LSM200 Series
Load Sharing Modules

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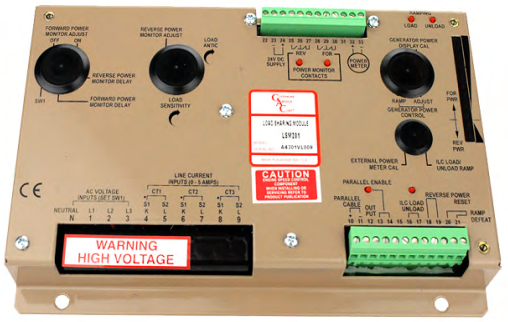
1 INTRODUCTION

The LSM200 Series controllers provide Isochronous load sharing. These multifunction load sharing and power control modules support GAC speed control units on generator set applications requiring isochronous paralleling and for mains power control.



Engine generator sets with isochronous speed control units maintain the requested speed very precisely. If synchronous generators are electrically paralleled to increase the total generated power capability, a system to apportion the load is required.

Even the finest electric governors have minor frequency differences among units to be paralleled, which would cause power variations. In this case, one generator set would continuously increase the power it produces, while the other sets would decrease the power they produce.

This condition eventually leads to motorizing one or more generator/ engines. The load sharing system continuously adjusts the governor speed settings so that no average power difference exists The generators are locked together through electrical synchronizing torques acting as a tightly connected gear drive. The line current measurements are usually taken from current transformers in the equipment such as those used for ammeter circuits.

The LSM201 is available in a CE and non-CE version. Each supports:

- 24 V DC
- Isochronous Load Sharing
- Load Anticipation and Droop
- Forward and Reverse Power Monitoring and Reset Capability
- Power Monitor Adjustment Control
- Generator Power Ramping and Control

2 SPECIFICATIONS

PERFORMANCE	
Load Sharing	Adjustable to within ± 2 % between sets
Operating Modes	Isochronous and main power control
Reverse Power Monitor Trip Point	Adjustable from -2 to -20 %
Reverse Power Delay (Inverse Time Delay)	Adjustable from 0.5 to 15 s
Forward Power Monitor Trip Point	ON trip point adjustable from 20 - 100 % OFF trip point adjustable from 0 - 80 %
Forward Power Delay	Adjustable from 0.4 to 30 s
Power Output Signal	0 to -1 V DC reverse power 0 to +6 V DC forward power
Forward and Reverse Power Relay Contact Rating	Form C, 10 A 290 VA
Parallel Cable Relay Contact Rating	Gold Clad, 1.25 A 60 VA MAX
ENVIRONMENTAL	
Operating Temperature	-40 to 185 °F [-40 to +85 °C]
Humidity	up to 95 %
All Surface Finishes	Fungus proof and corrosion resistance
COMPLIANCE / STANDARDS	
Agency	LSM201 - CE Approved LSM201N - Non-CE approved ROHs - Compliant

POWER INPUT \ OUTPUT	
3 phase AC Voltage signals	Two selectable ranges accommodate 100 - 500 V AC line-to-line Isolated from battery (-) by 5000 V DC Isolated from case by 1000 V DC
3 phase AC Line Currents	0-5 Amps with 1.25 VA requirement Isolated from case by 1000 V DC Connected to Speed Control Module
DC Supply	24 -32 V DC (Transient and Reverse voltage protected). Battery (-) on all sets must be connected together in common
Polarity	Negative ground case isolated.
Power Consumption Battery Supply	160 ma
AC Phase Voltage Inputs	2.5 ma
External Power Meter (Voltage Output)	10 ma MAX Current
PHYSICAL	
Dimensions	See Section 4, Wiring and Dimensions
Weight	1.2 lbf [0.56 kgf]
Mounting	Any Position
RELIABILITY	
Vibration	5 g, 20 - 500 Hz
Testing	100 % functional tested

