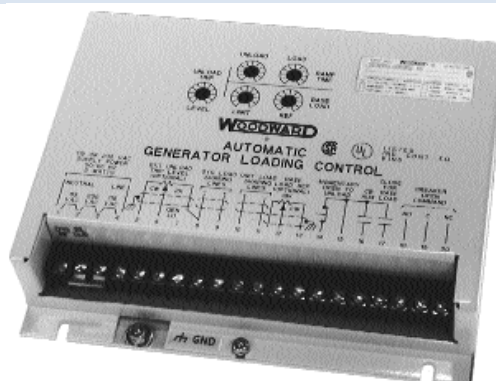


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**Product Manual 82004
(Revision D, 2/2021)
Original Instructions**



AGLC Automatic Generator Loading Control

**9905-096 (UL and CSA Listed)
9903-545**

Installation and Operation Manual

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Regulatory Compliance

The 9905-096 AGLC is UL and CSA Listed.

- The 9903-545 AGLC is for replacement use only and is unlisted in North America.

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AGLC Automatic Generator Loading Control

Chapter 1. General Information

Description

The Automatic Generator Loading Control (AGLC) is an auxiliary control (see Figures 1-1 and 1-2). It is designed to be used with a load sharing and speed control to automatically control the loading and unloading of an engine-generator set. The AGLC accomplishes a bumpless transfer when paralleling an engine generator set to a load-sharing system or separating an engine-generator set from a load-sharing system.

Relay K1 energizes on power-up. The AGLC activates when the generator-breaker auxiliary contacts close. Relay K3 energizes and the load sequence starts (see Figure 1-2). The AGLC compares the existing potential on the load-sharing lines of the oncoming generator with the potential on the system load-sharing lines. Starting at the existing load level, the generator load is ramped at a preset rate until the voltage on the unit load-sharing lines matches the voltage on the system load-sharing lines. When the voltages match, relay K2 energizes to connect the unit load-sharing lines to the system load-sharing lines and to isolate the load ramp signal.

The unload sequence is initiated by momentarily opening the unload contacts. The AGLC de-energizes load-sharing relay K2 (in AGLC) to separate the generator load-sharing lines from the system load-sharing lines. The K2 contacts in series with K3 close again to reconnect the loading ramp signal through K3 contacts to the unit load-sharing lines.

The AGLC then ramps the load down at a preset rate to a preset unload level. When the unload level is reached, the AGLC de-energizes relay K1 to automatically issue a breaker-open command. This command is used to separate the engine generator set from the paralleled system. After the circuit breaker auxiliary (CB AUX) contacts open (indicating the breaker has opened) the AGLC disconnects the ramp from the unit load-sharing lines and relay K1 is energized. The AGLC is then ready to energize relay K3 when it receives a contact closure signal from the CB AUX contacts to load the set again.

The unload procedure may be aborted by opening the CB AUX contacts while the Unload Switch is closed.

IMPORTANT

The AGLC activate (circuit breaker auxiliary) contacts must open when the circuit breaker is opened to reset the AGLC. If they do not, the unit will not be able to go online again.

The AGLC includes a base-load function. Whenever the AGLC is activated, the base load function can be activated by a contact closure. This function can be used in one of two modes; either as a system control to load against a utility or as a unit control to isolate a single generator set from a load-sharing system and load that set to a specific load. The second mode can also be used when a controlled unload is desired without taking the generator set offline. The external base load reference can be changed to a lower or higher level. The load will then ramp to that new level. The set can then be ramped back up to the system load by opening the base-load contact.

