LSM100 Series Load Sharing Module

INTRODUCTION

The function of a Load Sharing Module is to proportionally share load between two or more generator sets while the system frequency is held constant. As an accessory to the electronic governing system, the LSM100 measures the true power current, and through a parallel cable interconnection continuously controls the governing system. The all-electronic power sensing circuits of the LSM100 increase the accuracy of measuring the true power current over conventional methods. This modern method discriminates more closely between real and reactive current so that the governor will respond to the real portion only. By using various droop and power control connections, the Load Sharing Module can parallel and share load with the utility's main bus. In addition to its primary function of load sharing, a load anticipation circuit is included to maximize performance in single or parallel engine generator operation.

INSTALLATION

This unit is typically mounted in the generator set control cabinet with other dedicated control equipment. Always keep the clear terminal strip cover in place when high voltage is present.

The LSM100 module should be installed by qualified personnel only. This document should be reviewed before starting the installation.

WIRING

Electrical connections are illustrated in Diagram 1. Choice of the proper wire size is dependent on the maximum current expected at specific terminals of the load sharing module. Terminals 4-9 can experience a maximum of 5 amps. All others are less than 50 mA.

Terminal N is connected to the neutral of the generator.

Terminals 1-3 accept the 3 PHASE AC VOLTAGE inputs. See the specifications for the two selectable voltage ranges.

CAUTION

High Voltage Present at Terminals 1-3. Terminal Strip Cover Must Be In Place When In Operation

Terminals 4-9 accept the 3 PHASE CURRENT input from 5 amp current transformers. Either Terminals 4, 6, and 8 or Terminals 5, 7 and 9 can be connected together and then connected to battery ground of the speed control unit, not SIGNAL GND of the LSM100. Series connections can be made from the instrument panel Current Transformers (CT's). The CT burden of the load sharing module is 1.25 VA for each phase. This will add to the burden rate of the panel instruments and wiring on the current transformers.

Terminals 10 and 11 are the PARALLEL CABLE connections which link all load sharing modules together. Proper polarity must be observed. If these cables are longer than 10 ft (3m), they must be shielded with the shield grounded at Terminal 15.

Terminal 13 is the load sharing OUTPUT TERMINAL to the governor system speed control unit. If this cable connection is longer than 2 ft (0.6m), it must be shielded. Ground the shield at Terminal 15.

Terminal 14 is connected to the +10 VDC supply from the speed control or an EAM interface module.

Terminal 15 is connected to the ground reference terminal of the speed control unit.

Pre-paralleling Checks

1. Select the proper AC voltage range: SW1 "ON" for 100-240 V, SW1 "OFF" for 240-500 V.
2. LOAD SENSITIVITY adjustment – ¾ turn from full CCW (75).
3. LOAD ANTICIPATION – set to (10).
4. Governor Speed Setpoint – trim to speed setting.
5. CT Phasing – measure across the test posts TP1 and TP2 observing instrument polarity. TP1, the upper post, is (+). This voltage is directly proportional to load. A voltage of 0 to 7 VDC can be expected, depending on the load, LOAD SENSITIVITY adjustment, and CT ratios.

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With the individual generator set under isolated load, momentarily jumper across each CT one at a time with a short insulated lead at Terminals 4-5, 6-7 and 8-9. Each time a CT is independently shorted, the voltage reading will be reduced by about 1/3. If the voltage is not 1/3, this indicates improper CT or voltage phasing. Corrections to CT phasing must be performed while the generator set is not running.

CAUTION

Do Not Open Circuit Current Transformer Connections While Generator Set Is Running, High Voltage Will Be Present

ADJUSTMENTS

With the system paralleled and at no load, adjust each generators' speed using the governor speed trim control for zero real power as indicated on each generator set's wattmeter. Reactive current should be trimmed out with the generator set's voltage regulators. Electrical load can now be applied to the main generator.

Load Sharing

All generator sets in the system should share the system load nearly proportionally. The generator set carrying less than its share of the load should be adjusted to accept more of the system load. Move the LOAD SENSITIVITY adjustment counterclockwise to increase it's load.

Load Anticipation

LOAD ANTICIPATION adjustment is factory set at zero sensitivity (full counterclockwise). To improve transient response, gradually advance the adjustment clockwise while the engine generator sets are in parallel. The transient response improvement can be observed when engine load changes. Instability may result if the adjustment is advanced too far clockwise.