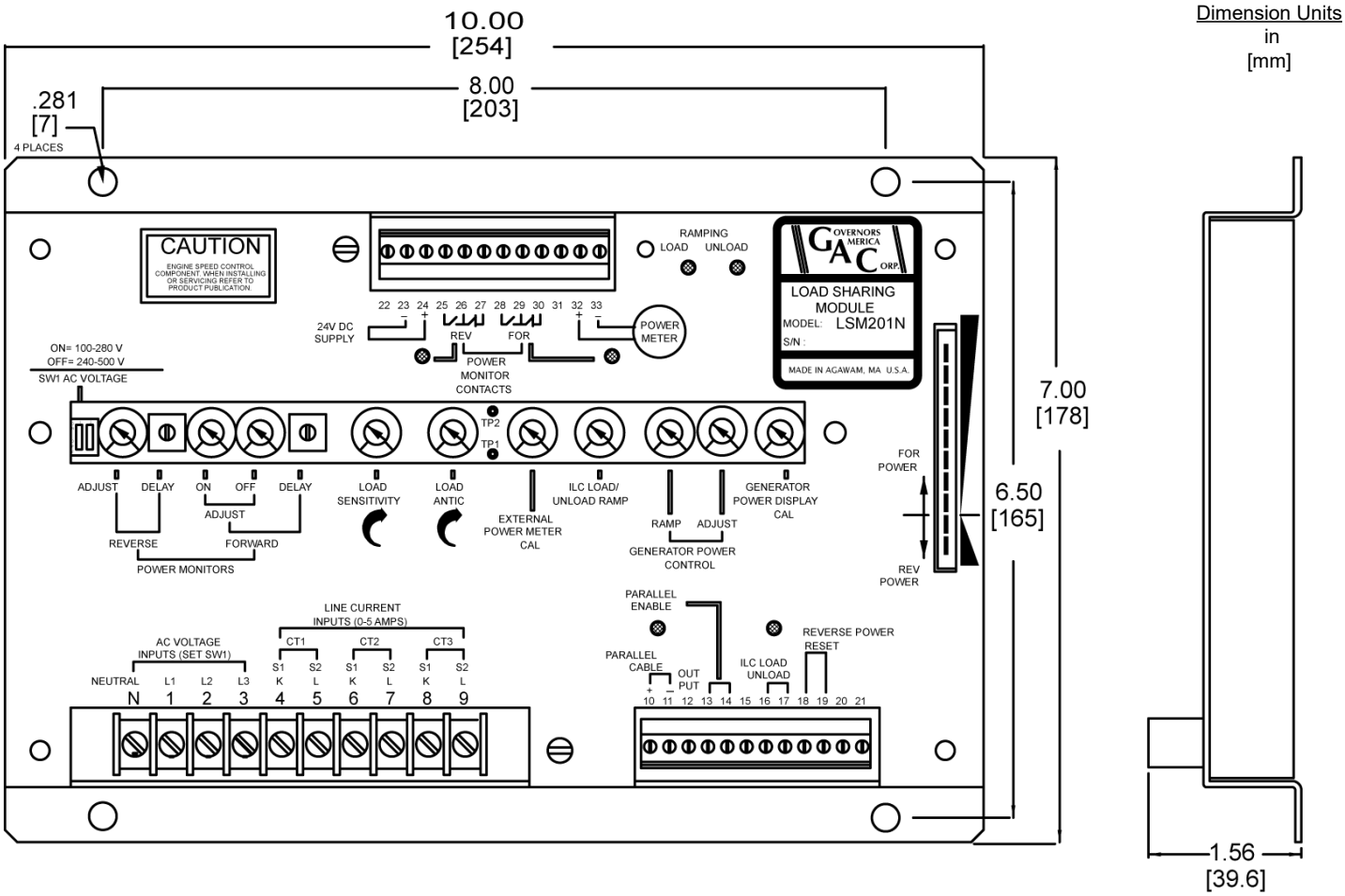
3 INSTALLATION

- An overspeed shutdown device, independent of the governor system, should be used to prevent loss of engine control which may cause personal injury or equipment damage.
- Do not rely exclusively on the governor system electric actuator to prevent overspeed. A secondary shutoff device, such as a fuel solenoid must be used.

Mount the LSM200 Series Module in the generator set control cabinet with the other dedicated control equipment. Locate the load sharing, synchronizer, and speed control devices as close together as possible to minimize inter-connection cable lengths.

All generator sets that are to be synchronized must be tested independently for their maximum capabilities. Information should be gathered for reference if operational issues arise after installation of this product.

Read this entire installation manual before starting installation of this product.

