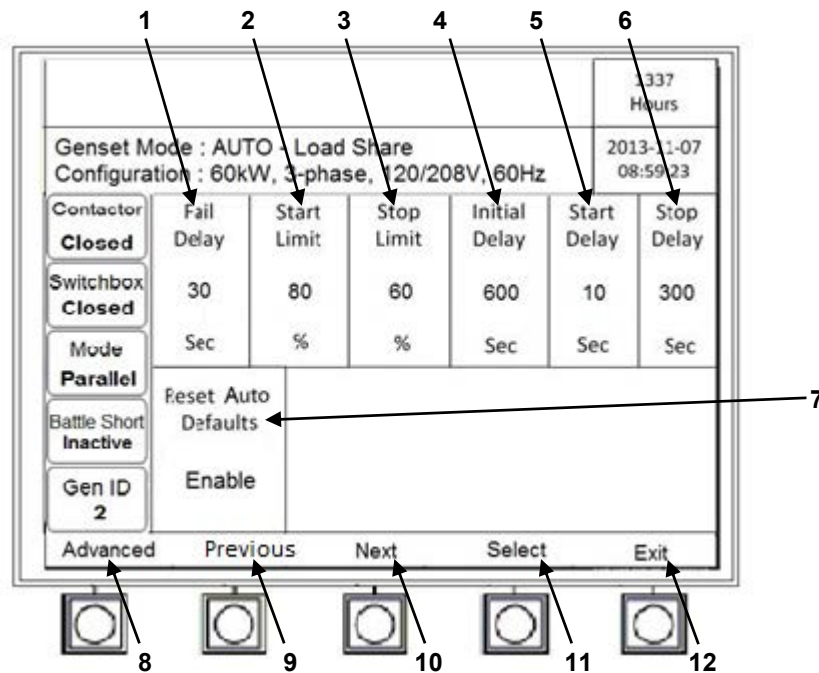


Figure A-6. System Setup Screen

Table A-6. System Setup Screen

KEY	CONTROL/INDICATOR	FUNCTION
1	[Fail Delay][xxxxsec]	Displays the current fail delay setting and is adjustable. Fail delay is the time the network allows for a generator to come online before calling it a failure.
2	[Start Limit][xxx%/kW]	Displays the current start limit in either % or kW depending on system setup and is adjustable.
3	[Stop Limit][xxx%/kW]	Displays the current stop limit in either % or kW depending on system setup and is adjustable.
4	[Initial Delay][xxxsec]	Displays the current initial delay before load monitoring determines generator start and stop. This setting is adjustable.
5	[Start Delay][xxxsec]	Displays the current start delay and is adjustable. Start delay is the time the load demand must exceed start limit before a generator is started.
6	[Stop Delay][xxxsec]	Displays the current stop delay and is adjustable. Stop delay is the time the load demand must be below stop limit before a generator is stopped.
7	[Reset Auto Defaults]	Selecting this will restore calibration supplied default settings to the settings on this screen.
8	[Advanced]	Changes the display context to the advanced setup screen.
9	[Prev]	Moves the selection area to the previous block.
10	[Next]	Moves the selection area to the next block.
11	[Select]	Allows the selected block to be adjusted.
12	[Exit]	Changes the display context to the auto mode main screen.

