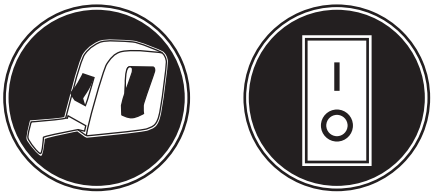

# Owner Manual

## Installation/Operator

Our energy working for you.™

Cummins® Power Generation

## Controller

PCC 1301

English 3–2010 900–0660 (Issue 7)

# Table of Contents

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# Foreword

The purpose of this manual is to provide the users with general control operation and fault code information. Refer to the equipment manufacturer's product support manuals for important safety precautions.

Manufacturers applying this control are respectfully advised that it is their responsibility to employ competent persons to carry out any installation work in the interests of good practice and safety. It is essential that the utmost care is taken with the application of this control device.

# Warranty

**Warranty:** This manual is published solely for information purposes and should not be considered all inclusive. Sale of product shown or described in this literature is subject to terms and conditions outlined in appropriate Cummins Power Generation selling policies or other contractual agreement between the parties. This literature is not intended to and does not enlarge or add to any such contract. The sole source governing the rights and remedies of any purchaser of this equipment is the contract between the purchaser and Cummins Power Generation.

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# IMPORTANT SAFETY INSTRUCTIONS

**SAVE THESE INSTRUCTIONS** – This manual contains important instructions that should be followed during installation and maintenance of the generator and batteries.

**Before operating the generator set (genset),** read the Operator's Manual and become familiar with it and the equipment. **Safe and efficient operation can be achieved only if the equipment is properly operated and maintained.** Many accidents are caused by failure to follow fundamental rules and precautions.

The following symbols, found throughout this manual, alert you to potentially dangerous conditions to the operator, service personnel, or the equipment.

**⚠ DANGER** ***This symbol warns of immediate hazards which will result in severe personal injury or death.***

**⚠WARNING** ***This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.***

**⚠ CAUTION** ***This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.***

## FUEL AND FUMES ARE FLAMMABLE

Fire, explosion, and personal injury or death can result from improper practices.

- DO NOT fill fuel tanks while engine is running, unless tanks are outside the engine compartment. Fuel contact with hot engine or exhaust is a potential fire hazard.
- DO NOT permit any flame, cigarette, pilot light, spark, arcing equipment, or other ignition source near the generator set or fuel tank.
- Fuel lines must be adequately secured and free of leaks. Fuel connection at the engine should be made with an approved flexible line. Do not use zinc coated or copper fuel lines with diesel fuel.
- Be sure all fuel supplies have a positive shutoff valve.
- Be sure battery area has been well-ventilated prior to servicing near it. Lead-acid batteries emit a highly explosive hydrogen gas that can be ignited by arcing, sparking, smoking, etc.

## EXHAUST GASES ARE DEADLY

- Provide an adequate exhaust system to properly expel discharged gases away from enclosed or sheltered areas and areas where individuals are likely to congregate. Visually and audibly inspect the exhaust daily for leaks per the maintenance schedule. Make sure that exhaust manifolds are secured and not warped. Do not use exhaust gases to heat a compartment.
- Be sure the unit is well ventilated.
- Engine exhaust and some of its constituents are known to the state of California to cause cancer, birth defects, and other reproductive harm.

## MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Keep your hands, clothing, and jewelry away from moving parts.
- Before starting work on the generator set, disconnect battery charger from its AC source, then disconnect starting batteries, negative (–) cable first. This will prevent accidental starting.
- Make sure that fasteners on the generator set are secure. Tighten supports and clamps, keep guards in position over fans, drive belts, etc.
- Do not wear loose clothing or jewelry in the vicinity of moving parts, or while working on electrical equipment. Loose clothing and jewelry can become caught in moving parts.
- If adjustment must be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

## DO NOT OPERATE IN FLAMMABLE AND EXPLOSIVE ENVIRONMENTS

Flammable vapor can cause an engine to overspeed and become difficult to stop, resulting in possible fire, explosion, severe personal injury and death. Do not operate a genset where a flammable vapor environment can be created by fuel spill, leak, etc., unless the genset is equipped with an automatic safety device to block the air intake and stop the engine. The owners and operators of the genset are solely responsible for operating the genset safely. Contact your authorized Cummins Power Generation distributor for more information.

## ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Remove electric power before removing protective shields or touching electrical equipment. Use rubber insulative mats placed on dry wood platforms over floors that are metal or concrete when around electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surface to be damp when handling electrical equipment. Do not wear jewelry. Jewelry can short out electrical contacts and cause shock or burning.
- Use extreme caution when working on electrical components. High voltages can cause injury or death. DO NOT tamper with interlocks.
- Follow all applicable state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician. Tag and lock open switches to avoid accidental closure.
- DO NOT CONNECT GENERATOR SET DIRECTLY TO ANY BUILDING ELECTRICAL SYSTEM. Hazardous voltages can flow from the generator set into the utility line. This creates a potential for electrocution or property damage. Connect only through an approved isolation switch or an approved paralleling device.

## GENERAL SAFETY PRECAUTIONS

- Coolants under pressure have a higher boiling point than water. DO NOT open a radiator or heat exchanger pressure cap while the engine is running. Allow the generator set to cool and bleed the system pressure first.
- Used engine oils have been identified by some state or federal agencies as causing cancer or reproductive toxicity. When checking or changing engine oil, take care not to ingest, breathe the fumes, or contact used oil.
- Keep multi-class ABC fire extinguishers handy. Class A fires involve ordinary combustible materials such as wood and cloth; Class B fires, combustible and flammable liquid fuels and gaseous fuels; Class C fires, live electrical equipment. (ref. NFPA No. 10).
- Make sure that rags are not left on or near the generator.
- Make sure generator set is mounted in a manner to prevent combustible materials from accumulating under the unit.
- Remove all unnecessary grease and oil from the unit. Accumulated grease and oil can cause overheating and engine damage which present a potential fire hazard.
- Keep the generator set and the surrounding area clean and free from obstructions. Remove any debris from the set and keep the floor clean and dry.
- Do not work on this equipment when mentally or physically fatigued, or after consuming any alcohol or drug that makes the operation of equipment unsafe.
- Substances in exhaust gases have been identified by some state or federal agencies as causing cancer or reproductive toxicity. Take care not to breath or ingest or come into contact with exhaust gases.
- Do not store any flammable liquids, such as fuel, cleaners, oil, etc., near the generator set. A fire or explosion could result.
- Wear hearing protection when going near an operating generator set.
- To prevent serious burns, avoid contact with hot metal parts such as radiator, turbo charger and exhaust system.

## KEEP THIS MANUAL NEAR THE GENSET FOR EASY REFERENCE

# 1. Introduction

## ABOUT THIS MANUAL

This manual provides installation and operation information regarding the 1301 series control.

This manual does not have instructions for servicing printed circuit board assemblies. After determining that a printed circuit board assembly is faulty, replace it. Do not repair it. Attempts to repair a printed circuit board can lead to costly equipment damage.

This manual contains basic (generic) wiring diagrams and schematics that are included to help in troubleshooting. Service personnel must use the actual wiring diagram and schematic shipped with each unit. The wiring diagrams and schematics that are maintained with the unit should be updated when modifications are made to the unit.

Read ***Important Safety Precautions*** and carefully observe all instructions and precautions in this manual.

## SYSTEM OVERVIEW

The 1301 control is a microprocessor-based control. All generator set control functions are contained on one circuit board. The circuit board provides engine speed governing (optional, when the governor output module and appropriate engine equipment is provided), main alternator voltage output regulation, and complete generator set control protection and monitoring.

The operating software provides control of the generator set and its performance characteristics. and displays performance information on an optional operator panel. It accepts menu-driven control and setup input from the push button switches on the operator panel.

**When using any PCCNet device on a genset control application, the wiring used to connected ALL devices in the network must be Belden 9729 Two Pair, Stranded, Shielded Twisted Pair Cable (24 AWG).**

## CERTIFICATIONS

The 1301 series control meets or exceeds the requirements of the following codes and standards.

- NFPA110 for level 1, 2, or 3 systems (level 1 compliance may require additional equipment on the the genset)
- ISO 8528−4: 1993 Compliance, Controls and Switchgear
- CE Marking: The control system is suitable for use on generator sets to be CE−marked
- EN 50081−1,2 Residential/Light Industrial emissions
- EN 50082−1,2 Industrial susceptibility
- ISO 7637−2, level 2; DC supply surge voltage test
- Mil Std 202C, Method 101 and ASTM B117: Salt Fog test

The control is suitable for use on generator sets that are UL2200 listed.

### Connector Seal Standards

The following standards apply to the connector seals used with the 1301 series control.

- **24 Pin Matrix** − AMP 794758-1
- **6 Pin Matrix** − AMP 794275−1 Interface seal and AMP 794276−1 Wire seal (both are required)

## HOW TO OBTAIN SERVICE

Contact your generator set manufacturer when seeking additional service information or replacement parts. Provide model and serial number information.

**⚠WARNING** ***Incorrect service or replacement of parts can result in severe personal injury or death, and/or equipment damage. Service personnel must be qualified to perform electrical and mechanical service. Read and follow Important Safety Precautions, on pages v and vi.***

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# 2. Description

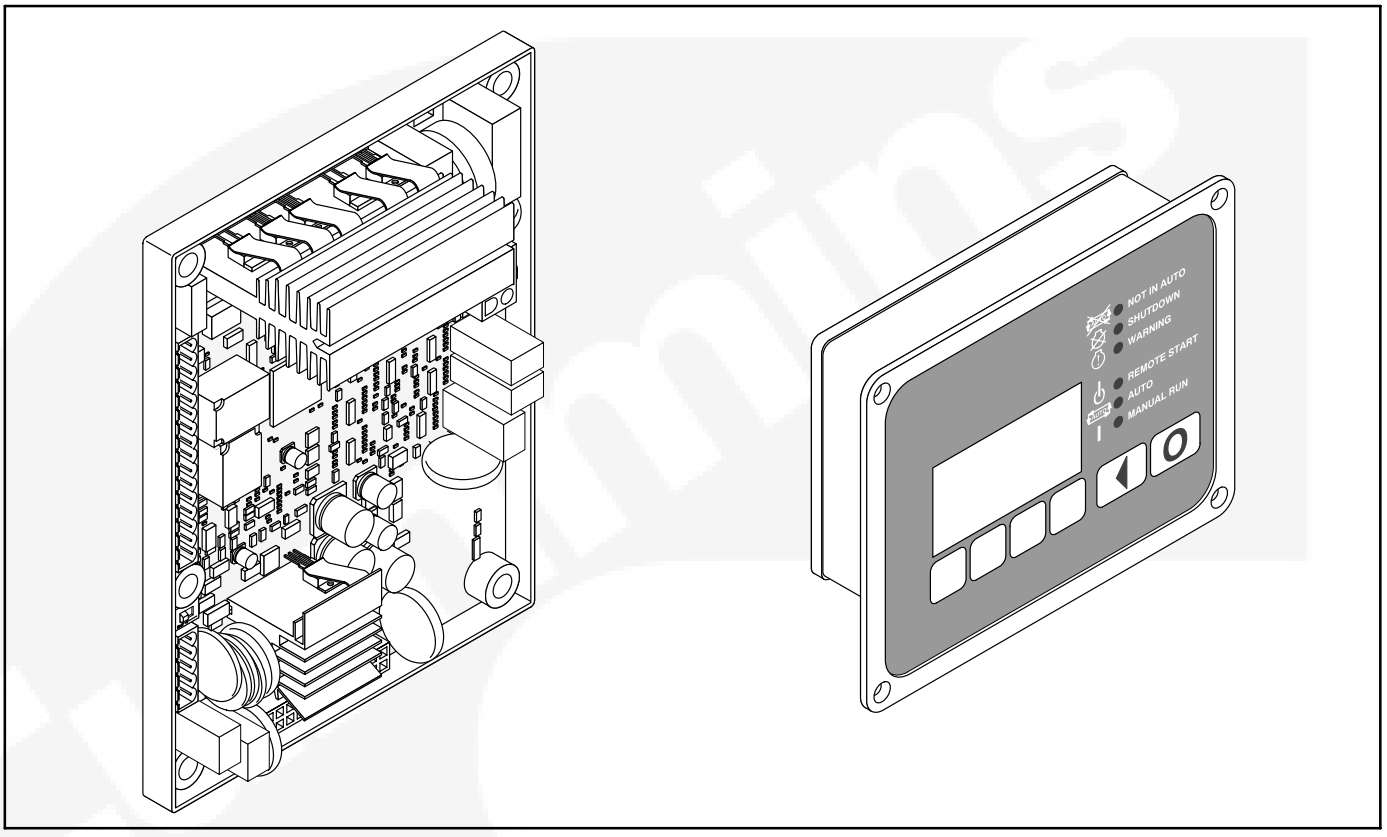



**FIGURE 2-1. 1301 MAIN CONTROL BOARD AND OPERATOR PANEL**

## OVERVIEW

The 1301 series controller is a microprocessor–based generator set monitoring, metering, and control system. The control provides a simple operator interface to the genset, digital voltage regulation, optional engine speed governing, remote start/stop control, and generator set protective functions.

The 1301 series controllers are suitable for use in non-paralleling applications and are compatible with reconnectable alternators up to 600 VAC. The control can also be configured for various frequency (50 or 60 Hz operation), voltage, and power connection configurations from 120 to 600 VAC.

The control is designed for mounting on the generator set. The 1301 series control is usually powered from the generator set starting batteries and works over a voltage range from 8 to 30 VDC.

The 1301 series controller meets NFPA 110 requirements (with appropriate accessories) and is designed for connection to a 12 or 24 VDC control system.

## KIT DESCRIPTION

The 1301 regulator kit includes the 1301 control board (12/24V control assembly with run and start relay drivers) and operator panel shown in Figure 2-1. Also included in this kit are the following sensors and harnesses.

- Coolant Temperature Sensor
- Oil Pressure Sensor
- Pressure Sensor Harness
- Coolant Temperature Sensor Harness
- P11 Control Harness
- P1 Operator Panel Harness (Control to Display)
- Accessory Harness
- Genset Harness

If your installation is to include an electronic governor, kit 541–1231 must be purchased separately.

## 1301 CONTROL FEATURES

The 1301 series controller includes the following features.

- Operates on 12 or 24 VDC.
- Includes single-phase or three-phase (delta or wye) voltage and current sensing. Current sensing with an external 0 – 5 amp current transformers.
- Can be configured for 50 or 60 Hertz frequency.
- Includes a MonNet communications connector (TB2) for remote Modbus monitoring.
- Driver output for glow plug or spark igniter controller.
- Environmental protection. The control system is designed for reliable operation in harsh environments. The main control board is potted module that is fully protected from the elements.

A 1301 control installation may also include the following options.

- If an operator panel is mounted on the genset (local display), as many as seven additional network modules can be mounted up to 4000 feet from the genset (remote displays). A setup menu in the optional operator panel is required to designate a display as Local or Remote (see page 5-12).
- A Manual Run/Off/Auto switch can be installed instead of using the operator panel included in this kit.
- Status Indicator Lamp – The 1301 main control board includes a lamp driver for an external fault / status indication. If this feature is used, it provides the operator with basic status information on the generator set. The Manual Run/Off/Auto switch mentioned above may include a status indicator lamp. For more information on the functions displayed with a control status indicator, see “Local Status Output Indicator” on page 4-1.
- Remote emergency stop (TB1-16 to TB1-15)
- Customer fault inputs 1 (TB1-14 to TB1-13) and 2 (TB1-12 to TB1-13) – Grounding one of these inputs activates the corresponding warning or shutdown sequence. External sensing equipment must be connected to the designated digital input.

  The nature of the fault is an optional customer selection. Example inputs: Low Fuel Day Tank, Water In Fuel, Ground Fault, etc.

  Two Customer Input Text message submenus are supplied to enter the event type and description (see page 5-18).
- Annunciator fault inputs 1, 2, and 3 – These outputs can be used when an annunciator is installed as part of an RS-485 interface connected to TB1-2 and TB1-3. Grounding one of these inputs on the annunciator activates the corresponding warning or shutdown sequence.

  Three Customer Annunciator Text message submenus are supplied to enter the event type and description (see page 5-22).
- Electronic Governor Enable/Disable. – Via an external Governor Output Module (kit 541–1231)
- PCCNet Remote Annunciator
- Base I/O Module (AUX101 – Kit 541–1291)
- Expansion I/O Module (AUX102 – Kit 541–0772)

## 1301 CONTROL SYSTEM

### Control Modules

The control board requires external start and run relays.

A basic control system consists of a single control board with an external control switch and status indicator. The control switch and status indicator are included in the operator panel included in this kit.

The control board includes all the functions necessary to locally or remotely start and stop the Genset, provide digital voltage regulation, and protect the Genset.

To use the electronic governor feature (kit 541–1231), an external governor power stage may be required to drive the fuel actuator.

### Control Run/Off/Auto Switch

**Off Mode** – If the control is in the OFF mode, the generator set is immediately shut down (if running) and can’t be started.

**Run Mode** – If the control is in the RUN mode, the generator set will execute its start sequence and operate at rated speed and voltage.

**Auto Mode** – If the control is in AUTO mode, the generator set can be started with a start signal from a remote device, such as an automatic transfer switch by accepting a ground signal.

**Fault Reset** – Placing the switch in the OFF position also resets the active/inactive faults in the control.

## OPERATOR PANEL

The 1301 series control is provided with an optional operator panel that may be either locally or remotely mounted. The operator menus are made up of English or internationally accepted symbols so translations are not required. The display is composed of an adjustable contrast backlit LCD display, with a series of 6 generator status LED lamps. The display is accompanied by a set of six tactile feel membrane switches that are used by the operator to navigate through control menus, and to make control adjustments. It is configurable for units of measurement.

The Run/Off/Auto switch function is integrated into the operator panel; therefore an external switch is not required when a operator panel is installed. The operator panel displays current active faults, and a time-ordered history of previous faults.

### Operator Panel Connections

Two connectors (J1 and J2) are located on the back of the operator panel (see Figure 2-2). Connections are listed in Table 2-1.

**NOTE:** J1 and J2 are identical. Either one can be used for the harness connection between the main control board and the operator panel.

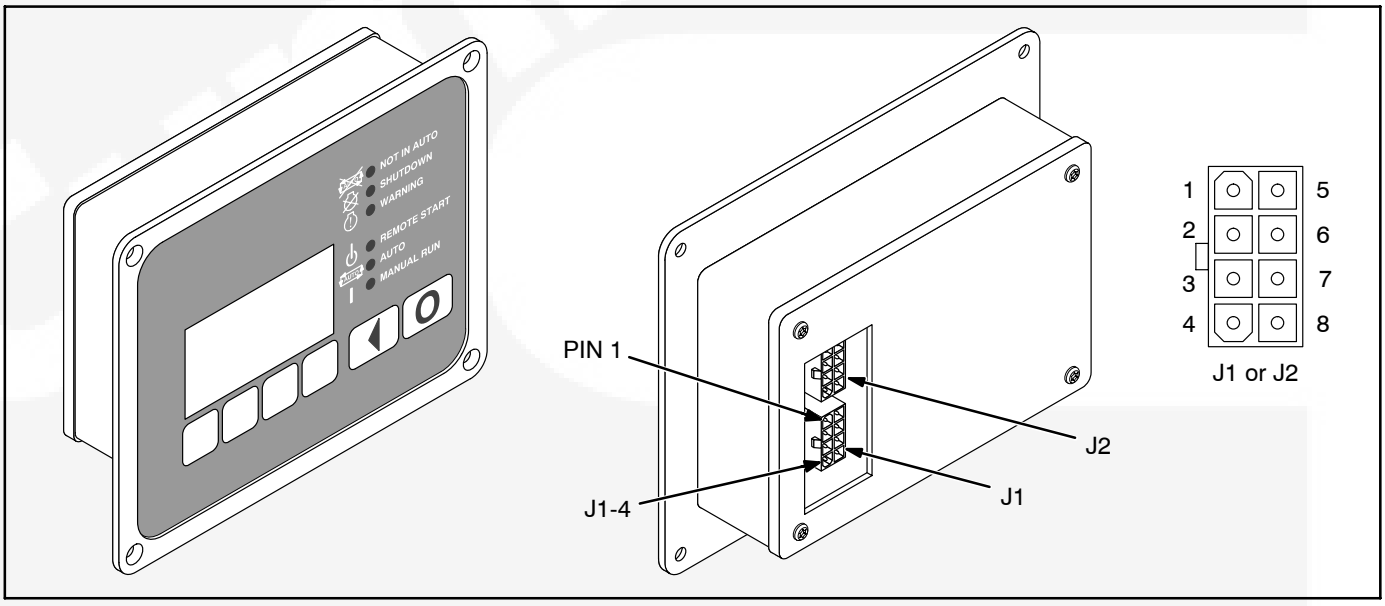



**FIGURE 2-2. 1301 OPERATOR PANEL**

**TABLE 2-1. OPERATOR PANEL CONNECTIONS**

| Connector Pin | Signal Name | Connect To / Comments |
|---|---|---|
| J1-1 | RS-485 Data A | Network Data A |
| J1-2 | RS-485 Data B | Network Data B |
| J1-3 | B+ | Network Supply |
| J1-4 | Wake Up | |
| J1-5 | Return | Network Supply Return |
| J1-6 | Run Output | Brown Wire |
| J1-7 | Auto Output | Blue/Pink Wire |
| J1-8 | | |

## CONTROL INPUTS AND OUTPUTS

### Control Inputs

Input signals to the main control board are:

- Run/Off/Auto switch
- Remote start signal
- Remote emergency stop
- Coolant temperature signal
- Lube oil pressure signal
- Battery voltage signal
- Wake up input
- Magnetic pick up signal
- Starter disconnect signal
- Single or three phase current transformer (CTs)
- Single or three phase voltage
- Configurable inputs – Fault_Input #1 and Fault_Input #2. The control includes two input signals from configurable discrete devices that are configurable for warning, shutdown, or status indication, as well as message displayed.

### Control Outputs

Output signals from the control are:

- Control status lamp.
- Configurable relay outputs (OUT1_NO and OUT2_NO) – The control includes two relay outputs rated at two amps. These outputs can be configured to activate on any control warning or shutdown fault as well as ready to load, not in auto, common alarm, common warning, and common shutdown.
- Ready to load (generator set running) signal – This output pin goes high when the genset is capable of supporting a load. The genset speed and voltage output are what determines the state of this pin.
- Communications connections – The control includes two RS-485 ports.
  - PC Tool Interface (TB2) – This communication port is to allow the control to communicate with a personal computer running a PC based service tool. This port also allows the control to communicate with external devices, such as a Programmable Logic Controller (PLC).
  - The Customer Inputs connector (TB1) is a communications port that also allows connection from the control to the operator panel.
- Local status – Refer to “Local Status Output Indicator” on page 4-1.
- Battery charging alternator – Alternator flash connection
- Fuel shut-off relay
- Starter output
- Glow plug solenoid
- Governor drive PWM command
- Field coil – AVR PWM command

## PROTECTION AND FAULTS

The 1301 series control features genset protection functions and fault detection.

On operation of a protective function the control indicates a fault by flashing the fault code, if equipped with a local status lamp. On systems with an optional operator panel, the warning or shutdown LED lights and the fault symbol and code is displayed on the operator panel. The nature of the fault and time of occurrence are logged in the control.

### Fault Codes

A list of fault/status codes is included in Section 4. Shutdown faults will shutdown the genset. Warning faults are issued to notify the genset operator of the problem but the 1301 series control will not shutdown the genset when they occur.

### Genset Protective Functions

The control provides the following system protective functions:

- Configurable Alarm and Status Inputs – The 1301 series control accepts up to two alarm or status inputs (configurable contact closed to ground or open) to indicate customer specified conditions. The control is programmable for warning, shutdown, or status indication, and for labeling the input.
- Emergency Stop – Annunciated whenever the emergency stop signal is received from an external switch.

### Engine Protection

- Overspeed Shutdown – The engine overspeed default setting is 115% of the rated engine speed nominal. The control includes time delays to prevent nuisance shutdown signals.
- Low Lube Oil Pressure Warning/Shutdown – The level is preset (configurable with a PC based service tool or through the display panel menus) to match the capabilities of the engine used. The control includes time delays to prevent nuisance warning/shutdown signals.
- High Engine Temperature Warning/Shutdown – The level is preset (configurable with PC based service tool or through the display panel menus) to match the capabilities of the engine used. The control includes time delays to prevent nuisance warning/shutdown signals.
- Low Coolant Temperature Warning – This warning indicates that the engine temperature may not be high enough for a 10-second start or proper load pickup. The level is preset (configurable with a PC based service tool or through the display panel menus) to match the capabilities of the engine used. The control includes time delays to prevent nuisance warning signals.
- Low Battery Voltage Warning – This warning indicates a battery charging system failure by continuously monitoring battery voltage. The control includes time delays to prevent nuisance warning signals.
- High Battery Voltage Warning – This warning indicates that the battery charging system is of a high level by continuously monitoring battery voltage. The control includes time delays to prevent nuisance warning signals.
- Weak Battery Voltage Warning – The control system tests the battery bank each time the generator set is signaled to start. A warning is announced if the generator set battery indicates impending failure. The control includes time delays to prevent nuisance warning signals.
- Fail to Start (Overcrank) Shutdown.
- Fail to Crank Shutdown – This shutdown indicates that the control signaled the starter to crank the engine but the engine did not rotate.
- Cranking Lockout – The control will not allow the starter to attempt to engage or to crank the engine when the engine is rotating (when the control senses the valid engine RPM above the noise threshold value.)
- Sensor Failure Indication – An out-of-range high or low diagnostic logic is provided on the base control to detect analog sensor or interconnecting wiring failures.

## Alternator Protection

- High/Low AC Voltage Shutdown – The high voltage default setting is 110% of the rated voltage with a 10 second time delay. The instantaneous voltage default setting is 130% of the rated voltage. The low AC voltage default setting is 85% of the rated voltage with a 10 second time delay.
- Over current Warning/Shutdown – The default for the warning is 110% of the rated current with a 60 second time delay. The default for the shutdown is 150% of the rated current with a 10 second time delay.
- Under/Overfrequency – The underfrequency default is – 6Hz of the 50 Hz / 60 Hz frequency with a 10 second time delay. The overfrequency default is + 6Hz of the 50 Hz / 60 Hz frequency with a 10 second time delay.
- Loss Of Sensing AC Voltage Shutdown – Loss of sensing AC voltage detects the loss of voltage sensing or senses the loss of zero crosses.
- Field Overload Shutdown – Field overload is used to detect the short circuit of a field coil when the Field Current Protection is enabled.

## CURRENT DRAW

The current draw information below is for the 1301 series control only. It does not include current draw for other application specific devices, such as the optional operator panel, external actuators, relay coils, or display lamps.

### Running Mode

When in Running mode, the 1301 series control consumes 1.1 amps of current.

### Parade Rest Mode

Parade Rest mode is when the 1301 series control is waiting for a start command (for example, the genset is not running). During Parade Rest mode, the control consumes 150 milliamps of current.

### Sleep Mode

The 1301 series control enters Sleep mode after five minutes in the Off or Auto mode when the current draw is not greater than 60 milliamps (DC) at normal battery voltage levels. During Sleep mode, the control consumes 150 milliamps of current.

# 3. Installation

Read these instructions completely and become familiar with safety warnings, cautions, and procedures before starting the installation.

**⚠WARNING** ***Incorrect installation, service, or replacement of parts can result in severe personal injury or death and/or equipment damage. Only trained and experienced personnel are to perform the following procedures.***

**⚠CAUTION** ***A generator set control must be serviced only by technically qualified personnel. High voltages are present. These voltages can cause electrical shock, resulting in personal injury.***

***Even with power removed, improper handling of components can cause electrostatic discharge and damage to circuit components.***

**⚠WARNING** ***AC voltages and currents present an electrical shock hazard that can cause severe personal injury or death. Incorrect installation, service, or parts replacement can result in severe personal injury, death, and/or equipment damage.***

Turn off or remove AC power from the battery charger (if present) and then remove the negative (–) battery cable from the set starting battery. This is to make sure the genset will not start while working on it and to avoid circuit board damage, caused by voltage spikes when removing and replacing circuit board connectors.

**⚠CAUTION** ***If present, always disconnect a battery charger from its AC source before disconnecting the battery cables. Otherwise, disconnecting the cables can result in voltage spikes high enough to damage the DC control circuits of the generator set.***

**⚠WARNING** ***Accidental starting of the generator set while working on it can cause severe personal injury or death. Prevent accidental starting by disconnecting the starting battery cables (negative [–] first).***

***Make certain the battery area has been well-ventilated before servicing the battery—Wear goggles—Stop the genset and disconnect the charger before disconnecting battery cables. Arcing can ignite explosive hydrogen gas given off by batteries, causing severe personal injury. Arcing can occur when a cable is removed or reattached, or when the negative (–) battery cable is connected and a tool used to connect or disconnect the positive (+) battery cable touches the frame or other grounded metal part of the generator set. Always remove the negative (–) cable first, and reconnect it last. Make certain hydrogen from the battery, engine fuel, and other explosive fumes are fully dissipated. This is especially important if the battery has been connected to a battery charger.***

**⚠WARNING** ***Ignition of explosive battery gases can cause severe personal injury or death. Arcing at battery terminals, light switch or other equipment, flame, pilot lights and sparks can ignite battery gas. Do not smoke, or switch trouble light ON or OFF near a battery. Discharge static electricity from body before touching batteries by first touching a grounded metal surface.***

## MOUNTING GUIDELINES

The main control board and the operator panel are suitable for non-engine mounting. As such, they should not be directly mounted on the engine.

The control and operator panel may be mounted on one of the following.

- A suitable frame on top of the alternator
- A frame supported from the genset base rail
- A stand-alone mounting frame isolated from the vibration of the genset

Appropriate vibration isolators should be used to make sure that neither the main control board, the operator panel, nor customer wiring are subjected to vibration levels beyond their capability.

To prevent the control board and the operator panel from being exposed to conditions beyond their specifications, care should be taken not to mount them close to the engine exhaust pipes. Mounting them in a manner that would expose them to direct sunlight, rain/snow should also be avoided.

It is recommended that the control board be mounted with the longer side horizontal and the

shorter side vertical so as to allow air to move freely upwards through the heat sink channels. Mounting the control board with the short side horizontal and the longer side vertical should be avoided.

## ENVIRONMENTAL CAPABILITY

The control system is specifically designed and tested for resistance to RFI/EMI and to resist the effects of vibration to provide a long reliable life when mounted on a generator set. The control includes transient voltage surge suppression to provide compliance to referenced standards.

### 1301 Main Control Board

The main control board is designed to withstand vibration levels of 50 mm / sec in the 20 to 100 Hz range and of 3.3 G in the 100–2000 Hz range.

The main control board is designed for proper operation without recalibration in ambient temperatures from –40 to +70 Deg C, and for storage from –55 to +80 Deg C. The control is designed to operate with humidity up to 95%, non-condensing, and at an altitude up to 13,000 feet (5000 meters).

The main control board is fully encapsulated to provide resistance to the effects of dust and moisture.

### 1301 Operator Panel

The operator panel is designed to withstand vibration levels of 40 mm / sec in the 4 to 100 Hz range. The operator panel can survive the engine vibration levels shown in Figure 3-1.

The operator panel is designed for proper operation in ambient temperatures from –4 to 158 Deg F (–20 to +70 Deg C) and for storage, from –22 to 176 Deg F (–30 to +80 Deg C).

The operator panel has a single membrane surface, which is impervious to the effects of dust, moisture, oil, and exhaust fumes.

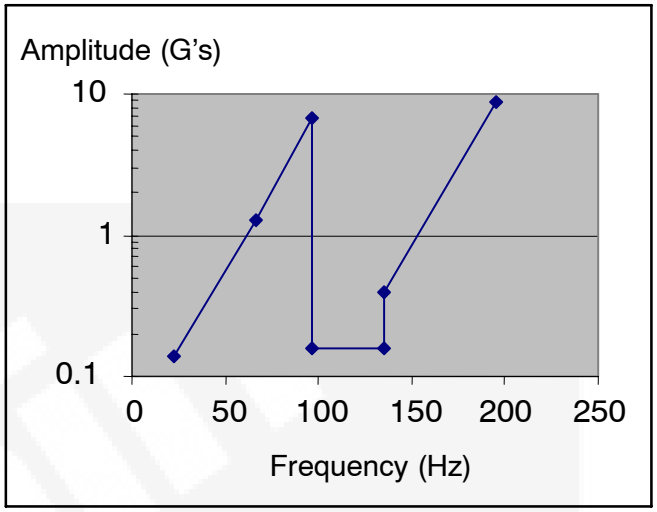



**FIGURE 3-1. OPERATOR PANEL VIBRATION LIMITS**

## CONTROL WIRING INFORMATION

- For connecting the Magnetic Pick Up, use minimum 0.8 sq. mm (18 gage), 2 conductors, twisted shielded cable. Connect the shield at J11 –11and leave shield un-connected at the magnetic pick up side of the cable.
- For connecting battery supply, use two twisted pair wires minimum 1 sq mm cable size (16 Gage).
- For connecting current transformers, use three twisted pair wires minimum 1 sq mm (16 gage).
- For All other connections use minimum 0.8 sq mm (18 gauge) wires.
- The Electronic Governor feature typically requires an external Governor Output Module Kit. Governor PWM output from the 1301 series control board is connected as input to the Governor Power Module by a minimum 0.8 sq. mm (18 gage), 2 conductors, twisted shielded cable.

## GUIDELINES FOR CURRENT TRANSFORMERS

All current transformers (CTs) used with a 1301 series control must conform to the following specifications.

- Continuous rated full load secondary output current: 5 amps at 50 or 60Hz
- Total burden VA rating: at least 2.5 VA
- Output terminals between which current is drawn in high and low ranges on tapped CTs.
- Maximum allowable ratio error at rated output: +/–1%
- Maximum allowable phase error at rated output: +/–1
- 10 second overload output current in rated metering load: 10 Amps
- Maximum allowable ratio error at overload output: +/–1%
- Ambient temperature rating: –40 to 176 Deg F (–40 to +80 Deg C)
- System voltage rating – 600VAC

### Current Transformer Selection

Current transformers (CTs) used in 1301 control applications are ideally sized to produce rated CT secondary amps at twice rated generator (full 200% range) output amperes. In other words, when the generator is producing 100% output amperes, the secondary current of the CTs is 2.5 amperes per phase. This requirement determines a lower bound of the CT ratio. An upper bound is determined by requiring that, at 100% rated output current, the CTs secondary current is at least 1 ampere. The purpose of this is to maintain sufficient metering resolution. The lower and upper bound of the CT limits are prescribed by the following two formulas.

$$Minimum\ CT\ Ratio = \frac{2 * Max\_Rated\_Current}{5}$$

$$Maximum\ CT\ Ratio = \frac{5 * Min\_Rated\_Current}{5}$$

In non-reconnectable genset applications, the Max_Rated_Current and Min_Rated_Current are the same. In reconnectable genset applications, they are different.

### Example of CT Sizing – Two Lead CT

A 250kVA rated genset application at 240V produces rated output current of 602 amps/phase. This yields a Minimum CT Ratio of 1204:5 and a Maxaximum CT Ratio of 3010:5. Any CT with a ratio between these two values would be sufficient for this application.

## Example of CT Sizing – Three Lead CT

A reconnectable generator capable of 208–240/416–480V outputs with a 125 kVA 3-phase only rating.

You first need to find the current in each phase for each output voltage. This is done using the following formula:

$$Current = \frac{Power(VA)}{\sqrt{3} * Voltage}$$

**or**

$$Current = \frac{Power(W)}{\sqrt{3} * Power\_Factor * Voltage}$$

Using the above equation, the current in each phase is computed as shown below.

| Voltage (V) | Output Current (A) |
|---|---|
| 208 | 346.376 |
| 240 | 300.192 |
| 416 | 173.188 |
| 480 | 150.096 |

The next step is to use the equations on page 3-3 to find the lower and upper bound for the CT ratios for each voltage configuration.

For a 208–240 voltage configuration:

$$Maximum\ CT\ Ratio = 5 * 300.192 = 1500.96$$

$$Minimum\ CT\ Ratio = 2 * 346.376 = 692.752$$

For a 416–480 voltage configuration:

$$Maximum\ CT\ Ratio = 5 * 150.096 = 754.8$$

$$Minimum\ CT\ Ratio = 2 * 173.188 = 346.376$$

For three-tap CTs, it would be advisable to choose a CT with a 1500/750:5 ratio.

For the 208–240 voltage configuration, connect the CT leads to the 1st and 3rd CT connections, leaving the center tap disconnected.

For the 416–480 voltage configuration, use the same 1500/750:5 ratio CT, but this time connect the CT leads to the first and second (center-tap) connections on the CT, leaving the third tap unconnected.

## Current Transformer Setup

After the 1301 series control kit has been installed, the controller must be programmed to use the CT by one of the following methods.

1. Enter an appropriate value in the CT ratio parameter on the operator panel.
2. Select a feature to be downloaded using the Manufacturing Tool.
3. Program an appropriate value in the Primary CT Current parameter using a PC-based service tool (for example, InPower).

**NOTE:** The 1301 series control automatically doubles the entered CT ratio when switching from high nominal voltage (above 300V) to lower nominal voltage (below 300V).

### *Operator Panel*

Information on setting the appropriate CT ratio value using the operator panel is included on page 5-32.

When entering the CT ratio using the operator panel, the following rules apply.