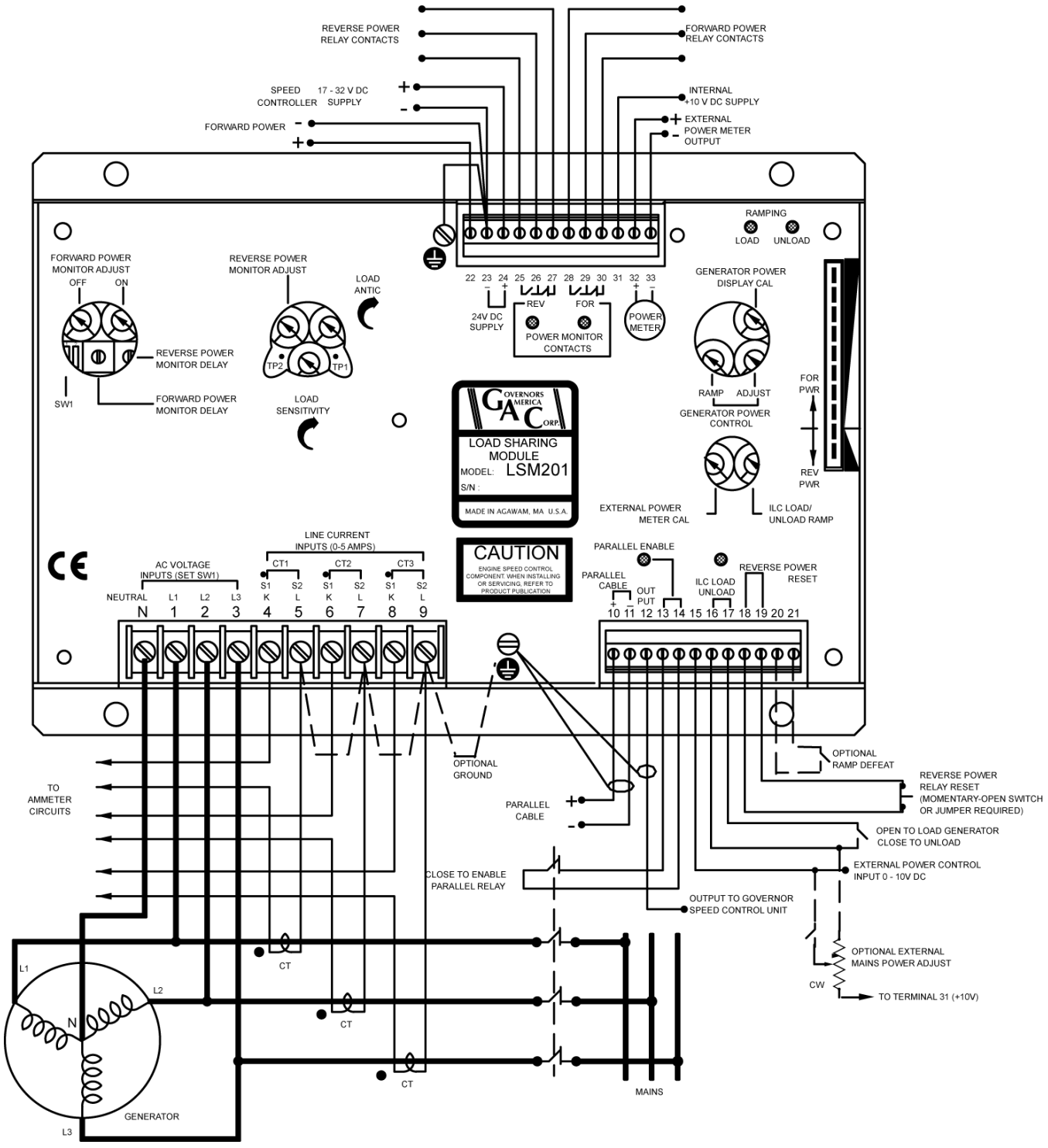


4 WIRING

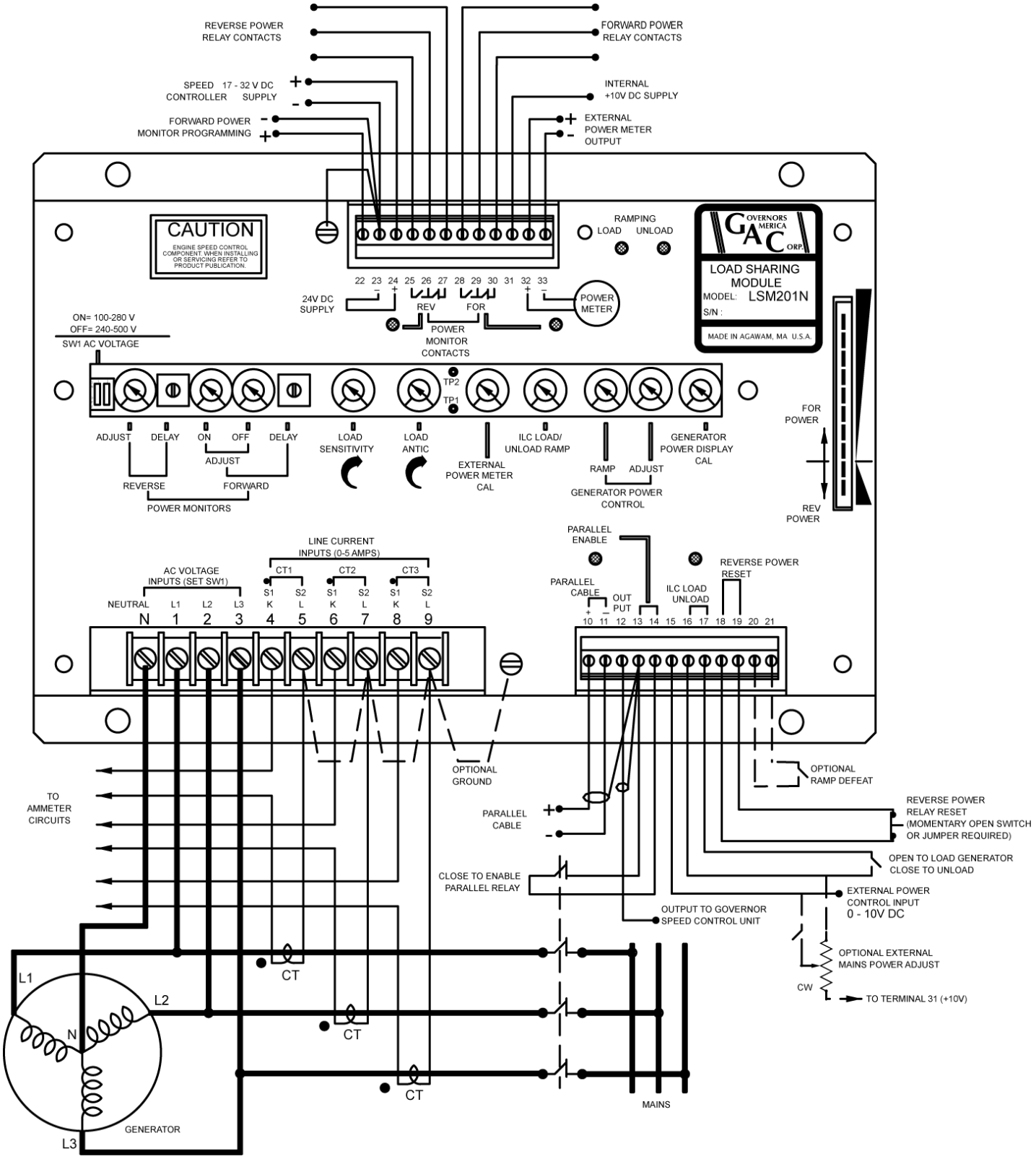
The LSM200 must only be installed by qualified personnel. Hazardous voltage is present when generator is in operational mode.