A.7 ADVANCED SETUP SCREEN

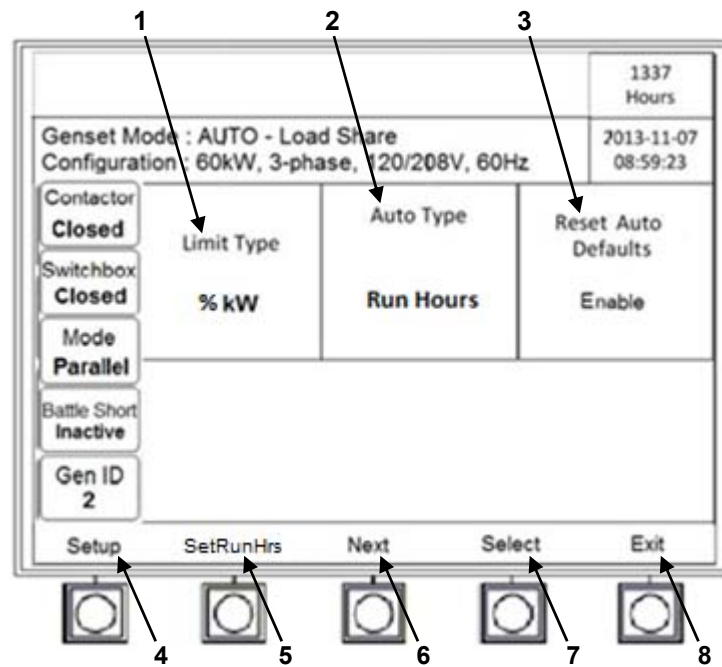


Figure A-7. Advanced Setup Screen

Table A-7. Advanced Setup Screen

KEY	CONTROL/INDICATOR	FUNCTION
1	[Limit Type]	Determines what measure limits are determined by. The two types are:
	[kW]	Allows limits to be set in terms of kW numbers.
	[%]	Allows limits to be set in terms of percentage of max capacity. Percentages are based on smallest node size connected to network.
2	[Auto Type]	Determines which Auto mode determines priority. The two types of Auto mode are:
	[Fixed Priority]	Auto mode priorities are based on a fixed setup that is user programmable.
	[Run Hours]	Auto mode priorities are based on run hour settings that are user Programmable.
3	[Reset Auto Defaults]	When selected, returns settings on this screen to calibration default values.
4	[Setup]	Changes the display context to the system setup screen.
5	[SetRunHrs]	Changes the display context to the run hours priority screen. This option is displayed when the [Auto Type] is set to [Run Hours].
	[SetPriority]	Changes the display context to the fixed priority screen. This option is displayed when the [Auto Type] is set to [Fixed Priority].
6	[Next]	Moves the cursor to the next selectable area.
7	[Select]	Selects the highlighted area and allows for adjustment of the contained parameter.
8	[Exit]	Changes the display context to the auto mode main screen.

A.8 FIXED PRIORITY SCREEN

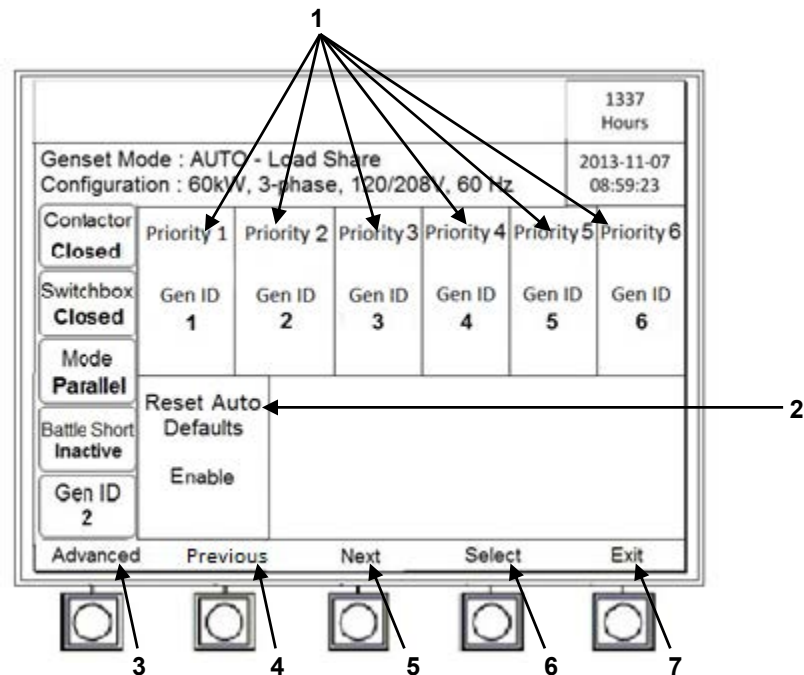


Figure A-8. Fixed Priority Screen

Table A-8. Fixed Priority Screen

KEY	CONTROL/INDICATOR	FUNCTION
1	[Priority][1-6][1-6]	Shows what priority is attached to which Gen ID. When selected, priorities can be changed by user.
2	[Reset Auto Defaults]	When selected, returns this screen's parameters to calibration default settings.
3	[Advanced]	Changes the display context to the advanced setup screen.
4	[Prev]	Moves the selectable area to the previously shown area.
5	[Next]	Moves the selectable area to the next area on the screen.
6	[Select]	Selects the highlighted area and allows for adjustments of contained parameters.
7	[Exit]	Changes the display context to the auto mode main screen.