Droop

Adjustable droop of about 5% can be obtained by placing a jumper between Terminals 11 and 12. Turn the DROOP adjustment clockwise to increase droop. See the Power Control Bulletins for applications that use droop in mains power control.

Offset (Above Load Sensitivity)

The OFFSET adjustment is factory set to null out any slight error in the load sensing system. This adjustment may be checked by applying both DC and AC voltages, but maintaining zero CT current. Adjust the offset so that a voltage of less than ±0.002 Volts is measured between test posts TP1 and TP2.

Bias Adjustment (left of Droop)

The common mode voltage on the parallel cable, the voltage from the Terminals 10 and 11 to Terminals 15, is factory set to 5.0 ±0.1 Volts. To check and adjust this setting, apply both DC and AC voltages but maintain zero CT current. Adjust the BIAS until the voltage measured between Terminals 10 and 15 is 5.0 ± 0.1 Volts.

SYSTEM TROUBLESHOOTING

Engine Instability

If instability is present when the generator sets are in parallel, equally reduce the load sensitivity adjustment of each load sharing module. Rotate the adjustments in small increments counterclockwise on all of the load sharing modules in the system until stability is restored. If the load sensitivity adjustment is reduced to less than 25%, poor load sharing may result.

If the instability still persists, disconnect all parallel cables and add a jumper across Terminals 11 and 12 of each unit. Droop will be present, but the system should be stable in parallel operation. If the system is not stable, check the generator voltage regulator stability.