- **Terminal N must be connected to the neutral of the generator**.
- Electrical connections are illustrated in the wiring diagrams.
- Choice of a proper wire size is dependent on the maximum current expected at specific terminals of the load sharing module. Large gauge wire should be used for Current Transformer (CT) Terminals 4 to 9 as the current can reach a maximum of 5 A.
- Long wires with high resistance can add to the burden of the CT shielded wire is recommended for sensitive control terminals, see your specific controllers wiring diagram.

LSM201 EXTRA FILTERING



LSM201N STANDARD FILTERING



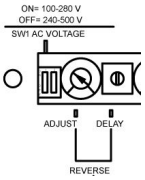
5 WIRING AND INITIAL ADJUSTMENTS

This section details the adjustments and inputs available with the LSM.

3 PHASE AC VOLTAGE INPUTS

HIGH VOLTAGE IS PRESENT AT TERMINALS N and 1-3.
The terminal strip cover must be in place when in operation

The generator's 3 phase voltages are measured at L1, L2, and L3 (Terminals 1 through 3). Terminal N **must** be connected to the generator neutral. The AC voltage inputs are isolated from the battery circuits for over 5000 Volts.

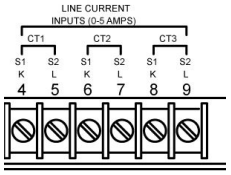


The LSM200 Series has two AC voltage ranges, Low and High. Select the voltage range to match the connections of the generator using the dip switch located in the adjustment window. The voltage ranges are wide and overlap significantly.

- LOW AC voltage range 100 - 280 V AV - SW1 (ON)
- HIGH AC voltage range 240 - 500 V AC (OFF)

3-PHASE LINE CURRENT INPUTS

Generator line currents are measured with external 5 A current transformers.



Connect the CTs with the phasing dot/start at Terminals 4, 6, and 8 as shown in the wiring diagram. The CT circuits are also isolated from battery minus so that they may have one side connected to the battery minus if required for the application.

Volt Amp burden of the LMS on CTs is very small (1.25 VA each).

DC SUPPLY VOLTAGE INPUT

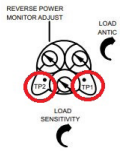
Battery power, 24 V DC, must be applied to the unit at Terminals 24 (+) and 23 (-). The voltage must be in the range of 17 to 32 V DC for proper operation.

Connections to the battery supply must come from connections at the speed control unit, or ground loops can result in improper operation. The total current consumption is less than 160 ma. 12 V DC units are available as a special order.

NOTE: In compliance with industry standards, all battery negatives should be commonly connected.

PARALLEL CABLE FUNCTION AND INTERNAL RELAY

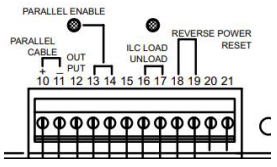
Each individual load sharing unit communicates with other units through an analog bus signal. The parallel cable connection sends each load sharing units signal to an external common node. Any difference in parallel cable voltage sent from one unit to the other causes an unbalanced current to circulate in the cable. The load sharing unit senses the imbalance in the parallel cables and cancels common mode signals. Battery minus (-) for all generators must be connected together to limit high common mode signals, indicating an unbalanced load condition. Each load sharing unit takes action to control its governor to minimize this imbalance. The imbalance should be less than 2 % when the system is adjusted properly.



The parallel cable voltage is proportional to the load on the generator. The voltage ranges from 0 - 7.5 V DC for a 0 - 5 A change in CT current (real power). Measure the internal parallel cable signal, before the sensitivity adjustment, at the two external test posts, TP1 (+) and TP2 (-) These posts are located near to the LOAD SENSITIVITY adjustment. Test post locations are noted on the wiring diagrams.

All parallel cables must be permanently hard wired together (+ to + and - to -). When a generator is off-line, its parallel cable must be disconnected from the rest of the units. Each LSM200 Series unit has its own internal relay to enable this disconnect and reconnection.

The parallel cable relay is closed when Terminals 13 and 14 are connected. A slave relay or contacts on the generator's main circuit breaker normally operates this connection when the generators main contact is closed. The PARALLEL ENABLE LED will light when this occurs, indicating that the internal parallel cable circuit is connected to the other units, Terminals 10 and 11.