- Two lead CT:
  - Above 300V applications – Enter the CT ratio, as read from the CT.
  - Below 300 V applications – Enter **half** of the CT ratio, as read from the CT.
- Three lead CT (center tapped) – Enter the **smaller** of the two ratios, as read from the CT.

### *Manufacturing Tool*

When entering the Primary CT Current using the Manufacturing Tool, the following rules apply.

- Two lead CT:
  - Above 300V applications – Select a feature corresponding to the CT ratio, as read from the CT.
  - Below 300 V applications – Select a feature corresponding to **half** of the CT ratio, as read from the CT.
- Three lead CT (center tapped) – Select a feature corresponding to the **smaller** of the two ratios, as read from the CT.

***PC-Based Service Tool***

When entering the Primary CT Current using a PC-based service tool (for example, InPower), the following rules apply.

- Two Lead CT:
  - Above 300V applications – Enter **half** of the CT ratio.
  - Below 300V applications – Enter **one quarter** of the CT ratio.
- Three lead CT (center tapped) – Enter **half** of the smaller of the two ratios, as read from the CT.

## Example of CT Setup – Two Lead CT

For this example, assume that a CT with a 1500:5 ratio is being used.

***Operator Panel***

- Above 300V – Enter 1500 into the CT Ratio parameter on the operator panel.
- Below 300V – Enter 750 into the CT Ratio parameter on the operator panel.

***Manufacturing Tool***

- Above 300V – Select a feature corresponding to 1500:5 to download using the Manufacturing Tool.
- Below 300V – Select a feature corresponding to 750:5 to download using the Manufacturing Tool.

***PC-Based Service Tool***

- Above 300V – Enter 750 into the Primary CT Current parameter using the PC-based service tool (for example, InPower).
- Below 300V – Enter 375 into the Primary CT Current parameter using the PC-based service tool.

## Example of CT Setup – Three Lead CT

For this example, assume that a CT with a 1500/750:5 ratio is being used.

***Operator Panel***

Enter 750 into the CT Ratio parameter on the operator panel.

***Manufacturing Tool***

Select a feature corresponding to 750:5 to download using the Manufacturing Tool.

***PC-Based Service Tool***

Enter 375 into the Primary CT Current parameter using a PC-based service tool (for example, InPower).

# BATTERY CHARGING ALTERNATOR CONNECTIONS

The 1301 series control currently supports the following charging alternator types.

## Denso Type Charging Alternators

A Denso charging alternator with IG and L (failure lamp) connection points is shown in Figure 3-2. This configuration is used to produce a start disconnect signal and to indicate a failed battery charging alternator.

A Denso type charging alternator works in 24V and 12V applications (1301 series control works on 12 VDC / 24 VDC).

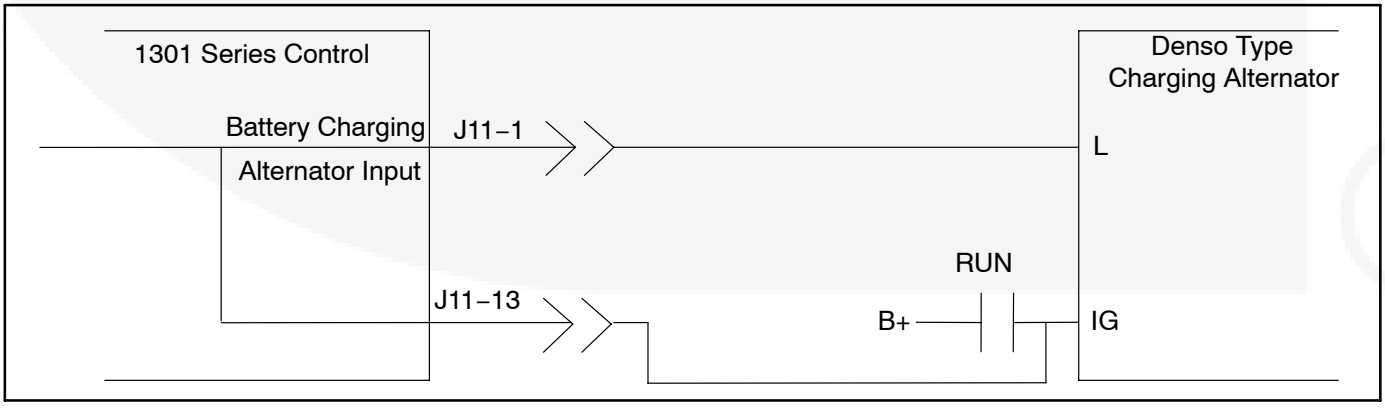



**FIGURE 3-2. DENSO CHARGING ALTERNATOR WIRING DIAGRAM**

## Bosch Type Charging Alternators

A Bosch charging alternator with D+ (flash input) connection point is shown in Figure 3-3. This configuration is used to produce a start disconnect signal and to indicate a failed charging alternator.

- Resistor power rating is adequate to work in both 24V and 12V applications.
- An external diode and a smaller sized resistor (15–22 Ohms) may be required to guarantee this method will both start the alternator and provide a start disconnect signal in the area of 600–700 engine RPM. The size of the resistor will need to be verified to ensure proper alternator operation.

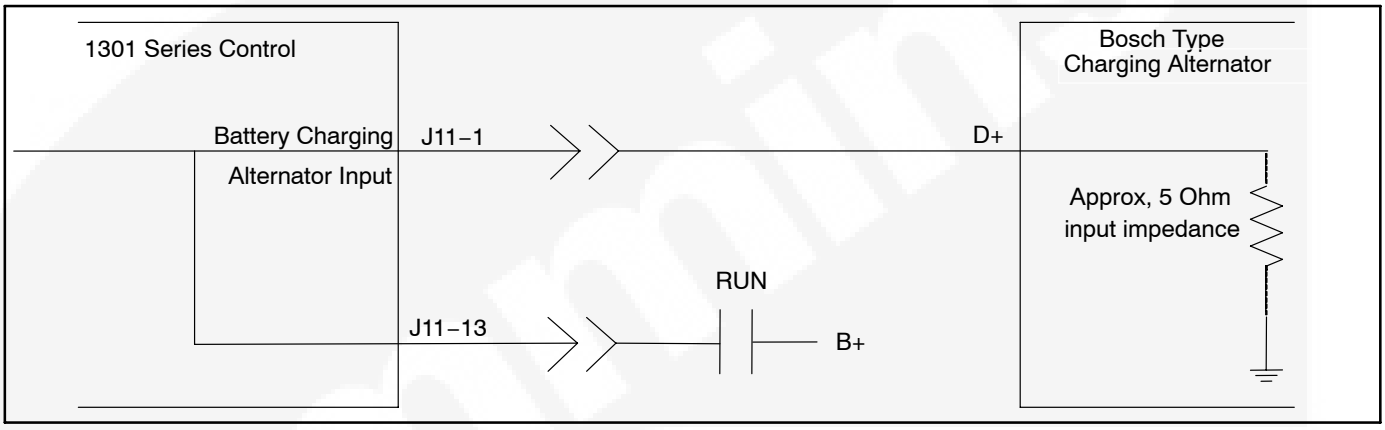



**FIGURE 3-3. BOSCH CHARGING ALTERNATOR WIRING DIAGRAM**

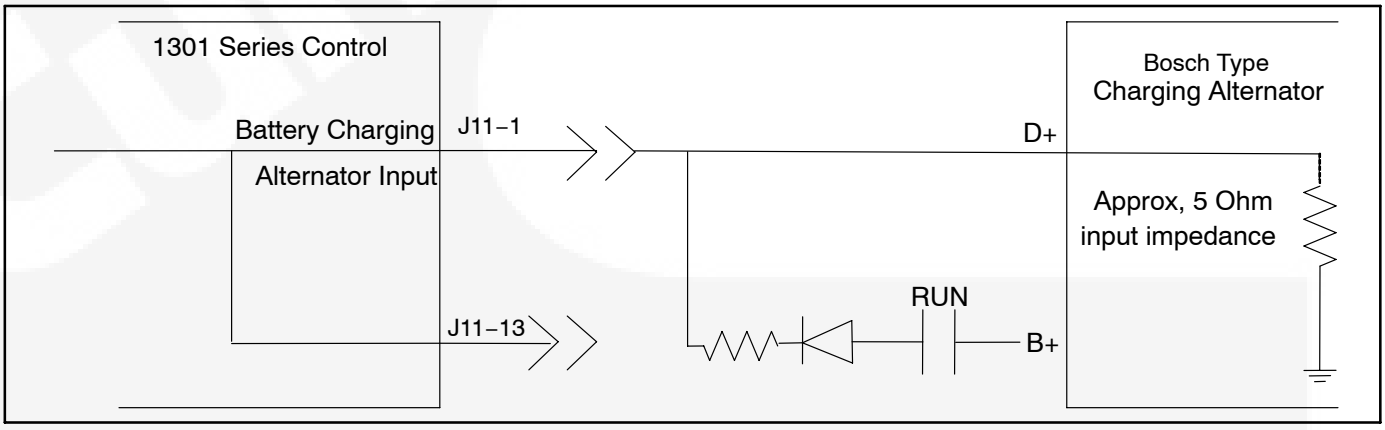



**FIGURE 3-4. BOSCH CHARGING ALTERNATOR WIRING DIAGRAM SHOWING EXCESSIVE VOLTAGE DROP**

## ALTERNATOR CONNECTIONS FOR NEWAGE ALTERNATORS

A fast acting UL certified ceramic fuse with a rating of ten amperes must be placed inline with the Sense U (J13-4) voltage sensing lead.

### Series Star

Series star connection yields an output voltage of 220–277/380–480 volts. Figure 3-5 shows the correct series–star alternator connections.

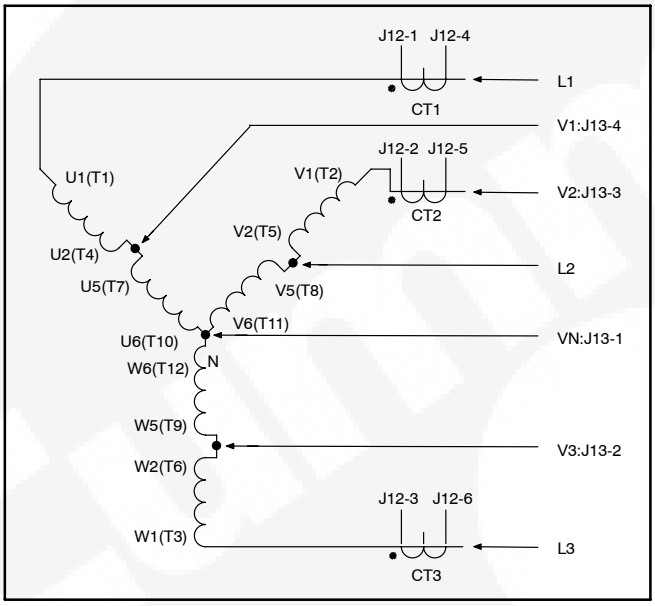



**FIGURE 3-5. SERIES STAR CONNECTIONS**

### Series Delta

Series delta provides for an output voltage of 110–120/220–240 volts. Figure 3-6 shows the correct series delta connections. Note: Sense N must not be connected in three phase delta connections

### Parallel Star

Parallel star alternator configuration yields an output voltage of 110–139/190–240 volts. Figure 3-7 illustrates the correct parallel star connections.

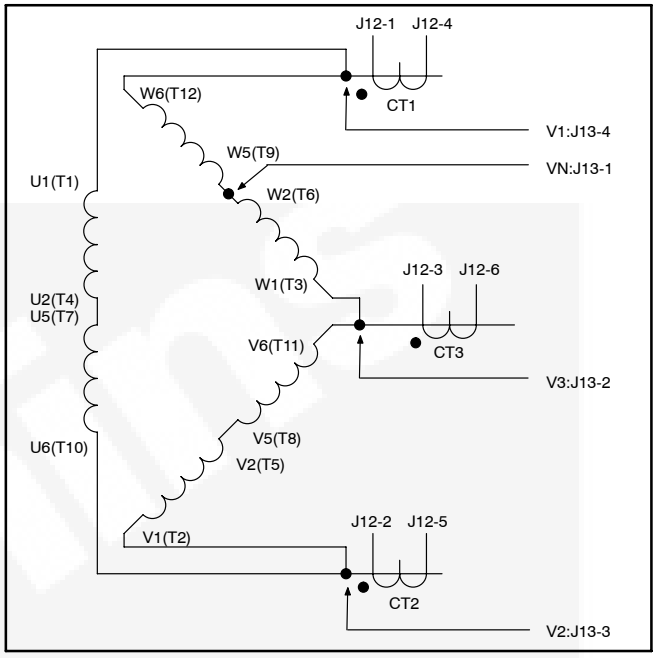



**FIGURE 3-6. SERIES DELTA CONNECTIONS**

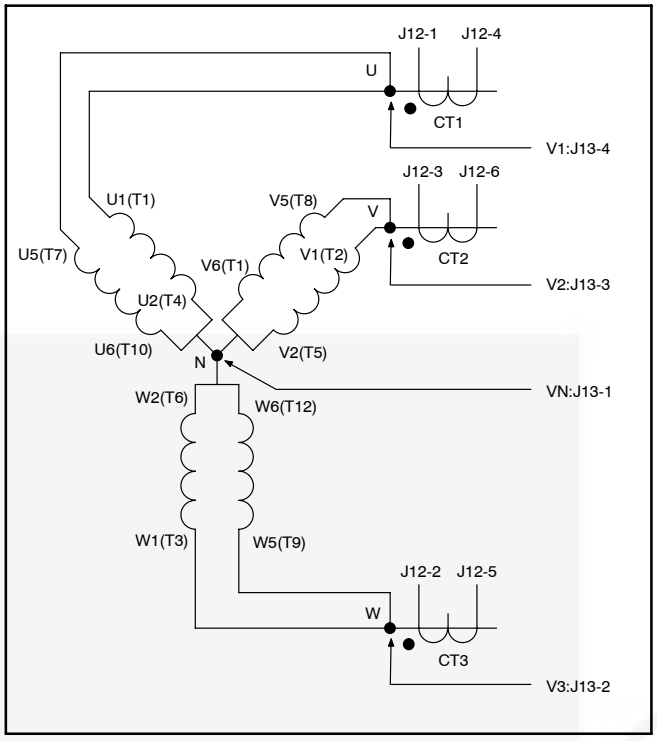



**FIGURE 3-7. PARALLEL STAR CONNECTIONS**

## Double Delta

The double delta alternator configuration yields an output voltage of 110–120/220–240 volts. Correct double delta connections are illustrate in Figure 3-8.

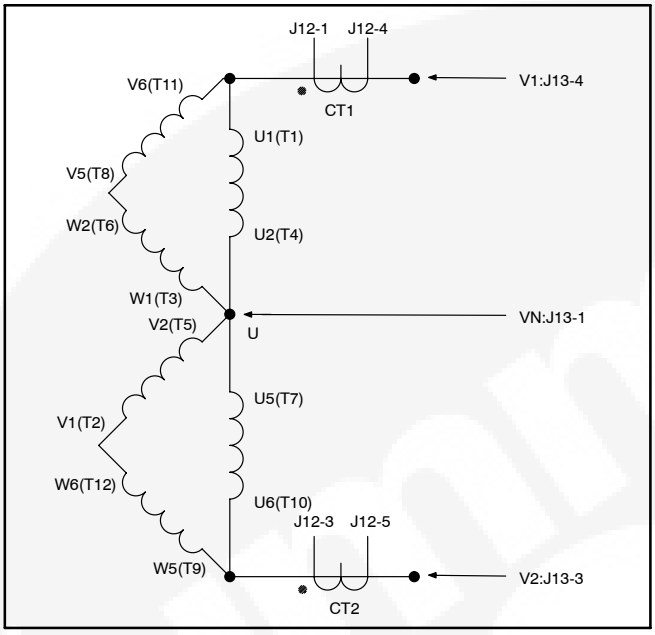



**FIGURE 3-8. DOUBLE DELTA CONNECTIONS**

## Single Phase

Single phase provides for an output voltage of 110–120/220–240 volts. Single phase alternator connection is shown in Figure 3-9.

## 600 Volt Series Star

The 600 volt configuration shown in Figure 3-10 yields and output voltage of 347/600.

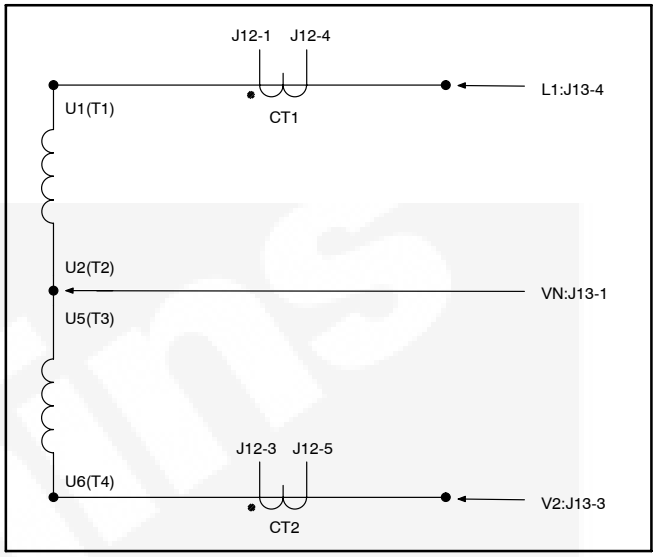



**FIGURE 3-9. SINGLE PHASE CONNECTIONS**

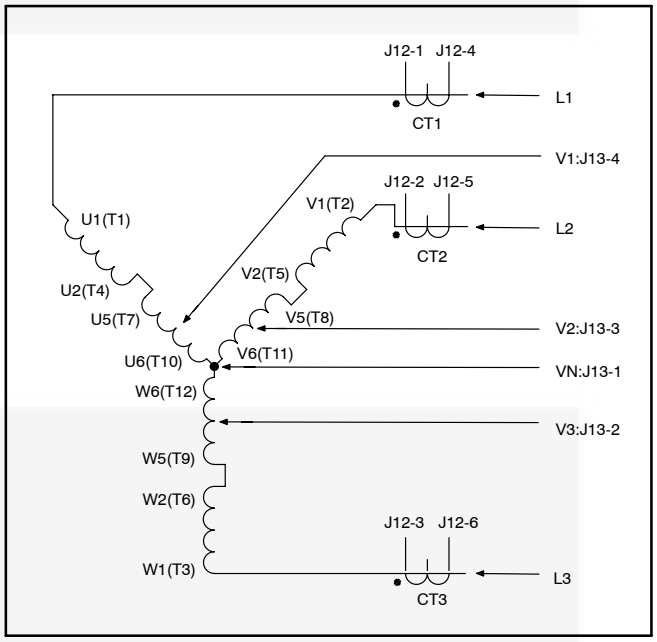



**FIGURE 3-10. 600 VOLT SERIES STAR CONNECTIONS**

## GUIDELINES FOR ENGINE SENSORS

The engine sensors included in this kit are:

- Coolant Temperature Sensor 193−0529−01
- Oil Pressure Sensor 193−0444

This section provides information on these plus additional engine sensors that can be used with 1301 series controllers.

### Coolant Temperature Sensors

The coolant temperature sensors that are available from Cummins Power Generation (CPG) are listed in Table 3-1.

The coolant temperature sensor connectors that are available from CPG are listed in Table 3-2.

### Oil Pressure Sensors

The 1301 series control can be programmed for either oil pressure sensors or switches. The control can also be programmed for either 3-wire or 2-wire sensors. Available switch and sensors are listed in Table 3-3.

For information on setting the oil pressure sender type using the display panel, see page 5-36.

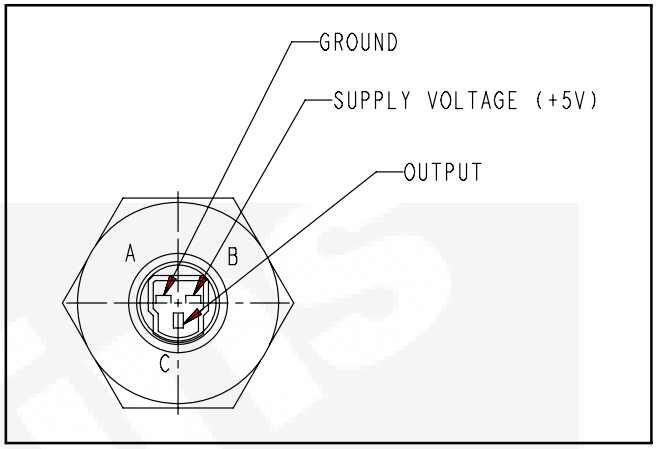



**FIGURE 3-11. THREE-WIRE PRESSURE SENSOR CONNECTIONS**

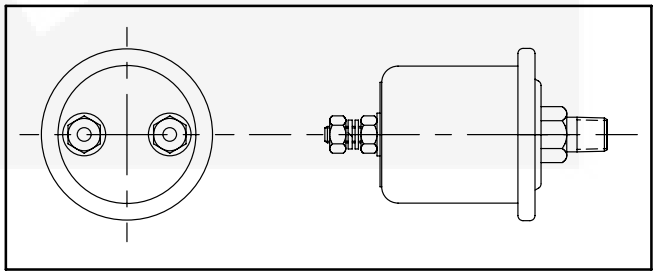


**FIGURE 3-12. TWO-WIRE PRESSURE SENSOR CONNECTIONS**

**TABLE 3-1. COOLANT TEMPERATURE SENSORS**

| CPG P/N | Manufacturer / P/N | Resistive Temp Range | Threading |
|---|---|---|---|
| 0193−0529−01 | AirPax / 5024−0250 | −40 to +230 F | 3/8 “NPTF |
| 0193−0529−02 | AirPax / 5024−0274 | −40 to +230 F | M14 X 1.5 with “O” Ring |

**TABLE 3-2. TEMPERATURE SENSOR CONNECTORS**

| CPG P/N | Manufacturer | Manufacturer P/N | Comments |
|---|---|---|---|
| 0323−1755 | Packard | 121621893 | Plastic shell with seal |
| 0323−1818 | Delphi | 12124075 | Socket Connector |

**TABLE 3-3. OIL PRESSURE SENSORS AND SWITCH**

| CPG P/N | Manufacturer / P/N | Sensor Type | Range / Unit | Resistance / Voltage | Comments |
|---|---|---|---|---|---|
| 193−0444 | Kavlico P165−5110 | 3-Wire Active Sender (Capacitive) | 0−100 PSIG | 0−5 VDC | Mating Connector 326−1666 (Packard 12065287) includes 323−1667 socket terminals (Packard 12103881) |
| 193−0430−02 | F.W. Murphy ED2P-100 | 2-Wire Standard Resistive Sender | 0−100 PSIG | 240−33 Ohms | Includes 10-32 hex nut connectors, 1/8” NPTF dry sealing threading, and a diaphragm operated resistive sensing element |
| 309−0641−XX | Stewart Warner | Pressure Switch | | | ** (see following page) |

## Lube Oil Pressure Switch

** The XX portion of the 309−0641part number is dependent the trip pressure point. Refer to Table 3-4 to select an appropriate lube oil pressure switch. If an oil pressure switch is used, the active state (active high or active low) of the switch must be configured using a PC based service tool or through the menus available with the display panel. A software setting allows for selection of the active state of the switch. The Lube Oil Pressure Switch Polarity can be set to Active High or Active Low.

For information on setting the oil pressure switch polarity using the display panel, see page 5-36.

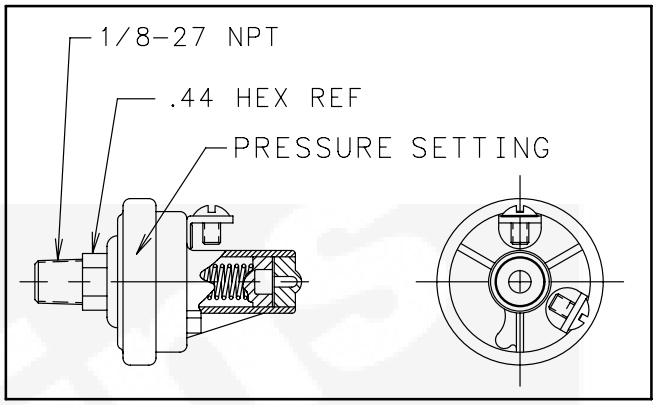



**FIGURE 3-13. PRESSURE SWITCH**

**TABLE 3-4. AVAILABLE PRESSURE SWITCHES (309−0641)**

| Part No. | Set Point | Contact (At Rest) | No. of Terminals |
|---|---|---|---|
| 309−0641−01 | 14 ±2.0 PSI | Closed | 1 |
| 309−0641−02 | 14 ±2.0 PSI | Open | 2 |
| 309−0641−03 | 14 ±2.0 PSI | Closed | 2 |
| 309−0641−04 | 9 ±1.5 PSI | Open | 2 |
| 309−0641−05 | 9 ±1.5 PSI | Closed | 1 |
| 309−0641−06 | 10 ±1.5 PSI | Open | 2 |
| 309−0641−07 | 20 ±2.0 PSI | Closed | 1 |
| 309−0641−08 | 20 ±2.0 PSI | Closed | 2 |
| 309−0641−10 | 20 ±3.0 PSI | Closed | 2 |
| 309−0641−13 | 30 ±3.0 PSI | Closed | 1 |
| 309−0641−14 | 4 ±1.0 PSI | Open | 2 |
| 309−0641−15 | 5 ±1.0 PSI | Open/Closed | 3 |
| 309−0641−16 | 5 ±1.0 PSI | Closed | 1 |
| 309−0641−17 | 5 ±1.0 PSI | Open | 1 |
| 309−0641−18 | 5 ±1.0 PSI | Open | 2 |
| 309−0641−19 | 14 ±2.0 PSI | Closed | 2 |
| 309−0641−20 | 20 ±2.0 PSI | Closed | 1 |
| All pressure switches have steel base and nipple construction. | | | |

## CONTROL BOARD CONNECTIONS

The 1301 control board includes the following connectors (see Figure 3-14).

- TB1 − Customer connections (see Table 3-5 and Figure 6-1)
- TB2 − Tools interface connections (see Table 3-6)
- J11 − Engine connections (see Table 3-7)
- J12 − Alternator voltage sense and field output connections (see Table 3-8)
- J13 − Alternator CT connections (see Table 3-9)

Mating connector and connector pin part numbers for the control board are listed in Table 3-10.

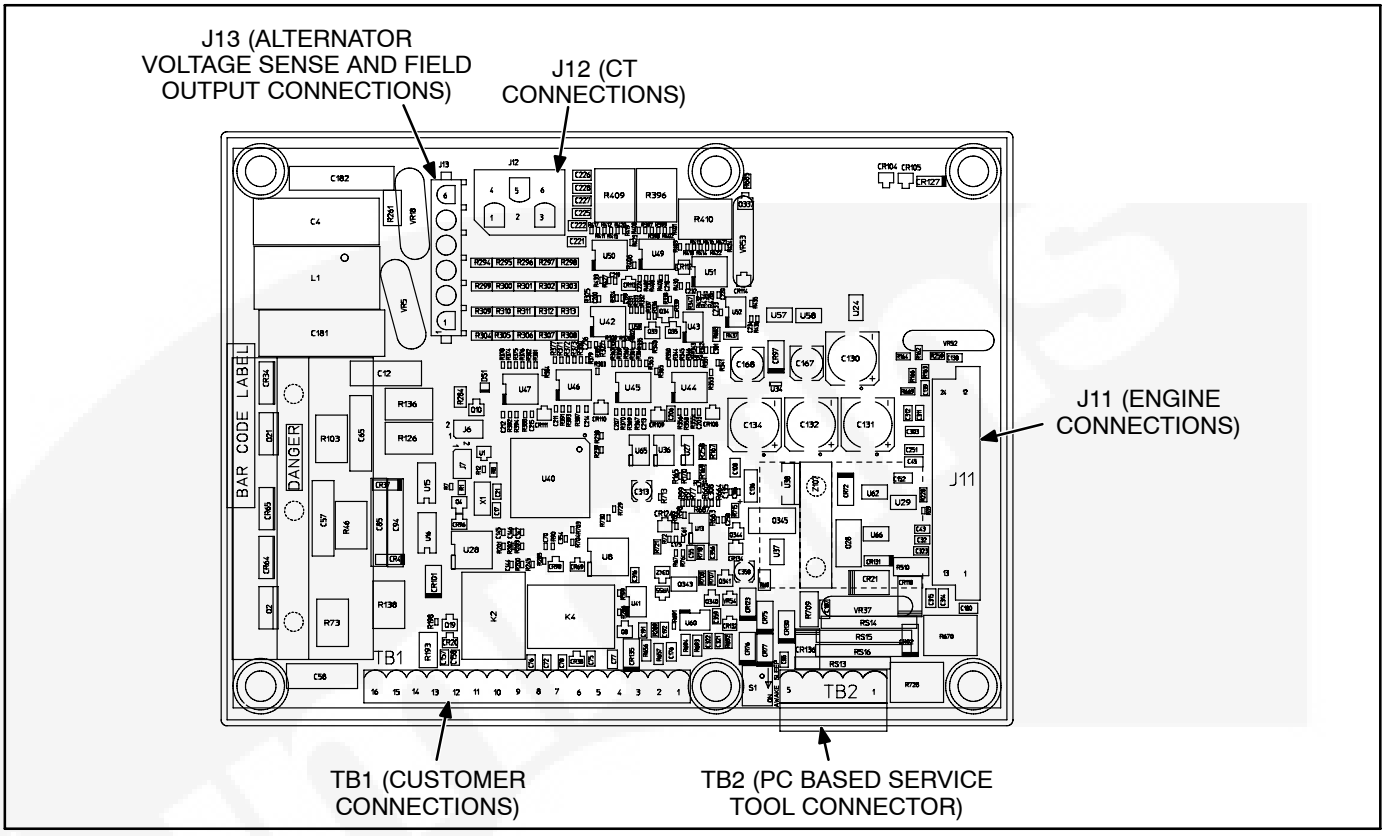



**FIGURE 3-14. CONTROL BOARD CONNECTIONS**

**TABLE 3-5. TB1 CONNECTIONS**

| Pin | Signal Name | Connect To |
|---|---|---|
| TB1-1 | B2+ | Network Power Supply |
| TB1-2 | RS-485 Data A | Network Data A |
| TB1-3 | RS-485 Data B | Network Data B |
| TB1-4 | GND | Network Power Supply Return |
| TB1-5 | Ready to Load | |
| TB1-6 | Configurable Output 1 – Return | |
| TB1-7 | Configurable Output 1 – NO | |
| TB1-8 | Configurable Output 2 – Return | |
| TB1-9 | Configurable Output 2 – NO | |
| TB1-10 | Remote Start Return | Remote Start NO contact or Push Button |
| TB1-11 | Remote Start | Remote Start NO contact or Push Button |
| TB1-12 | Configurable Fault Input 2 | Configurable input, pull low with respect to TB1-13 to activate.<br>A dry contact connecting it to TB1-13 or an open collector transistor with its emitter at the same potential as TB1-13. |
| TB1-13 | Configurable Fault Input – Common | Common for the two configurable fault inputs |
| TB1-14 | Configurable Fault Input 1 | Configurable input, pull low with respect to TB1-13 to activate.<br>A dry contact connecting it to TB1-13 or an open collector transistor with its emitter at the same potential as TB1-13. |
| TB1-15 | Remote E-STOP Return | Remote E-STOP |
| TB1-16 | Remote E-STOP | Remote E-STOP |

**TABLE 3-6. TB2 CONNECTIONS**

| Connector Pin | Signal Name | Connect To |
|---|---|---|
| TB2-1 | Return | Network Power Supply Return |
| TB2-2 | BAT+ | Network Power Supply |
| TB2-3 | RS-485 Data A | Network Data A |
| TB2-4 | RS-495 Data B | Network Data B |
| TB2-5 | Wake Up Input | Active low wake-up signal |

**TABLE 3-7. J11 CONNECTIONS**

| Connector Pin | Signal Name | Wire Color | Connect To |
|---|---|---|---|
| J11-1 | D+ (Battery Charging alt) | Red/Orange | Battery Charging Alt D+ terminal |
| J11-2 | Relay Coil B+ | Red/Yellow | Glow Plug Relay, Local Status Lamp, Fuel Shutoff Relay, Starter Relay Supply Side |
| J11-3 | B+ | Red | Unswitched Battery Supply |
| J11-4 | RUN | Brown | Run position of external RUN/OFF/AUTO switch |
| J11-5 | Oil Pressure Sender (active) +5V | Yellow | |
| J11-6 | Oil Pressure Sender or Switch / Coolant Temperature Sender or Switch Return | Green/White | All engine sensors return |
| J11-7 | Governor Drive – | Orange/Yellow | Governor power module low side driver |
| J11-8 | Return | Black | Common terminal of external RUN/Off/AUTO switch |
| J11-9 | GND | Black | Battery ground |
| J11-10 | GND | Black | Battery ground |
| J11-11 | Magnetic Pickup Return | | |
| J11-12 | Magnetic Pickup Supply | | |
| J11-13 | Starter Disconnect Input | Blue/Green | |
| J11-14 | Governor Drive + | Orange | Governor Drive + (for low side driver) |
| J11-15 | B+ | Red | Unswitched battery supply |
| J11-16 | AUTO | Blue/Pink | Auto position of external RUN/Off/AUTO switch |
| J11-17 | Oil Pressure Sender | Brown/White | |
| J11-18 | Coolant Temperature Sender | Blue/White | |
| J11-19 | Glow Plug Solenoid Command | Blue/Red | |
| J11-20 | Local Status (LAMP) | Blue/Yellow | |
| J11-21 | Starter Output Command | Blue | |
| J11-22 | Fuel Shutoff Command | Blue/Black | |
| J11-23 | Chassis GND | Black | Chassis |
| J11-24 | Magnetic Pickup – | | |

**TABLE 3-8. J12 CONNECTIONS**

| Connector Pin | Signal Name | Wire Color | Connect To |
|---|---|---|---|
| J12-1 | CT1 | Pink | |
| J12-2 | CT2 | Purple | |
| J12-3 | CT3 | Orange | |
| J12-4 | CT1 Common | Gray | |
| J12-5 | CT2 Common | Gray | |
| J12-6 | CT3 Common | Gray | |

**TABLE 3-9. J13 CONNECTIONS**

| Connector Pin | Signal Name | Wire Color | Connect To |
|---|---|---|---|
| J13-1 | VN | White | Neutral main alternator |
| J13-2 | V3 | Blue | Phase 3 |
| J13-3 | V2 | Red | Phase 2 |
| J13-4 | V1 | Black | Phase 1 |
| J13-5 | Field + | Yellow | X+ (F1) |
| J13-6 | Field – | Yellow/Black | XX– (F2) |

**TABLE 3-10. CONNECTOR PART NUMBERS**

| Connector | Connector Housing | | Connector Pins | |
|---|---|---|---|---|
| | CPG P/N | Man/Man P/N | CPG P/N | Man/Man P/N |
| J11 | 323–2161 | Amp/Tyco / 790587–1 | 323–2009 | Amp/Tyco / 770904–1/ 770988–1/171637–3 |
| J12 | 323–1932 | Amp/Tyco / 1–4807004–0 | 323–1200 | Amp/Tyco / 350536–1/350550–1 |
| J13 | 323–1304 | Amp/Tyco / 640585–1 | 323–1200 | Amp/Tyco / 350536–1/350550–1 |
| TB1 | 323–1678–15 | Magnum / EM2565 16 H – BKL1 | | |
| TB2 | | | | |

## KIT INSTALLATION

**Refer to the control wiring diagram included in Section 6** when installing the items included in this kit. This wiring diagram also includes information on wiring items (annunciator, I/O module, and governor power module) not included in this kit.

While the harnesses included in this kit should be long enough for all types of installations, it is a good idea to make sure that the distance between two connecting parts does not exceed the length of the harness. Excess wiring may be trimmed if it interferes with your installation.

**NOTE:** Mounting hardware for the 1301 control and the operator panel is not included in this kit. The instructions below include suggested hardware sizes.

1. Make sure the generator set is shut down and disabled:
   a. The generator set Run/Off/Auto switch is in the Off position and the generator is cool (to the touch).
   b. The battery charger (if equipped) is turned off and disconnected.
   c. The negative (–) cable from the battery is disconnected to prevent accidental starting.
2. Select a suitable location (see “Mounting Guidelines” on page 3-1) and mount the 1301 control board using M4 hardware. Figure 3-15 shows the control board dimensions. The outside dimensions do not include necessary clearance for wire connections.