A.9 RUN HOUR SETUP SCREEN

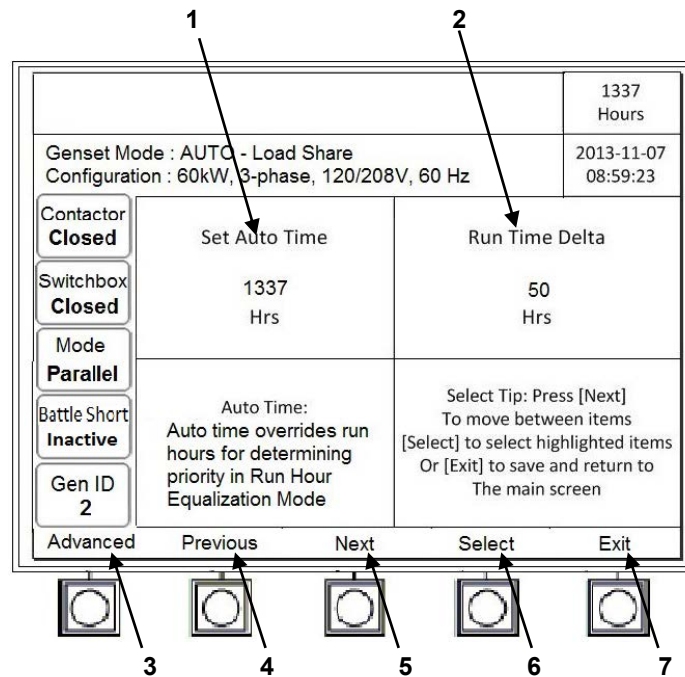


Figure A-9. Run Hour Priority Screen

Table A-9. Run Hours Priority Screen

KEY	CONTROL/INDICATOR	FUNCTION
1	[Set Auto Time]	Displays the time used for run hour equalization calculations. If this parameter is set above current set elapsed hours, the set will operate at high priority until Auto Time is reached.
2	[Run Time Delta]	Run time delta is the operation interval for sets equalizing their hours. Once a set's run hours are equal to the Run Time Delta plus the run hours of any other set, its priority is lowered.
3	[Advanced]	Changes the display context to the advanced setup screen.
4	[Previous]	Moves the selectable area to the previously shown area.
5	[Next]	Moves the selectable area to the next area on the screen.
6	[Select]	Selects the highlighted area and allows for adjustments of contained parameters.
7	[Exit]	Changes the display context to the auto mode main screen.

A.3 MLD Parameter Default Settings

Active Defaults					
If everything is at its default value these parameters will be used					
Parameter Name	Description	Default Value	Units	Logical Number	Enum values
Load Demand Priority Type		0	enum	15526	Run Hours Equalization. Fixed Sequence
Load Demand Threshold Method		1	enum	15548	kW, %kW
Load Demand Genset Run Hours Base	An offset value between Load Demand Genset Run Hours (vol) and Engine Run Time	0	hours	15259	
Load Demand Stop Threshold kW %		60	%	15535	
Load Demand Start Threshold kW %		80	%	15536	
Load Demand Run Hour Differential	The difference of hours used for calculate run hours based priority.	50	hours	15538	
Load Demand Initial Delay		600	seconds	15539	
Load Demand Start Delay		10	seconds	15540	
Load Demand Stop Delay		300	seconds	15541	
Load Demand Genset Fail Delay	Sets the time delay that the system waits for a genset to come online before declaring it as failed.	60	seconds	15233	
Load Demand Start Assurance Enable		3	enum	15698	None, Low Temp Recovery, Battery Charge Recovery, Both
MLD Warning Response Enable		1	enum	15714	Disable, Enable

Inactive Defaults					
These are the defaults for the non default modes of operation					
Parameter Name	Description	Default Value	Units	Logical Number	Enum values
Load Demand Fixed Priority 1	Assigns a genset to fixed priority 1. Used when Load Demand Type is set to Fixed Sequence	1	NA	15288	
Load Demand Fixed Priority 2	Assigns a genset to fixed priority 2. Used when Load Demand Type is set to Fixed Sequence.	2	NA	15289	
Load Demand Fixed Priority 3	Assigns a genset to fixed priority 3. Used when Load Demand Type is set to Fixed Sequence.	3	NA	15290	
Load Demand Fixed Priority 4	Assigns a genset to fixed priority 4. Used when Load Demand Type is set to Fixed Sequence.	4	NA	15291	
Load Demand Fixed Priority 5	Assigns a genset to fixed priority 5. Used when Load Demand Type is set to Fixed Sequence.	5	NA	15292	
Load Demand Fixed Priority 6	Assigns a genset to fixed priority 6. Used when Load Demand Type is set to Fixed Sequence.	6	NA	15293	
Load Demand Start Threshold (kW)	Spinning reserve requirement in kW	12	kW	15313	
Load Demand Stop Threshold (kW)	Required available capacity before a set is shut off	24	kW	15314	