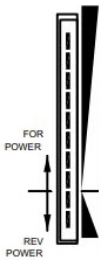


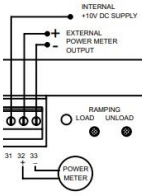
OUTPUT SIGNALS TO THE GOVERNOR

Terminal 12 signals the speed controller to change generator power (speed change). It has a nominal output of 5.0 V DC with respect to the signal ground point (Terminal 23) unless the unit is calling for a speed change. **Terminal 23 must be connected to the speed controls signal ground terminal.**

Refer to the speed control's publication for the appropriate load sharing input terminal (AUX) on the speed control to which Terminal 12 (output) and Terminal 23 (signal ground) should be connected.

VOLTAGE SIGNAL: ANALOG POWER OUTPUT SIGNAL, INTERNAL AND EXTERNAL METERING





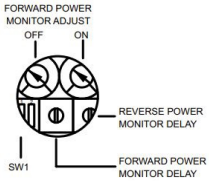
The voltage signal at Terminals 32 (+) and 33(-) may be adjusted with the EXTERNAL POWER METER CAL adjustment, and has a range of approximately -1 to 5 V DC. These voltages are proportional to the CT currents. An output of 5V indicates 5 A CT current (forward power) and -1 volt will indicate 1 A CT current (reverse power). Terminal 32 maximum current consumption should be limited to 10 mA.

The Internal Power Meter / Bar graph displays the generator power in the external power meter operation. The bar graph can be calibrated for generator power. The display normally shows the zero power output position with no power, or with full power to the applied to the generator it displays the third dot. Adjust the GENERATOR POWER DISPLAY CAL for a full-scale reading. Be sure that the adjustment is made by moving CW from the zero position.

FORWARD POWER MONITOR

The forward power monitor can signal two levels of power output from the generator. The two trip points are:

- ON where power is increasing and exceeds the monitors high limit set point. ON range is from 20-100% power which corresponds to a 0-80 on the adjustment scale.
- OFF when the power is falling below the monitors lower load limit set point. OFF range is from 0-80% power which corresponds to 0-100 on the adjustment scale.
- If the maximum CT currents are less than 5 A, the adjustment range will exceed these power levels.



The monitor also includes a DELAY adjustment. In the full CCW position (0) the delay is very short, about 0.4 seconds. In the full CW position (100), the delay is about 30 s.

An internal relay with 10 A Form C contacts normally open (NO) and normally closed (NC) are included at Terminals 28, 29, and 30 along with an LED to signal the monitor relay status.

1. Always set the ON point first with the delay set to minimum delay. With the ON adjustment at a setting of 80, adjust the generator load for a desired trip point, i.e. 90% load. Turn the ON adjustment CCW until the monitor turns on with 90% load applied.
2. With the OFF adjustment at a setting of 0, adjust the generator load for a desired reset point, i.e. 20% load. Adjust the OFF adjustment CW until the monitor resets to OFF with the load reduced to 20%.
3. Adjust the monitor's DELAY setting. The Full CCW position offers minimum delay (about 0.4 seconds) and the Full CW position offers a delay of about 30 seconds. These are inverse time delays as in the reverse power circuits.

PROGRAMMABILITY

Once the ON and OFF adjustment have been set, they can be externally programmed with an analog DC signal at Terminal 22. If this terminal is connected to signal ground, it will lower the set point of the monitors approximately 20%. Raising the voltage at Terminal 22 above the nominal 3 V will increase the set points to a level higher than the internal settings. Consult GAC for details.

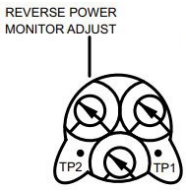
REVERSE POWER MONITOR

Use care when setting the Reverse Power Delay so excessive delay does not damage the generator or switch gear.

Do Not Disconnect the CT's while the engine is running.

LSM200 Series monitors forward and reverse power output of the generator. The reverse power relay signals if the generator's power has gone negative. If negative power exists above a small level, the generator must be removed from service. Reverse power relay contacts are Terminals 25-27.

The set point is adjustable between 2 % and 20 % based on a 5 A CT rating at 100 % power, where 0 is the most sensitive and 100 is about 20 % reverse power, the highest setting.



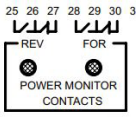
NOTE: The reverse power monitor circuit must have a jumper wire or a reverse power reset switch across Terminals 18 and 19. The Reverse Power reset jumper or switch must be in p/ace at Terminals 18 & 19 for this monitor to function.

Latching and non-latching operation of the Reverse Power monitor relay signal is supported. Factory defaults are set to non-latching configuration which, when a reverse power condition above the set point takes place, the reverse power relay activates. When the reverse power condition reduces or disappears, the monitor automatically resets. If a latching condition for the reverse power monitor is required, connect E1 and E2 together. These posts are located on the circuit board just above and to the right of the AC Voltage Selector DIP Switch. On the LSM201N module, these posts are located on the circuit board just above the AC Voltage Selector DIP Switch.