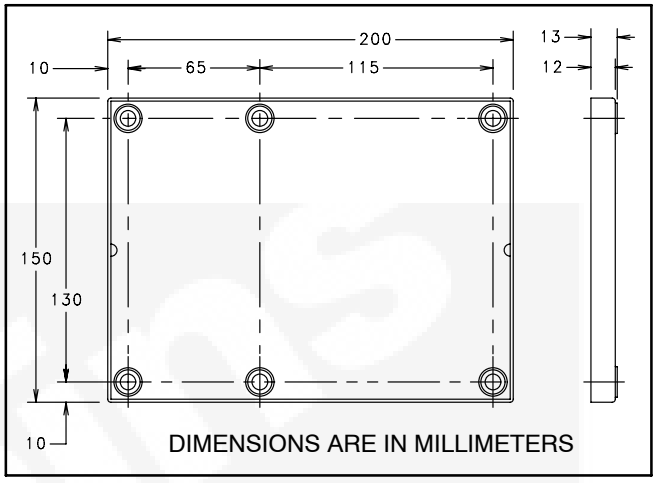



**FIGURE 3-15. 1301 CONTROL FOOTPRINT**

3. Install the operator panel and operator panel harness.
   a. Select a suitable location and mount the panel using #6–32 hardware. Figure 3-16 shows the operator panel dimensions. The operator panel must be mounted within 72 inches (1828.8 mm) of the control board.
   b. Install the operator panel harness wires listed for TB1 in Figure 3-18 to the TP1 connector included with this kit (see Figure 3-17).
   c. Install the TP1 connector on the control board TB1 connector.
      **NOTE:** Do not remove the jumper connected from TP1-15 to TP1-16. This jumper is needed because the 1301 control is not shipped with an E-stop switch.
   d. Connect the operator panel harness wire marked TB2-5 to the TB2 connector plug on the 1301 control board.
   e. Leave the wires marked J11-4 and J11-16 loose for now. These connections will be made when the control harness is installed (see step 5).
   f. Connect the P1 connector of the operator panel harness to either the J1 or the J2 connector on the back of the operator panel.

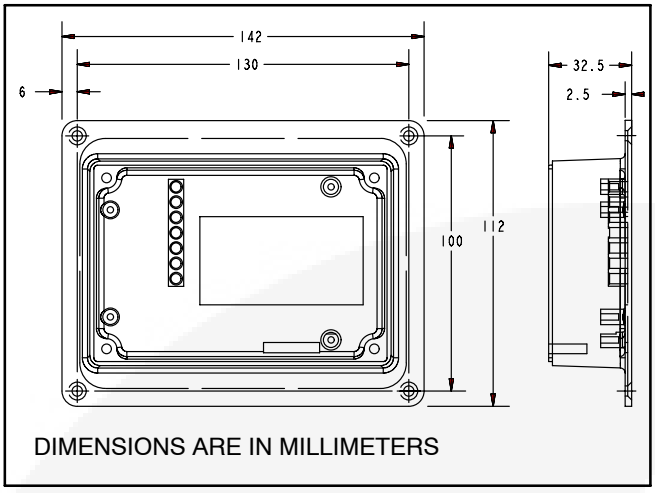



**FIGURE 3-16. OPERATOR PANEL FOOTPRINT**

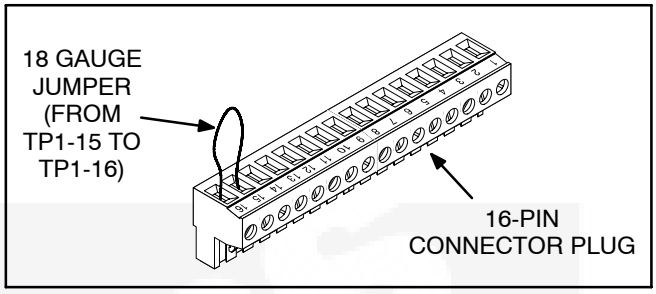
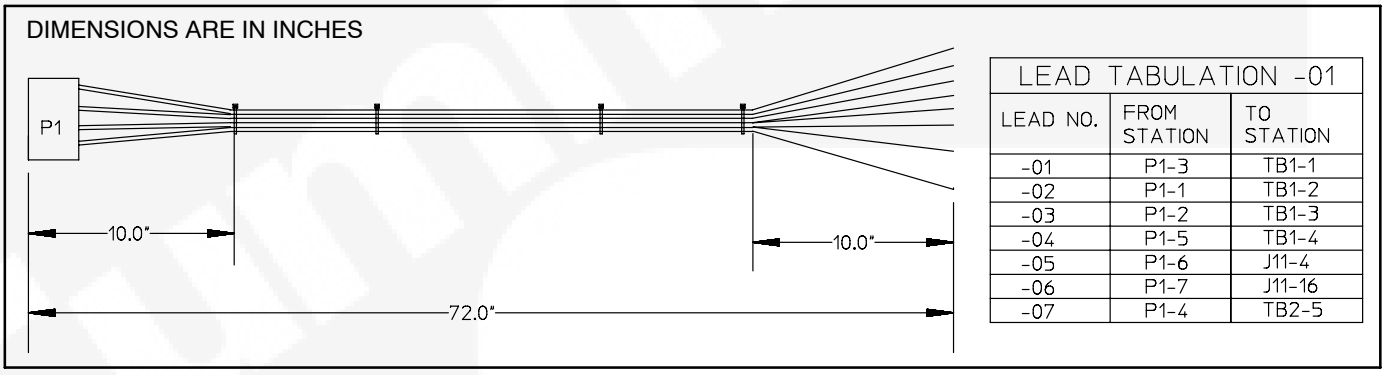



**FIGURE 3-17. TP1 CONNECTOR**




LEAD TABULATION -01

| LEAD NO. | FROM STATION | TO STATION |
|---|---|---|
| -01 | P1-3 | TB1-1 |
| -02 | P1-1 | TB1-2 |
| -03 | P1-2 | TB1-3 |
| -04 | P1-5 | TB1-4 |
| -05 | P1-6 | J11-4 |
| -06 | P1-7 | J11-16 |
| -07 | P1-4 | TB2-5 |

**FIGURE 3-18. OPERATOR PANEL HARNESS**

4. Install the genset harness.

   a. Make sure the current transformers installed are appropriate for use with a 1301 series control. Refer to the “Guidelines for Current Transformers” subsection, starting on page 3-3.

   b. Make sure the battery charging alternator installed is one of the types listed in the “Battery Charger Alternator Connections” subsection, starting on page 3-5.

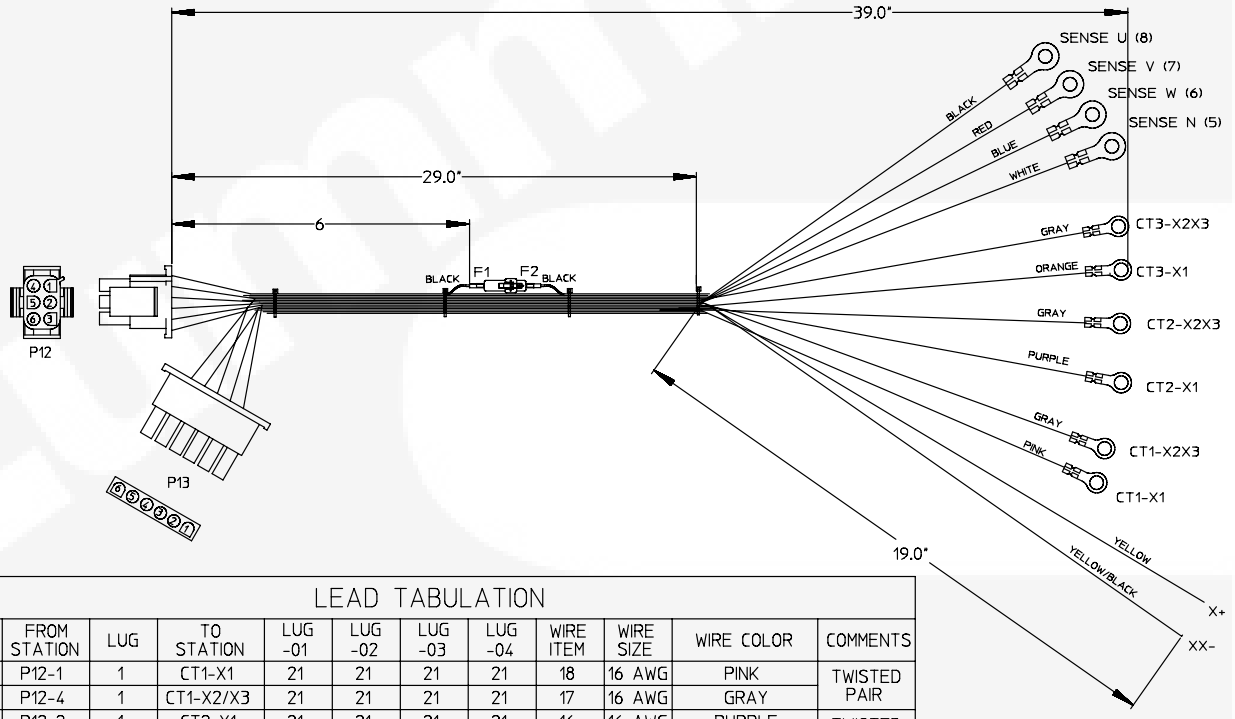
   c. Make sure the alternator connections are appropriate for your installation (see “Alternator Connections” on page 3-7).

   d. Connect the six harness CT wires to the current transformers.

   e. Connect the four harness sense wires to the alternator.

   f. Connect the harness X+ and XX– wires to the generator field windings.

   g. Connect the harness P12 and P13 connector to the J12 and J13 connectors on the 1301 control board.




LEAD TABULATION

| LEAD NO. | FROM STATION | LUG | TO STATION | LUG -01 | LUG -02 | LUG -03 | LUG -04 | WIRE ITEM | WIRE SIZE | WIRE COLOR | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | P12-1 | 1 | CT1-X1 | 21 | 21 | 21 | 21 | 18 | 16 AWG | PINK | TWISTED PAIR |
| 2 | P12-4 | 1 | CT1-X2/X3 | 21 | 21 | 21 | 21 | 17 | 16 AWG | GRAY | |
| 3 | P12-2 | 1 | CT2-X1 | 21 | 21 | 21 | 21 | 16 | 16 AWG | PURPLE | TWISTED PAIR |
| 4 | P12-5 | 1 | CT2-X2/X3 | 21 | 21 | 21 | 21 | 17 | 16 AWG | GRAY | |
| 5 | P12-3 | 1 | CT3-X1 | 21 | 21 | 21 | 21 | 19 | 16 AWG | ORANGE | TWISTED PAIR |
| 6 | P12-6 | 1 | CT3-X2/X3 | 21 | 21 | 21 | 21 | 17 | 16 AWG | GRAY | |
| 7 | P13-1 | 1 | SENSE N 5 | 6 | 20 | 7 | 19 | 15 | 16 AWG | WHITE | |
| 8 | P13-2 | 1 | SENSE W 6 | 6 | 20 | 7 | 19 | 14 | 16 AWG | BLUE | |
| 9 | P13-3 | 1 | SENSE V 7 | 6 | 20 | 7 | 19 | 13 | 16 AWG | RED | |
| 10 | P13-4 | 1 | F1 | - | - | - | - | 12 | 16 AWG | BLACK | |
| 10 | F2 | - | SENSE U 8 | 6 | 20 | 7 | 19 | 12 | 16 AWG | BLACK | |
| 11 | P13-5 | 1 | X+ | - | - | - | - | 10 | 16 AWG | YELLOW | TWISTED PAIR |
| 12 | P13-6 | 1 | XX- | - | - | - | - | 11 | 16 AWG | YELLOW/BLACK | |

DIMENSIONS ARE IN INCHES

**FIGURE 3-19. GENSET HARNESS**

5. Install the control harness.

   a. Connect the color-coded control harness wires marked P11-4 and P11-16 to the operator panel harness wires marked J11-4 and J11-16.

   b. Connect the color-coded control harness wires marked P11-5, P11-6, and P11-17 to the oil pressure harness wires marked J11-5, J11-6, and J11-17 (see Figure 3-21).

   c. Connect the color-coded control harness wires marked P11-6 and P11-18 to the coolant temperature sensor harness wires marked J11-6 and J11-18 (see Figure 3-22).

   d. If installed, connect the control harness wires marked P11-11, P11-12, and P11-24 to the magnetic pickup sensor on the engine. If not installed, tie the wires back.

   e. Connect the remaining control harness wires to the appropriate locations indicated in Figure 3-20.

      **NOTE:** If your installation does not include an electronic governor, tie the wires marked P11-14 and P11-7 back.

   f. Connect the harness control P11 connector to the 1301 control board J11 connector.

6. Install the oil pressure sensor and harness.

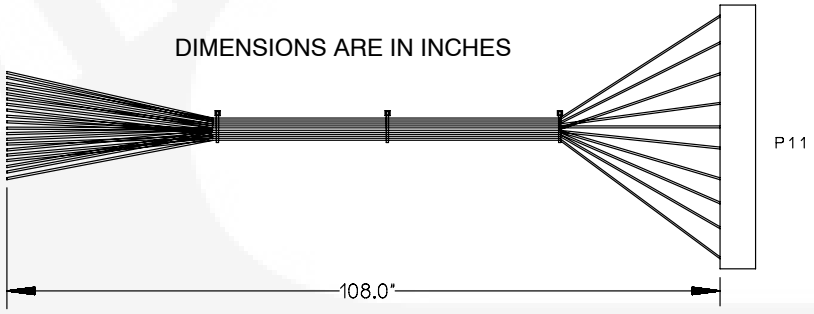
   a. Install the sensor on the engine.

   b. Connect the harness connector to the oil pressure sensor.

7. Install the coolant temperature sensor and harness.

   a. Install the sensor on the radiator.

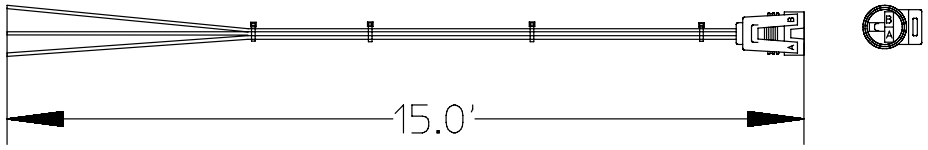
   b. Connect the harness connector to the temperature sensor.




LEAD TABULATION

| LEAD NO. | FROM STATION | LUG | TO STATION | LUG | WIRE ITEM | WIRE SIZE | WIRE COLOR | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| 1 | AUTO | - | P11-16 | 2 | 19 | 20 AWG | BLUE/PINK | |
| 2 | OP_5V | - | P11-5 | 2 | 6 | 18 AWG | YELLOW | |
| 3 | RUN | - | P11-4 | 2 | 9 | 20 AWG | BROWN | |
| 4 | STARTER_OUTPUT | - | P11-21 | 2 | 8 | 18 AWG | BLUE | |
| 5 | GND | - | P11-8 | 2 | 10 | 18 AWG | BLACK | |
| 6 | RELAY_COIL_B+ | - | P11-2 | 2 | 12 | 18 AWG | RED/YELLOW | |
| 7 | LOCAL_STATUS | - | P11-20 | 2 | 17 | 18 AWG | BLUE/YELLOW | |
| 8 | FUEL-SHUTOFF | - | P11-22 | 2 | 21 | 18 AWG | BLUE/BLACK | |
| 9 | STARTER_DISC_INPUT | - | P11-13 | 2 | 18 | 16 AWG | BLUE/GREEN | |
| 10 | D+ BAT_CHARGE_ALT | - | P11-1 | 2 | 11 | 18 AWG | RED/ORANGE | |
| 11 | H20 | - | P11-18 | 2 | 20 | 18 AWG | BLUE/WHITE | TWISTED TRIPLE |
| 12 | OIL_PRESS_SENDER | - | P11-17 | 2 | 14 | 18 AWG | BROWN/WHITE | |
| 13 | COM | - | P11-6 | 2 | 15 | 18 AWG | GREEN/WHITE | |
| 14 | CHASSIS_GND | - | P11-23 | 2 | 7 | 18 AWG | GREEN | |
| 15 | GLOW_PLUG_SOL | - | P11-19 | 2 | 16 | 18 AWG | BLUE/RED | TWISTED PAIR |
| 16 | B+ | - | P11-15 | 2 | 4 | 18 AWG | RED | |
| 17 | GND | - | P11-10 | 2 | 10 | 18 AWG | BLACK | |
| 18 | B+ | - | P11-3 | 2 | 4 | 18 AWG | RED | |
| 19 | GND | - | P11-9 | 2 | 10 | 18 AWG | BLACK | |
| 20 | GOV_DR+ | - | P11-14 | 2 | 5 | 18 AWG | ORANGE | TWISTED PAIR |
| 21 | GOV_DR- | - | P11-7 | 2 | 13 | 18 AWG | ORANGE/YELLOW | |
| 22 | MAG_PICK+ | - | P11-12 | 2 | 22 | 18 AWG | CABLE | TWISTED PAIR |
| 23 | MAG_PICK- | - | P11-24 | 2 | 22 | 18 AWG | CABLE | |
| 24 | MAG_PU_GND | - | P11-11 | 2 | 22 | 18 AWG | CABLE/SHIELD | SHIELD |

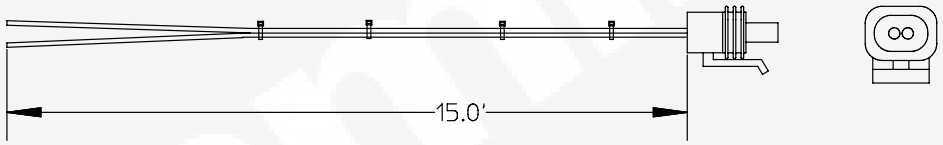
**FIGURE 3-20. CONTROL HARNESS**




| LEAD TABULATION | | | | | |
|---|---|---|---|---|---|
| LEAD NO. | FROM STATION | LUG ITEM NO. | TO STATION | LUG ITEM NO. | WIRE ITEM NO. |
| -01 | J11-6 | 3 | A | - | 6 |
| -02 | J11-5 | 3 | B | - | 1 |
| -03 | J11-17 | 3 | C | - | 5 |

DIMENSIONS ARE IN FEET

**FIGURE 3-21. ACTIVE LUBE OIL PRESSURE SENSOR HARNESS**




| LEAD TABULATION | | | | | |
|---|---|---|---|---|---|
| LEAD NO. | FROM STATION | LUG ITEM NO. | TO STATION | LUG ITEM NO. | WIRE ITEM NO. |
| -01 | J11-6 | 3 | A | - | 5 |
| -02 | J11-18 | 3 | B | - | 1 |

DIMENSIONS ARE IN FEET

**FIGURE 3-22. COOLANT TEMPERATURE SENSOR HARNESS**

8. Reconnect the generator starting battery cables (positive [+] cable first).
9. Connect the battery charger (If equipped).
10. Press any button on the operator panel to "wake up" the control.
11. Use the operator panel to access the Service menus (see *Section 5*) and/or a PC service tool to adjust the appropriate control parameters.
    a. For general information on all available parameters that can be adjusted, see "Setup, Trims, and Adjustments" on page 3-20.
    b. Follow the setup procedures for current transformers listed on page 3-4.
    c. For information on alternator control adjustments, see page 3-29.
    d. For information on genset tuning, see page 3-29.
    e. For information on other control functions, see page 3-41. These include:
       - Remote start mode
       - Remote emergency stop
       - 12V/24V batteries
       - Engine starting
       - Cycle cranking
       - Spark ignition power/Glow plug control
       - Genset cooldown start and stop time delays
    f. For information on the Battle Short option, see page 3-42.
12. Place the generator set Run/Off/Auto switch in the desired position.

## INPOWER COMMUNICATIONS

The PCC 1301 requires an RS-232 to RS-485 data converter and a unique cable for InPower communications (see Figure 3-23). The communications cable and RS-232 to RS-485 data converter are included in the 541−1199 kit.

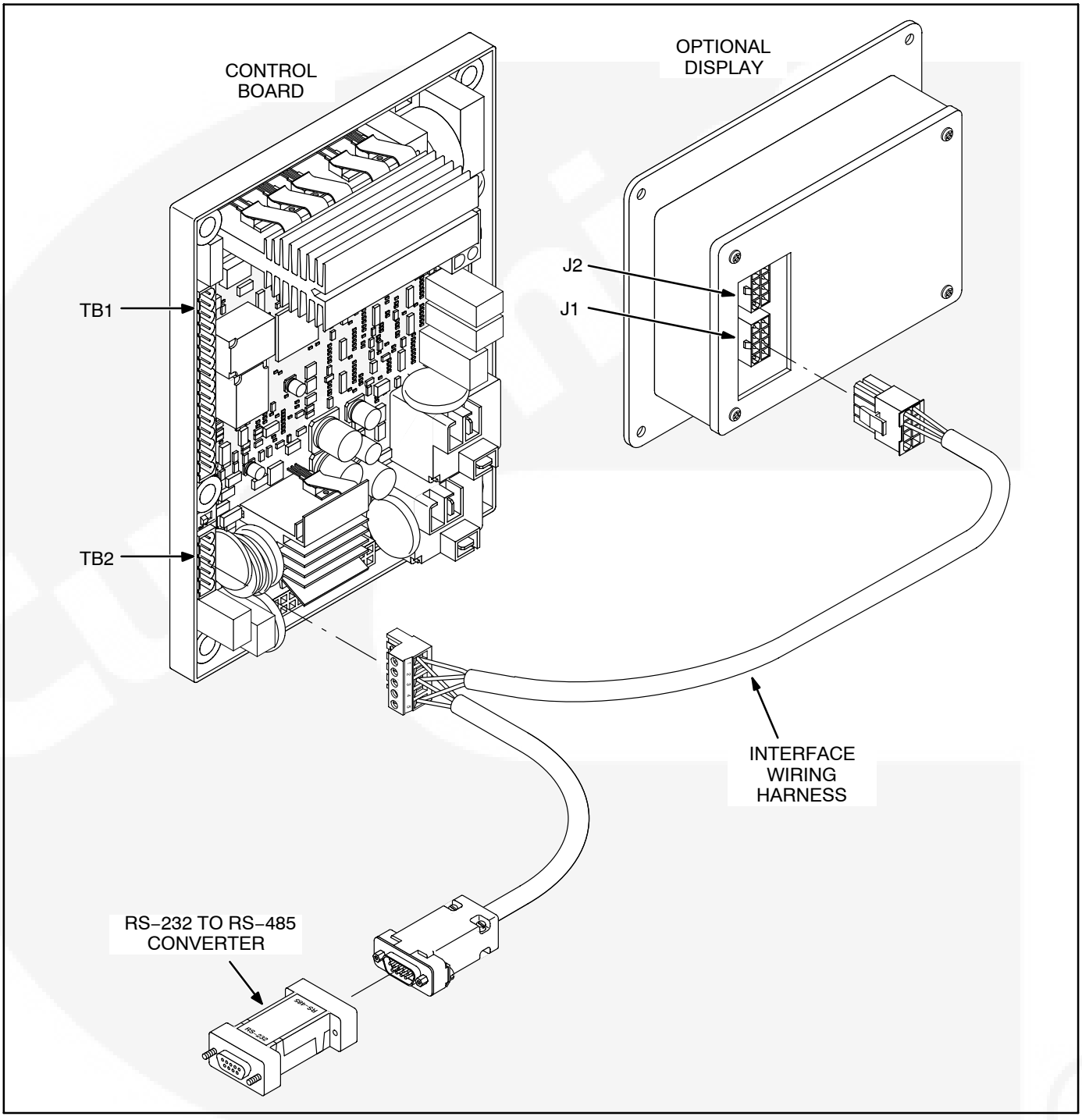



**FIGURE 3-23. INPOWER COMMUNICATIONS KIT**

## SETUP, TRIMS, AND ADJUSTMENTS

While applying a 1301 series control to a new application, make sure the parameters listed in Table 3-11 have appropriate values. Many of these can be adjusted using the operator panel but some require use of a PC based service tool.

**NOTE:** Section 5 includes information on all of the Service menus that are used to adjust parameters using the 1301 operator panel.

The engine oil lube pressure must be set for a three wire sender. This setting can be made using the operator panel or the PC based service tool. This can also be accomplished by loading feature file part number 326–6585.

**TABLE 3-11. 1301 CONTROL PARAMETERS**

| Group | Parameter Name | Adjusted Using | | Limits | | Units | Pg Ref |
|---|---|---|---|---|---|---|---|
| | | PC Based Service Tool | Operator Panel | Lower Limit | Upper Limit | | |
| Adjustment | Voltage Adjust | X | | –5 | 5 | % | — |
| | Start Delay | X | X | 0 | 300 | Seconds | 5-8 |
| | Stop Delay | X | X | 0 | 600 | Seconds | 5-8 |
| | Volts / Hz Knee Frequency | X | X | 0 | 10 | Hertz | 5-14 |
| | Volts / Hz Slope | X | X | 0 | 5 | % | 5-14 |
| | Awake in Auto Function Enabled | X | | Enabled or Disabled | NA | NA | 4-3 |
| Setup – Genset | Nominal Battery Voltage | X | X | 12 or 24 | NA | VDC | 5-34 |
| | CT Ratio | X | X | 0 | 4000 | Amps | 5-32 |
| | Genset Application Rating | X | X | Standby or Prime | NA | NA | 5-32 |
| | Speed/Frequency Mismatch Fault Threshold | X | X | 0.1 | 20.0 | Hz | 5-42 |
| | Speed/Frequency Mismatch Fault Time Delay | X | X | 0.2 | 10.0 | Seconds | 5-42 |
| | Number of Phases | X | X | 1 or 3 | NA | Phases | 5-8 |
| | Connection Type (Phase) | X | X | Delta or Wye | NA | NA | 5-8 |
| | AVR Enable / Disable | X | | Enable or Disable | NA | NA | — |
| | | | X | Yes or No | NA | NA | 5-10 |
| | Charging Alternator Functions Enable / Disable | X | | Enable or Disable | NA | NA | — |
| | | | X | Yes or No | NA | NA | 5-8 |
| | Nominal Voltage | X | X | 190 | 480 | VAC | 5-8 |
| | Nominal Frequency | X | X | 50 or 60 | N/A | Hz | 5-8 |
| | Standby KVA Rating – Single Phase 60 Hz | X | X | 0 | 2000 | kVA | 5-32 |
| | Standby KVA Rating – Three Phase 60 Hz | X | X | 0 | 2000 | kVA | 5-32 |
| | Standby KVA Rating – Single Phase 50 Hz | X | X | 0 | 2000 | kVA | 5-32 |
| | Standby KVA Rating – Three Phase 50 Hz | X | X | 0 | 2000 | kVA | 5-32 |

* Information on the optional I/O Module is included in Instruction Sheet C693.

**TABLE 3-11. 1301 CONTROL PARAMETERS (CONT.)**

| Group | Parameter Name | Adjusted Using | | Limits | | Units | Pg Ref |
|---|---|---|---|---|---|---|---|
| | | PC Based Service Tool | Operator Panel | Lower Limit | Upper Limit | | |
| Setup – Genset (Continued) | Prime KVA Rating – Single Phase 60 Hz | X | X | 0 | 2000 | kVA | 5-32 |
| | Prime KVA Rating – Three Phase 60 Hz | X | X | 0 | 2000 | kVA | 5-32 |
| | Prime KVA Rating – Single Phase 50 Hz | X | X | 0 | 2000 | kVA | 5-32 |
| | Prime KVA Rating – Three Phase 50 Hz | X | X | 0 | 2000 | kVA | 5-32 |
| | Speed / Frequency Ratio | X | X | 20, 30, or 60 | N/A | RPM/Hz | 5-32 |
| | Engine Oil Pressure Sensor Type | X | X | Switch or Sender | N/A | N/A | 5-36 |
| | Engine Oil Pressure Switch Polarity | X | X | Active Low or Active High | N/A | N/A | 5-36 |
| | Engine Oil Pressure Sender Type | X | X | 2 or 3 Wire | N/A | N/A | 5-36 |
| | Electronic Governor Enable / Disable | X | | Enable or Disable | N/A | N/A | — |
| | | | X | Yes or No | N/A | N/A | 5-10 |
| | Initial Crank Fuel Duty Cycle | X | X | 0 | 50 | % | 5-16 |
| | Initial Crank Fuel Period | X | X | 0 | 10 | Seconds | 5-16 |
| | Crank Fueling Ramp Rate | X | X | 5 | 100 | %/Sec | 5-16 |
| | Governor Gain GK1 (Proportional) | X | X | 5 | 1000 | % | 5-16 |
| | Governor Gain GK2 (Integral) | X | X | 5 | 1000 | % | 5-16 |
| | Governor Gain GK3 (Damping) | X | X | 95 | 105 | % | 5-16 |
| | Minimum Governor Duty Cycle | X | X | 0 | 100 | % | 5-16 |
| | Maximum Governor Duty Cycle | X | X | 0 | 100 | % | 5-16 |
| | Glow Plug | X | | Enable or Disable | N/A | N/A | — |
| | | | X | Yes or No | N/A | N/A | 5-8 |
| | Fuel Type | X | X | Diesel or Gas | N/A | N/A | 5-8 |
| | Fuel Burn Time Delay | X | X | 0 | 10 | Seconds | 5-8 |
| | Magnetic Pick-up | X | | Enable or Disable | None | N/A | — |
| | | | X | Yes or No | None | N/A | 5-32 |
| | Flywheel Teeth | X | X | 0 | 255 | Teeth | 5-32 |
| | Dither Factor | X | X | 0 | 30 | % | 5-16 |

* Information on the optional I/O Module is included in Instruction Sheet C693.

**TABLE 3-11. 1301 CONTROL PARAMETERS (CONT.)**

| Group | Parameter Name | Adjusted Using | | Limits | | Units | Pg Ref |
|---|---|---|---|---|---|---|---|
| | | PC Based Service Tool | Operator Panel | Lower Limit | Upper Limit | | |
| | Maximum Duty Cycle | X | X | 0 | 100 | % | 5-16 |
| Setup – Genset (Continued) | AVR K1 Gain Adjust (Proportional) | X | X | 5 | 1000 | % | 5-14 |
| | AVR K2 Gain Adjust (Integral) | | X | 5 | 1000 | % | 5-14 |
| | AVR Damping Adjust | | X | 95 | 105 | % | 5-14 |
| | Regulator Gain 50 Hz (K1) | X | | 0 | 65535 | N/A | — |
| | Regulator Gain 60 Hz (K1) | X | | 0 | 65535 | N/A | — |
| | Regulator Integral 50 Hz (K2) | X | | 0 | 65535 | N/A | — |
| | Regulator Integral 60 Hz (K2) | X | | 0 | 65535 | N/A | — |
| | Regulator Gain 50 Hz (K3) | X | | 0 | 65535 | N/A | — |
| | Regulator Gain 60 Hz (K3) | X | | 0 | 65535 | N/A | — |
| | Regulator Damping 50 Hz | X | | 0.2 | 0.99 | N/A | — |
| | Regulator Damping 60 Hz | X | | 0.2 | 0.99 | N/A | — |
| | Cycle Crank Attempts | X | X | 1 | 7 | Attempts | 5-10 |
| | Cycle Crank Period | X | X | 3 | 30 | Seconds | 5-10 |
| | Cycle Crank Rest Period | X | X | 0 | 60 | Seconds | 5-10 |
| | Remote / Local Display | X | X | Remote or Local | N/A | N/A | 5-12 |
| | Battle Short Enable | | X | Active or Inactive | N/A | N/A | 5-10 |
| | Battle Short Switch Input | X | X | Configurable Input 1, 2, or Operator Panel | N/A | N/A | 5-10 |
| | Governor Ramp Time | X | X | 0 | 30 | Seconds | 5-16 |
| | Start Time Delay | X | X | 0 | 300 | Seconds | 5-8 |
| | Stop Time Delay | X | X | 0 | 600 | Seconds | 5-8 |
| | Configurable 1 and 2 Switch Enable | X | | Enable or Disable | N/A | N/A | — |
| | Configurable 1 and 2 Switch Active State Selection | X | | Active Open or Active Closed | N/A | N/A | — |
| | 12V Battery Charger Failure High Threshold | X | X | 13 | 20 | Volts | 5-46 |
| | 24V Battery Charger Failure High Threshold | X | X | 24 | 40 | Volts | 5-46 |
| | 12V Battery Charger Failure Low Threshold | X | X | 2 | 13 | Volts | 5-46 |
| | 24V Battery Charger Failure Low Threshold | X | X | 2 | 25 | Volts | 5-46 |
| | Battery Charger Failure Time Delay | X | X | 2 | 300 | Seconds | 5-46 |

* Information on the optional I/O Module is included in Instruction Sheet C693.

**TABLE 3-11. 1301 CONTROL PARAMETERS (CONT.)**

| Group | Parameter Name | Adjusted Using | | Limits | | Units | Pg Ref |
|---|---|---|---|---|---|---|---|
| | | PC Based Service Tool | Operator Panel | Lower Limit | Upper Limit | | |
| | Genset Model and Serial Numbers | | X | NA | NA | NA | 5-12 |
| Setup – Configurable I/O | Configurable 1 and 2 Fault Responses | X | X | | N/A | N/A | 5-18 |
| | Configurable Inputs 1 and 2 Text | X | X | | N/A | N/A | 5-18 |
| | Configurable Inputs 1 and 2 Type | X | | Warning, Shutdown, or None | N/A | N/A | — |
| | | | X | Warning, Shutdown, or Event | N/A | N/A | 5-18 |
| | Configurable Output 1 and 2 Maps | X | X | 0 | 255 | Fault Code Numbers | 5-18 |
| Regulated Voltage Adjust | Metering Voltage Adjust L1-N 50 Hz | X | X | 0.9 | 1.1 | % | 5-20 |
| | Metering Voltage Adjust L1-N 60 Hz | X | X | 0.9 | 1.1 | % | 5-20 |
| | Metering Voltage Adjust L2-N 50 Hz | X | X | 0.9 | 1.1 | % | 5-20 |
| | Metering Voltage Adjust L2-N 60 Hz | X | X | 0.9 | 1.1 | % | 5-20 |
| | Metering Voltage Adjust L3-N 50 Hz | X | X | 0.9 | 1.1 | % | 5-20 |
| | Metering Voltage Adjust L3-N 60 Hz | X | X | 0.9 | 1.1 | % | 5-20 |
| | Metering Current Adjust L1-N 50 Hz | X | X | 0.8 | 1.2 | % | 5-20 |
| | Metering Current Adjust L1-N 60 Hz | X | X | 0.8 | 1.2 | % | 5-20 |
| | Metering Current Adjust L2-N 50 Hz | X | X | 0.8 | 1.2 | % | 5-20 |
| | Metering Current Adjust L2-N 60 Hz | X | X | 0.8 | 1.2 | % | 5-20 |
| | Metering Current Adjust L3-N 50 Hz | X | X | 0.8 | 1.2 | % | 5-20 |
| | Metering Current Adjust L3-N 60 Hz | X | X | 0.8 | 1.2 | % | 5-20 |
| | Regulated Voltage Adjust 50 Hz | X | X | 0.9 | 1.1 | % | 5-20 |
| | Regulated Voltage Adjust 60 Hz | X | X | 0.9 | 1.1 | % | 5-20 |
| | Genset Frequency | X | X | –6 | +6 | Hz | 5-20 |
| | High AC Voltage Threshold | X | X | 105 | 125 | % | 5-38 |
| | High AC Voltage Time Delay | X | X | 1 | 10 | Seconds | 5-38 |

* Information on the optional I/O Module is included in Instruction Sheet C693.

**TABLE 3-11. 1301 CONTROL PARAMETERS (CONT.)**

| Group | Parameter Name | Adjusted Using | | Limits | | Units | Pg Ref |
|---|---|---|---|---|---|---|---|
| | | PC Based Service Tool | Operator Panel | Lower Limit | Upper Limit | | |
| Regulated Voltage Adjust (Continued) | Low AC Voltage Threshold | X | X | 50 | 95 | % | 5-38 |
| | Low AC Voltage Time Delay | X | X | 2 | 20 | Seconds | 5-38 |
| | Underfrequency Threshold | X | X | 2 | 10 | Hz | 5-38 |
| | Underfrequency Delay | X | X | 500 | 2000 | 1/2 Cycles | 5-38 |
| | Overfrequency Enable | X | | Enable or Disable | N/A | N/A | — |
| | Overfrequency Threshold | X | X | 2 | 10 | Hz | 5-38 |
| | Overfrequency Delay | X | X | 100 | 2000 | 1/2 Cycles | 5-38 |
| | High AC Current Warning Threshold | X | X | 110 | 130 | % | 5-40 |
| | High AC Current Warning Delay | X | X | 10 | 60 | Seconds | 5-40 |
| | High AC Current Shutdown Threshold | X | X | 130 | 190 | % | 5-40 |
| | High AC Current Shutdown Delay | X | X | 2 | 60 | Seconds | 5-40 |
| Engine Protection | Overspeed Shutdown Threshold 50 Hz | X | X | 0 | 8192 | RPM | 5-42 |
| | Overspeed Shutdown Threshold 60 Hz | X | X | 0 | 8192 | RPM | 5-42 |
| | Low Oil Pressure Shutdown Threshold | X | X | 0 | 100 | PSig | 5-44 |
| | Low Oil Pressure Shutdown Delay | X | X | 2 | 15 | Seconds | 5-44 |
| | Low Oil Pressure Warning Threshold | X | X | 0 | 100 | PSig | 5-42 |
| | Low Oil Pressure Warning Delay | X | X | 2 | 15 | Seconds | 5-42 |
| | Low Coolant Temperature Warning Threshold | X | X | 32 | 100 | Degrees F | 5-46 |
| | High Coolant Temperature Shutdown Threshold | X | X | 180 | 300 | Degrees F | 5-44 |
| | High Coolant Temperature Shutdown Delay | X | X | 2 | 10 | Seconds | 5-44 |
| | High Coolant Temperature Warning Threshold | X | X | 150 | 290 | Degrees F | 5-44 |
| | High Coolant Temperature Warning Delay | X | X | 2 | 10 | Seconds | 5-44 |
| | Low Battery Voltage Threshold for 12V Battery | X | X | 11 | 13 | VDC | 5-34 |
| | Low Battery Voltage Threshold for 24V Battery | X | X | 22 | 27 | VDC | 5-34 |

* Information on the optional I/O Module is included in Instruction Sheet C693.