DIAGRAM 1 SYSTEM WIRING AND OUTLINE

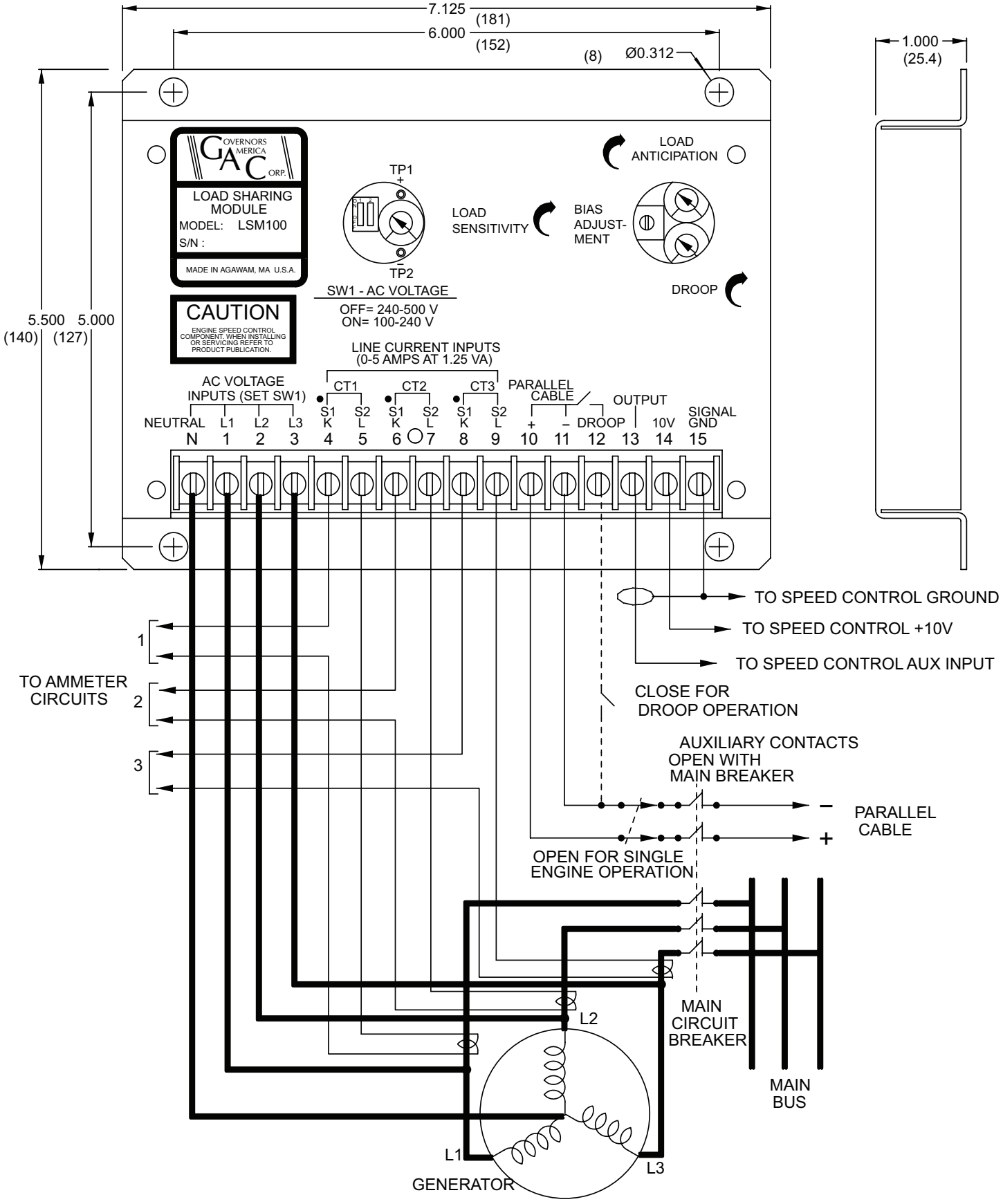
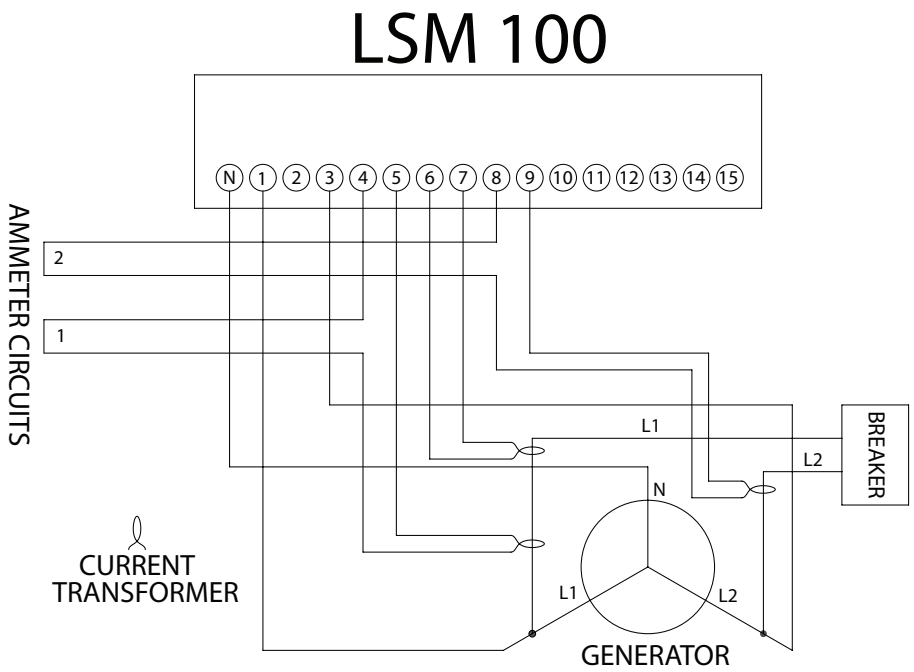


DIAGRAM 1 SINGLE PHASE WITH LSM100



PICTURE FOR WIRING REFERENCE ONLY

SPECIFICATIONS

PERFORMANCE

Load Sharing.....Adjustable to within +1- 2% between sets
Performance.....Isochronous and droop paralleling and power control
Power Output Signal.....0 to 7 Volts DC representing no load to full load
All performance specifications are based on 5 amps from the current transformer (CT) secondaries at full load

POWER INPUT

AC SIGNAL.....SW1 "ON" for 100-240 VAC, SW1 "OFF" for 240-500 VAC nominal line to line, 5 amp CT's with a minimum 1.25 VA rating (Internal 0.05 ohm burden resistors)
DC Supply.....+10 VDC from speed control
Polarity.....Negative ground (case isolated)
Power Consumption.....20 mA typical

ENVIRONMENTAL

Temperature Range.....-40° to 185°F (-40°C to +85°C)
Relative Humidity.....up to 100%
All Surface Finishes.....Fungus proof and corrosion resistant
Agency.....RoHS Compliant

PHYSICAL

Dimensions.....See Diagram 1
Weight.....1.2 lb (0.56 kg)
Mounting.....Any Position, vertical preferred

RELIABILITY

Vibration.....5G @ 20-5000 Hz
Testing.....100% Functional Testing before and after potting