REVERSE POWER MONITOR (CONTINUED)

Solder a jumper wire across these posts without damaging the circuit board. When a reverse power condition occurs, the internal relay will activate and latch. To reset the relay, open the external Reverse Power Relay switch between Terminals 18 and 19.

The reverse power monitor also offers a time delay adjustment. The time delay is an inverse function where the higher the reverse power, the shorter the delay in the monitor's operation. This provides faster response if a major reverse power condition occurs. Set the time delay to the shortest delay (maximum CCW) unless a long delay is required.



10 A Form C NO and NC relay contacts are provided at Terminals 25, 26, and 27 to operate the external protection mechanisms that remove the generator from service once a reverse power condition has occurred. LEDs signal the reverse power monitor relay's condition.

Use caution in setting the reverse power adjustment to prevent damage to the generator from excessive delay

PARALLELING WITH OTHER GAC LOAD SHARING MODULE

The LSM200 Series may be used with other types of GAC load sharing modules, where an external mains auxiliary parallel cable relay already exists. Connect Terminals 13 and 14 together permanently, closing the internal parallel cable relay and treat the parallel cable as external series contacts.
NOTE: The smooth ramping function during paralleling will not be available under these circumstances.

DROOP

The LSM200 Series operate as isochronous systems, with no internal available droop. Droop can be required add 1 MΩ across the parallel cable to add <1% droop. Lower values of resistance with provide increased values of droop.
NOTE: If droop is used, the automatic load/unload individual load control functions will not operate.

ILC (INDIVIDUAL LOAD CONTROL) AND LOAD RAMPING

Individual generator control is a main function of the LSM200 Series. Opening and closing a switch at Terminals 16 and 17 loads and unloads the generator. Two LEDs (LOAD and UNLOAD) indicate the status for the operator. The Typical operation is:

- When a group of engines are operating together in a load sharing mode, and one engine needs to be removed from service, the ILC unload switch is closed (Terminals 16 and 17).
- The selected generator will start to reduce power until it gives up all its load and is held at zero power at which time it can be removed from service by opening its generator circuit breaker.
- The speed at which the unit reduces its load is controlled by the ILC LOAD I UNLOAD RAMP adjustment. This control adjusts the unloading rate, and thus the smoothness, at which the load transition occurs.
- The generator can be held at zero power indefinitely. If the ILC switch is opened, the generator will increase its load and smoothly ramp back up to normal power.

Once a generator is removed from service, the ILC switch must be opened so the system will smoothly parallel and accept load when the generator is put back into service. When re-paralleling a generator set (ILC open), the LSM201 will match the existing parallel cable voltage with its own so that a smooth connection is made (zero voltage difference). The load control will ramp to equal load sharing. See details in Load Sharing Mode.

LOAD ANTICIPATION FUNCTION

The load anticipation function improves the governor response to loads applied to parallel generators. The basic transient response of the system is improved because the electrical load is measured directly by the LSM. This load occurs before the speed changes and thus the response delays are reduced. The internal LOAD ANTICIPATION adjustment allows the operator to adjust the magnitude of the response to the load change that is presented to the governor. A CW adjustment increases the magnitude of the compensation. Transient reductions of 10 - 30 % are possible if the capability of the engine is not limiting the system. Optimize this adjustment with repetitive load steps.

MAINS POWER CONTROL

The generator power control feature is intended to be used when the generator is supplying power to the infinite main bus (exporting power). See Section 4 Wiring diagrams. In this mode, a temporary connection is made across the parallel cable at Terminals 10 and 11. After synchronizing and paralleling to the mains, the parallel enable switch (Terminals 13 and 14) must be closed when the main generator circuit breaker is closed.

The GENERATOR POWER CONTROL Adjustment can be turned CW toward 100. This will cause the generator to start supplying power to the mains. The generator power output is a function of how far the ADJUST control is turned CW and how high the load sensitivity control is adjusted. Once this setting is made, the power output can be reduced to zero with a switch connection between Terminals 15 and 16. The power setting can also be set externally with a simple potentiometer and a switch that applies a voltage to Terminal 15.

This power control function can be ramped for smooth operation. Adjustment of the RAMP control towards 100 will slow down the load pickup time. The load up and load down times are about the same. For fast response, temporarily connect Terminals 20 and 21.

6 BEFORE STARTING THE ENGINE

LETHAL HIGH VOLTAGE is present at Terminals 1, 2, & 3. Do not disconnect the CT wiring (Terminals 4, 5, 6, 7, 8, 9) when the generator is operating.

Once the LSM200 Series is connected into the system per the appropriate wiring diagram, the following adjustments can be made in the following order.