**TABLE 3-11. 1301 CONTROL PARAMETERS (CONT.)**

| Group | Parameter Name | Adjusted Using | | Limits | | Units | Pg Ref |
|---|---|---|---|---|---|---|---|
| | | PC Based Service Tool | Operator Panel | Lower Limit | Upper Limit | | |
| Engine Protection (Continued) | Low Battery Time Delay for 12V and 24V Battery | X | X | 2 | 60 | Seconds | 5-34 |
| | High Battery Voltage Threshold for 12V Battery | X | X | 14 | 17 | VDC | 5-34 |
| | High Battery Voltage Threshold for 24V Battery | X | X | 28 | 34 | VDC | 5-34 |
| | High Battery Time Delay for 12V and 24V Battery | X | X | 2 | 60 | Seconds | 5-34 |
| | Weak Battery Voltage Threshold for 12V Battery | X | X | 6 | 10 | VDC | 5-34 |
| | Weak Battery Voltage Threshold for 24V Battery | X | X | 12 | 20 | VDC | 5-34 |
| | Weak Battery Time Delay for 12V and 24V Battery | X | X | 1 | 5 | Seconds | 5-34 |
| Fault History | Reset Runs | X | | N/A | NA | NA | — |
| | Reset Start Attempts | X | | N/A | NA | NA | — |
| Display Setup | Display Symbols | | X | Yes or No | NA | NA | 5-12 |
| | Mode Access Code | | X | Yes or No | NA | NA | 5-12 |
| Annunciator Setup | Annunciator Switch #1, #2, or #3 Enable | X | | Enable or Disable | NA | NA | — |
| | Annunciator Switch Fault Response | X | X | Warning, Shut-down, or Event | NA | NA | 5-22 |
| | Annunciator Fault #1, #2, or #3 Description | X | X | NA | NA | NA | 5-22 |
| | Annunciator Output Map #1, #2, #3, or #4 Code | X | X | 0 | 255 | NA | 5-24 |
| | Annunciator Output Description | X | X | NA | NA | NA | 5-24 |
| Modbus Setup | Modbus Enable | X | X | Yes or No | NA | NA | 5-26 |
| | Address | X | X | 2 | 999 | NA | 5-26 |
| | Baud Rate | X | X | 2400, 4800, 9600, or 19200 | NA | NA | 5-26 |

* Information on the optional I/O Module is included in Instruction Sheet C693.

**TABLE 3-11. 1301 CONTROL PARAMETERS (CONT.)**

| Group | Parameter Name | Adjusted Using | | Limits | | Units | Pg Ref |
|---|---|---|---|---|---|---|---|
| | | PC Based Service Tool | Operator Panel | Lower Limit | Upper Limit | | |
| I/O Module (Optional) | I/O Module Input 1 Fault Response | X | X | Warning, Shut-down, or Event | NA | NA | * |
| | I/O Module Input 1 Descrip-tion | X | X | NA | NA | NA | * |
| | I/O Module Input 1 Event Name | X | X | Active Low or Active High | NA | NA | * |
| | I/O Module Input 1 Voltage Bias | X | X | 0 | 99 | Volts | * |
| | I/O Module Input 2 Fault Response | X | X | Warning, Shut-down, or Event | NA | NA | * |
| | I/O Module Input 2 Descrip-tion | X | X | NA | NA | NA | * |
| * Information on the optional I/O Module is included in Instruction Sheet C693. | | | | | | | |

**TABLE 3-11. 1301 CONTROL PARAMETERS (CONT.)**

| Group | Parameter Name | Adjusted Using | | Limits | | Units | Pg Ref |
|---|---|---|---|---|---|---|---|
| | | PC Based Service Tool | Operator Panel | Lower Limit | Upper Limit | | |
| I/O Module (Optional) (Continued) | Input 2 Event Name | X | X | Active Low or Active High | NA | NA | * |
| | Input 1 Speed Bias | X | X | 0 | 200 | RPMs | * |
| | Input 3, 4, 5, and 6 Fault Response | X | X | Warning, Shutdown, or Event | NA | NA | * |
| | Input 3, 4, 5, and 6 Description | X | X | NA | NA | NA | * |
| | Input 3, 4, 5, and 6 Event Name | X | X | Active Low or Active High | NA | NA | * |
| | Input 3, 4, 5, and 6 Sender | | | Oil Temp, Exhaust Temp, Ambient Temp, Fuel Level, Alternator RTD, or Intake Manifold | NA | NA | * |
| | Input 3, 4, 5, and 6 Sender Event Type | | | Warning or Shutdown | NA | NA | * |
| | Input 7 and 8 Fault Response | X | X | Warning, Shutdown, or Event | NA | NA | * |
| | Input 7 and 8 Description | X | X | NA | NA | NA | * |
| | Input 7 and 8 Event Name | X | X | Active Low or Active High | NA | NA | * |
| | Input 9, 10, 11, and 12 Fault Response | X | X | Warning, Shutdown, or Event | NA | NA | * |
| | Input 9, 10, 11, and 12 Description | X | X | NA | NA | NA | * |
| | Input 9, 10, 11, and 12 Event Name | X | X | Active Low | NA | NA | * |
| | Output 1 – 3 and 5 – 16 | X | X | (Fault Code Number) | NA | NA | * |
| | Output 4 | X | X | (Three Or'd Fault Code Numbers) | NA | NA | * |
| | Oil Temperature Sender High Warning Threshold | X | X | –40 | 300 | Degrees | * |
| | Oil Temperature Sender Time Delay | X | X | 0 | 15 | Seconds | * |
| | Exhaust Temperature Sender High Warning Threshold | X | X | –40 | 900 | Degrees | * |
| | Exhaust Temperature Sender Time Delay | X | X | 0 | 15 | Seconds | * |

* Information on the optional I/O Module is included in Instruction Sheet C693.

**TABLE 3-11. 1301 CONTROL PARAMETERS (CONT.)**

| Group | Parameter Name | Adjusted Using | | Limits | | Units | Pg Ref |
|---|---|---|---|---|---|---|---|
| | | PC Based Service Tool | Operator Panel | Lower Limit | Upper Limit | | |
| I/O Module (Optional) (Continued) | Ambient Temperature Sender High Warning Threshold | X | X | –40 | 300 | Degrees | * |
| | Ambient Temperature Sender Time Delay | X | X | 0 | 15 | Seconds | * |
| | Fuel Level Sender Low Warning Threshold | X | X | 0.0 | 99.9 | Percent | * |
| | Fuel Level Sender Time Delay | X | X | 0 | 15 | Seconds | * |
| | Fuel Level Sender 100% Resistance | X | X | 600 | 2500 | Ohms | * |
| | Alternator RTD Sender High Warning Threshold | X | X | –40 | 300 | Degrees | * |
| | Alternator RTD Sender Time Delay | X | X | 0 | 15 | Seconds | * |
| | Intake Manifold Temperature Sender High Warning Threshold | X | X | –40 | 300 | Degrees | * |
| | Intake Manifold Temperature Sender Time Delay | X | X | 0 | 15 | Seconds | * |
| * Information on the optional I/O Module is included in Instruction Sheet C693. | | | | | | | |

## ALTERNATOR CONTROL ADJUSTMENTS

The 1301 series control includes an integrated line-to-line voltage sensing regulation system. The voltage regulation system is an SCR type. Excitation power is derived directly from the generator terminals. Positive voltage build up from residual levels is ensured by the use of efficient semiconductors in the power circuitry.

### AVR Enable/Disable Feature

The 1301 series control provides automatic voltage regulating capability for the generator set when the AVR feature is enabled on the genset. It has a field adjustment trim to enable or disable the AVR feature. The trim parameter for this is AVR Enable = Enable / Disable.

For information on enabling/disabling the AVR feature using the operator panel, see page 5-10.

### Digital Output Voltage Regulation

The 1301 series control supports digital output voltage regulation as defined below.

- Voltage setpoint algorithm sets the level of the automatic voltage regulation. It is adjustable.
- The maximum allowed rated current for the field coil for the regulation is 4.0 Amps RMS and maximum 6.0 Amps for 10 seconds.
- The control provides voltage ramping at start-up if the AVR algorithm is enabled, such that voltage overshoot can be controlled. AVR boot enable logic supports the step by step voltage ramping.
- A PC based service tool allows the operator to adjust the output voltage within plus or minus 5.0% of rated voltage.

### Torque-Matched Volts/Hz Overload Control

A frequency measuring circuitry monitors the generator output and provides output underspeed protection of the excitation system, by reducing the output voltage proportionally with speed.

The voltage rolloff set point and rate of decay (i.e., the slope of the volts/hertz curve) is adjustable in the control.

Major system features include.

- %Volts/Hz rolloff supports the engine speed recovery under block loading. The slope setting (%volts/Hz) range is 0.0–5.0% of rated with 0.1% increment.
- The knee frequency range is 0.0–10.0Hz less than the nominal frequency with 0.1 Hz increment.

For information on adjusting rolloff and knee frequency settings using the operator panel, see page 5-14.

## GENSET TUNING

The 1301 series control uses a standard 4 coefficient PID algorithm. In general, K1 increases and K2 decreases in value with increasing generator size, but they can vary in different applications.

### V/Hz Curve

The 1301 series control uses a simple breakpoint and slope approach to the V/Hz curve to allow for the matching of the torque curve of the engine during a large transient load acceptance. The two adjustment points are the V/Hz knee frequency, which set the point at which the V/Hz curve starts, and the V/Hz Roll-off Slope, which sets the roll-off slope of the voltage setpoint as a function of frequency error.

The default V/Hz settings are:

| Parameter | Default Value |
|---|---|
| V/Hz Knee Frequency | 0.5 Hz |
| V/Hz Roll-off Slope | 2.2 %V/Hz |

The voltage set point command is calculated from the frequency error between commanded frequency and the actual frequency. For example, a voltage set point of 93.4% of nominal would be commanded if there is a frequency error of 3.5Hz under nominal. There is no offset to voltage for errors above nominal frequency.

**NOTE:** There is only one pair of V/Hz settings per calibration so the values must be used for both 50 and 60Hz operation. If a particular application requires vastly different V/Hz settings for 50 and 60Hz operation, it will be required that they be adjusted for each application.

For information on how to adjust the slope and knee frequency using the operator panel, see page 5-14.

## Governor

The 1301 series control's governor also uses the 4 coefficient PID algorithm. There are gains for use at 50 and 60Hz operation. Standard values for the K1–K4 and Damping terms for both 60 and 50 Hz for engines in the Cummins 4B3.9 and 6B5.9 range are listed in Table 3-12.

**TABLE 3-12. GOVERNOR GAINS FOR SMALL ENGINES**

| 60Hz | 50Hz |
|---|---|
| GK1 = 1696 | GK1 = 1200 |
| GK2 = 240 | GK2 = 200 |
| GK3 = 28,800 | GK3 = 28,800 |
| GK4 (calc) = 7424 | GK4 (calc) = 7424 |
| Governor Damping = 0.936 | Governor Damping = 0.936 |

### *Governor Tuning*

A good starting point for any new engine application is to start with a set of released gains for an engine of a similar type and size should they already exist.

If a set of pre-developed gains are not available, the gains listed above should work well enough to start most engines and to allow them to run smoothly.

The value of GK1 should be adjusted to meet the specification for percent off rated voltage during a load acceptance, to prevent large voltage overshoots during offloads, and during engine/alternator startup.

The value of GK2 should be adjusted to control the recovery characteristics of the engine during large load acceptance and rejection transients. GK2 is a true integral type gain and is applied to the governor output as GK2 times the sum of all the previous governor error. GK2 values that are too high can cause unstable voltage performance and values that are too low can cause slow performance or steady state voltage offset errors.

The values of GK3, GK4, and the damping factor are used to set the basic steady state stability of the engine. These values also influence the overall governor response speed in transient situations. Adjustment of GK3 and the damping factor is an iterative process started by finding the engine load level which produces the worst steady state engine performance (note: GK1 and GK2 may have to be adjusted first to allow the engine to be transitioned smoothly into this) and adjusting GK3 until the best performance is observed, then doing the same for the damping factor. Repeat this process at least one more time to make sure that the best possible values for GK3 and the damping factor have been determined.

For information on how to adjust the GK1and GK2 values and the damping factor using the operator panel, see page 5-14.

### *Magnetic Pickup Speed Sensor*

For non-electronically governed gensets, the magnetic pickup is optional. If it is not used, engine speed is calculated from the alternator output frequency.

If it is used, the 1301 series control receives an engine speed input from the magnetic pickup speed sensor. The magnetic pickup signal needs to be calibrated for number of engine flywheel teeth. Table 3-13 lists the number of flywheel teeth for some common engine types. If a magnetic pickup is installed, it must be enabled.

**TABLE 3-13. ENGINE FLYWHEEL TEETH**

| Engine Type | Number of Flywheel Teeth |
|---|---|
| Cummins 4B and 6B | 159 |
| Cummins 4C | 138 |
| Ford 4 Cycle Gas | 104 |
| Kubota Engines | 105 |
| Cummins L10 and NT855 | 118 |
| Komatsu 3.3 Liter | 110 |
| Cummins V28, K19, K38, and K50 | 142 |
| Ford V6 and V10 Gas | 133 |

For information on how to enable the magnetic pickup and to set the number of flywheel teeth using the operator panel, see 5-32.

### *Alternator Startup*

The alternator is started up and brought to rated voltage when the engine speed reaches rated speed. If the AVR feature is enabled, the PWM command to the field coil now steps through an AVR boot table until the sensed voltage becomes greater than the value of the AVR boot threshold trim. The regulator then brings the voltage up to rated voltage.

The purpose of the AVR boot table is to aid alternator startup in shunt excitation applications. The value of the AVR boot table and the AVR boot threshold

can be set to bring the voltage up both as quickly and as smoothly as possible, but should already be set in the calibration to their ideal values.

### Setup for Gain Tuning

In order to properly set up engine and alternator control parameters, it is convenient to set up the PC based service tool to be used to monitor volts, Hz, and kVA.

The following are step-by-step procedures for determining engine and alternator control parameters.

1. Determine 60Hz governor gains, regulator gains, and V\Hz curve values with PMG excitation.

    a. Start the genset, bring it to rated speed and temperature, and adjust the GK3 and damping factor for 60Hz operation to allow the engine to run smoothly in steady state operation.

    **NOTE:** GK1 and/or GK2 may need to be adjusted to allow this to happen.

    Apply various loads up to 100% rated and verify the steady state operation at all load levels. Most engines have some load level which is inherently less stable than others and must be found to determine the correct value for GK3 and the damping factor.

    **NOTE:** It is important to control the steady state performance of the engine. Unstable engine performance is carried over into the generator output voltage. Very fast increases or decreases in engine speed, even if the magnitude of the increase or decrease is small, tend to be carried into the alternator voltage as large increases and decreases in voltage at the same frequency as the engine speed changes.

    b. Do a series of load steps to determine the transient characteristics of the genset. Tuning of the governor GK1 and GK2 values, the settings of the V/Hz curve, and the values of K1 and K2 (mostly K1) for the regulator must be done concurrently. In general, these values should be adjusted to achieve the maximum possible performance from both the engine and the alternator. A production test spec (if available) should give the full load step transient performance levels for any given genset model. This is a very iterative process and many require some time to find the best combination of gains to fit the application. In general, adjust GK1 to control the peak frequency during transients and adjust GK2 to control the recovery shape of the frequency transient. A V/Hz slope too steep causes the engine to recover too quickly and recovers to nominal speed very poorly. A V/Hz curve too shallow causes a very slow engine recovery from a transient.

    c. Re-verify steady state voltage and governor performance.

2. Determine 50Hz governor gains, Regulator gains, and V/Hz curve values. Follow the same process as used at 60Hz. The order of 50Hz vs 60Hz testing can be reversed.

3. Determine the correct values for the governor startup parameters (see “Speed Governor Algorithm and Adjustment” below).

    a. Adjust the Initial Crank Fueling Command, Initial Crank Fueling Period, Crank Fueling Ramp Rate, and Max Crank Fueling Command parameters to control the way the engine transitions through the cranking stage of the engine startup. The controls default values should work well.

    b. The value of the Crank Exit Fueling Command parameter should be set to the governor duty at which the engine runs when at rated speed, or to a value slightly higher.

### *Speed Governor Algorithm and Adjustment*

The 1301 series control supports the following speed governor algorithm characteristics:

- It uses a four-coefficient field adjustable closed-loop PID control algorithm (Proportional-Integral-Derivative) – three are user adjustable and a fourth is automatically calculated.
- It allows field tuning of the speed coefficients.
- The 1301 series control provides a dither feature. Dither is a method of introducing small amounts of noise into the speed governing system. The purpose of this feature is to prevent the fuel actuators from becoming stuck. Therefore dither should be used in applications where the fuel actuators are prone to sticking. This feature has adjustable dither amplitude (0% to 30% of governor duty cycle). The dither function is enabled by selecting a dither factor. The dither function is disabled by setting the dither factor to 0%.

  For information on how to adjust the dither factor using the operator panel, see page 5-16.

The following cranking fuel control characteristics are also provided to “tune up” the genset startup to suit the application. Cold weather applications might need a longer cranking period and OR higher levels of cranking fuel. Following parameters should be chosen to make sure the genset starts up quickly enough but does not overshoot or produces excessive smoke at startup.

- The Initial Cranking Fuel Duty Cycle can be chosen to suit the engine / application.
- The Initial Cranking Fuel Period can be chosen to suit the application.
- The Cranking fuel is ramped up during cranking after initial cranking fueling period is over. The rate of ramping up of fueling can be chosen to suit the application.
- The Maximum Crank fuel duty cycle can be chosen to suit the application. During cranking the duty cycle of the PWM output to the actuator will be limited to this value.
- The Crank Exit Fuel Duty Cycle can be chosen to suit the application. After the engine fires, the fueling level will return to this value before the 4 coefficient algorithm takes over the control of the PWM output to the actuator.

Fueling will be initially set to the Initial Crank Fueling Duty Cycle value and will remain at that value for the Initial Crank Fueling Period. After this period expires, the fuel command will be ramped at the Crank Fueling Ramp Rate until the Maximum Crank Fueling limit is reached. Upon reaching the Starter Disconnect Speed, the fueling command is pulled back to the Crank Exit Fueling Duty Cycle value until the Governor Enable Engine Speed is reached. When the Governor Enable Engine Speed is reached the governor is enabled, the speed setpoint is set to the sensed engine speed value at this point, and the setpoint ramped to rated speed in a time equal to the Governor Ramp Time. Figure 3-24 illustrates these setpoints.

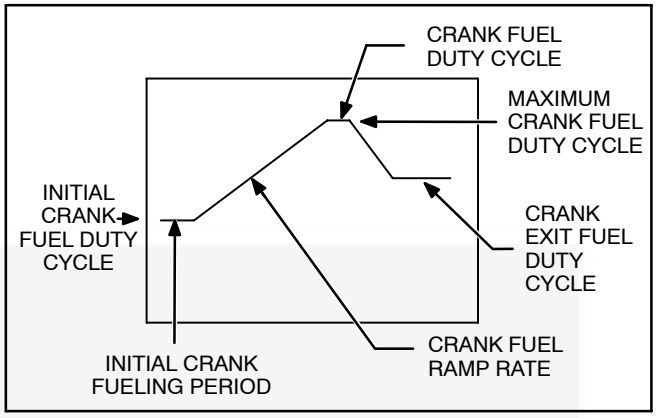



**FIGURE 3-24. CRANK FUELING**

For information on how to set the crank settings using the operator panel, see page 5-16.

### *Gain Tuning Parameters*

Table 3-14 is a list of all of the parameters which affect genset performance. A correct value should be determined for each of the parameters listed. This value may vary from genset to genset. Initial values should be recorded for future reference.

Table 3-15 lists the default gain tuning parameter values for four CPG genset models.

**NOTE:** For any parameters that have something listed in the "Value" column, it is recommended that the parameter stay at that value during testing. Some parameters should never be changed during testing and are listed as never to be changed.

**TABLE 3-14. GAIN TUNING PARAMETERS**

| Parameter | Comments |
|---|---|
| **Engine Starting Parameters** | |
| Initial Crank Fueling Duty Cycle | The initial value assigned to Governor Duty Cycle at entry in Crank State |
| Initial Crank Fueling Period | The period for which the value of Initial Crank Fuel Duty Cycle is assigned to Governor Duty Cycle, after entry in Crank State |
| Crank Fueling Ramp Rate | The Rate at which the value of Governor Duty Cycle is ramped up by during Crank State after expiration of Initial Crank Fueling Period |
| Maximum Crank Fueling | The level to which the Governor Duty Cycle is limited during Crank State |
| Crank Exit Fueling Duty Cycle | The Value at which the Governor Duty Cycle is held after disengaging the starter until Governor is enabled |
| Governor Enable Engine Speed | The Value of speed above which the electronic governor starts controlling the value of Governor Duty Cycle |
| Governor Ramp Time | Sets the minimum governor speed reference ramp rate |
| **Engine Governing Parameters** | |
| GK1 (50 Hz) | Sets overall governor gain in 50Hz applications. This is a true proportional gain which is multiplied against the frequency error signal. |
| GK2 (50 Hz) | Controls the recovery shape of speed transients in 50Hz applications. This is a true integral gain which is multiplied against the sum of all previous errors. |
| GK3 (50 Hz) | Affects high frequency characteristics of the governor algorithm in 50Hz applications. Adjust for frequency stability reasons. |
| Damping Effect (50 Hz) | Affects high frequency characteristics of the governor algorithm in 50Hz applications. Adjust for frequency stability reasons. |
| GK1 (60 Hz) | Sets overall governor gain in 60Hz applications. This is a true proportional gain which is multiplied against the speed error signal. |
| GK2 (60 Hz) | Controls the recovery shape of frequency transients in 60Hz applications. This is a true integral gain which is multiplied against the sum of all previous errors. |
| GK3 (60 Hz) | Affects high frequency characteristics of the governor algorithm in 60Hz applications. Adjust for frequency stability reasons. |
| Damping Effect (60 Hz) | Affects high frequency characteristics of the governor algorithm in 60Hz applications. Adjust for frequency stability reasons. |
| Dither Factor | Prevents the fuel actuators from becoming stuck by introducing small amounts of noise into the speed governing system. Adjust in applications where the fuel actuators are prone to sticking. |
| Minimum Governor Duty Cycle | Sets the lowest possible commanded duty cycle for the governor. Adjust to a lower value when the application requires the ability for the engine to go slower than what it allowed by default. |

**TABLE 3-14. GAIN TUNING PARAMETERS (CONT.)**

| Parameter | Comments |
|---|---|
| **AVR Parameters** | |
| K1 (50 Hz) | Sets overall AVR gain in 50 Hz applications. This is a true proportional gain which is multiplied against the voltage error signal. |
| K2 (50 Hz) | Controls the recovery shape of voltage transients in 50Hz applications. This is a true integral gain which is multiplied against the sum of all previous errors. |
| K3 (50 Hz) | Affects high frequency characteristics of the AVR algorithm in 50Hz applications. Adjust for voltage stability reasons. |
| Damping Effect (50 Hz) | Affects high frequency characteristics of the AVR algorithm in 50Hz applications. Adjust for voltage stability reasons. |
| K1 (60 Hz) | Sets overall AVR gain in 60Hz applications. This is a true proportional gain which is multiplied against the voltage error signal. |
| K2 (60 Hz) | Controls the recovery shape of voltage transients in 60Hz applications. This is a true integral gain which is multiplied against the sum of all previous errors. |
| K3 (60 Hz) | Affects high frequency characteristics of the AVR algorithm in 60Hz applications. Adjust for voltage stability reasons. |
| Damping Effect (60 Hz) | Affects high frequency characteristics of the AVR algorithm in 60Hz applications. Adjust for voltage stability reasons. |

**TABLE 3-15. GAIN TUNING DEFAULT VALUES**

| Parameter | Genset Model | | | |
|---|---|---|---|---|
| | GGDB | DKAC | DKAE | DKAF |
| **Engine Starting Parameters** | | | | |
| Initial Crank Fueling Duty Cycle | 25 | 25 | 50 | 50 |
| Initial Crank Fueling Period | 2 | 2 | 2 | 2 |
| Crank Fueling Ramp Rate | 25 | 25 | 25 | 25 |
| Maximum Crank Fueling | 100 | 100 | 100 | 100 |
| Crank Exit Fueling Duty Cycle | 25 | 25 | 25 | 25 |
| Governor Enable Engine Speed | 1100 | 1100 | 1100 | 1100 |
| Governor Ramp Time | 0.25 | 0.25 | 0.25 | 0.25 |
| **Engine Governing Parameters** | | | | |
| GK1 (50Hz) | 900 | 1500 | 1500 | 1500 |
| GK2 (50Hz) | 210 | 300 | 300 | 300 |
| GK3 (50Hz) | 30000 | 28800 | 28800 | 28800 |
| Dampening Effect (50Hz) | 0.65 | 0.936 | 0.936 | 0.936 |
| GK1 (60Hz) | 900 | 1500 | 1696 | 1696 |
| GK2 (60Hz) | 300 | 240 | 240 | 240 |
| GK3 (60Hz) | 30000 | 29500 | 28800 | 28800 |
| Dampening Effect (60Hz) | 0.65 | 0.85 | 0.936 | 0.936 |
| Dither Factor | 0 | 15 | 15 | 15 |
| Minimum Governor Duty Cycle | 10 | 20 | 20 | 20 |
| **AVR Parameters** | | | | |
| K1(50Hz) | 1000 | 1200 | 1200 | 1200 |
| K2(50Hz) | 650 | 700 | 650 | 650 |
| K3(50Hz) | 10000 | 10000 | 10000 | 10000 |
| Dampening Effect (50Hz) | 0.8 | 0.8 | 0.8 | 0.8 |
| K1 (60Hz) | 1000 | 1200 | 1200 | 1200 |
| K2 (60Hz) | 650 | 650 | 750 | 750 |
| K3 (60Hz) | 10000 | 10000 | 14000 | 14000 |
| Dampening Effect (60Hz) | 0.8 | 0.8 | 0.8 | 0.8 |
| Rolloff Knee Frequency | 0.5 | 0.5 | 0.5 | 0.5 |
| Volt Rolloff Slope | 2.2 | 2.2 | 2.2 | 2.2 |

## Controller Calibration

The internal circuitry of the 1301 series control may be field-calibrated to improve AC voltage and current measurement accuracy. There are three different components which may need this. They are:

- Voltage measurement for regulation
- Voltage measurement for display
- Current measurement for display

The internal circuits must be calibrated in the order listed in Table 3-16.

**TABLE 3-16. CONTROLLER CALIBRATIONS FOR GENSETS**

| Component to be Calibrated | Calibration Method | |
|---|---|---|
| | **PC Based Service Tool** | **Operator Panel** |
| Voltage Measurement for Regulation<br>The goal of this is to calibrate the regulation circuitry so it regulates the genset to the desired nominal voltage. | 1. Connect to the control with your PC based service tool.<br>2. Verify the Nominal Voltage Trim is set to the desired value. The trim Alternator Nominal Voltage is available at Adjustments → AC Measurement Calibrations → Voltage Measurement for Regulation. Set the Alternator Nominal Voltage to the voltage that the genset will generate.<br>3. Adjust the trim Voltage Regulation Calibration 50Hz or Voltage Regulation Calibration 60Hz for your desired application. The effect of this trim is inverse on the regulated voltage. Increasing the trim, well lower the regulated voltage, and decreasing the trim will raise the regulated voltage. Adjust the trim so regulated voltage matches the desired nominal voltage measured with a known calibrated voltage meter.<br>4. Save the adjustments by doing a Save Trims with your PC based service tool. | 1. View the Service Menu by holding down the “up” and “down” arrow keys on any of the operator menus (see Figure 3-25).<br>2. Select item 1, “Setup Menus”.<br>3. Enter setup menu password 574.<br>4. Select item 1, “Genset Service”.<br>5. Select item 1, and verify the “Volts AC” setting is correct for your application. If necessary, press the “Adjust” button and change the setting. and press the “Save” button.<br>6. Press the back button to return to the service menu.<br>7. Select item 3, “Meter Calib.”<br>8. Press the “Adjust” button and change the “Reg Volt Adj:” value. The effect of this trim is inverse on the regulated voltage. Increasing the percentage will decrease the regulated voltage. Decreasing the percentage will increase the regulated voltage.<br>9. Save the adjustments by pressing the “Save” button. |
| Voltage Measurement for Display | 1. Connect to the control with your PC based service tool.<br>2. Verify the Nominal Voltage Trim is set to the desired value. The trim Alternator Nominal Voltage is available at Adjustments → AC Measurement Calibrations → Voltage Measurement for Regulation. Set the Alternator Nominal Voltage to the voltage that the genset will generate.<br>3. Adjust the trim Alternator LX–N 50Hz Voltage Display Adjust or Alternator LX–N 60Hz Voltage Display Adjust trim for your application. Each line will need to be adjusted independently. The goal is to have the value read by the PC based service tool correspond to the actual voltage being produced.<br>4. Save the adjustments by doing a Save Trims with your PC based service tool. | 1. View the Service Menu by holding down the “up” and “down” arrow keys on any of the operator menus (see Figure 3-26).<br>2. Select item 1, “Setup Menus”.<br>3. Enter setup menu password 574.<br>4. Select item 1, “Genset Service”.<br>5. Select item 3, “Meter Calib.”<br>6. Press the down arrow twice to scroll down to the “Metering Voltage Adjust”<br>7. Adjust the three parameters listed so the display voltage matches the voltage being produced by the genset.<br>8. Save the adjustments by pressing the “save” button. |

**TABLE 3-16. CONTROLLER CALIBRATIONS FOR GENSETS (CONT.)**

| Component to be Calibrated | Calibration Method | |
|---|---|---|
| | **PC Based Service Tool** | **Operator Panel** |
| Current Measurement for Display | 1. Apply a load to the genset and monitor the current with a calibrated current meter.<br>2. Connect to the control with your PC based service tool.<br>3. Verify the CT ratio settings and power ratings are correct for your application. The Power Rating of the alternator is configurable with the trims located in Genset Power Ratings menu. The CT ratio adjustable trim is available at Features → Genset Setup.<br>4. Adjust the LX 50Hz Current Adjust or LX 60Hz Current Adjust trim for your current application so the 1301 series control measured current matches the current read by the know current meter. Each of the three lines will have to be adjusted independently of each other.<br>5. Save the adjustments by doing a save trims with your PC based service tool. | 1. View the Service Menu by holding down the “up” and “down” arrow keys on any of the operator menus (see Figure 3-27).<br>2. Select item 1, “Setup Menus”.<br>3. Enter service menu password 574.<br>4. Select item 2, “Genset Setup”.<br>5. Enter the setup menu password 1209.<br>6. Verify with the display that the CT ratios and power rating are correct by scrolling through the available screens.<br>7. Return to the Setup Menu screen by press the back arrow twice.<br>8. Select item 1, “Genset Service”.<br>9. Select item 3, “Meter Calib.”<br>10. Press the down arrow three times to scroll down to Metering Current Adjust.<br>11. Adjust the three parameters to match the current being displayed by the known current meter.<br>12. Save the adjustments by pressing the “Save” button. |

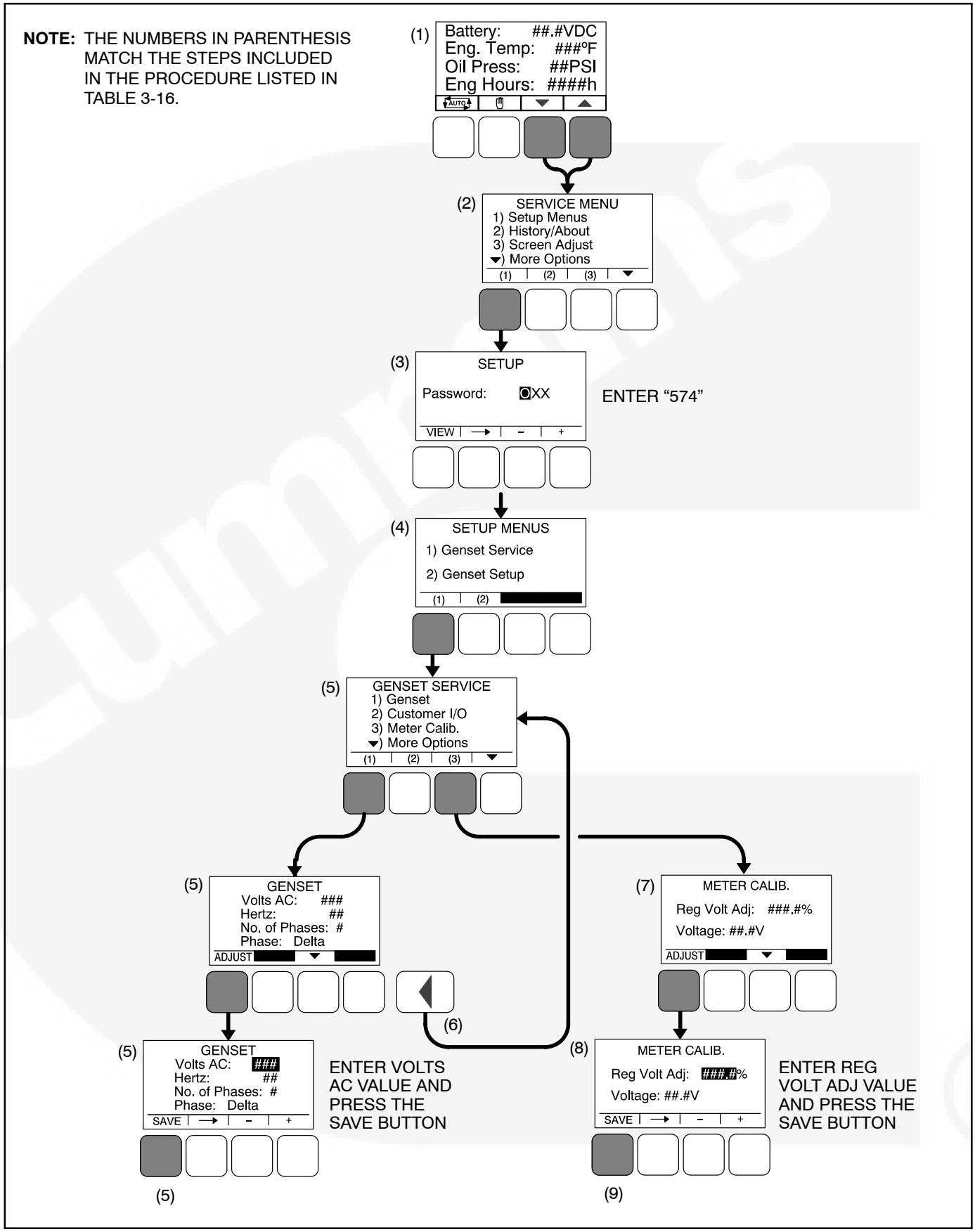



**FIGURE 3-25. OPERATOR PANEL MENUS FOR CALIBRATING VOLTAGE MEASUREMENT FOR REGULATION**

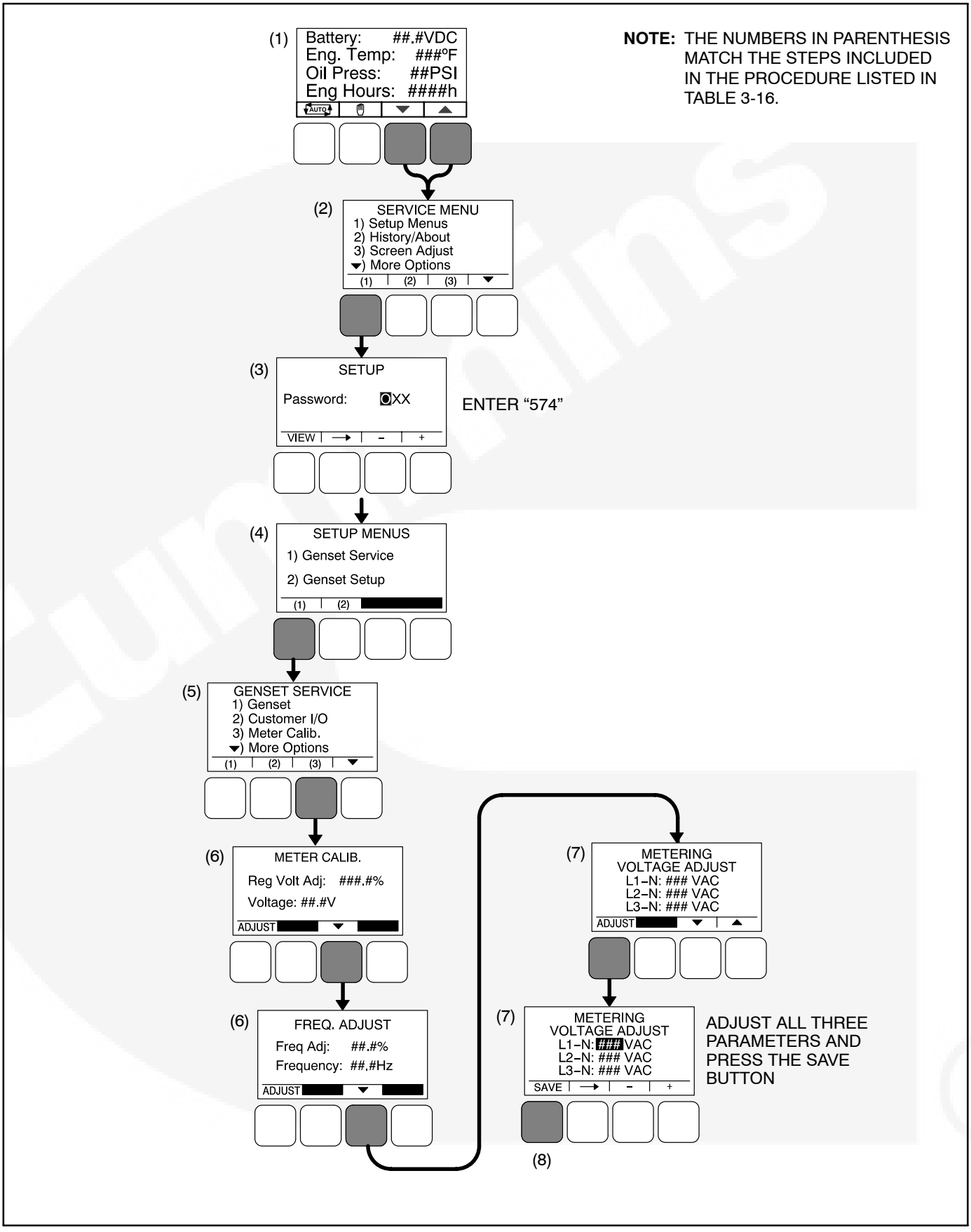



**FIGURE 3-26. OPERATOR PANEL MENUS FOR CALIBRATING VOLTAGE MEASUREMENT FOR DISPLAY**

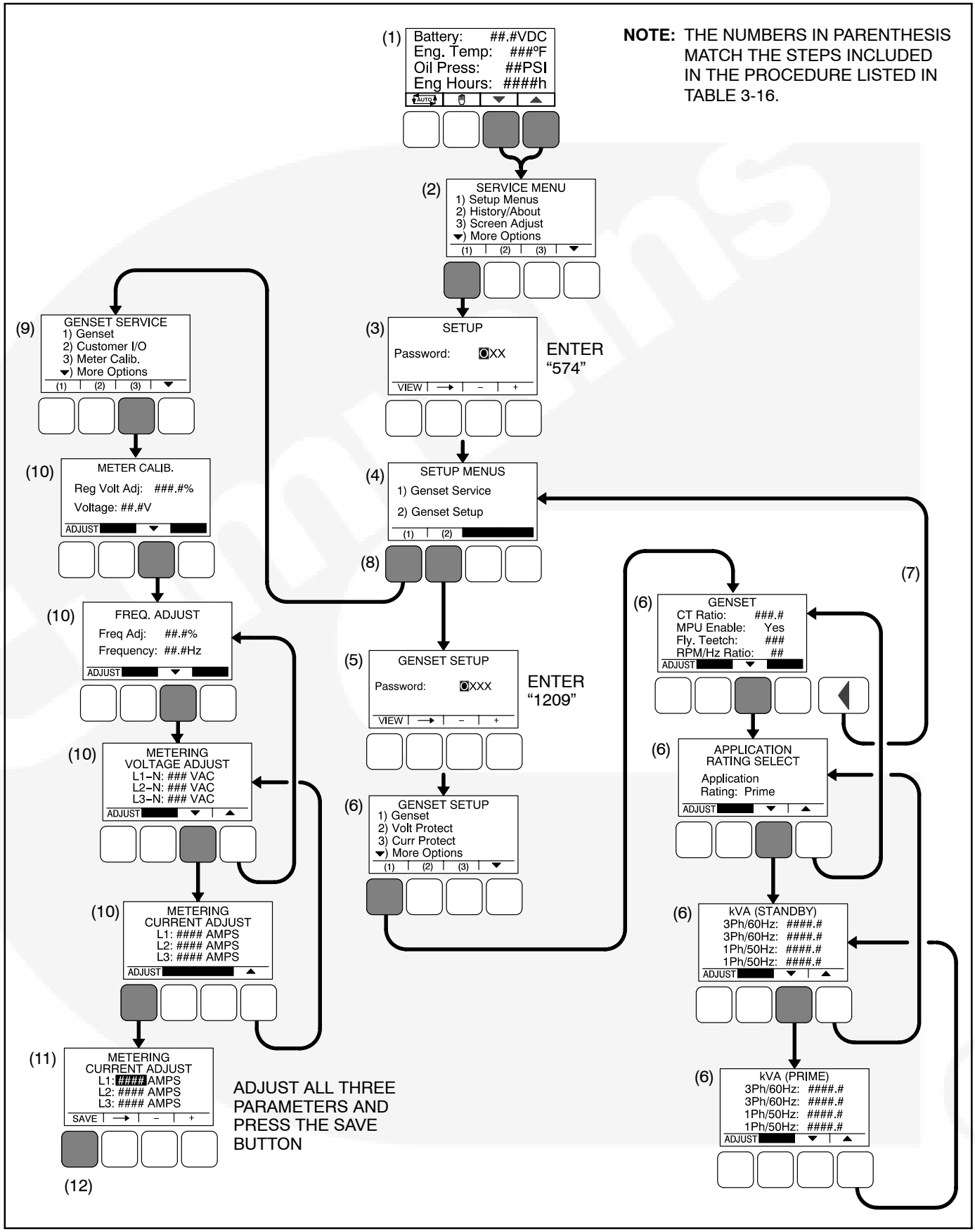



**FIGURE 3-27. OPERATOR PANEL MENUS FOR CALIBRATING CURRENT MEASUREMENT FOR DISPLAY**

## 1301 CONTROL FUNCTIONS

### Remote Start Mode

The 1301 series control accepts a ground signal from remote devices to automatically start the generator set and immediately accelerate to rated speed and voltage. The control can incorporate a time delay start.