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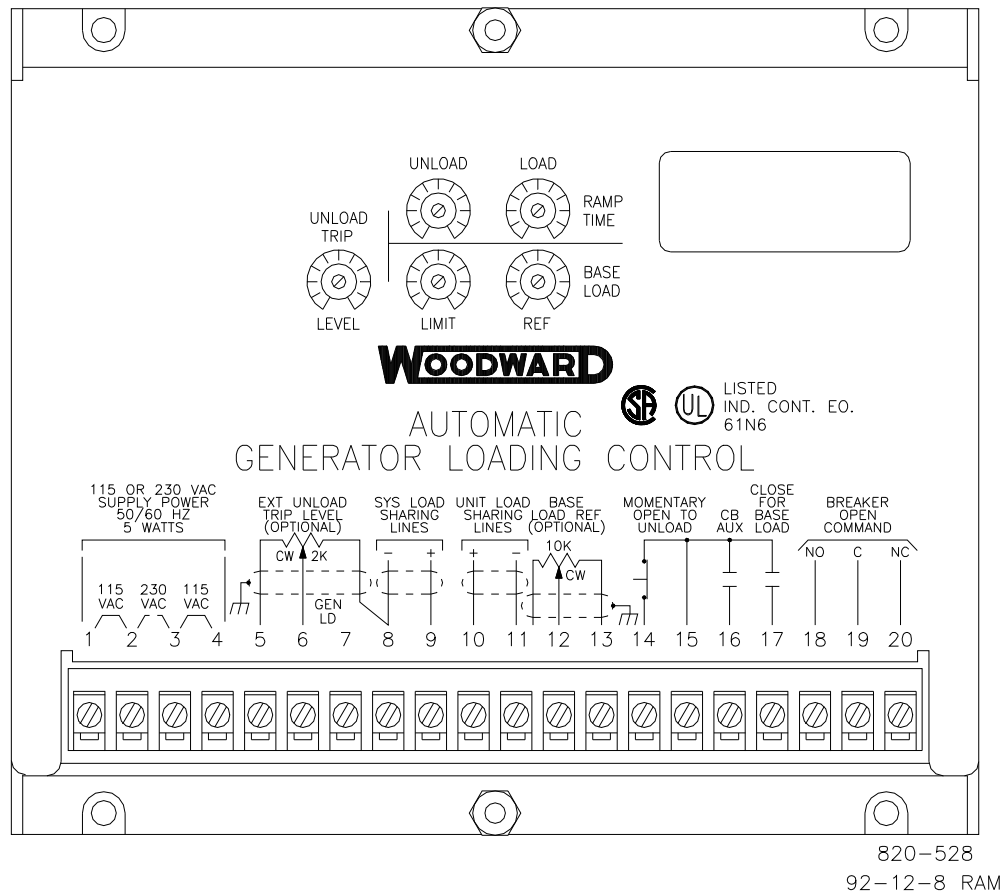


Figure 1-1. Automatic Generator Loading Control

When the base load is activated, the AGLC isolates the engine-generator set load-sharing lines by energizing relay K2. This opens K2₁ and closes K2₂ (as shown in Figure 1-2). This separates the generator load-sharing lines from the system load-sharing lines and closes the ramp-circuit signal through K2₂ to the unit load-sharing lines. The load on the engine generator is ramped up or down to the base-load setting. The base-load setting can be adjusted to different load levels (with the ramps still in effect) while operating in the base-load mode.

The load increases or decreases at preset rates. A base-load limit prevents overloading. This adjustment sets maximum base-load demand. When the AGLC is used as a unit control, opening the base-load contacts automatically ramps the engine-generator set back into the load-share system. Opening the breaker auxiliary contacts (which activate the AGLC without opening the baseload activate contacts) removes the base-load bias signal from the system. Re-closing the breaker auxiliary contacts will then ramp the system back into base load.

As a system control, one AGLC can be used to base load from one to fifteen engine generator sets against a utility. In this mode, the system load-sharing lines are connected to the AGLC unit load-sharing lines. The AGLC system load-sharing lines are not used (see Figure 2-3).

All AGLC controlled load changes start at the existing load on the engine generator set or on the system being controlled. This eliminates load bumps when separating from another system or connecting to another system (following proper synchronization). The up and down ramp rates are linear. These rates are set by the load and unload time adjustments. The ramps are independently adjustable from five seconds to five minutes for load changes equal to 100% of rated load.