1. Pre-checks
2. Current transformer phasing
3. load sharing adjustment
4. Load anticipation adjustment
5. Reverse power adjustment
6. Forward power Monitor adjustment
7. Power meter operation

PRE-CHECKS

The following pre-checks must be made before starting engine:

1. With the Reverse Power reset jumper or switch in place at Terminals 18 & 19, set the following:

ADJUSTMENT	POSITION	SETTING
Reverse Power	10	Approx. 5%
Reverse Power Relay	Full CCW	Fastest
Forward Power “On”	80	100%
Forward Power “OFF”	100	0%
Forward Power Delay	Full CCW	Fastest
Load Sensitivity	100	Most Sensitive
Load Anticipation	0	0
External Power Meter Cal	100	Max. Range
ILC Load Ramp	20	Approx. 4 Sec.
Generator Power Ramp	0	0
Generator Power Adjust	0	0
Generator Power Display Cal	50	5 Amps = Full Scale

2. Measure the following voltages at these terminals in this order with DC power applied to the unit.

TERMINAL	VOLTAGE MEASUREMENT	VALUE
31 (+) to 23 (-)	Internal Power Supply	10.6 ± 0.2 V DC
12 (+) to 23 (-)	Output to Governor	5.0 ± 0.1 V DC

3. Apply AC voltages to unit (run engine at no load)

TERMINAL	VOLTAGE MEASUREMENT	VALUE
TPI1 (+) to TP2 (-)	Generator Power Signal	0 ± 0.2 V DC
32 (+) to 33 (-)	Internal Power Meter	0 ± 0.2 V DC

CURRENT TRANSFORMER PHASING

Test for Phasing:

1. With a DC meter across TP1 (+) and TP2 (-), apply a small amount of load to the generator and note the voltage reading and polarity.
2. With a large gauge jumper wire, short out each CT signal (Terminals 4 to 5, 6 to 7, 8 to 9) one at a time.
3. If the short is of low resistance, a 1/3 drop in voltage at the test points will be measured.
4. If the drop is not near 1/3 or the voltage increases, the CT / AC line voltage phasing is improper and must be corrected in the wiring.

7 ADVANCED ADJUSTMENTS

LOAD SHARING ADJUSTMENT

When proper phasing has been confirmed, the generators can be synchronized and paralleled. With the system paralleled and operating with no load, adjust each governor's speed trim for zero real power as indicated on each generator set's hertz-meter.

The system should be stable and no significant power from either generator should be indicated. If the system does not seem stable, adjust each of the LOAD SENSITIVITY controls CCW about 1/3 of a turn or until the system is stable. If the sensitivity is set below 40 %, refer to System Troubleshooting section.

Electrical load can now be applied to the system.

All generator sets in the system should be sharing the systems load nearly proportionally. The generator set carrying the least amount of load should be adjusted to accept more of the total system load. Turn the LOAD SENSITIVITY control adjustment CCW on this unit to increase its load contribution.

LOAD ANTICIPATION ADJUSTMENT

The LOAD ANTICIPATION adjustment is factory set to zero sensitivity. To improve the genset's transient response, gradually advance the adjustment CW to about 50 % while the generator sets are in parallel. The transient response improvement can be observed when the engine load is changed. An optimum setting requires a speed recorder to minimize the transient in both magnitude and duration. Instability may result it the adjustment is advanced too far CW.

REVERSE POWER ADJUSTMENT

With the reset switch or jumper across Terminals 18 and 19, the reverse power monitor can be calibrated. To obtain reverse power on a generator may be difficult. An alternate method is to simulate reverse power by reversing all the CTs temporarily when the unit is in single unit operation.

NOTE: No serviceable points, parts or adjustments internally.

With the CTs still reversed, adjust the monitor's setting from 20 to 100 and the DELAY to fastest (full CCW). Apply a small amount of load representing the trip point of the reverse power monitor, approximately 10 %. Turn the REVERSE POWER MONITOR adjustment from 100 slowly toward 0 until the monitor turns on. Remove the generator load. The monitor should turn OFF (reset). Recheck the setting by applying the 10% load again.

The Reverse Power Delay may now be set by turning this adjustment CW. The minimum delay necessary should be used, otherwise leave this setting to full CCW (minimum delay).

NOTE: **The delays are of the inverse time type. See previous description for details. Be sure to reinstate the CT connections to their proper polarity before attempting parallel operation.**

POWER RAMP DEFEAT - OPTIONAL

When in parallel with the mains under power control, if the mains fail the LSM200 Series load sharing module must revert to isochronous load sharing quickly. The connection across the parallel cable (Terminals 10 and 11) must be opened and the mains load sharing reduced to zero quickly (Terminals 15 to 16 connection). Defeating the mains ramp using a connection from Terminal 20 to 21. See Section 5 Wiring diagram.

If the generator power control function is not used, adjust the RAMP and ADJUST to their 0 settings.

POWER METER OPERATION

The analog power output voltage signal is a good measure of engine power when the AC voltage from the generator is considered to be constant. The external power meter can be any analog or digital meter with a relatively high input impedance (>10 K Ω) that is within the voltage range of the unit. The (+) signal output is at Terminal 32 and the reference is at Terminal 33(-). Terminal 33 is referenced at a voltage of 2.0 V DC above battery minus. Limit Terminal 32 to 10 ma.

The maximum range of voltage is -2 to +5 V DC across these two terminals. The bipolar output allows reverse power as well as forward power to be detected. The EXTERNAL POWER METER CAL adjustment (-1 to % V DC) allows this signal to be adjusted for lower levels to match the external instruments. CCW adjustment reduces the voltage range. Proportional to the CT current an output of 5V indicates 5 A CT power (forward), and -1V indicates 1 A (reverse).