For information on how to set a start time delay using the operator panel, see page 5-8.

### Remote Emergency Stop

For operation of the genset, a closed relay contact between TB1-15 and TB1-16 must be present. The control enters an emergency stop mode when the short is removed. Before the genset can be restarted, the control must be manually reset by re-applying the short and acknowledging the fault. The E-stop circuit contains two parallel paths. One path is fed into the micro-processor for status processing. The second path is fed directly into the relay drivers, disabling them when an E-stop is present.

### 12/24V Battery

The 1301 series control provides 12 and 24 VDC battery operation capability for genset system. It requires battery voltage input from the genset starter batteries.

The control system provides a field adjustable trim to select either 12V/24V battery operations for selection of the internal thresholds to this feature.

For information on how to set the nominal battery voltage using the operator panel, see page 5-34.

### Engine Starting

The control system supports automatic engine starting. Primary and backup start disconnects are achieved by one of the following three methods: magnetic pickup, battery charging alternator feedback, or main alternator output frequency.

### Cycle Cranking

Configurable for number of starting cycles (1 to 7) and duration of crank and rest periods. Control includes starter protection algorithms to prevent the operator from specifying a starting sequence that might be damaging.

For information on how to set the cycle crank attempts using the operator panel, see page 5-10.

### Spark Ignition Power/Glow Plug Control

Pin J11-19 on the 1301 series control is dual purpose.

When the trim parameter Fuel Type = Diesel pin J11-19 can be used to control a glow plug pre−heat solenoid. This feature can be disabled when not required. The trim parameter for this is Glow Plug = Enable/Disable.

When the trim parameter Fuel Type = Gas pin J11-19 can be used to control an external spark ignition control module. Pin J11-19 is turned on simultaneously with the fuel solenoid and held on as long as the genset is running. Both drivers stay on while the engine speed is above 150 RPM. When a shutdown command is received the fuel solenoid is disabled but the ignition control module driver stays on until the Fuel Burn Off Time delay timer expires. By running the ignition system off of this delayed output, all of the fuel downstream of the fuel solenoid will be burned following genset stop / shutdown. This will remove the occasional fuel flash in the exhaust system after stop / shutdown. In addition to setting the Fuel Type trim to Gas, two other trim parameters need to be configured. The first is the Fuel Burn Time Delay (0 −10 seconds). The default value for this trim is 5 sec. The user also must configure the Fail to Stop Time delay. It is recommended that this trim be set to at a minimum 10 seconds longer the Fuel Burn Time Delay.

For information on how to set the Fuel Type, enable a Glow Plug, and set a Fuel Burn Time Delay using the operator panel, see page 5-8.

### Start and Stop Time Delays (Cool Down)

Configurable for time delay of 0–300 seconds prior to starting after receiving a remote start signal, and for time delay of 0–600 seconds prior to ramp to shut down after signal to stop in normal operation modes. The default for both time delay periods is 0.

For information on how to set a start or stop time delay using the operator panel, see page 5-8.

## BATTLE SHORT MODE OPTION

The 1301 series control can be programmed to work in battle short mode.

The PC service tool is required to enable the Battle Short feature. If the operator panel is not installed, the PC service tool is also required to enable the external Battle Short switch.

The controller then can accept Configurable Input 1, Configurable Input 2 as battle short switch inputs. If an operator panel is used, it can be also selected as a source of input by selecting the appropriate input source value for the trim.

### Installations With a Operator Panel

To activate the Battle Short feature for installations that include the operator panel (see Figure 3-28),

1. Use the PC service tool to enable the Battle Short mode feature. Contact an authorized service center for assistance.
2. View the Service Menu by simultaneously holding down the “up” and “down” arrow keys.
3. Select item 1, “Setup Menus”.
4. Enter setup menu password 574.
5. Select item 1, “Genset Service”.
6. Select item 1, “Genset”.
7. Press the ▼ selection button four times to view the “Battleshort” menu.

   **NOTE:** This menu is displayed only if the Battle Short mode feature has been enabled with the PC service tool.

8. Press the ADJUST button.

   – If you want the operator panel to be the activation source of this feature, change the “Switch Input:” setting to “Operator Panel.”

   **NOTE:** When Switch Input is set to “Operator Panel”, the “Battle Short: Active/Inactive” subject is displayed. Battle Short should **not** be set to “Active” until it is needed by the customer.

   – If you want a customer input to be the activation source of this feature, change the “Switch Input:” setting to “Customer Input 1” or “Customer Input 2.” Refer to page 5-18 for information on setting up customer inputs.

9. Save the adjustments by pressing the “Save” button.

For more information on the Battle Short feature, see Section 4.

### Installations Without a Operator Panel

Installations without a operator panel require the following.

- A Manual Run/Off/Auto switch must be connected to the control harness.
- A status indicator lamp must be installed to flash shutdown fault codes.
- An external On/Off switch must be connected to one of the customer configured inputs on the control board.
- The PC service tool must be used to enable the Battle Short mode feature.
- The PC service tool must be used to enable the external Battle Short On/Off switch.

Contact an authorized service center for assistance. For more information on the Battle Short feature, see Section 4.

### Battle Short Mode

Battle Short mode is designed to work only in critical load circumstances and is used to satisfy local code requirements, where necessary. This feature can only be used if the necessary software was installed at the factory when the 1301 control was purchased or if it was installed by an authorized customer service representative.

Battle Short mode prevents the genset from being shutdown by all but a select few critical shutdown faults. **All shutdown faults, including those overridden by Battle Short, must be acted upon immediately to ensure the safety and well being of the operator and the genset.**

**⚠WARNING** ***Use of the Battle Short mode feature can cause a fire or electrical hazard, resulting in severe personal injury or death and/or property and equipment damage. Operation of the genset must be supervised during Battle Short operation.***

This feature must only be used during supervised, temporary operation of the genset. The faults that are overridden when in Battle Short mode are faults that can affect genset performance or cause permanent **engine, alternator, or connected equipment damage. Operation may void the generator set warranty if damage occurs that relates to the fault condition(s).**

Before the Battle Short feature can be used, it must first be enabled. Only trained and experienced service personnel should enable this feature. When shipped from the factory, this feature is disabled.

***Installations with an Operator Panel***

Battle Short can be enabled or disabled (set to Active or Inactive) using the operator panel.

**The PC service tool is required to enable the Battle Short mode feature. Contact an authorized service center for assistance.**

Before Battle Short can be used on installations with the operator panel, the Switch Input setting on the Battle Short submenu must be set to "Operator Panel" (see page 5-11). In addition, Battle Short mode must be enabled (set to Active) in the Battle Short submenu (see page 5-11).

When Battle Short mode is enabled, the Warning status indicator lights, and code **218 – Battle Short Active** is displayed.

When Battle Short mode is enabled and an **overridden shutdown fault** occurs, the shutdown lamp remains lit even though the genset continues to run. Fault code **220 – Fail to Shut Down** is displayed. If the ▼, ▲, or ◀ button is pressed to acknowledge the fault, the fault message is cleared from the display but remains in the Fault History file with an asterisk sign (***** indicates an active fault) as long as Battle Short mode is enabled.

Battle Short is suspended and a shutdown occurs immediately if:

- Any of the following shutdown faults occurs.
  - Overspeed – Fault code 31
  - Emergency Stop – Fault code 61
  - Speed Signal Lost (Loss of Speed Sense) – Fault code 45
  - Excitation Fault (Loss of Voltage Sense) – Fault code 27
- Battle Short mode is disabled after an overridden shutdown fault occurred while in Battle Short mode. To disable Battle Short mode, navigate to the Battle Short submenu (see page 5-11) and select "Inactive." Fault code **77 – Shutdown After Battle Short** is then displayed.

***Installations without an Operator Panel***

A Manual Run/Off/Auto switch must be installed in installations that do not include a operator panel. Battle Short can be turned on or off with a customer installed external switch connected to one of the two customer configured inputs.

**The PC service tool is required to enable the Battle Short mode feature and to enable the external Battle Short switch using one of the two available customer inputs. Contact an authorized service center for assistance.**

When Battle Short mode is enabled and an overridden shutdown fault occurs, the genset continues to run and the status indicator lamp flashes the shutdown fault code. See "Local Status Output" on page 4-1 for information on interpreting the status indicator light.

Battle Short is suspended and a shutdown occurs immediately if:

- Any of the following shutdown faults occurs.
  - Overspeed – Fault code 31
  - Emergency Stop – Fault code 61
  - Speed Signal Lost (Loss of Speed Sense) – Fault code 45
  - Excitation Fault (Loss of Voltage Sense) – Fault code 27
- The external Battle Short switch is moved to the OFF position after an active but overridden shutdown fault occurred while in Battle Short mode. The status indicator lamp then flashes fault code **77 – Shutdown After Battle Short**.

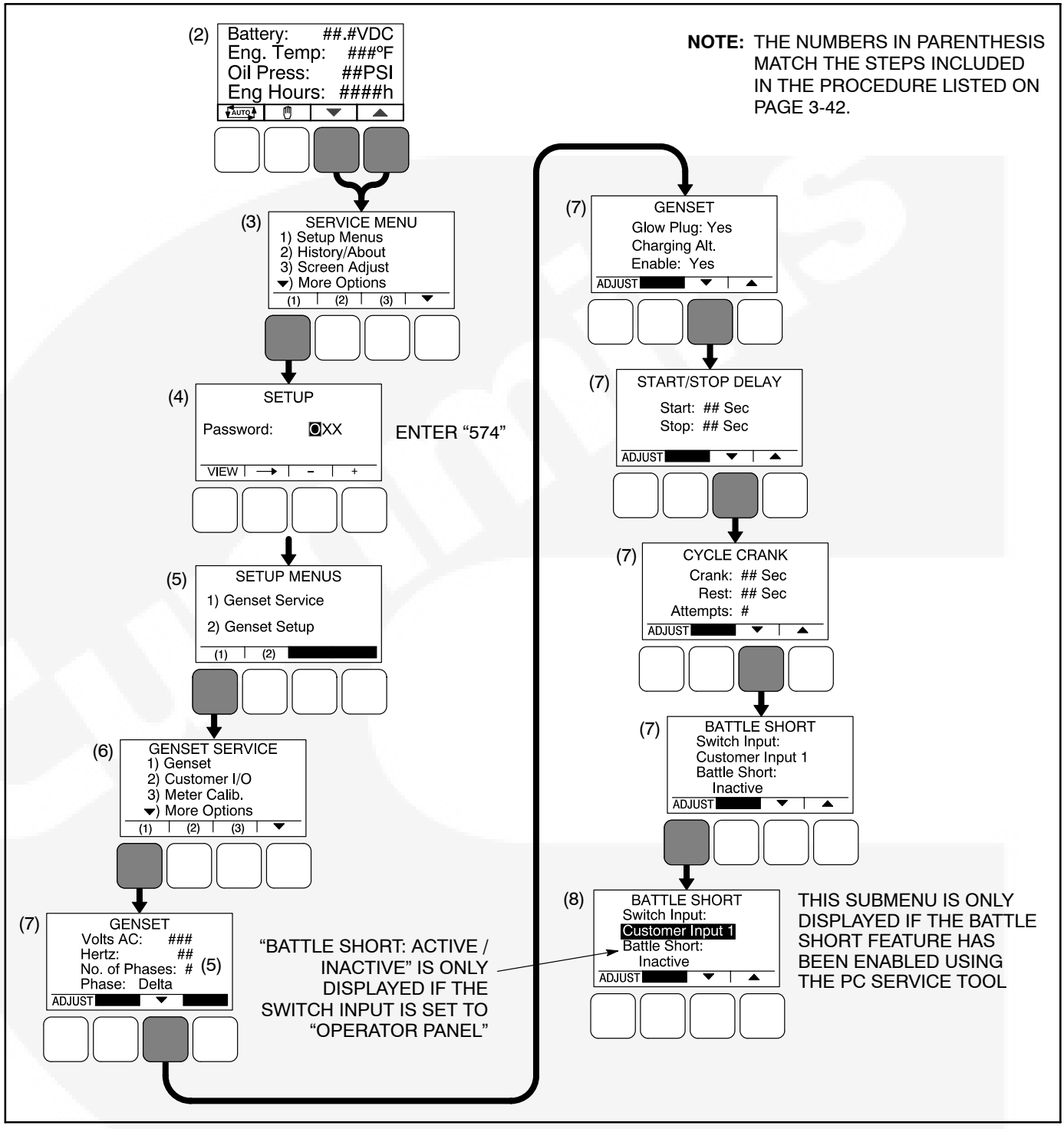



**FIGURE 3-28. OPERATOR PANEL MENUS FOR CALIBRATING BATTLE SHORT MODE**

# 4. Operator Panel Operation

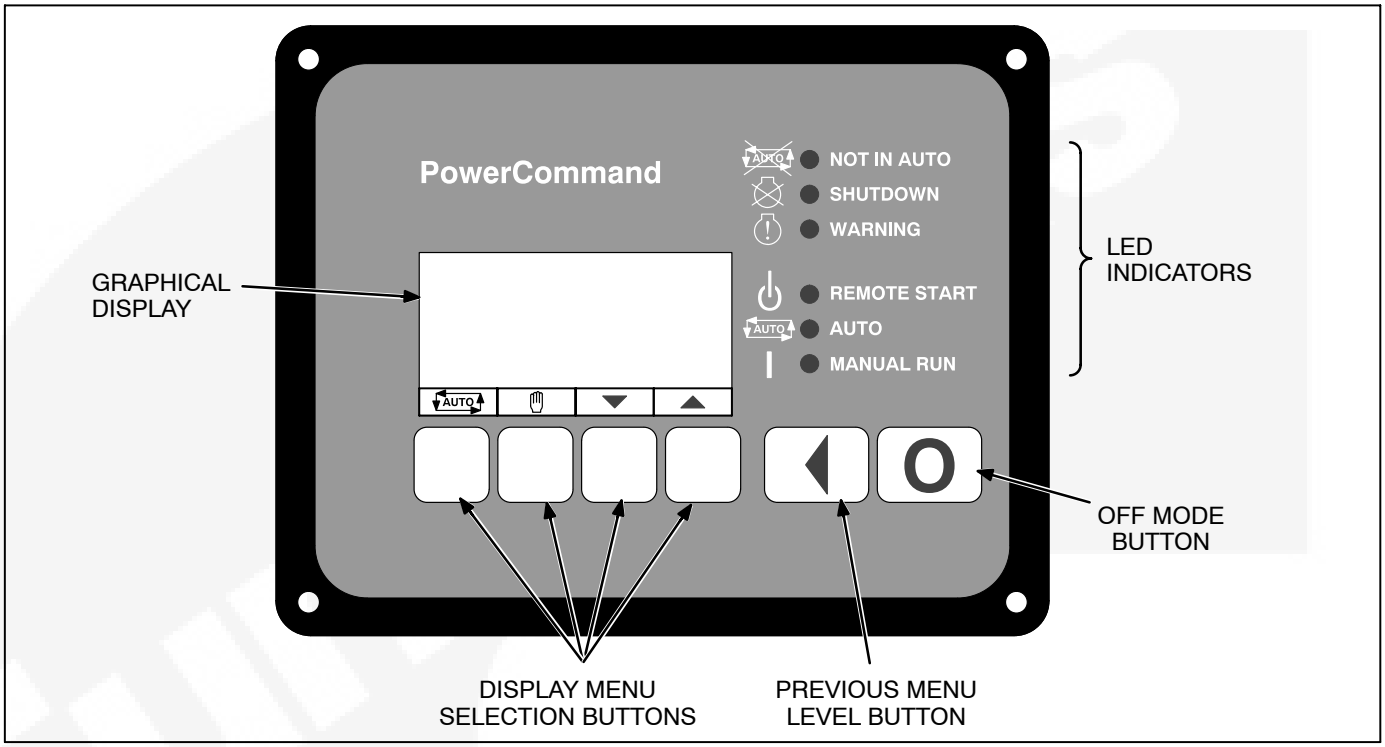



**FIGURE 4-1. 1301 OPTIONAL OPERATOR PANEL**

## INTRODUCTION

This section includes information on the following.

- Control Features
- Operator Panel Components
- Operator Panel Functions
- Operator Panel System Messages
- Description of Fault and Status Codes
- Basic Operator Menus
- Selecting Auto, Manual Run, and Off Modes
- Operator Service Menus

## LOCAL STATUS OUTPUT INDICATOR

If your installation includes a status indicator lamp that flashes genset status and shutdown fault codes, the following describes how to interpret the status indicator light.

- Constant Fast Flashing = This occurs during preheat (when used) and while the generator set is starting.
- Constant On = The genset is running.
- Intermittent Flashing = A genset shutdown fault condition exists. All of the shutdown faults described in Table 4-2 can be announced with a status indicator lamp.
  - **One blink**, followed by a two-second pause, indicates a shutdown due to high engine coolant temperature.
  - **Two blinks**, followed by a two-second pause, indicates a shutdown due to loss of engine oil pressure.
  - For **two-digit shutdown fault codes**, the first digit in the code is flashed, followed by a half-second pause, and then the second digit is flashed, followed by a two-second pause.

  **NOTE:** Only the last shutdown fault is flashed.

  When a fault is corrected, the Manual Run/Off/Auto switch must be placed in the Off position to reset the control.
- Under all other indications, the status lamp is off.

## OPERATING MODES

The 1301 control works with a Manual Run/Off/Auto switch, used to control genset operating modes. This capability is located either in the harness (switch) or is integrated into the operator panel included in this kit.

### Off Mode

When in Off mode, the control does not allow the genset to start. If the genset is already running and the control is set to Off, it initiates a normal shutdown sequence.

### Manual Run Mode

When in Manual Run mode, the genset starts and continues to run until the control is put into the Off mode. While in Manual Run mode, any remote start signal is ignored.

### Auto Mode

When in Auto mode, the control allows the genset to be started with a remote start signal only.

When in Auto mode, the genset can start at any time. When a remote start signal is received, the genset starts after a time delay preheat and time delay start (if programmed) is completed.

If the genset is running in Auto mode and the Off button is pressed, the control immediately stops the genset and the control transitions to the Off mode.

When all remote start signals are removed, the control performs a normal shutdown sequence which may include a time delay stop.

### Emergency Stop Mode

When the optional emergency stop button is used, it immediately shuts down the generator set, bypassing any time delay stop. The red Shutdown LED lights and code **61 – Emergency Stop** is either displayed (installations with a operator panel) or flashed (installations with a status indicator lamp).

To reset the control, open (disable) the emergency stop button and either press the O (Off) button (installations that include a operator panel) or move the control switch to the OFF position (installations with a Manual Run/Off/Auto switch).

## Sleep Mode

The 1301 series control enters a low power (sleep) mode of operation where the current draw is not greater than 60 milliamps (DC) at normal battery voltage levels. The control is set to enter sleep mode after five minutes in the Off or Auto mode. (Sleep mode can only be disabled if a jumper is installed on the optional operator panel.)

**Starting with v5.19, the control has an additional trim that has created sleep mode issues in the field. To resolve this issue, make sure the *Awake in Auto Function Enabled* trim is Disabled, not Enabled (the default value). Then, verify that the control and display go to sleep after five minutes of low current draw.**

The control will not enter the sleep mode if there are any active, unacknowledged faults, if the control is in the Manual Run mode, or if there are any active serial communications.

Once in sleep mode, any activated input will wake the control. These include:

- Selecting Manual Run mode
- Pressing any button on the operator panel
- Sending a ground signal to the wake-up pin (TB2, pin 5)

If the S1 switch on the control board is set to the "ON" (awake) position (near the outer edge of the board), the control can **only enter sleep mode if it is in Off mode**. The control can be awakened by any of the following.

- Selecting Manual Run mode
- Selecting Auto mode
- Connecting the PC service tool

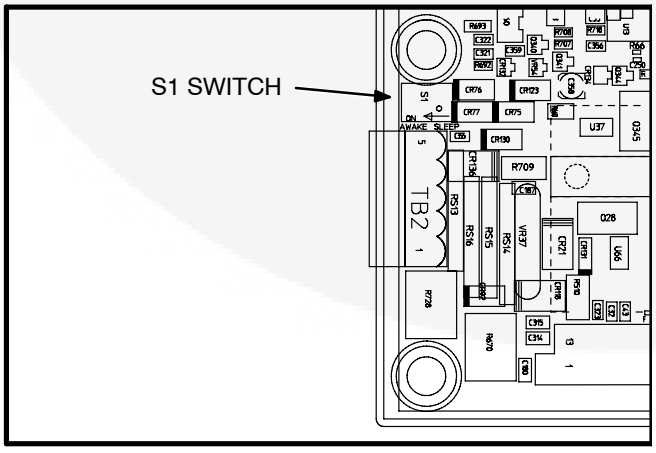



**FIGURE 4-2. S1 SWITCH LOCATION ON CONTROL BOARD**

If the S1 switch on the control board is set to the "OFF" (sleep) position (away from the outer edge of the board), the control can **enter sleep mode if it is in Off or Auto mode**. The control can be awakened by one of the following.

- Sending a Remote Start command to the control (see ***Installations with a Remote Start Command***)
- Connecting the PC service tool

***Installations with an Operator Panel***

Sleep mode is automatically enabled on the operator panel. When sleep mode is enabled, the operator panel turns itself off after five minutes of keypad inactivity. It awakes from sleep mode if any button is pressed.

With the **original operator panels** (part numbers 300−5875 and 300−6037), sleep mode can be disabled by connecting B+ to pin 4 (power on) of J1 or J2. This can be accomplished by installing a jumper between J1-3 and J1-4 (or between J2-3 and J2-4) on the back of the operator panel (see Figure 4-3). The installed jumper disables the S1 switch function.

**NOTE:** J1 and J2 are identical. Either one can be used for the harness connection between the control board and the operator panel.

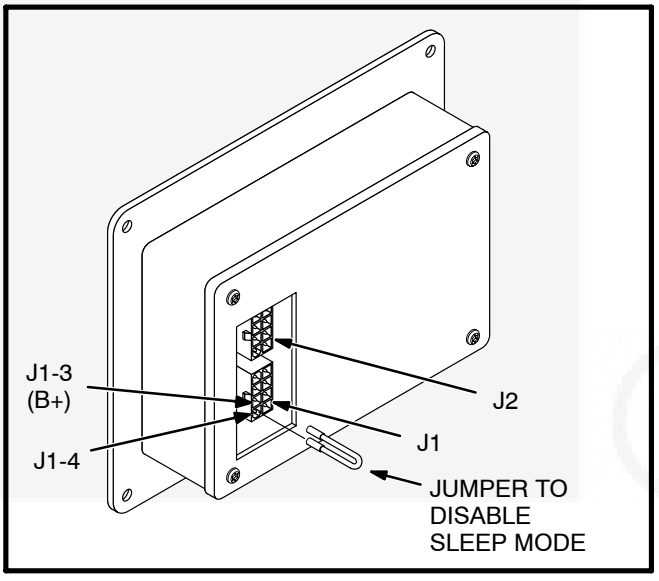



**FIGURE 4-3. JUMPER INSTALLATION TO DISABLE SLEEP MODE – ORIGINAL PRODUCTION**

With **current production operator panels**, sleep mode can be disabled by connecting pin 4 (power on) to GND. This can be accomplished by installing a jumper between J1-4 and J1-5 (or between J2-4 and J2-5) on the back of the operator panel (see Figure 4-4). The installed jumper disables the S1 switch function.

**NOTE:** Current production operator panels include two certification labels.

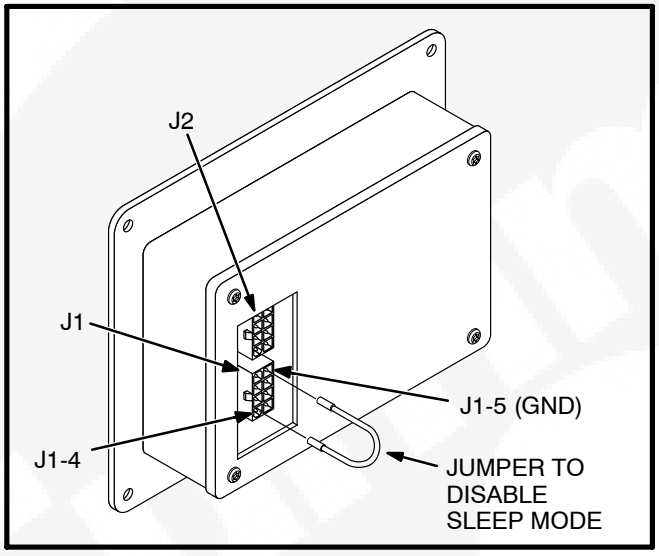



**FIGURE 4-4. JUMPER INSTALLATION TO DISABLE SLEEP MODE – CURRENT PRODUCTION**

***Installations with a Manual Run/Off/Auto Switch***

For installations that utilize an Manual Run/Off/Auto switch located in the harness, the control awakes from sleep mode if Manual Run or Auto mode is selected.

***Installations with a Remote Start Command***

For installations in which a remote start signal should wake the control, the implementation requires a Manual Run/Off/Auto switch. In this implementation, the operator must use the switch, not the operator panel, to control the mode of operation.

**If you put the Manual Run/Off/Auto switch near the HMI, make sure it is not confused with the emergency stop switch.**

Follow the instructions below to implement sleep mode with a remote start signal.

1. Confirm that v5.9 has been loaded on the control, and perform the initial calibration.
2. Cut the wire running to J1-6, J1-7, and J1-8 on the HMI, and connect it to RUN, AUTO, and OFF, respectively, on the switch instead
3. Connect the remote start signal to J1-4 (Wake up) on the HMI, in addition to the connection to the control. The remote start signal will now wake up the operator panel.
4. Set the S1 switch on the control to the OFF position.
5. Make sure sleep mode is enabled, and make sure *Awake in Auto Function Enabled* is Disabled, not Enabled (the default value).

Verify that the control enters sleep mode and that it wakes up when it receives a remote start signal.

## OPERATOR PANEL

Figure 4-1 shows the front of the optional operator panel. It includes six LED indicators, the graphical display, and six buttons used to navigate through the menus and adjust parameters.

### Graphical Display

This graphical display is used to view menus of the menu-driven operating system. The bottom of the graphical display indicates the functions that are available by pressing the four selection buttons. Refer to the menu trees later in this section.

System messages (communication, event, status, and fault) are also shown on the graphical display. For more information, see page 4-7.

### Display Text / Symbolic Versions

Using the Display Setup Service submenu (see page 5-12), the graphical display can be set up to show either text or symbolic versions of fault messages, some Operator menus, and the Mode Change menu. A description of commonly used symbols used are included in Table 4-1. Combinations of symbols are used to display some fault conditions. Additional specialized symbols are also used for some faults (see Table 4-2).

**TABLE 4-1. SYMBOLS**

| SYMBOL | DESCRIPTION |
|---|---|
|  | Generator Warning Fault |
|  | Generator Shutdown Fault |
|  | Coolant Temperature |
|  | Oil Pressure |

| | |
|---|---|
| ~V | Voltage Alternating Current (VAC) |
| ⎓V | Voltage Direct Current (VDC) |
| ~A | AC Current |
| Hz | Frequency |
| − + | Battery |
| ‹‖› | Out of Range |
| ↑ | High or Pre-High |
| ↓ | Low or Pre-Low |
| | Annunciator |

## Display Menu Selection Buttons

Four momentary soft-key buttons are used to step through the various menus and to adjust parameters. These selection buttons are "active" when a word or symbol in the graphical display is shown above the button. Some submenus do not include any active buttons.

The function of the four selection buttons varies with each menu.

- When the AUTO symbol is displayed, the selection button can be used to switch to **Auto** mode.
- When the ✋ symbol is displayed, the selection button can be used to switch to **Manual Run** mode.
- When the up and down triangles (▲ and ▼) are displayed, the selection buttons are used to navigate between a series of submenus.

  **NOTE:** When any Operator menu is displayed, a series of Service menus can be viewed by simultaneously pressing the ▲ and ▼ selection buttons for two seconds (see page 4-24).

  **NOTE:** When a fault is displayed, it can be cleared from the front panel by pressing the ▲ or ▼ button.
- When a ◀ symbol is displayed, the selection button can be used to abort the Auto or Manual Run mode and return to the Operator menu that was displayed before the Auto or Manual Run mode was selected.
- When **ADJUST** is displayed, the selection button is used to display an adjustable menu. When the **ADJUST** button is pressed, the first adjustable parameter or value in the submenu is highlighted.
- When the ⟶ symbol is displayed, the selection button is used to navigate to an editable field within a menu.
- When the + and – symbols are displayed, the selection buttons are used to increase or decrease a parameter or value shown on the screen.

  When changing values, pressing the button below the + symbol increase the value and pressing the button below the – symbol decreases the value.
- When **SAVE** is displayed, the selection button is used to save changes made in a submenu. **If the Previous Menu button is pressed before pressing SAVE, the changes are not saved.**
- Some menus include a list of numbered subjects. These menus include numbers in parenthesis (for example, **(1)**) displayed above the selection buttons. The selection buttons are then used to display submenus of the subjects included in the list.
- When a black box ■ is displayed, the selection button has no function.

## Previous Main Menu Button

Press the ◀ button to view the previous main menu (see Figure 4-5).

**NOTE:** In the Screen Adjust menu, settings are not saved when the ◀ button is pressed.

The ◀ button is also used to acknowledge warning and shutdown messages after the fault has been corrected. Pressing this button clears the fault from the front panel display and the previous menu is redisplayed.

**NOTE:** Pressing the ▲ or ▼ button also clears the fault from the front panel display.

## Off Button

Press the O button to switch to the **Off** mode (see Figure 4-5). The Off mode disables the control Auto or Manual Run modes. Pressing the O button resets the control.

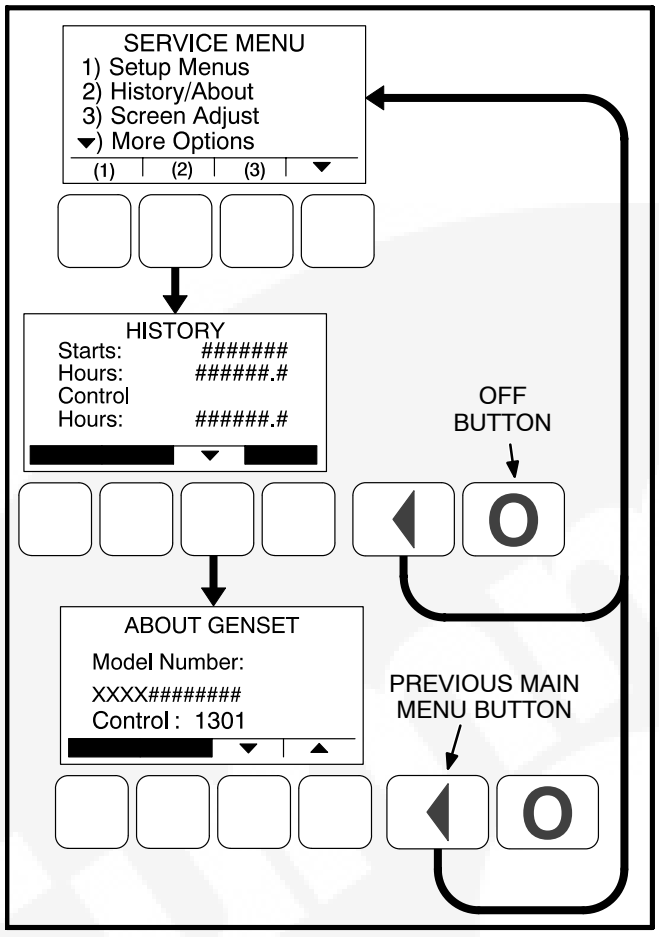



**FIGURE 4-5. PREVIOUS MAIN MENU AND OFF BUTTONS**

If the O button is pressed during genset operation (manual or remote start), the engine immediately shuts down. If possible, this hot shutdown should be avoided to help prolong the reliability of the genset.

If a shutdown fault occurs and the fault condition is corrected, pressing the O button clears the fault from the display and resets the control.