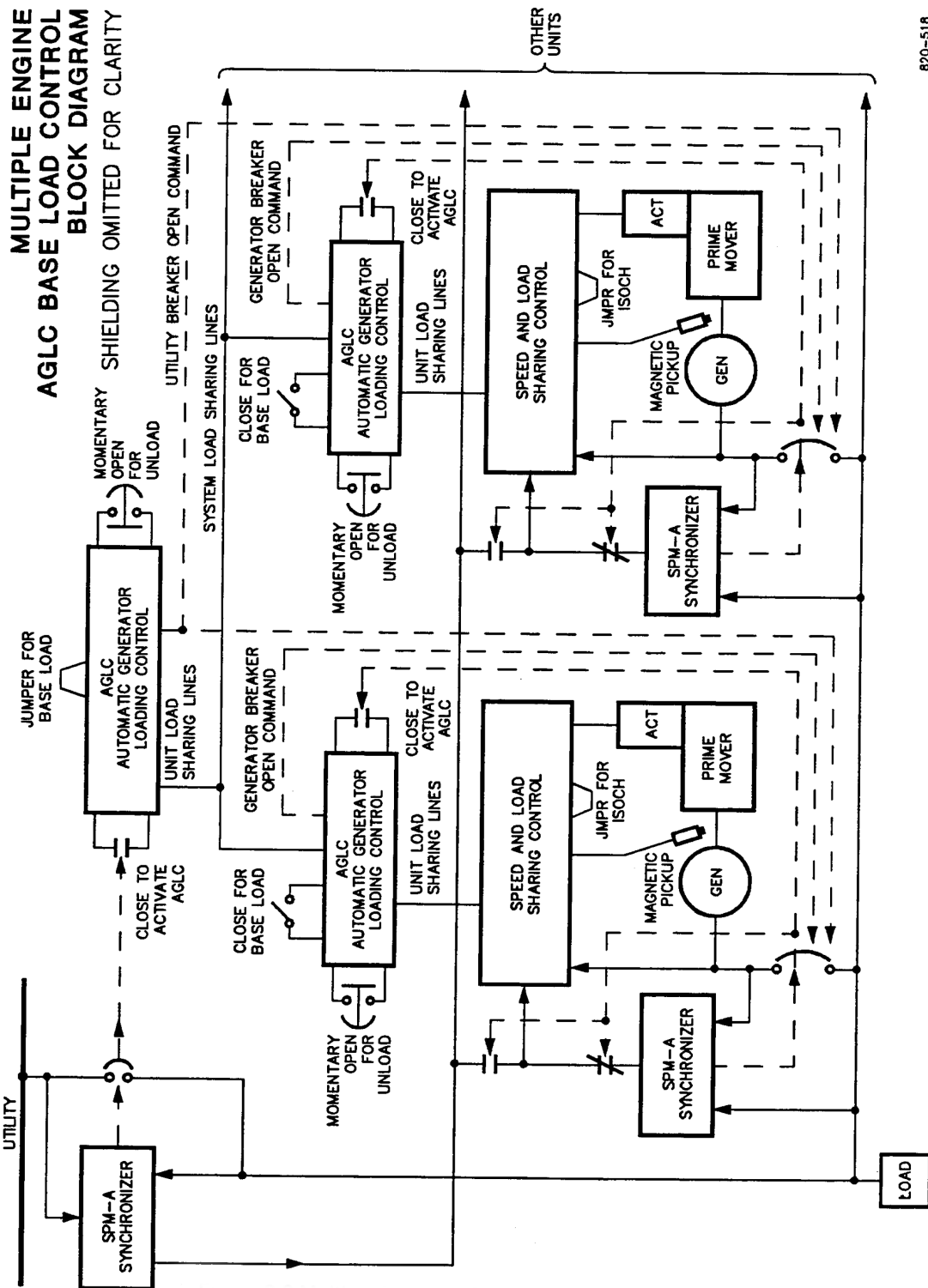
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Figure 2-3. Block Diagram of Multiple Engine AGLC Base Load Control

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Chapter 3. Installation

Unpacking

Be careful when unpacking the control. Check the control for signs of damage such as bent or dented case, and loose or broken parts. If damage is found, notify the shipper immediately. The control may be stored in its original shipping container until it is ready for installation. Protect the control from weather and from extreme humidity or temperature fluctuations during storage. The control is shipped enclosed in a special plastic bag which protects it from accidental electrostatic-discharge damage. Do not remove the control from this special package until ready to install it on the control panel.