The internal bar graph is taken from the same voltage source. The bar graph can be calibrated for generator power output. The third dot is zero power output and the 10th dot is 100% output. After full power has been applied to the generator, adjust the GENERATOR POWER DISPLAY CAL for a full scale reading. Be sure the adjustment is made by turning the adjustment CW from the zero position.

8 TROUBLESHOOTING

BEGIN TROUBLESHOOTING BY TESTING THE FOLLOWING
Measure the following voltages and record the readings. Perform these voltage checks under the following conditions:

- No AC power applied to the unit
- Terminals 13 to 14 open
- Terminals 16 to 17 open
- Terminals 18 to 19 closed.

TEST LOAD SHARING FUNCTION

1. Measure the battery power output. 24 V DC at terminals 24(+) and 23(-) [12 V DC for -12 versions]
2. Measure the internal 10 V DC supply at terminals 31 (+) to 23 (-).10.6 V DC ± 0.2 V
3. Measure the output at Terminals 12(+) and 23(-). 5.0 V DC ±0.1 V
4. All LED's except the Load should be OFF
5. Apply the AC Voltage to the phase voltage inputs (N, 1, 2, 3)
6. Measure the power meters output:
   Terminals 32(+) to 33(-). 0 V DC ± 0.1 V.
   Terminals 33(+) to 23(-).2.0 V DC ± 0.2 V.
7. Measure the test points TP1 (+) and TP2 (-) Parallel Cable Differential Voltage. 0 V DC ± 0.1 V
8. Apply full power to the Generator Set (or as high as possible). In isolated mode, measure the Test Points TP1 and TP2 and note the polarity and magnitude of the voltage. For a unity power factor condition, and a CT current level of 5 A in all phases the test points should read between 6.0 and 7.0 V DC with TP1 being positive. If not, check the CT and Voltage phasing.
9. With full CT current (generator set in isolated mode) applied, check the parallel cable output voltage at terminals 10(+) and 11 (-). With a meter connected from 10 to 11 short terminals 13 and 14 to close the internal relay. Note the parallel enable LED should light. The voltage output at terminals 10 and 11 should be adjustable via the LOAD SENSITIVITY adjustment from 0 up to the maximum as stated in step 8. Failure to obtain the above readings, look for an open generator neutral connection, missing AC current or AC voltage signal or SW1 voltage range switch set improperly.
10. To confirm that the Load Sharing portion is controlling the governor, temporarily connect a jumper across Terminals 10 to 11 and short Terminals 13 to 14.
11. Apply load to the engine. The speed of the engine should fall (droop) as more load is applied to the engine. Remove engine load and the temporary jumpers. Load sharing function is normal.

IF THE LOAD SHARING IS UNSTABLE FOLLOW THESE STEPS

1.	Check that the battery minus on all genera-tors are connected together.
2.	Ensure the shielded cables are connected at one end, at load sharing module as shown in the proper wiring diagram.
3.	Check to see that the case ground and the battery minus are at the same potential. See EMC/CE information in this publication.
4.	Reduce ALL load sharing sensitivity controls until the system is stable. Do not go below 25 on the sensitivity adjustment or load sharing will be poor.
5.	If still unstable, reduce the Gain in the speed control unit slightly.
6.	Check the stability of the Automatic Voltage Regulator, including the reactive current compensation.

IF THE ILC DOES NOT UNLOAD TO ZERO POWER

1.	With ILC in unload position, measure the voltage at the test points TP1 to TP2 to determine if the LSM is sensing zero power internally This voltage should fall to about 0.2 V DC.
2.	Condition which can prevent unloading to zero power is the AVR (Automatic Voltage Regulator) droop/cross current compensation does not track and allow the sets to have different power levels (load on the generator set is highly reactive).
3.	Improper speed setting of the governor on one or more governors.
4.	Adjust the ILC ramp time to a longer time.

OTHER ISSUES

EMI SUSCEPTIBILITY

The governor system can be adversely affected by large interfering signals that are conducted through the cabling or through direct radiation into the control circuits.

All GAC speed control sensors contain filters and shielding designed to protect the units sensitive circuits from moderate external interfering sources.

Although it is difficult to predict levels of interference, applications that include magnetos, solid sate ignition systems, radio transmitters, voltage regulators or battery chargers should be considered suspect as possible interfering sources.

If it is suspected that external fields, either those that are radiated or conducted, are or will affect the governor systems operation, it is recommended to use shielded cable for all external connections. Be sure that only one end of the shields, including the speed sensor shield, is connected to a single point on the case of the speed control unit. Mount the speed control to a grounded metal back plate or place it in a sealed metal box.

- Radiation is when the interfering signal is radiated directly through space to the governing system. To isolate the governor system electronics from this type of interference source, a metal shield or a solid metal container is usually effective.
- Conduction is when the interfering signal is conducted through the interconnecting wiring to the governor system electronics. Shielded cables and installing filters are common remedies.

In severe high-energy interference locations such as when the governor system is directly in the field of a powerful transmitting source, the shielding may require to be a special EMI class shielding. For these conditions, contact GAC for specific recommendations.