If an emergency stop button is included in your installation, the O button is also used to reset the control after the emergency stop button is used and then disabled.

## LED Indicating Lamps

The operator panel includes LED indicating lamps for the functions listed below.

### *Not In Auto Indicator*

This red lamp is lit when the control is not in the Auto mode.

### *Shutdown Indicator*

This red lamp is lit when the control detects a Shutdown condition. The generator set cannot be started when this lamp is on. After the condition is corrected, the lamp can be reset by pressing the O (off) button. When Battle Short mode is enabled and an overridden shutdown fault occurs, the Shutdown lamp is lit even though the genset continues to run.

### *Warning Indicator*

This yellow lamp is lit whenever the control detects a warning condition. This lamp is automatically shut off when the warning condition no longer exists.

### *Remote Start Indicator*

This green lamp indicates the control is receiving a remote run signal.

### *Auto Indicator*

This green lamp indicates the control is in Auto mode. Auto mode can be selected by pressing the AUTO selection button from any of the Operator menus (see page 4-22).

### *Manual Run Indicator*

This green lamp indicates the control is in the Manual Run mode. Manual Run mode can be selected by pressing the ✋ selection button from any of the Operator menus (see page 4-22).

## OPERATOR PANEL SYSTEM MESSAGES

A system pop-up message is displayed when the event it is displaying becomes active. These pop-up messages remain displayed until pre-empted by another pop-up message or until the ▼ or the ◀ display buttons is pressed. Once the ▼ or the ◀ button is pressed, the previous screen is redisplayed.

## Communication Messages

System messages are displayed for initial power-up or when there is a subsequent loss of communications. Auto and Manual Run modes can also be selected when communication messages are displayed (for more information, see page 4-22).

Upon initial power-up, the message “Establishing communication with control” is displayed (see Figure 4-6). This menu also displays the screen’s software number and version.

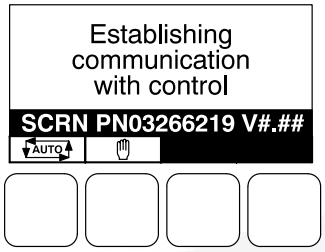



**FIGURE 4-6. ESTABLISHING COMMUNICATIONS MESSAGE**

When the display detects that it is no longer communicating with the control, the Shutdown, Warning, and Remote Start LEDs are turned off.

If communications are lost, the message “Re-establishing communication with control” is displayed until communications have been re-established (see Figure 4-7). The LEDs then return to the state determined by the control.

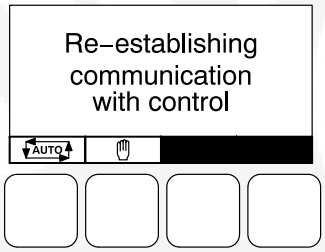



**FIGURE 4-7. RE-ESTABLISHING COMMUNICATIONS MESSAGE**

**If either communication message remains displayed (cannot view other menus), this is an indication that communications between the operator panel and the control logic is lost. Contact an authorized service center for service.**

## Event Messages

When pre-set events (start or stop) are activated, Event messages are displayed showing the time remaining until the event occurs (see Figure 4-8).

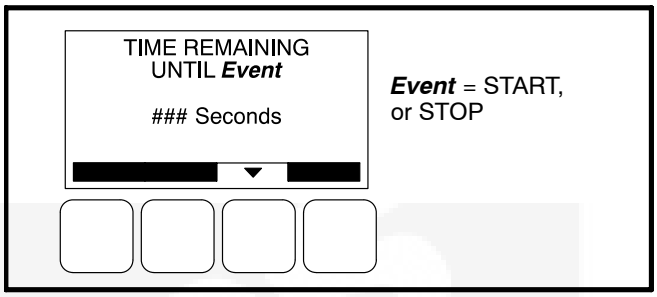



**FIGURE 4-8. EVENT MESSAGE**

## Status Messages

Status messages for some events are displayed on the optional operator panel with a code number but are not announced with a lamp indicator. Text status messages include the event code, a short description, and the time the event occurred. Symbolic status messages include the event code and symbols to indicate the type of event that occurred. Status messages and their code numbers are listed below. These events are not currently displayed. Additional information on these events is included in Table 4-2.

| STATUS EVENT | EVENT CODE |
|---|---|
| Ready to Load | 150 |
| Not In Auto | 153 |
| Common Alarm | 155 |
| Common Warning | 156 |
| Common Shutdown | 157 |
| Cust Input 1 | 158 |
| Cust Input 2 | 159 |
| Annunciator Fault 1 | 160 |
| Annunciator Fault 2 | 161 |
| Annunciator Fault 3 | 162 |

## Fault Messages

A Fault message is an indicator of a Warning or Shutdown condition that is also announced with a lamp indicator. Text fault messages include the fault code number, a short description, and when the fault occurred (see Figure 4-9). Symbolic fault messages include the fault code number and symbols, indicating the type of fault (see Figure 4-10). With the symbolic versions of fault messages, the ⓘ and ⏱ symbols flash.

Five of the most recent faults are saved in a file and can be viewed using the Fault History Menus (see page 4-28).

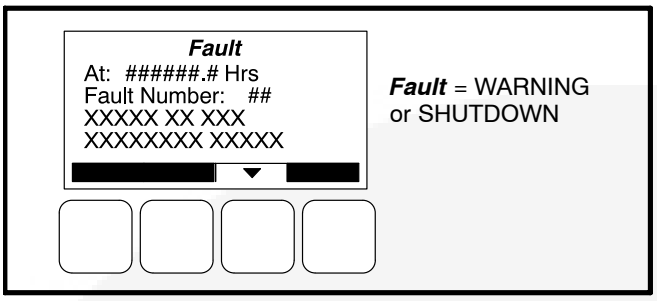



**FIGURE 4-9. FAULT MESSAGE – TEXT VERSION**

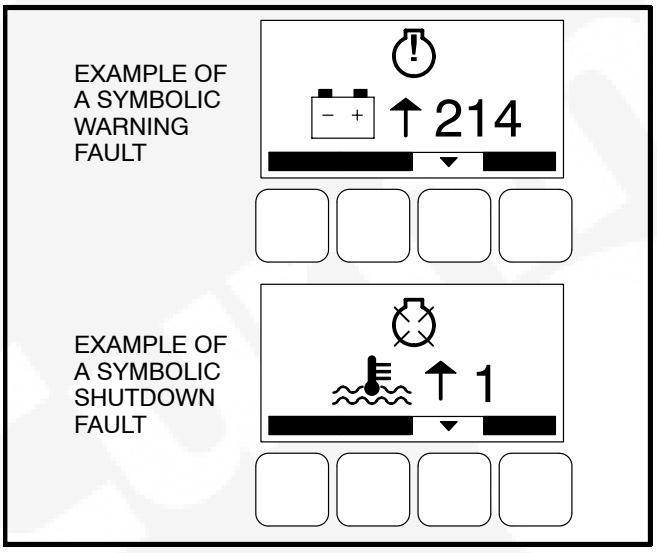



**FIGURE 4-10. FAULT MESSAGES – SYMBOLIC VERSION**

## Fault Acknowledgement

Shutdown faults must be acknowledged after the faults have been corrected. If in Auto or Manual Run mode, the control must be set to “O” (off). When in Auto mode, faults can also be acknowledged by removing the remote start command. Faults are cleared from the operator panel display by pressing the ▼, ▲, or ◄ buttons.

Faults are re-announced if they are detected again after being acknowledged.

## FAULT/STATUS CODES

Table 4-2 provides a list of fault and status codes, types, displayed messages/symbols, descriptions, and fault categories (CTG).

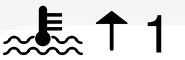
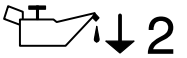
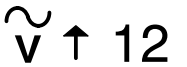
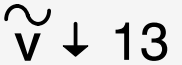
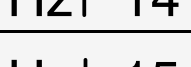
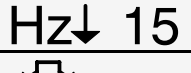
***Category A Fault Codes:*** Pertain to engine or alternator shutdown faults that require immediate repair by trained and experienced service personnel (generator set non-operational). The control prevents the generator set from being restarted if a shutdown fault is not corrected.

***Category B Fault Codes:*** Consist of faults that can affect generator set performance or can cause **engine, alternator, or connected equipment damage.** Operate the genset only when it is powering critical loads and cannot be shut down. Category B faults require repair by trained and experienced service personnel.

***Category C Fault Codes:*** Consist of faults that are repairable by site personnel. Service will be required by trained and experienced service personnel if site personnel cannot resolve the problem.

***Category D Fault Codes:*** Indicates non-critical operational status of generator set, external faults, or customer fault inputs. These faults require repair by trained and experienced service personnel.

**TABLE 4-2. FAULT AND STATUS CODES**

| CTG | CODE | LAMP | DISPLAYED MESSAGE/SYMBOLS | | DESCRIPTION |
|---|---|---|---|---|---|
| | | | TEXT VERSION | SYMBOLIC VERSION | |
| C | 1 ** | Shutdown | HIGH COOLANT TEMP |  | Indicates that the engine coolant temperature is above normal and has reached the shutdown trip point for the configured time delay. |
| A | 2 ** | Shutdown | LOW OIL PRESSURE |  | Indicates the engine oil pressure has dropped below normal and has reached the shutdown trip point for the configured time delay. |
| A | 12 ** | Shutdown | HIGH AC VOLTAGE |  | Indicates that the one or more measured AC output voltages has exceeded the threshold for longer than a specified time limit. The threshold and time limits are 130% of nominal for 1 second or 110% of nominal for 10 seconds. |
| A | 13 ** | Shutdown | LOW AC VOLTAGE |  | Indicates that the measured AC output voltage is below the threshold for longer than a specified time limit. The threshold and time limits are 85% of nominal for 10 seconds. |
| A | 14 ** | Shutdown | OVER FREQUENCY |  | Indicates that the alternator frequency is 6 hertz above the governor reference. |
| C | 15 ** | Shutdown | UNDER FREQUENCY |  | Indicates that the alternator frequency is 6 hertz under the governor reference. |
| A | 27 | Shutdown | EXCITATION FAULT |  | Indicates that a loss of voltage or frequency sensing from the generator has occurred. |
| A | 31 ** | Shutdown | OVERSPEED |  | Indicates that the engine has exceeded normal operating speed. The default thresholds are 1725 RPM (50 Hz) or 2075 RPM (60 Hz). |

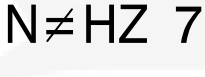
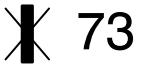
**NOTE:** Shutdown fault codes can also be announced with a local status lamp indicator.

***** For more information on these events, refer to the Battle Short Mode description on page 3-42.

****** Any values listed in the Description column for these faults are default values. If authorized, these values can be changed using the Genset Setup menus (see page 5-30).

**^** These faults are only available if your installation includes the optional I/O Module (Kit 541–1291).

**TABLE 4-2. FAULT AND STATUS CODES (CONT.)**

| CTG | CODE | LAMP | DISPLAYED MESSAGE/SYMBOLS | | DESCRIPTION |
|---|---|---|---|---|---|
| | | | TEXT VERSION | SYMBOLIC VERSION | |
| A | 38 | Shutdown | FIELD OVERLOAD |  | Indicates that the Field AVR Duty Cycle has been at the maximum continuously for 15 seconds. |
| A | 45 | Shutdown | SPEED SIGNAL LOST |  | Indicates that no magnetic pickup pulses were sensed for the Loss of Speed delay. If a magnetic pickup is not installed, this fault is diabled. |
| A | 46 ** | Shutdown | HIGH AC CURRENT |  | Indicates that alternator output current (one or more phases) has exceeded 150% of the rated output current continuously for more than 10 seconds. |
| C | 61 | Shutdown | EMERGENCY STOP |  | Indicates an Emergency Stop has been activated. |
| A | 71 ** | Shutdown | SPEED HZ MATCH |  | Indicates that measured engine speed and measured alternator AC output frequency do not agree. |
| C | 72 | Shutdown | FAIL TO CRANK |  | The genset has failed to sense rotation for two start attempts. This indicates a possible fault with the control, speed sensing, or the starting system. |
| C | 73 | Shutdown | FAIL TO START |  | The genset has failed to start after a set number of crank attempts. This indicates a possible fuel system problem (engine cranks but fails to start). |
| B | 74 | Shutdown | FAIL TO STOP |  | The genset continues to run after receiving a shutdown command from the controller. |
| D | 75 | Shutdown | Customer Input 1 |  | The nature of the fault is an optional customer selection. |
| D | 76 | Shutdown | Customer Input 2 |  | The nature of the fault is an optional customer selection. |
| B | 77 * | Shutdown | SHUTDOWN AFTER BS |  | A shutdown fault occurred while the Battle Short mode was enabled. |
| D | 81 | Shutdown | Annunciator Fault 1 |  | The nature of the annunciator fault is an optional customer selection. |
| D | 82 | Shutdown | Annunciator Fault 2 |  | The nature of the annunciator fault is an optional customer selection. |
| D | 83 | Shutdown | Annunciator Fault 3 |  | The nature of the annunciator fault is an optional customer selection. |

**NOTE:** Shutdown fault codes can also be announced with a local status lamp indicator.

***** For more information on these events, refer to the Battle Short Mode description on page 3-42.

****** Any values listed in the Description column for these faults are default values. If authorized, these values can be changed using the Genset Setup menus (see page 5-30).

**^** These faults are only available if your installation includes the optional I/O Module (Kit 541−1291).

**TABLE 4-2. FAULT AND STATUS CODES (CONT.)**

| CTG | CODE | LAMP | DISPLAYED MESSAGE/SYMBOLS | | DESCRIPTION |
|---|---|---|---|---|---|
| | | | TEXT VERSION | SYMBOLIC VERSION | |
| D | 84^ – 91^ | Shutdown | Base I/O Module Input 1 – Input 8 | 84 thru 91 | The nature of the Base I/O Module “Fault” is an optional customer selection. |
| D | 92^ – 95^ | Shutdown | Aux I/O Module Input 9 – Input 12 | 92 thru 95 | The nature of the Aux I/O Module “Fault” is an optional customer selection. |
| C | 96^ | Shutdown | OIL TEMP HIGH | (None) | Indicates that the engine oil temperature is above normal and has reached the shutdown trip point. (I/O Module option) |
| C | 97^ | Shutdown | EXHAUST TEMP HIGH | (None) | Indicates engine exhaust manifold air temperature is above normal and has reached the shutdown trip point. (I/O Module option) |
| C | 98^ | Shutdown | AMBIENT TEMP HIGH | (None) | Indicates ambient temperature is above normal and has reached the shutdown trip point. (I/O Module option) |
| C | 99^ | Shutdown | FUEL LEVEL LOW | (None) | Indicates that fuel level has reached the shutdown trip point. (I/O Module option) |
| C | 100^ | Shutdown | ALTERNATOR RTD HIGH | (None) | Indicates alternator temperature is above normal and has reached the shutdown trip point. (I/O Module option) |
| C | 101^ | Shutdown | INTAKE MANIFOLD TEMP HIGH | (None) | Indicates intake manifold temperature is above normal and has reached the shutdown trip point. (I/O Module option) |
| A | 102^ | Shutdown | VOLTAGE BIAS OOR | V 102 | Indicates the voltage bias circuit output is out of range (OOR), high or low. (I/O Module option) |
| A | 103^ | Shutdown | SPEED BIAS OOR | (None) | Indicates the speed bias circuit output is out of range (OOR), high or low. (I/O Module option) |
| A | 106^ | Shutdown | I/O MODULE LOST | 106 | Indicates the data link between the I/O module and the 1301 series control is lost. |
| D | 150 | None | READY TO LOAD | 150 | The genset is at rated voltage and frequency. |

**NOTE:** Shutdown fault codes can also be announced with a local status lamp indicator.

***** For more information on these events, refer to the Battle Short Mode description on page 3-42.

****** Any values listed in the Description column for these faults are default values. If authorized, these values can be changed using the Genset Setup menus (see page 5-30).

**^** These faults are only available if your installation includes the optional I/O Module (Kit 541–1291).

**TABLE 4-2. FAULT AND STATUS CODES (CONT.)**

| CTG | CODE | LAMP | DISPLAYED MESSAGE/SYMBOLS | | DESCRIPTION |
|---|---|---|---|---|---|
| | | | TEXT VERSION | SYMBOLIC VERSION | |
| D | 153 | None | NOT IN AUTO | AUTO 153 | Indicates that the 1301 control is not in Auto mode. |
| D | 155 | None | COMMON ALARM | 155 | The control has detected a Warning or Shutdown fault. |
| D | 156 | None | COMMON WARNING | 156 | The control has detected a Warning fault. |
| D | 157 | None | COMMON SHUTDOWN | 157 | The control has detected a Shutdown fault. |
| D | 158 | None | Customer Input 1 | 158 | The nature of the fault is an optional customer selection. |
| D | 159 | None | Customer Input 2 | 159 | The nature of the fault is an optional customer selection. |
| D | 160 | None | Annunciator Fault 1 | 160 | The nature of the annunciator fault is an optional customer selection. |
| D | 161 | None | Annunciator Fault 2 | 161 | The nature of the annunciator fault is an optional customer selection. |
| D | 162 | None | Annunciator Fault 3 | 162 | The nature of the annunciator fault is an optional customer selection. |
| D | 163^ – 170^ | (None) | Base I/O Module Input 1 – Input 8 | (None) | The nature of the Base I/O Module “Event” is an optional customer selection. |
| D | 171^ – 174^ | (None) | Aux I/O Module Input 9 – Input 12 | (None) | The nature of the Aux I/O Module “Event” is an optional customer selection. |
| C | 202 ** | Warning | PRE-HIGH COOLANT TEMP | ↑ 202 | Indicates that the engine has begun to overheat and the engine coolant temperature has risen to an unacceptable level for the configured time delay. |
| C | 203 ** | Warning | LOW COOLANT TEMP | ↓ 203 | Indicates that the engine coolant temperature is below the adjusted setpoint. This may indicate that the coolant heater is not operating or is not circulating coolant. |
| D | 204 | Warning | Customer Input 1 | 204 | The nature of the fault is an optional customer selection. |
| D | 205 | Warning | Customer Input 2 | 205 | The nature of the fault is an optional customer selection. |
| B | 212 | Warning | COOLANT SENSOR OOR | 212 | Indicates the coolant temperature sensor output is out of range (OOR), high or low. |

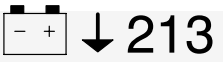
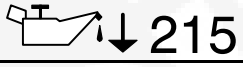
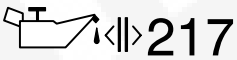
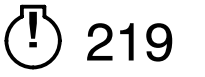
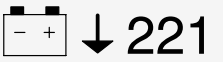
**NOTE:** Shutdown fault codes can also be announced with a local status lamp indicator.

***** For more information on these events, refer to the Battle Short Mode description on page 3-42.

****** Any values listed in the Description column for these faults are default values. If authorized, these values can be changed using the Genset Setup menus (see page 5-30).

**^** These faults are only available if your installation includes the optional I/O Module (Kit 541–1291).

**TABLE 4-2. FAULT AND STATUS CODES (CONT.)**

| CTG | CODE | LAMP | DISPLAYED MESSAGE/SYMBOLS | | DESCRIPTION |
|---|---|---|---|---|---|
| | | | TEXT VERSION | SYMBOLIC VERSION | |
| C | 213 ** | Warning | LOW BATTERY |  | Indicates battery voltage supply to the control is approaching a low level at which unpredictable operation can occur. |
| C | 214 ** | Warning | HIGH BATTERY |  | Indicates battery voltage supply to the control is approaching a high level at which damage to the control can occur. |
| C | 215 ** | Warning | PRE-LOW OIL PRESSURE |  | Indicates that the engine oil pressure is approaching an unacceptable level. |
| B | 216** | Warning | HIGH AC CURRENT |  | Indicates that the alternator output current (one or more phases) has exceeded 130% of nominal, or has exceeded 110% of nominal for 60 seconds. |
| B | 217 | Warning | OIL PRESS SENSOR OOR |  | Indicates the oil pressure sensor output is out of range (OOR), high or low. |
| C | 218 * | Warning | BATTLE SHORT ACTIVE |  | Indicates that the control is in Battle Short mode – used to bypass several fault shutdowns for genset operation during emergencies. |
| B | 219 ** | Warning | CHARGER FAILURE |  | Indicates the battery charging alternator has not reached a acceptable voltage range within the selected time period (default = 120 seconds).<br>This warning is also displayed if your alternator is a type that does not support the control's charging alternator logic functionality. If this occurs, this warning can be disabled if the Charging Alt. Enable setting is set to "No." See the Genset Service submenus on page 5-8. |
| B | 220 * | Warning | FAIL TO SHUTDOWN |  | Indicates that a shutdown fault is active, but is being bypassed by Battle Short. |
| C | 221 ** | Warning | WEAK BATTERY |  | Indicates that the genset battery voltage is below battery thresholds during cranking. |
| D | 222 | Warning | Annunciator Fault 1 |  | The nature of the annunciator fault is an optional customer selection. |
| D | 223 | Warning | Annunciator Fault 2 |  | The nature of the annunciator fault is an optional customer selection. |
| D | 224 | Warning | Annunciator Fault 3 |  | The nature of the annunciator fault is an optional customer selection. |

**NOTE:** Shutdown fault codes can also be announced with a local status lamp indicator.

***** For more information on these events, refer to the Battle Short Mode description on page 3-42.

****** Any values listed in the Description column for these faults are default values. If authorized, these values can be changed using the Genset Setup menus (see page 5-30).

**^** These faults are only available if your installation includes the optional I/O Module (Kit 541–1291).

**TABLE 4-2. FAULT AND STATUS CODES (CONT.)**

| CTG | CODE | LAMP | DISPLAYED MESSAGE/SYMBOLS | | DESCRIPTION |
|---|---|---|---|---|---|
| | | | TEXT VERSION | SYMBOLIC VERSION | |
| D | 225 | Warning | ANNUNCIATOR OUTPUT CONFIGURATION ERROR |  225 | Indicates a mismatch in the configuration of one of the annunciator relay outputs. |
| D | 226^ – 233^ | Warning | Base I/O Module Input 1 – Input 8 |  226 thru  233 | The nature of the Base I/O Module “Fault” is an optional customer selection. |
| D | 234^ – 237^ | Warning | Aux I/O Module Input 9 – Input 12 |  234 thru  237 | The nature of the Aux I/O Module “Fault” is an optional customer selection. |
| C | 238^ | Warning | OIL TEMP HIGH | (None) | Indicates engine has begun to overheat (oil temperature has risen to an unacceptable level). Increase in load or higher ambient temperature may cause High Oil Temp (**code 96**) shutdown. (I/O Module option) |
| B | 239^ | Warning | OIL TEMP OOR | (None) | Indicates the oil temperature sensor output is out of range (OOR), high or low. (I/O Module option) |
| C | 240^ | Warning | EXHAUST TEMP HIGH | (None) | Indicates engine exhaust manifold air temperature has exceeded the warning threshold for high exhaust manifold temperature. Increase in load or higher ambient temperature may cause a High Exhaust Temp (**code 97**) shutdown. (I/O Module option) |
| B | 241^ | Warning | EXHAUST TEMP OOR | (None) | Indicates the exhaust temperature sensor output is out of range (OOR), high or low. (I/O Module option) |
| C | 242^ | Warning | AMBIENT TEMP HIGH | (None) | Indicates the ambient temperature has exceeded the warning threshold for genset room temperature. Increase in load may cause Ambient Temp High (**code 98**) shutdown. (I/O Module option) |
| B | 243^ | Warning | AMBIENT TEMP OOR | (None) | Indicates the ambient temperature sensor output is out of range (OOR), high or low. (I/O Module option) |

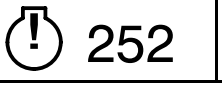
**NOTE:** Shutdown fault codes can also be announced with a local status lamp indicator.

***** For more information on these events, refer to the Battle Short Mode description on page 3-42.

****** Any values listed in the Description column for these faults are default values. If authorized, these values can be changed using the Genset Setup menus (see page 5-30).

**^** These faults are only available if your installation includes the optional I/O Module (Kit 541–1291).

**TABLE 4-2. FAULT AND STATUS CODES (CONT.)**

| CTG | CODE | LAMP | DISPLAYED MESSAGE/SYMBOLS | | DESCRIPTION |
|---|---|---|---|---|---|
| | | | TEXT VERSION | SYMBOLIC VERSION | |
| C | 244^ | Warning | FUEL LEVEL LOW | (None) | Indicates that the fuel level has dropped below the low fuel level trip point. Allows time to refill before Fuel Level Low (**code 99**) shutdown occurs. (I/O Module option) |
| B | 245^ | Warning | FUEL LEVEL OOR | (None) | Indicates the fuel level sensor output is out of range (OOR), high or low. (I/O Module option) |
| C | 246^ | Warning | ALTERNATOR RTD HIGH | (None) | Indicates the alternator temperature has exceeded the warning threshold. Increase in load may cause an Alternator RTD High (**code 100**) shutdown. (I/O Module option) |
| B | 247^ | Warning | ALTERNATOR RTD OOR | (None) | Indicates the alternator temperature sensor output is out of range (OOR), high or low. (I/O Module option) |
| C | 248^ | Warning | INTAKE MANIFOLD TEMP HIGH | (None) | Indicates the engine intake manifold air temperature has exceeded the warning threshold for high intake manifold temperature. Increase in load or higher ambient temperature may cause an Intake Manifold Temp (**code 101**) shutdown. (I/O Module option) |
| B | 249^ | Warning | INTAKE MANIFOLD TEMP OOR | (None) | Indicates the engine intake manifold temperature sensor output is out of range (OOR), high or low. (I/O Module option) |
| B | 252^ | Warning | I/O MODULE LOST |  | Indicates an intermittent data link between the I/O Module and the Base board. |

**NOTE:** Shutdown fault codes can also be announced with a local status lamp indicator.

***** For more information on these events, refer to the Battle Short Mode description on page 3-42.

****** Any values listed in the Description column for these faults are default values. If authorized, these values can be changed using the Genset Setup menus (see page 5-30).

**^** These faults are only available if your installation includes the optional I/O Module (Kit 541–1291).

## ADJUSTING DEFAULT SETTINGS

The optional operator panel can be set up to display with SAE or SI units of measurement.

For more information, see the Adjust Screen menu shown on page 4-30.

## SAVING YOUR CHANGES

All adjustments made to menus are temporary until the **SAVE** button is pressed. If the **SAVE** button is pressed and the engine is running, the adjustments are not saved until after the engine speed is zero. If power is lost to the control before a SAVE is executed, all temporary adjustments are lost.

Adjustments to the following are stored in flash memory in the optional operator panel.

- Contrast
- Brightness
- Units
- Local or remote display
- Symbols or text displayed
- Access code required for mode change to Auto or Manual Run

All other adjustments are stored in the control board.

When the **SAVE** button is pressed, the previous menu is redisplayed.

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## OPERATOR MENUS

Figures 4-11 and 4-12 show block representations of the following Operator menus.

- Engine Status
- Alternator Status
- Line-to-Line Voltage
- Line-to-Neutral Voltage
- Alternator Amperage

To navigate between the Operator menus, press the buttons next to the ▲ and ▼ symbols in the graphical display.

The Operator menus can be used to select Auto or Manual Run modes (see page 4-22).

### Engine Status Menu

This menu displays the engine starting battery voltage, engine coolant temperature, engine oil pressure, and hours of engine operation.

### Alternator Status Menu

This menu displays genset load (in kVA), frequency, and engine speed (RPM).

### Alternator Line-to-Line Voltage Menu

This menu displays L1-L2, L2-L3, and L3-L1 line-to-line voltages for three phase applications only.

### Alternator Line-to-Neutral Voltage Menu

This menu displays line-to-neutral voltages for L1, L2, and L3 for three phase wye configurations only. In delta configurations, this menu is not shown.

### Alternator Single Phase Voltage Menu

This menu displays L1-N, L2-N, and L1-L2 voltages for single phase applications only.

### Alternator Amperage Menu

For applications that include current transformers, this menu displays L1, L2, and L3 current sense amperage.

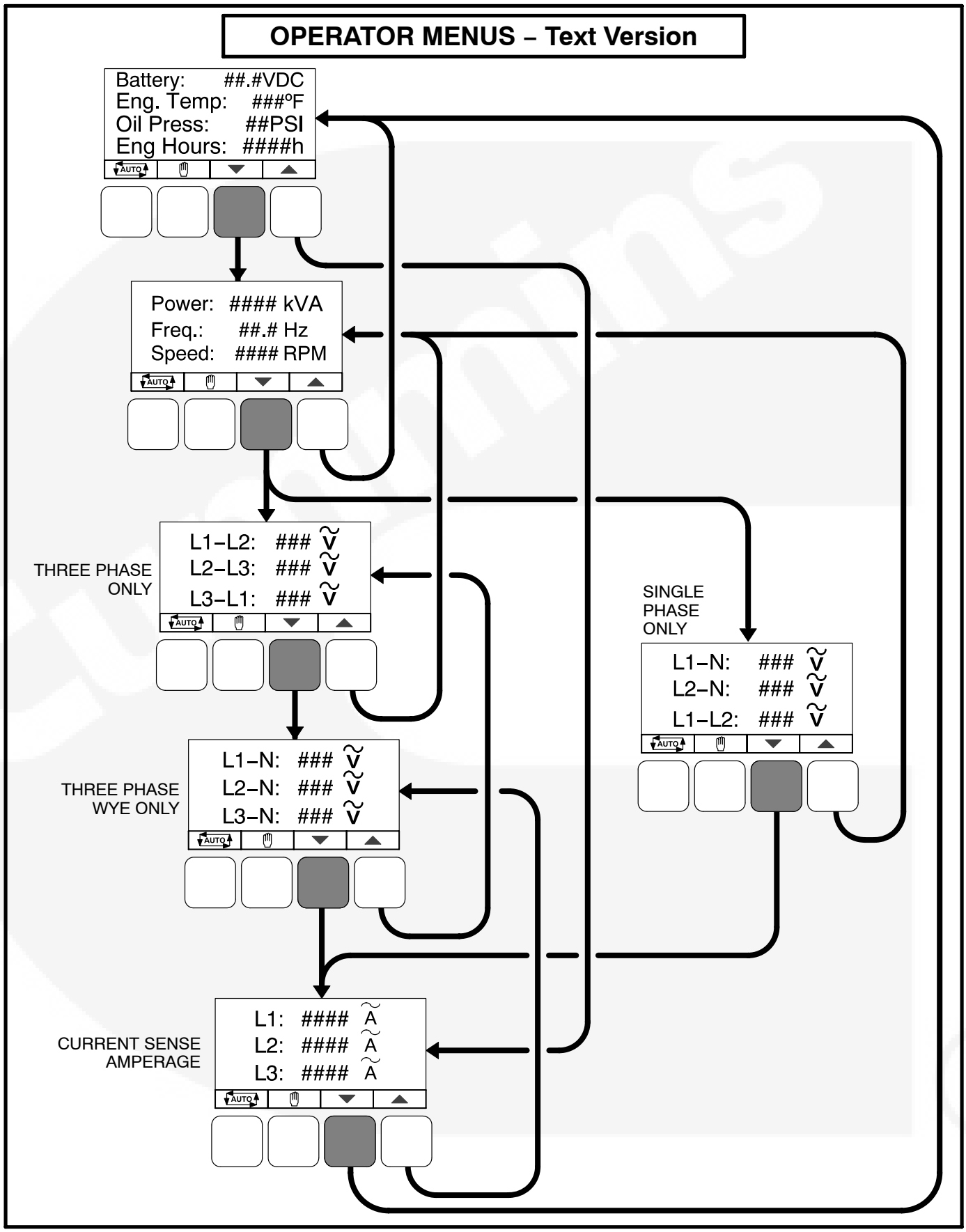


**FIGURE 4-11. OPERATOR MENUS (TEXT VERSION)**

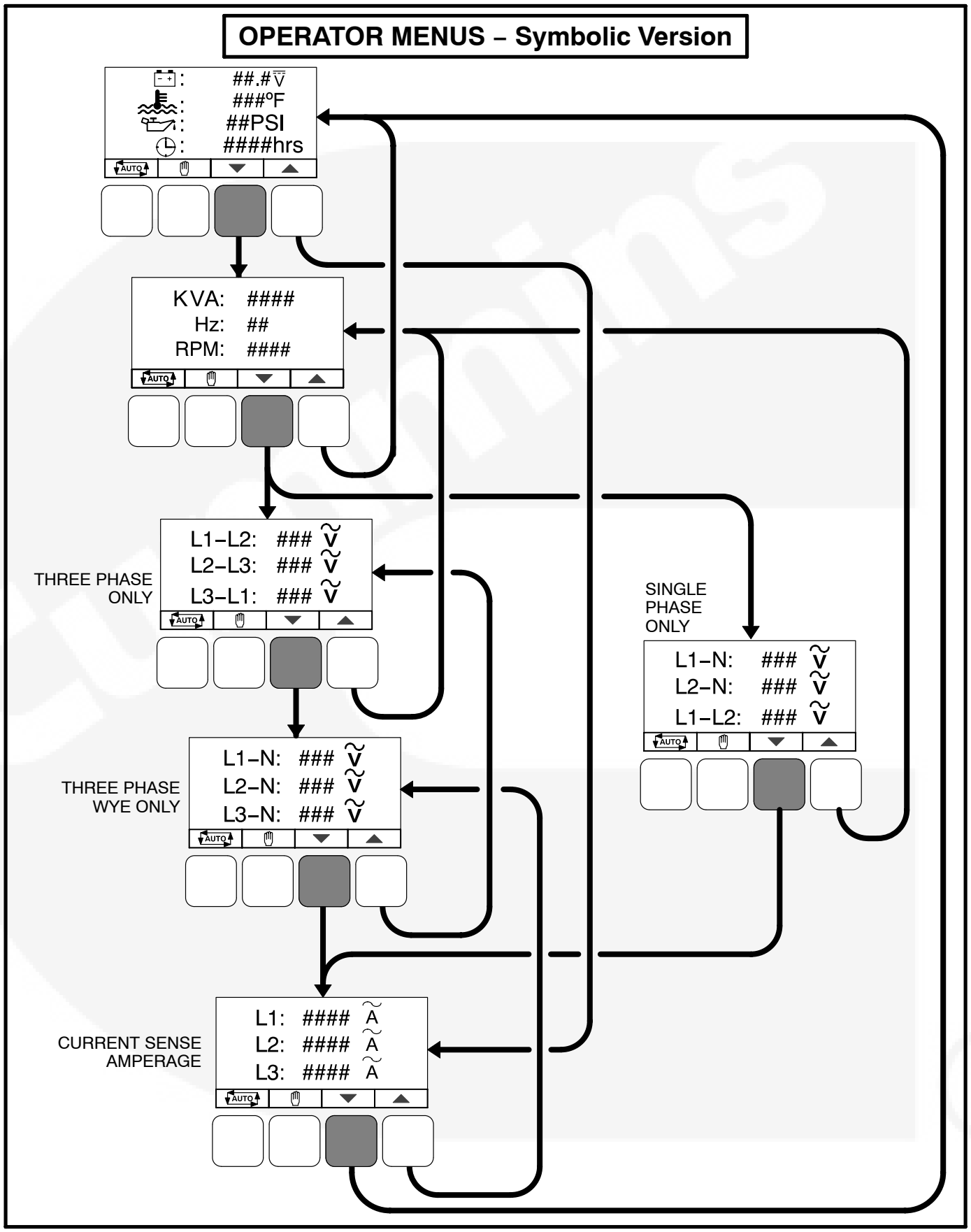


**FIGURE 4-12. OPERATOR MENUS (SYMBOLIC VERSION)**

## SELECTING AUTO, MANUAL RUN, AND OFF MODES

Auto, Manual Run, and Off modes can be selected:

- From any of the Operator menus
- When the message “Establishing communication with control” is displayed
- When the message “Re-establishing communication with control” is displayed

Switching to Auto, Manual Run, or Off mode can be restricted to authorized personnel. If a operator panel is set up with the mode change access code feature enabled, an access code must first be entered before the mode can be changed. The mode change access code feature is enabled through the Display Setup submenu (see page 5-12).

### Entering the Mode Change Access Code

If the mode change feature access code is enabled, an access code must be entered to switch to Auto, Manual Run, or Off modes. The text and symbolic versions of the Mode Change menu are shown in Figure 4-13.

To enter the mode change access code,

1. With the first character highlighted, press the button below to the + or – symbols until the value reads “1.”
2. Press the arrow selection button ⟶ to move to the next numeric character.
3. Press the button below the + or – symbols until the value reads “2.”
4. Press the arrow selection button ⟶ to move to the next numeric character.
5. Press the button below the + or – symbols until the value reads “1.”
6. After you have completed entering the password, press the arrow selection button ⟶.

**NOTE:** If an incorrect password is entered, the Operator menu that was displayed before Auto, Manual Run, or Off mode was selected is redisplayed.