Power Requirements

The AGLC requires a supply of either 115 Vac or 230 Vac power, either 50 or 60 Hz. The power supply must be uninterrupted while the AGLC is being used in the generating system. The AGLC may be connected to the bus for power.

IMPORTANT

All AGLCs in a system must be powered up when any of the system's AGLCs are used. Failure to do so will create a "droop-like" symptom in the system.

Location Considerations

Carefully study this chapter before choosing the location for the AGLC. The AGLC can have a number of control options which must be accessed by the operator. The wiring of these options may influence the selection of a location for the AGLC.

Consider the following requirements when selecting the location.

- Adequate ventilation for cooling
- A location that will provide an operating temperature range of -40 to $+85$ °C (-40 to $+185$ °F)
- Space for servicing
- Protection from direct exposure to water or to a condensation-prone environment
- Protection from high-voltage or high-current devices, or devices which produce electromagnetic interference
- Avoidance of vibration

The AGLC is usually installed in the control cabinet for convenient access to other plant controls and the various inputs which will be needed.

Shielded Wiring

All shielded cable must be twisted conductor pairs with either a foil or a braided shield. Do not attempt to tin a braided shield. All signal lines should be shielded to prevent picking up stray signals from adjacent equipment. Connect the shields as shown in the plant-wiring diagram (Figure 3-1). Wire exposed beyond the shield must not exceed two inches. The other end of the shields must be left open and insulated from any other conductor. Do not run shielded signal wires with other wires carrying large currents. See manual 50532, EMI Control for Electronic Governing Systems, for more information.

Installations with severe electromagnetic interference (EMI) may require shielded wire run in conduit, double shielded wire, or other precautions. Contact Woodward for more information.

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Chapter 4. Plant Wiring and Adjustments

Introduction

The following information is intended to expand on the requirements for plant-wiring options presented by the AGLC. All wiring options are the responsibility of the installer and the instructions which follow are suggestions only.

Figure 4-1 is the plant wiring diagram for the AGLC. Figure 4-2 shows the interconnections between controls for a typical system.

IMPORTANT

Switch size and type, wire size and type, and potentiometer size and type suggested in this chapter will generally provide adequate operation of the AGLC. Special problems which surround individual installations must be considered and allowed to overrule these suggestions. No consideration to hazardous environments or other special conditions have been made in offering these suggestions.

Power Supply and Operation Selections

Wire Size

Connect the control to the voltage source with a minimum of 20 AWG (0.5 mm²) insulated wire. Connect the wires to the control with crimp-on, insulated, number-6 connectors. If relay contacts are to be used for the full 10 ampere rating, a minimum of 16 AWG (1.0 mm²) wire should be used.

Power Supply

The input power may be from the local bus. 115 V supply must be between 88 and 132 V, 50 or 60 Hz. The 220 V supply must be between 170 and 264 V, 50 or 60 Hz. Maximum current use is 0.10 A.

IMPORTANT

All AGLCs in the system must be powered up during any combination of engine operation, even single engine operation.

Use solid plate-type jumpers to jumper terminals 1 to 2 and 3 to 4 if a 115 Vac supply is being used. Use the same type of jumper to jumper terminals 2 to 3 if a 220 Vac supply is to be used.

Woodward part number 1606-899 is the recommended jumper.

Connect supply leads (either 230 or 115 Vac) to terminals 1 and 4 (polarity is not important). If fused, use a 2 A fuse in series with the supply.