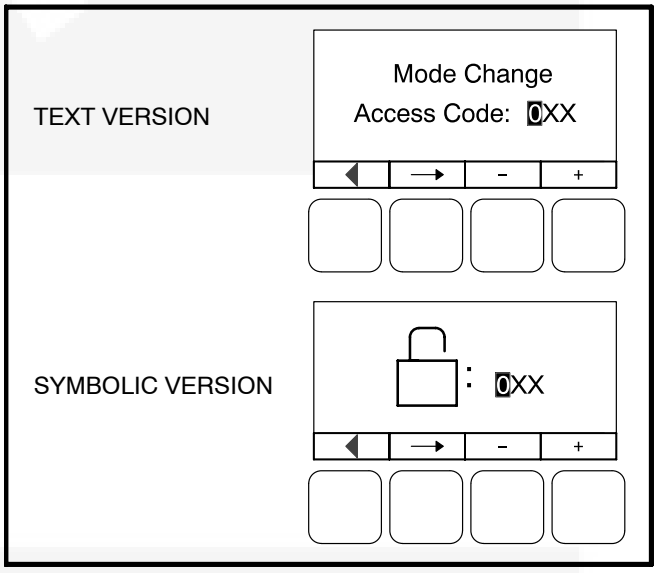


**FIGURE 4-13. MODE CHANGE MENU**

### Selecting Auto Mode

To switch to Auto mode (see Figure 4-14),

1. Press the AUTO button on any of the Operator menus or the "Establishing/Re-establishing communication with control" menus.
2. If the mode change access code feature is enabled, the Mode Change Access Code menu is displayed. Enter the mode change access code as described above.
3. A menu with alternating arrows is displayed above a second AUTO symbol. Press the second AUTO button. The Operator menu that was displayed before Auto mode was selected is redisplayed.

To disable Auto mode, press the O button.

**NOTE:** Manual Run mode can also be selected while in Auto mode.

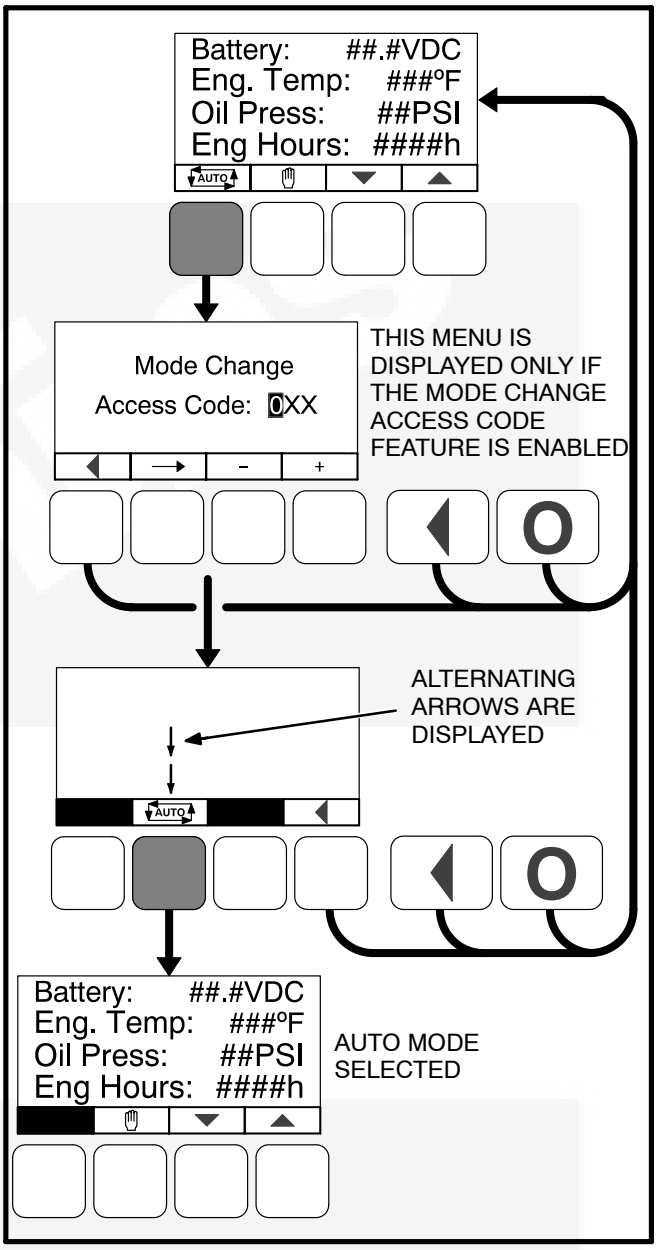


**FIGURE 4-14. SELECTING AUTO MODE**

## Selecting Manual Run Mode

To switch to Manual Run mode (see Figure 4-15),

To switch to Manual Run mode,

1. Press the ✋ button on any of the Operator menus or the “Establishing/Re-establishing communication with control” menus.

2. If the mode change access code feature is enabled, the Mode Change Access Code menu is displayed. Enter the mode change access code as described on the previous page.

3. A menu with alternating arrows is displayed above a second ✋ symbol. Press the second ✋ button. The Operator menu that was displayed before Manual Run mode was selected is redisplayed.

To disable Manual Run mode, press the O button.

**NOTE:** Auto mode can also be selected while in Manual Run mode. Switching to Auto mode may result in the generator set shutting down.

## Aborting the Transition to Auto or Manual Run Mode

If the Mode Change Access Code menu or the menu showing alternating arrows above the AUTO or ✋ buttons is displayed, the transition to Auto or Manual Run mode is aborted when:

- Either the ◀, ◀, or O button is pressed.
- A selection button is not pressed within ten seconds.

If the transition to Auto or Manual Run mode is aborted, the Operator menu that was displayed before Auto or Manual Run mode was selected is redisplayed

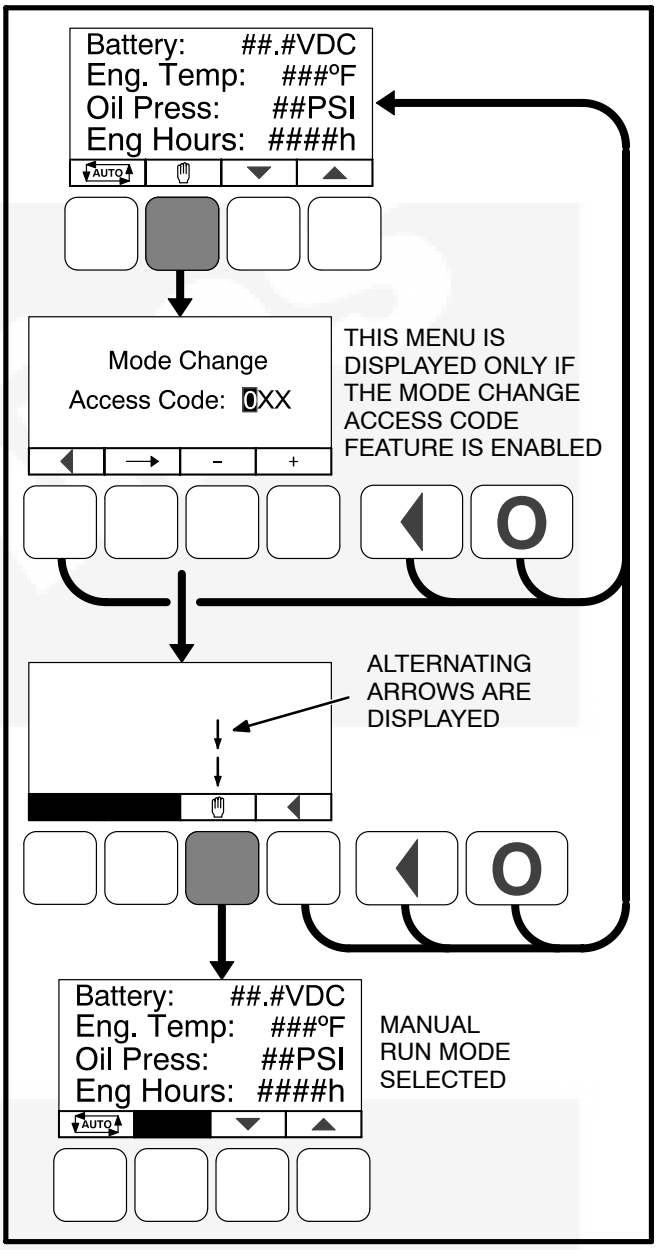


**FIGURE 4-15. SELECTING MANUAL RUN MODE**

## Selecting Off Mode

To switch to Off mode, press the O button. If the genset is running and Off mode is selected, a normal shutdown sequence is initiated. More information on the use of the Off button is included on page 4-6.

## SERVICE MENUS

Figure 4-16 shows a block representation of the menus available from the Service Menus.

The first Service Menu can be viewed from any of the Operator menus by simultaneously pressing the ▲ and ▼ selection buttons for two seconds. The first Service Menu provides access to the following menus:

- Setup Menus – Used by Service personnel. Adjusting the Setup menus is restricted by a password and is described in the Control Service section. To view the Setup menus only, press the VIEW button on the Setup password menu.
- History / About – see page 4-26
- Screen Adjust – see page 4-30

To return to the Operator menu that was displayed prior to viewing the Service Menu, press the ◀ button.

The second Service Menu can be viewed by pressing the ▼ selection button on the first Service Menu. The second Service Menu provides access to the following menus:

- Fault History – see page 4-28
- Status – see below
- Lamp Test – The six LEDs on the operator panel should light as long as the button **(6)** is pressed.
- If configured to be viewed, a Volts/Frequency Adjustment menu is displayed (see page 4-31).

The third Service Menu can be viewed by pressing the ▼ selection button on the second Service Menu. The third Service Menu provides access to the Network Status menus.

### Status Menu

The Status menu is displayed when the **(5)** button is pressed on the second Service Menu. The Status menu shows the following:

- Voltage regulator (drive) level, in percentage of duty cycle.
- Governor regulator (drive) level, in percentage of duty cycle. This value is only displayed if the governor is enabled.

### Network Status Menus

The Network Status menus are displayed when the **(7)** button is pressed on the third Service Menu. Two menu are used to display the quantity of the following devices that are connected to the network.

- Auto Mains Failure (AMF) modules
- Universal Annunciators
- Bar graphs
- Battery chargers
- Controls
- I/O modules
- Operator panels (any type)

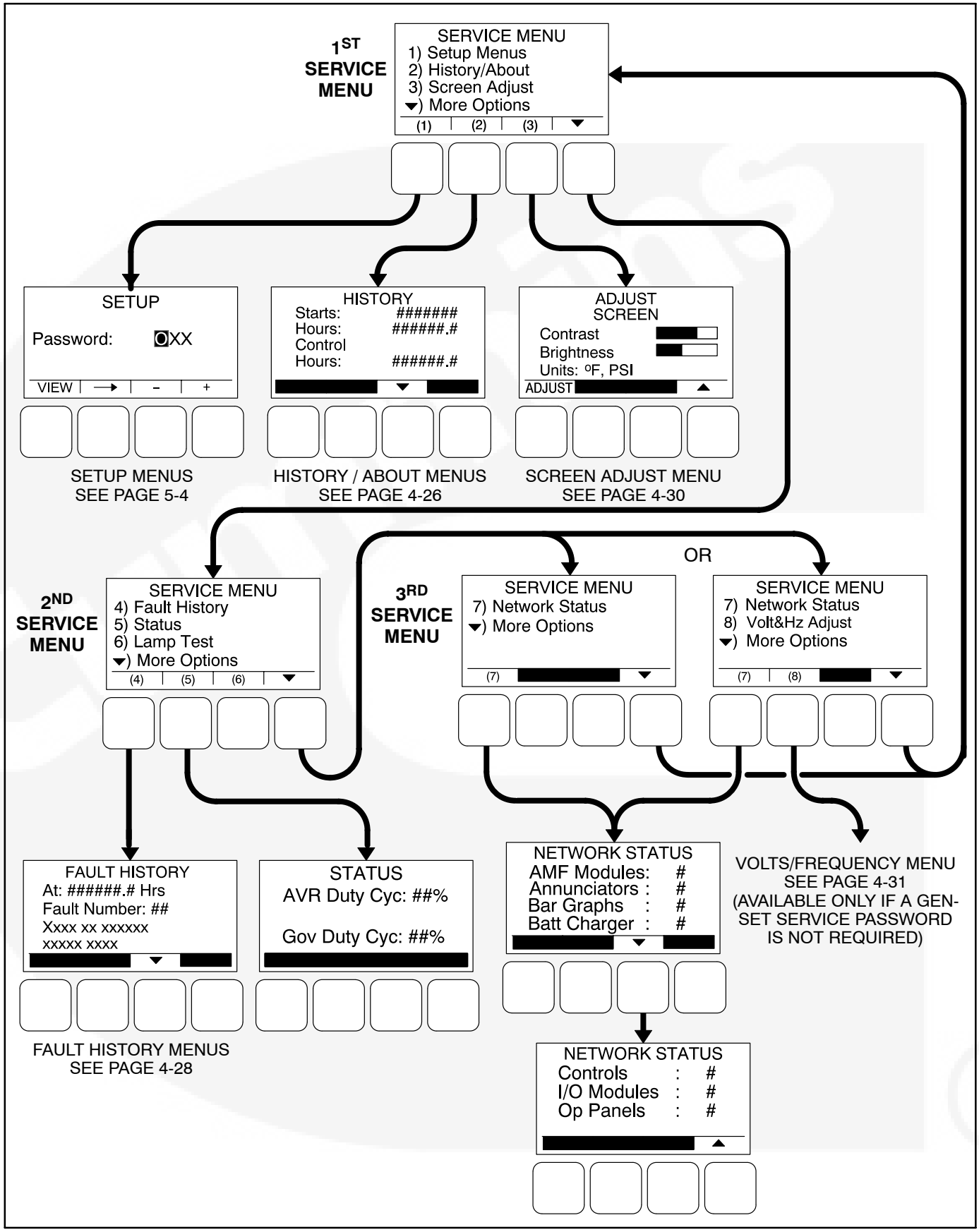


**FIGURE 4-16. SERVICE MENUS**

## HISTORY / ABOUT MENUS

Figure 4-17 shows a block representation of the History / About menus. The first History / About submenu is displayed when the **(2)** button is pressed on the Service Menu (see Figure 4-16).

Press the buttons next to the ▲ and ▼ symbols in the graphical display to navigate between the History / About submenus. Press the ◄ button to return to the Service Menu.

### History Submenu

This submenu displays the number of engine starts, hours of operation for the engine, and hours of operation for the control.

### About Genset Submenus

Two submenus display the generator set model number, control number, and genset application frequency rating.

### About Control Submenu

This submenu displays the control's part number, serial number (up to 11 characters), software part number (up to 9 characters), and software version.

### About Display Submenu

This submenu displays the optional operator panel software part number, software version, screen part number, and screen version of the display.

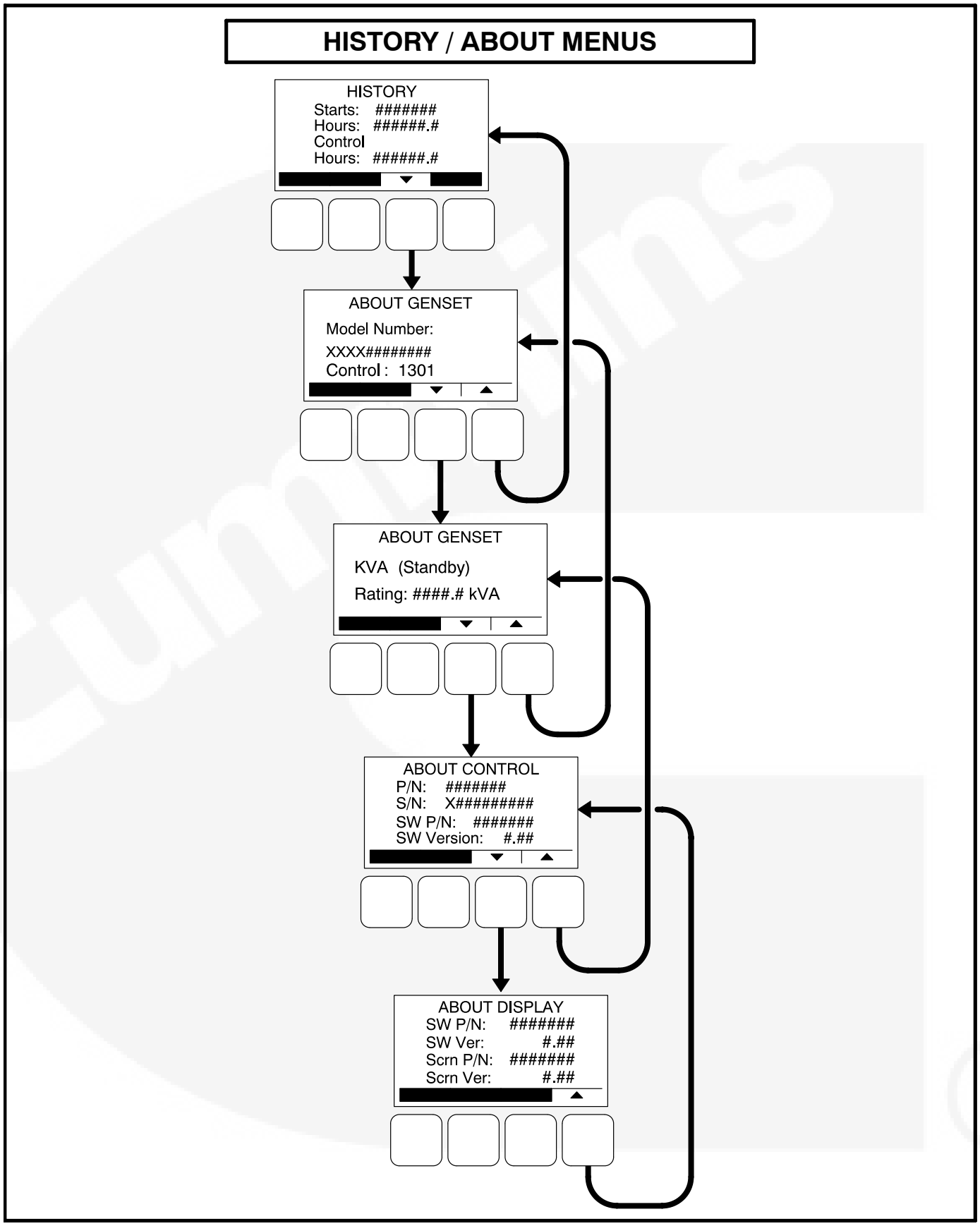


**FIGURE 4-17. HISTORY / ABOUT MENUS**

## FAULT HISTORY MENU

Figure 4-19 shows a block representation of the Fault History menu. The first Fault menu is displayed when the **(4)** button is pressed on the second Service Menu (see Figure 4-16). If there are any active fault submenus, an “Active Fault” heading is displayed for the most recent active fault. All other fault submenus display a “Fault History” heading. Five of the most recent faults can be viewed. An example of how a fault code is displayed is shown in Figure 4-18.

Press the buttons next to the ▲ and ▼ symbols in the graphical display to navigate between menus.

Press the ◄ button to return to the Service Menu.

Information on faults is included in Table 4-2 on page 4-9.

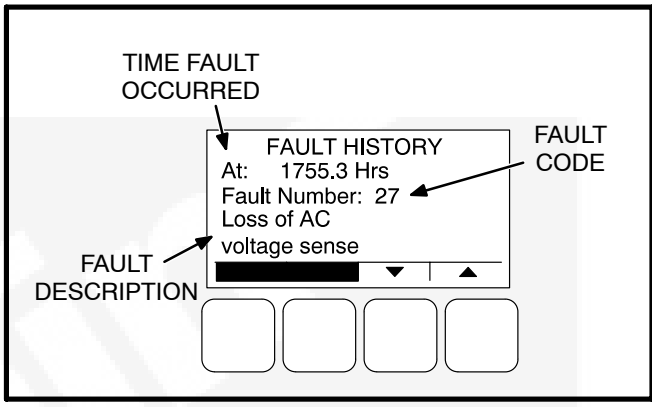


**FIGURE 4-18. FAULT HISTORY MENU EXAMPLE**

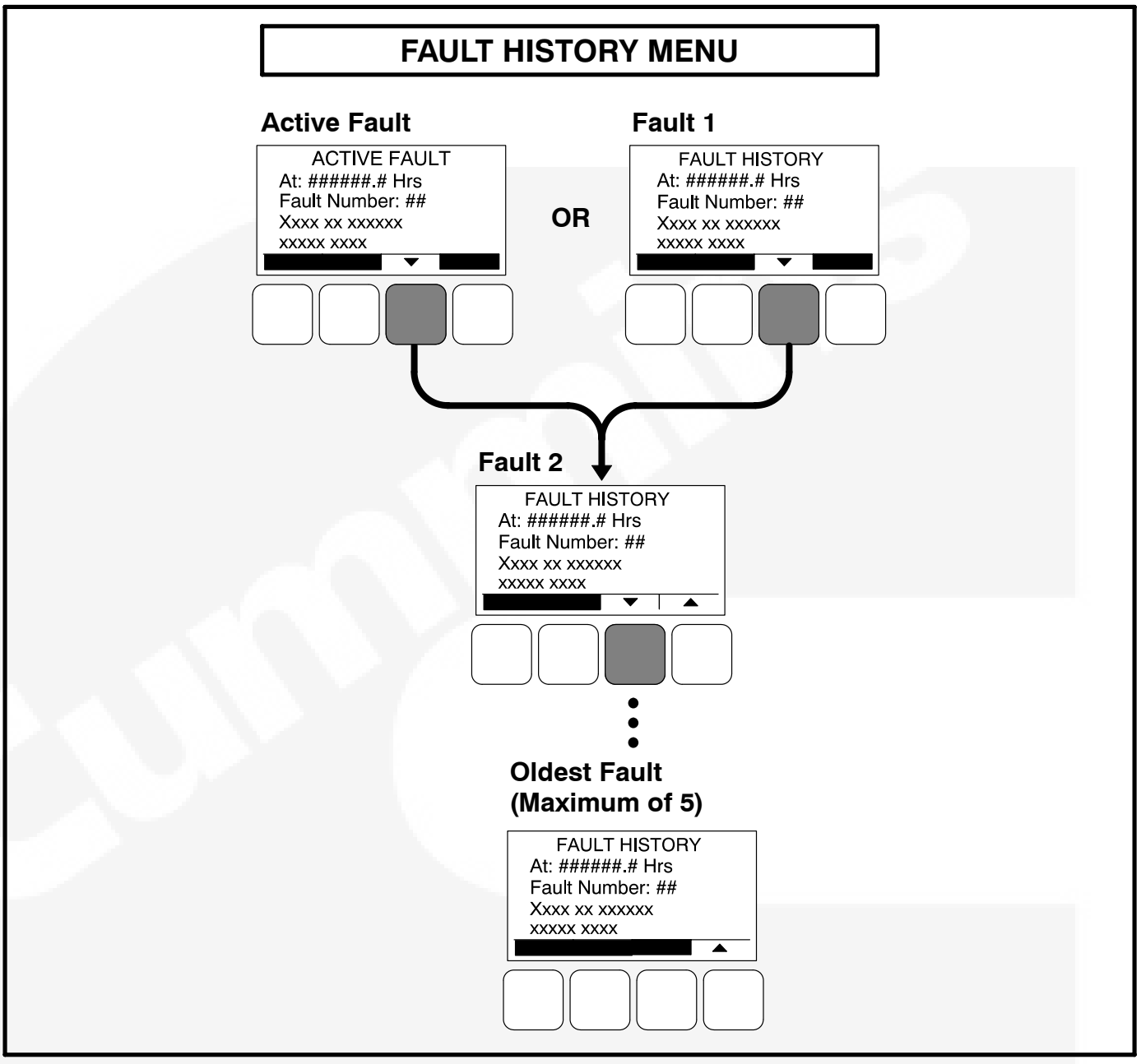


**FIGURE 4-19. FAULT HISTORY MENU**

## SCREEN ADJUST MENU

Figure 4-20 shows a block representation of the Screen Adjust menu. The Screen Adjust menu is displayed when the **(3)** button is pressed in the first Service Menu (see Figure 4-16).

### Adjusting Values/Parameters

1. Press the **ADJUST** selection button to select the first parameter or value to be changed.
2. Press the + or – selection buttons to adjust values or select parameters.
3. Press the arrow selection button ⟶ to navigate to the next or previous adjustable value or parameter.
4. After adjusting values/selecting parameters, press the **SAVE** button to save your settings.

**NOTE:** If the Previous Menu button ◀ is pressed before pressing the SAVE button, the changes are not saved.

5. Press the ◀ button to return to the Service Menu.

### Screen Adjust Menu

This menu allows for adjusting the screen's contrast and brightness and for selecting the units of measurement (SAE or SI) to be displayed.

- *Contrast* and *Brightness*: Press the + or – selection buttons to adjust the screen's contrast and brightness. Changing the brightness setting also affects the brightness of the LEDs on the operator panel.
- *Units:* Press the + or – selection buttons to select SAE (°F, PSI) or SI (C, kPa) units of measurement to be displayed.

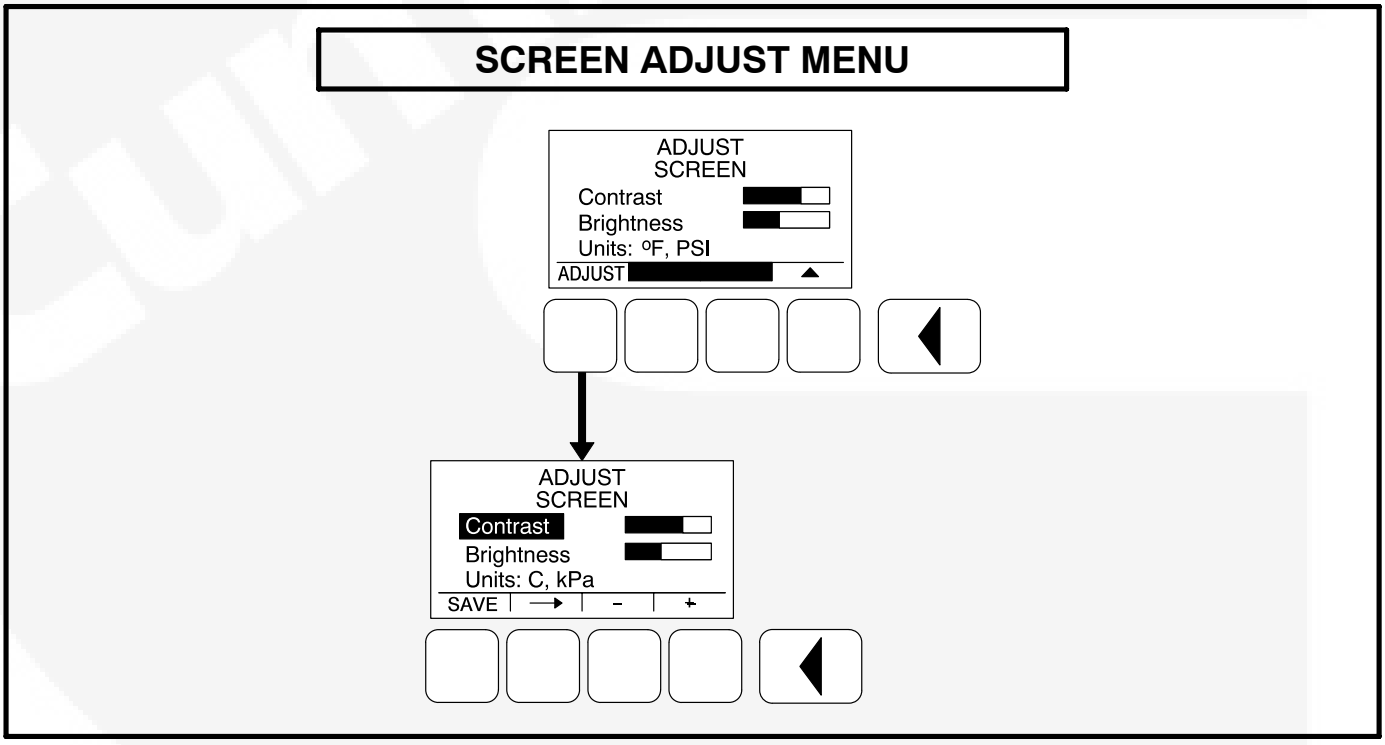


**FIGURE 4-20. SCREEN ADJUST MENU**

## VOLTS / FREQUENCY MENU

The Volts / Frequency menu is designed only for use with rental units. Changing the parameters on this menu must only be done by trained service personnel.

The Volts / Frequency menu is only viewable if the control is configured through the Genset Service Menus to display the “Volts&Hz” category. Information on how to do this is included in Section 5.

When available, the Volts / Frequency menu can be viewed by pressing the **(8)** button on the third Service menu (see Figure 4-21).

**WARNING** ***Adjusting the voltage and frequency settings must only be done by technically trained and experienced service personnel. The voltage and frequency settings must only be adjusted to correspond to the parameters of the installed input power supply. Saving settings that do not correspond to the power supply can cause severe personal injury and equipment or property damage.***

- *Volts AC*: Press the + or – selection buttons to adjust the volts setting (190, 200, 208, 220, 230, 240, 380, 400, 416, 440, 460, or 480 VAC, default = 208).

- *Hertz:* Press the + or – selection buttons to select a frequency of 50 or 60 hertz (default = 60 hertz).

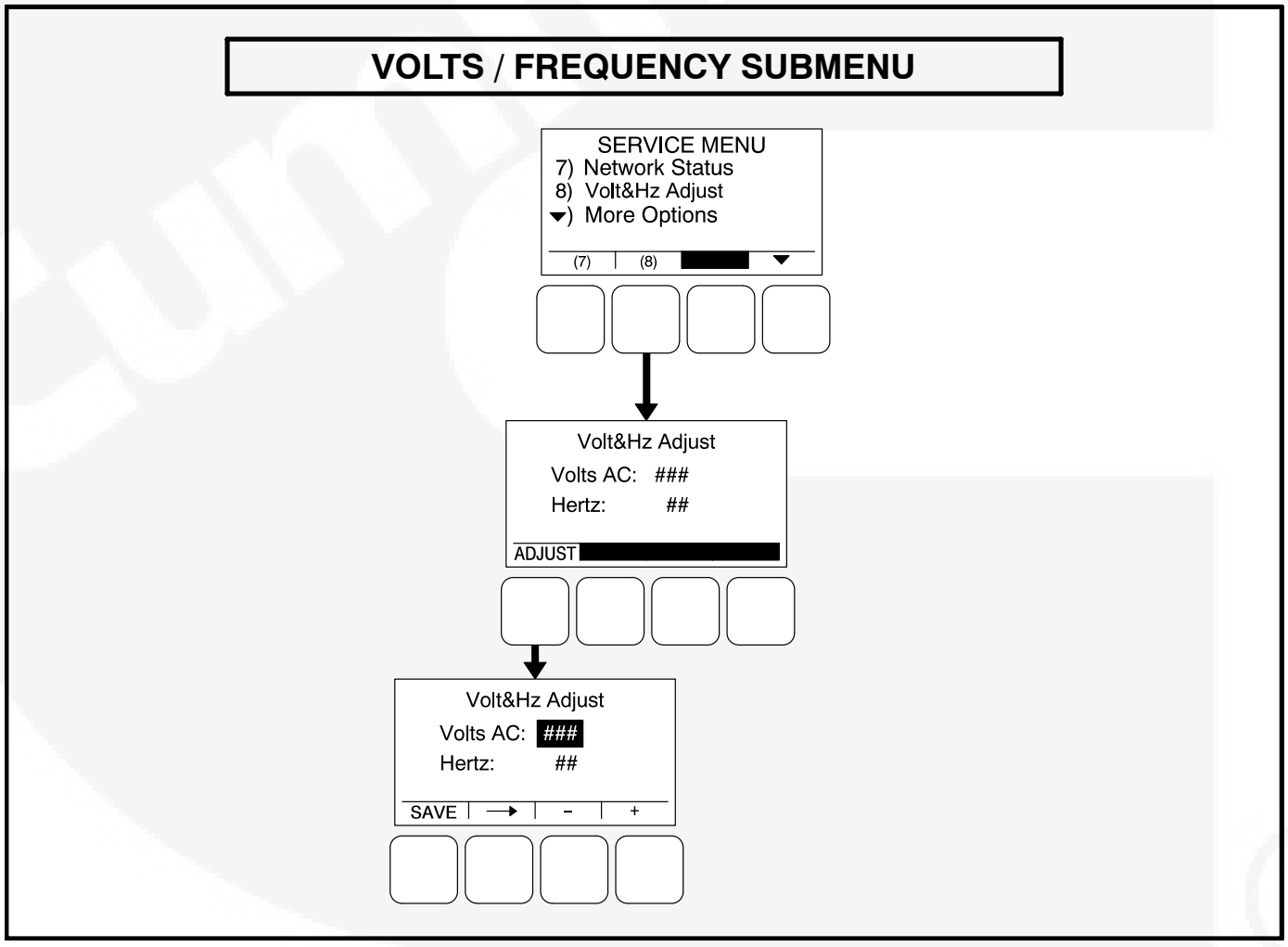


**FIGURE 4-21. VOLTS / FREQUENCY SUBMENU**

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# 5. 1301 Control Panel Service Menus

## SERVICE MENUS

**⚠ CAUTION** ***Incorrect settings can result in equipment malfunction and damage. Only trained and experienced personnel should be authorized to change the settings.***

The Service Menus shown in this section can be viewed and, if the correct password(s) are entered, modified. Changing the settings should be restricted to trained and experienced installation and service personnel.

Figure 5-1 shows a block representation of the menus available from the Service Menu.

The first Service Menu can be viewed from any of the Operator menus by simultaneously pressing the ▲ and ▼ selection buttons for two seconds. The first Service Menu provides access to the following menus:

- Setup Menus – See page 5-3
- History / About – See page 4-27
- Screen Adjust – See page 4-30

Changes can be made to Adjust submenus without entering a password. However, a password is required to change any of the Setup submenus.

To return to the Operator menu that was displayed prior to viewing the Service Menu, press the ◀ button.

The second Service Menu can be viewed by pressing the ▼ selection button on the first Service Menu. The second Service Menu provides access to the following menus:

- Fault History
- Status
- Lamp Test – The six LEDs on the control panel should light as long as the button **(6)** is pressed.

The third Service Menu can be viewed by pressing the ▼ selection button on the second Service Menu. The third Service Menu provides access to the Network Status menus. The Network Status menus are displayed when the **(7)** button is pressed on the third Service Menu. Two menu are used to display the quantity of the following devices that are connected to the network.

- Auto Mains Failure (AMF) modules
- Universal Annunciators
- Bar graphs
- Battery chargers
- Controls (1301)
- I/O modules
- Operator panels (any type)

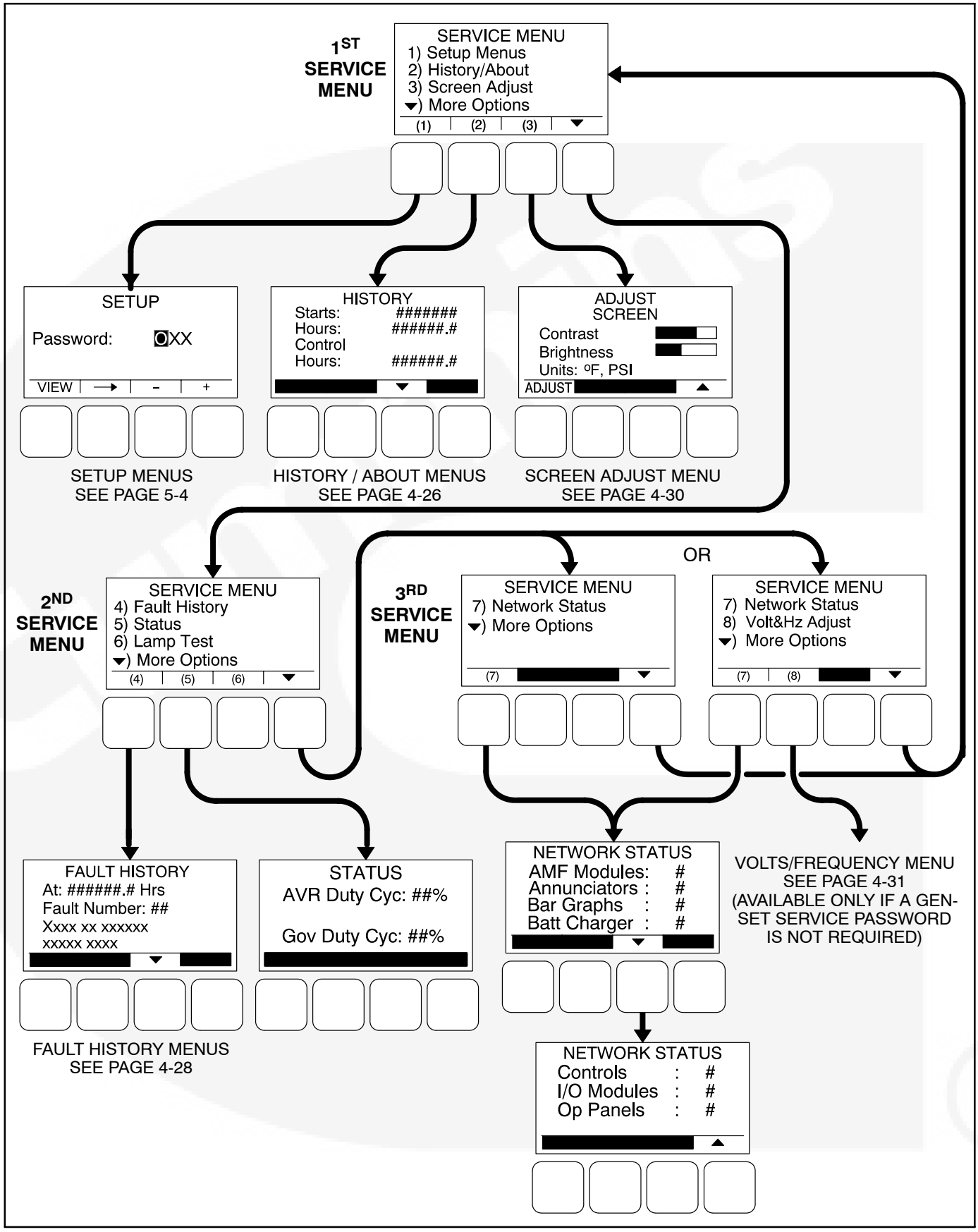


**FIGURE 5-1. SERVICE MENUS**

## SETUP MENUS

The Setup menus are available by pressing the **(1)** button on the first Service menu (see Figure 5-1).