Unload Trip and Base Load Reference Selections

Unload Trip

The unload trip level may be set with the potentiometer in the AGLC or by an external potentiometer. **The external potentiometer will always override the Unload Trip Level set with the internal potentiometer in the AGLC.**

To connect the external unload trip level potentiometer:

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Close for Base Load

Install a Base Load switch between terminals 17 and 15. When the AGLC is activated and this switch is closed, the AGLC will be in the base-load mode and the generator or local system load will increase or decrease at the ramp rate to the previously set base-load level.

Trip Relay

This relay is energized except when the unload trip level is reached or when the unit or system is off line. When the trip level is reached the circuit through terminals 18 and 19 will open and the circuit through 19 and 20 will close. The change in circuit state is used to issue a generator breaker open command. The circuits will remain in the trip position until the switch at terminals 14 and 15 closes and the AGLC trip relay is reset when the generator breaker's auxiliary contacts open.

Table 4-1 Breaker Open Relay Contact Rating

	Resistive	Inductive	Motor	Lamp
28 Vdc	10 A	6.0	3.0	1.0
115 V 400 Hz	5 A	2.5	3.0	0.8
115 V 60 Hz	3 A	2.0	1.5	0.5

Potentiometer Adjustments

The five potentiometers accessed through the cover provide all the adjustments for the AGLC.

The unload trip level is set with the extreme left-hand potentiometer on the control. The one-turn potentiometer setting is overridden by any setting which is made on an optional external potentiometer connected to terminals 5, 6, and 7.

The base-load limit is set with a one-turn potentiometer. This limit applies to the base-load limit set with either the potentiometer on the control or the optional remote baseload setting at terminals 11, 12, and 13. The Base Load Limit is used to prevent accidental overloading through the base-load setting.

Ramp times are separately adjustable between 5 seconds to 5 minutes for 100% load change.

Both ramp rates are set with one-turn log-taper potentiometers. The log-taper potentiometer gives finer resolution at the 5-second end of adjustment than it does at the 5-minute end. This provides better resolution where it is required. Clockwise adjustment of the rate potentiometers increases the ramp time (adjusts the ramp toward the 5-minute slow limit.)

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Chapter 5. Troubleshooting

Introduction

When the AGLC is properly installed and the two ramp rates, unload trip, and the base load points have been established, operation is totally automatic. When the breaker closes, the auxiliary contacts activate the AGLC and the oncoming generator or generator system is loaded at a controlled rate. When the unload switch is opened momentarily, the controlled unit will unload to the trip point and, when the unload trip point is reached, signal the breaker to open. When the generator is paralleled with the utility and the base-load contacts are closed, the unit will ramp up or down to the base-load setting.

Troubleshooting

The following procedure is provided to permit bench testing of AGLC functions. All adjustments are accessible through the cover. The cover will not have to be removed for these tests. The complete control must be returned to the factory for any repair.

The bench test requires that ramp rates and set points be preset. The bench test should not be attempted unless the AGLC is suspected as the cause of control system problems.

IMPORTANT

Inspect all other portions of the control system and inspect all of the AGLC plant wiring and connections before determining that system problems are related to the AGLC. Take particular care while inspecting the system wiring to be sure that all shields are in place and properly grounded according to installation instructions.

Bench Test Tools

The following tools will be needed to conduct the bench test:

- High impedance multimeter
- Potentiometers and switches as shown in the plant wiring diagram, and 115 or 230 Vac power supply

AGLC Bench Test

This test may be used to check the AGLC for suspected malfunction.

Test Setup Procedure

1. Connect control inputs and outputs as shown on the plant wiring diagram. Connect all switch contacts and external potentiometers as indicated.
2. Preset the Unload and Load ramp-time potentiometers to full counterclockwise.
3. Preset the Unload Trip Level potentiometer full counter clockwise.
4. Preset the Base Load Limit potentiometer to mid position.
5. Preset the Base Load Reference potentiometer full clockwise.
6. Measure infinite resistance between all terminals and the chassis.



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