The Setup Menus (see Figure 5-2) provide access to genset menus with settings that can be viewed and, if a password is entered, adjusted.

The first Setup menu is displayed when the **(1)** button is pressed on the Service Menu. From the Setup Password menu, a second Setup menu is displayed that provides access to the following two categories of genset menus.

- Genset Service menus
- Genset Setup menus – Go to page 5-28

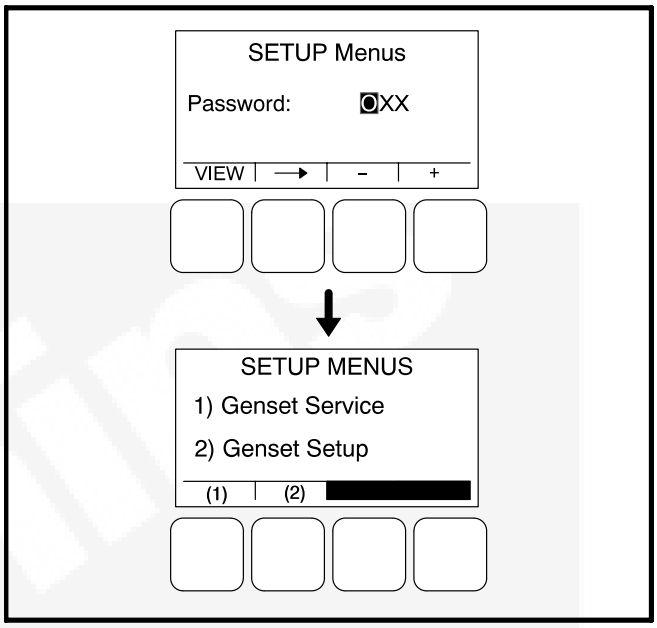


**FIGURE 5-2. SETUP MENUS**

## GENSET SERVICE MENUS

The first Genset Service menu is available by pressing the **(1)** button on the Setup Menus menu (see Figure 5-2).

This section covers Genset Service menus only. For information on Genset Setup menus, go to page 5-28.

If a password is entered, the settings in the Genset Service menus can be adjusted. However, if a password is not entered, these menus can still be viewed.

### Viewing Only

Figure 5-3 is a block representation of the Genset Service menus that are available when a password is not entered (or an incorrect password is entered) in the Setup Password menu.

The first Genset Service Menu provides access to the following menus:

- Genset
- Customer I/O
- Meter Calibration

The second Genset Service Menu provides access to the following menus:

- Annunciator
- Modbus
- I/O Module – (see Instruction Sheet C693)

The Genset Service menus can be viewed by selecting the **VIEW** button on the Setup Password menu and then selecting **(1)** on the second Setup menu. When the VIEW button is selected without entering the correct password, the ADJUST button is not displayed on any of the Genset Service menus; therefore, no adjustments can be made.

#### *Menu Navigation*

1. Press the buttons above the ▲ and ▼ symbols in the digital display to navigate between submenus.

2. To return to the genset Setup Menus menu from any of the submenus, press the ◖ button.

3. To return to the Service Menu from the genset Setup Menus menu, press the ◖ button.

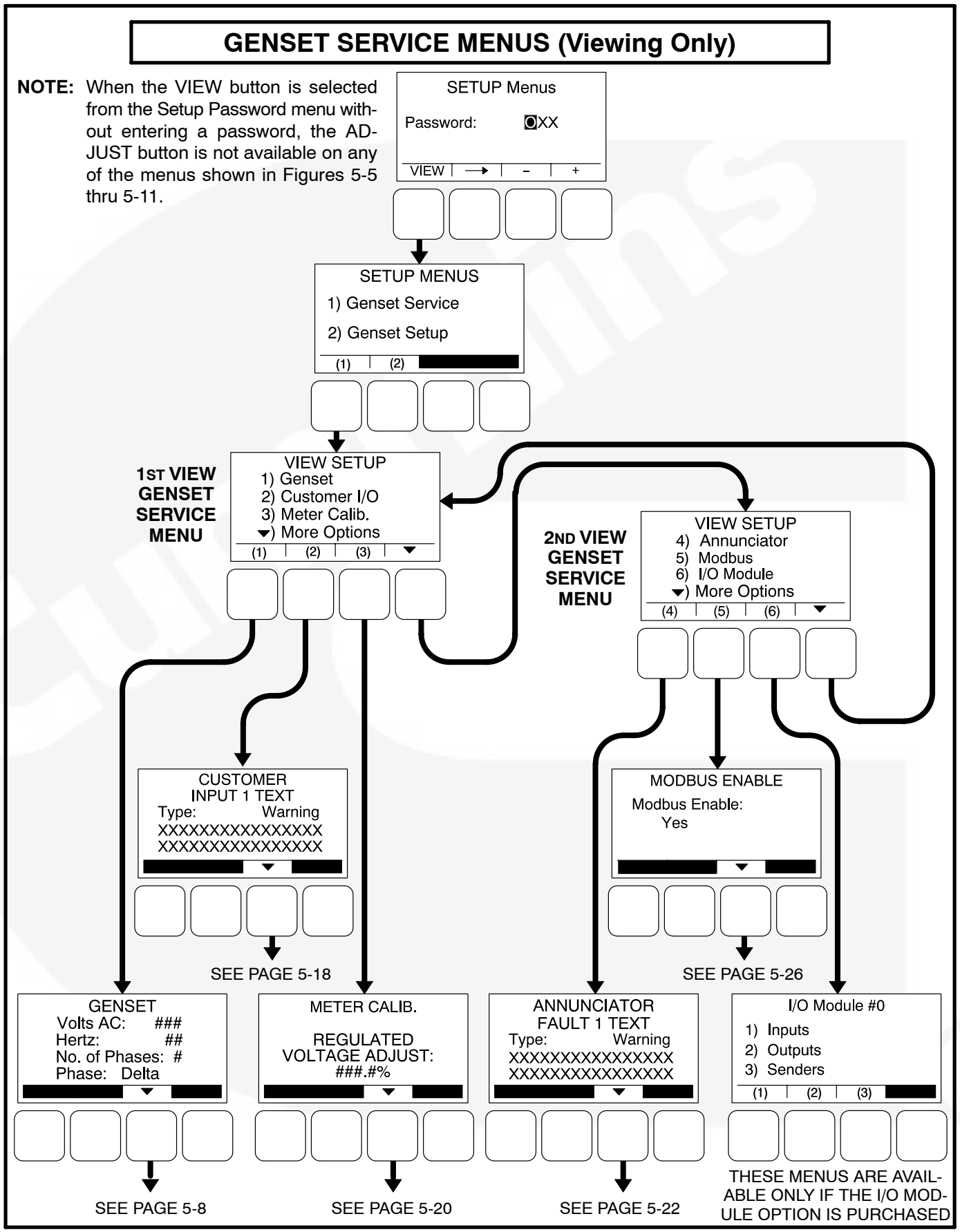


**FIGURE 5-3. VIEWING GENSET SERVICE MENUS WITHOUT ENTERING A PASSWORD**

## Viewing and Adjusting

Figure 5-4 is a block representation of the Genset Service menus that are available from the Setup Menus menu after the correct password has been entered. The **ADJUST** button is available on these submenus; therefore, adjusting the settings is allowed.

The first Genset Service Menu provides access to the following menus:

- Genset
- Customer I/O
- Meter Calibration

The second Genset Service Menu provides access to the following menu:

- Annunciator

## Setup Password Submenu

Adjusting the Genset Service menus is restricted to service personnel and a password must be entered to modify these menus.

When the Password menu is displayed, the first numeric character (0) is highlighted (see Figure 5-4).

**NOTE:** When selected (highlighted), each character initially turns to "0" and the remaining characters turn to "X".

**NOTE:** Make sure that each numeric character is correct before you move to the next character. If a wrong character is entered, you will not be able to go back and correct it. If the wrong password is entered, you will be able to view the Genset Service menus but you won't be able to change them.

To enter the password:

1. With the first character highlighted, press the button below to the + or – symbols until the value reads "5."
2. Press the arrow selection button ⟶ to move to the next numeric character.
3. Press the button below the + or – symbols until the value reads "7."
4. Press the arrow selection button ⟶ to move to the next numeric character.
5. Press the button below the + or – symbols until the value reads "4."
6. After you have completed entering the password, press the arrow selection button ⟶. The first main Setup menu is displayed.

After the correct password is entered, it will be remembered until five minutes of button inactivity has elapsed. If five minutes of button inactivity has elapsed, you will have to re-enter the password to access and change Setup menus.

## Adjusting Values/Parameters

Once the correct password has been entered and Genset Service **(1)** is selected on the Setup Menus menu, the first Genset Service submenu is displayed.

1. Press the buttons above the ▲ and ▼ symbols in the digital display to navigate between submenus.
2. Press the **ADJUST** selection button to select the first parameter or value to be changed.
3. Press the + or – selection buttons to adjust values or select parameters.
4. Press the arrow selection button ⟶ to navigate to the next or previous adjustable value or parameter.
5. After adjusting values/selecting parameters, press the **SAVE** button to save your settings.

   **NOTE:** If the ◀ button is pressed before pressing the SAVE button, the changes are not saved.

6. Press the ◀ button to return to the Service Menu.

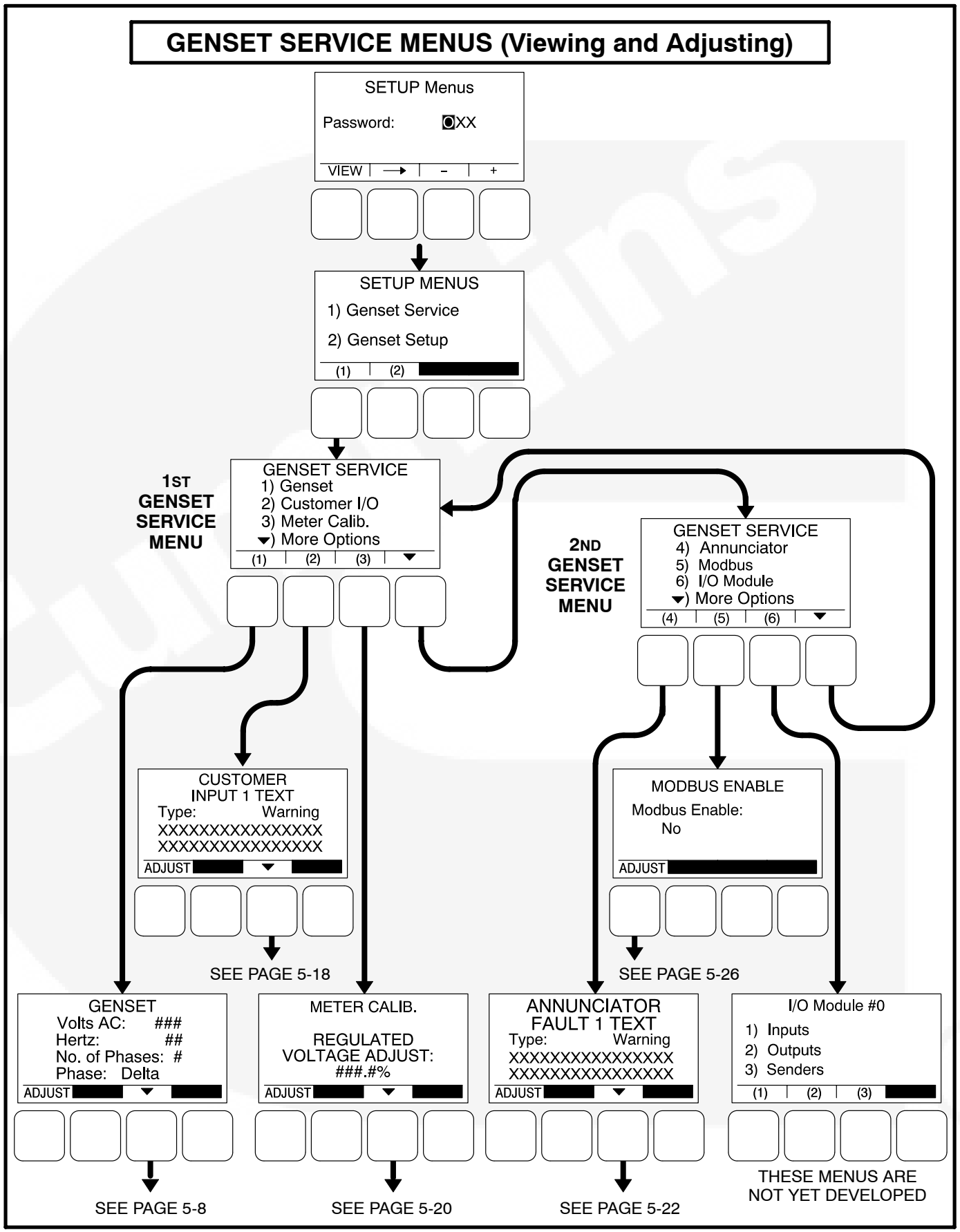


**FIGURE 5-4. GENSET SERVICE MENUS**

## Genset Service Submenus

The Genset Service submenus are available by pressing the **(1)** button on the first Genset Service menu (see Figure 5-3 or Figure 5-4).

The Genset Service submenus consist of ten basic submenus.

- Genset, Part 1
- Genset, Part 2
- Fuel System
- Start/Stop Time Delays
- Cycle Crank
- Battle Short
- Automatic Voltage Regulator Setup*
- Electronic Governor*
- Genset Model and Serial Number
- Display Setup

* If enabled, the Automatic Voltage Regulator has two additional submenus and the Electronic Governor has five additional submenus.

### *Genset Menu, Part 1*

The first genset menu displays the preset AC Voltage, genset frequency, number of phases, and phase type.

- *Volts AC:* Displays the AC voltage (190, 200, 208, 220, 230, 240, 380, 400, 416, 440, 460, or 480 VAC, default = 208).
- *Hertz:* Displays the genset frequency (50 or 60 Hz, default = 60 Hz). The control selects limits, gains, and frequency values based upon this selection.
- *No. of Phases:* Displays the number of phases (1 or 3, default = 3).
- *Phase:* Displays the phase type (Delta or Wye default = Wye).

### *Genset Menu, Part 2*

The second genset menu allows for enabling or disabling charging alternators.

- *Charging Alt. Enable:*

  A starter disconnect will occur whenever any one of the following three possible signals reaches its disconnect setpoint.

  - The average engine speed (if a magnetic pickup unit is installed)
  - The average frequency
  - The charging alternator voltage (if the Charging Alt feature is enabled)

  The Charging Alt. Enable menu is used to enable or disable the Charging Alt feature. While the default setting is “Yes,” this menu provides a means to disable the control’s charging alternator logic if it is not supported by your alternator. If your alternator does not support this functionality, the Charger Failure warning (fault code 219) will constantly be displayed unless this setting is changed to “No.” When disabled (set to “No”), the start disconnect signal is based only on the average engine speed or frequency and the Charger Failure warning is disabled.

### *Fuel System*

The Fuel System menu allows for selecting fuel type and, depending on the type selected, enabling/disabling glow plugs or setting a fuel burn time delay.

- *Fuel System:* Allows for selecting the fuel type (Diesel or Gas, default = Diesel).

If Fuel System is set to “Diesel”

- *Glow Plug Enable:* Allows control of Glow Plugs for a particular genset (Yes or No, default = No).

If Fuel System is set to “Gas”

- *Fuel Burn Delay:* After the genset receives a stop signal, this feature allows for setting a fuel time delay from 0 to 10 seconds (default = 5 seconds) in which the ignition remains on so that any fuel down stream of the intake manifold is burned.

### *Start/Stop Delay Menu*

The time delay after receiving a valid start signal, until the genset starts, can be adjusted. The time delay that the genset is allowed to ruin at rated speed after receiving a stop signal, until the genset stops, can also be adjusted. These time delays do not apply to manual start/runs.

- *Start:* The genset start time delay can be adjusted from 0 to 300 seconds (default = 0 seconds).
- *Stop:* The genset stop time delay can be adjusted from 0 to 600 seconds (default = 0 seconds).

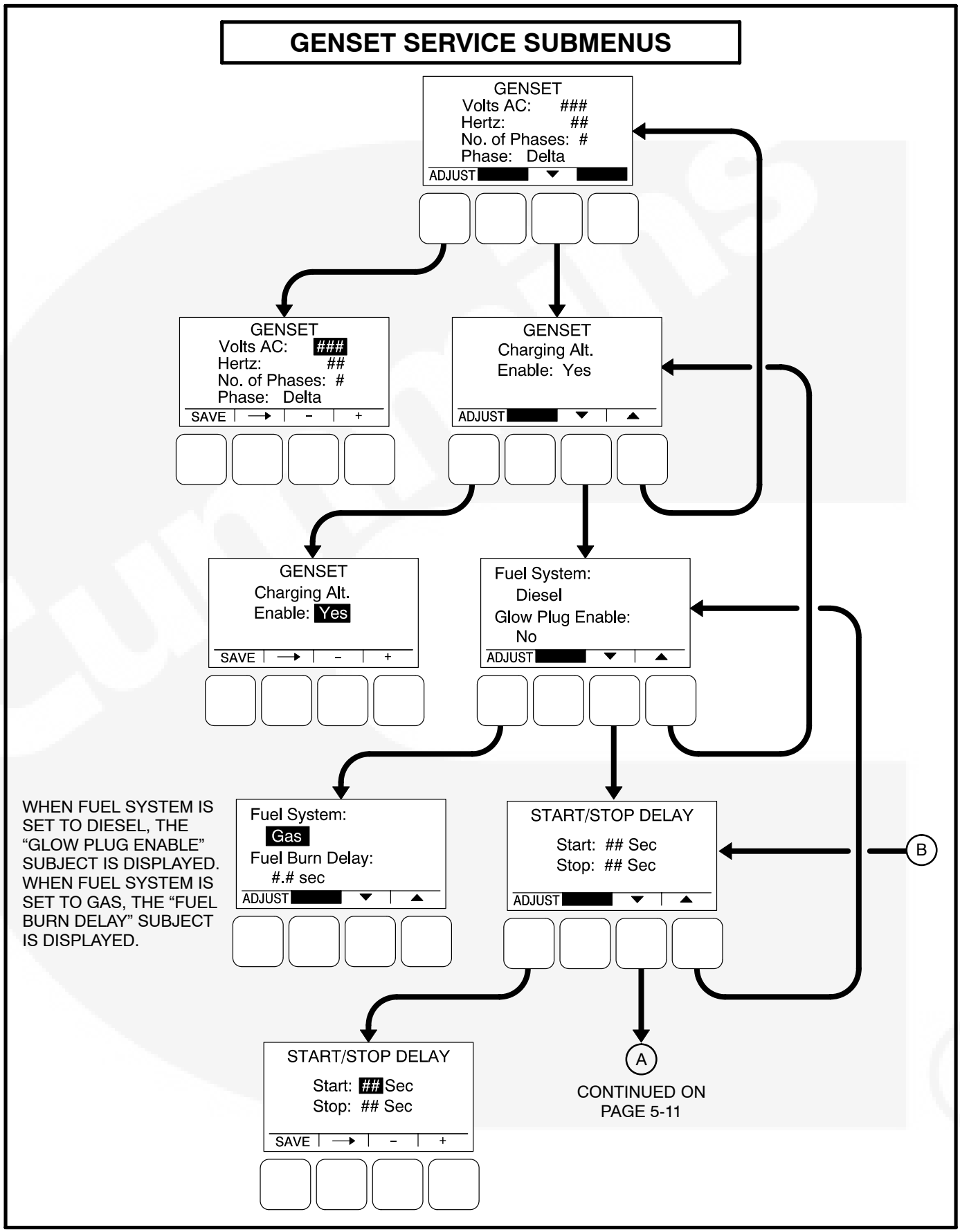


**FIGURE 5-5. GENSET SERVICE SUBMENUS (SHEET 1 OF 3)**

### *Cycle Crank Menu*

The Cycle Crank menu allows for configuring the generator for all starting modes (manual and remote), as follows:

- *Crank:* The cranking period can be set from 3 to 30 seconds (default = 15 seconds). This time limit is used to determine a Fail to Start status.
- *Rest:* The minimum amount of time between crank attempts can be set from 0 to 60 seconds (default = 30 seconds).
- *Attempts:* The maximum number of times the starter can be engaged when attempting to start the engine with cycle cranking can be set from 1 to 7 attempts (default = 3).

### *Battle Short Menu*

This menu is displayed only if the PC service tool has been used to enable the Battle Short feature (see page 3-42 for more Battle Short information). Before the Battle Short feature can be used, one of three available activation sources must be selected. If the activation source switch input is set to "Operator Panel," then Battle Short functionality can be enabled or disabled with this menu.

- *Switch Input:* The Switch Input can be set for Configurable Input 1, Configurable Input 2, Operator Panel, or None (default = None).
- *Battle Short:* Battle Short functionality can be enabled or disabled (set to Active or Inactive), (default = Inactive). This subject will only be displayed if the switch input is set to "Operator Panel."

### *AVR Setup Menu*

The AVR Setup menu is used to enable or disable the automatic voltage regulator (default = Yes). If enabled, two additional menus are displayed that can be used to adjust the AVR settings (see page 5-15).

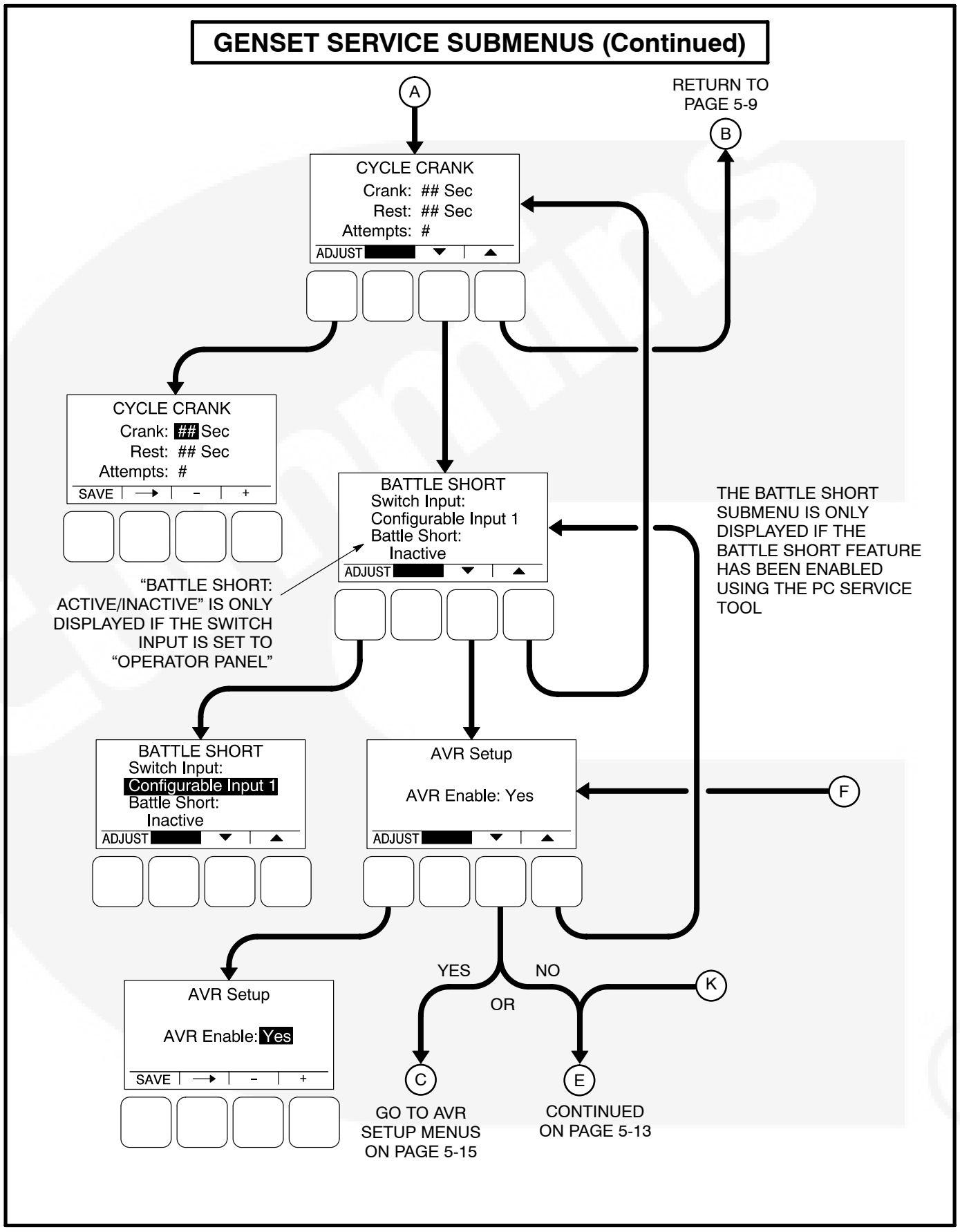


**FIGURE 5-5. GENSET SERVICE SUBMENUS (SHEET 2 OF 3)ELECTRONIC GOVERNOR MENU**

The engine Electronic Governor Enable menu is used to enable or disable the electronic governor on gensets with electronic governors and magnetic pickup sensors (default = No). If enabled (set to "Yes"), four additional menus are displayed that can be used to adjust governor settings (see page 5-17).

### *Genset Number Menu*

The Genset Number menu is used to enter the genset's model and serial numbers. Each allow up to 16 characters to be entered.

### *Display Setup Menu*

The Display Setup menu is used to set the display for **Local** (Auto/Off/Manual Run switch functions on the operator panel are turned on) or **Remote** (Auto/Off/Manual Run switch functions on the operator panel are turned off).

- *Connection:* A display can be set up to be Local or Remote (default = Local).
- *Access Code:* A display can be set up to require or not require entering the mode (Auto, Manual Run, or Off) change access code (default = No).
- *Symbols:* A display can be set up to display international symbols on the Operator menus (default = Yes).

### *Volt & Hz Menu*

The Volt & Hz menu is used to control displaying a menu that allows for adjusting the genset voltage and frequency settings. This menu cannot be changed unless the Setup password is entered (see page 5-6).

- *Password:* A password can either be Required (default) or Not Required. If set to "Required," the "Volt&Hz Adjust" adjust category will not be displayed on the third Service menu (see Figure 5-1). If set to "Not Required," the "Volt&Hz Adjust" adjust category is displayed on the third Service menu and, when selected, the voltage and frequency parameters can be adjusted (see Figure 4-21).

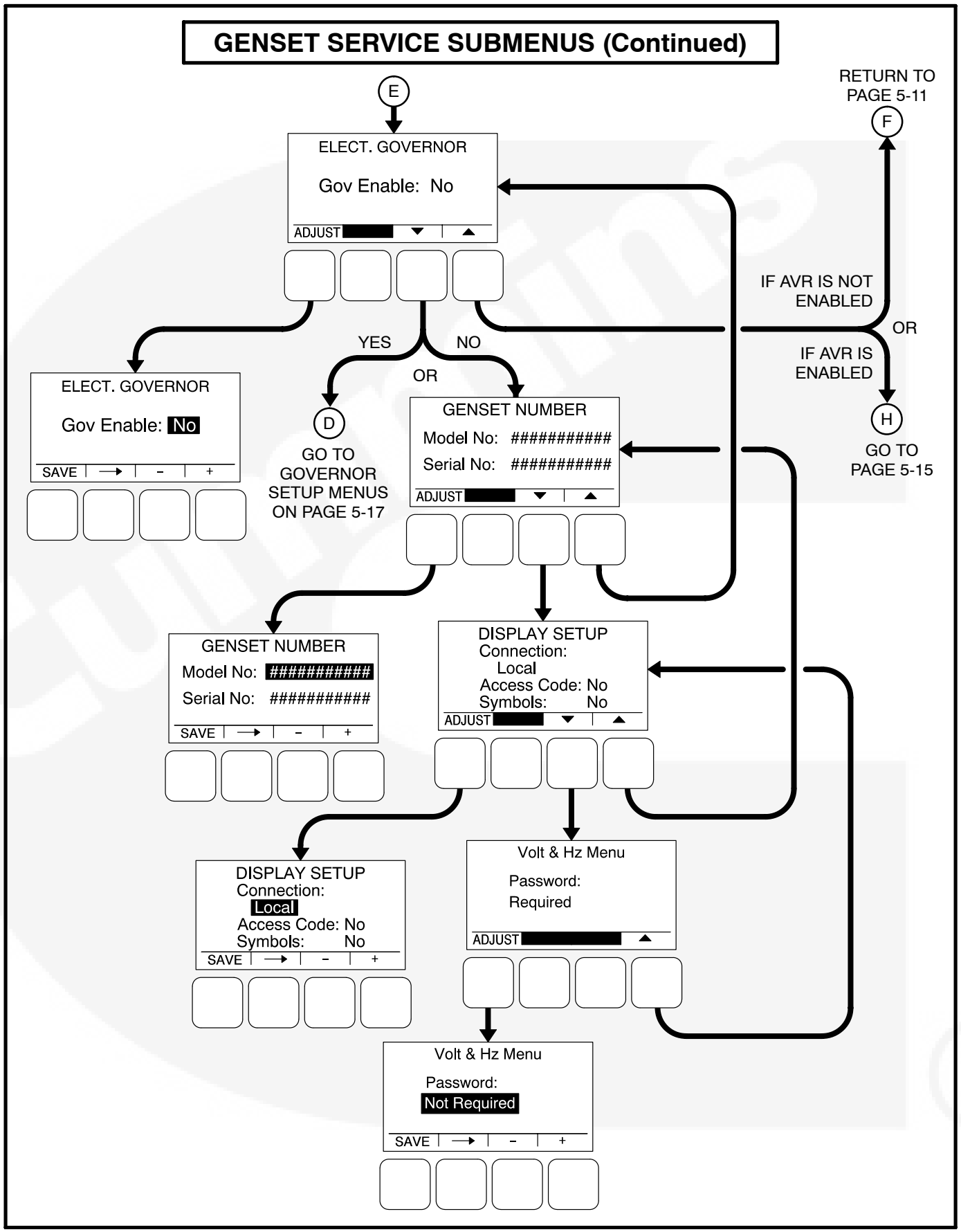


**FIGURE 5-5. GENSET SERVICE SUBMENUS (SHEET 3 OF 3)**

## Automatic Voltage Regulator Submenus

The Automatic Voltage Regulator (AVR) submenus are available only if the AVR is enabled (see page 5-11).

Two Automatic Voltage Regulator (AVR) submenus (see Figure 5-7) can be used to adjust Volts/Hz Rolloff and Regulator Gains settings.

### *Volts/Hz Rolloff Menu*

The Volts/Hz Rolloff function helps optimize the genset's response to added load. If the engine speed drops below nominal frequency, the control automatically drops the voltage until the engine speed starts to recover.

This menu allows for adjusting the knee frequency and voltage setpoint slope parameters. The knee frequency is the value below nominal frequency at which the rolloff function begins. For example, if the knee frequency is set to 5 Hz on a 60 Hz genset, this function begins when the frequency drops below 55 Hz.

Slope refers to how fast the voltage is rolled off below the knee frequency. The voltage is rolled off the slope percent setting for every 1 Hz below the knee. For example, on a 60 Hz genset, if the slope is set to 5% and the knee frequency is set to 5 Hz, then if the frequency drops to 54 Hz, the voltage set point is reduced 5%. If the frequency drops to 53 Hz, the voltage set point is reduced 10%, etc.

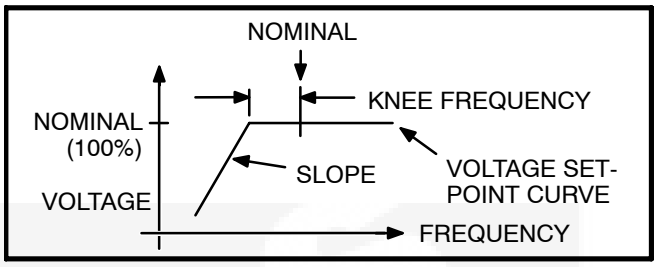


**FIGURE 5-6. KNEE FREQUENCY AND SLOPE**

- *V/Hz Knee:* The Knee Frequency can be adjusted from 0.0 to 10.0 Hertz in 0.1 Hz increments (default = 1.0 Hz). When generator set speed decreases by more than the value of the knee frequency, the generator set voltage decreases by the %/Hz value.
- *V/Hz Rolloff*: The Rolloff setting can be adjusted from 0.0 to 5.0 percent of rated voltage, in 0.1% increments (default = 2.0%).

### *Regulator Gains Menu*

The Regulator menu allows for setting proportional Gain, Integral Gain, and Damping values.

- *Gain:* The proportional Gain (K1) multiplier can be set from 5 to 1000% (default = 100%). This allows for a scale factor of 0.05 to 10.0.
- *Int:* The Integral Gain (K2) multiplier can be set from 5 to 1000% (default = 100%).
- *D:* The Damping adjustment can be set from 95 to 105% (default = 100%).

# AUTOMATIC VOLTAGE REGULATOR SUBMENUS

**NOTE:** These menus are only available if the Automatic Voltage Regulator (AVR) is enabled (see page 5-11).

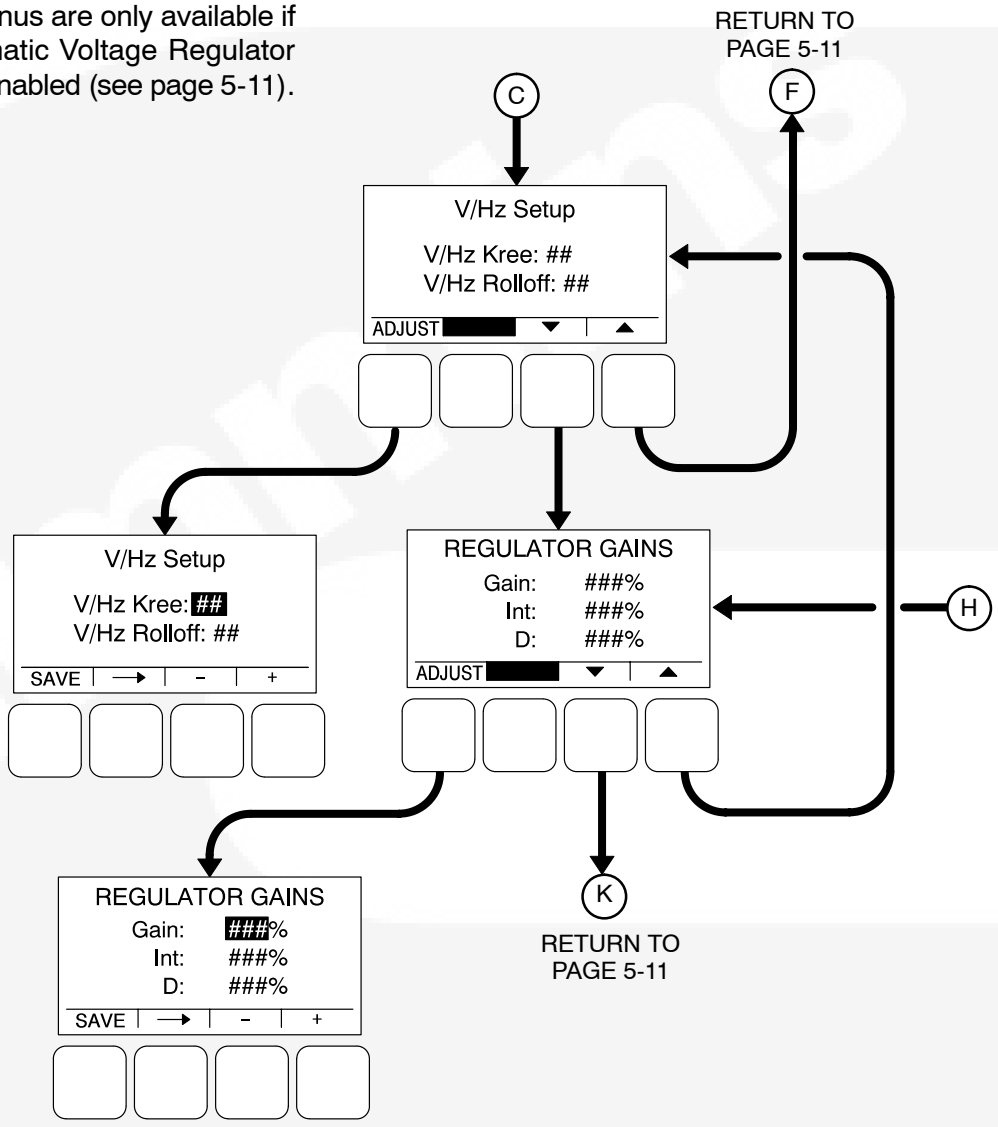


**FIGURE 5-7. AUTOMATIC VOLTAGE REGULATOR SUBMENUS**

## Electronic Governor Submenus

The Electronic Governor submenus are available only if the governor is enabled (see page 5-11).

Four Electronic Governor submenus (see Figure 5-8) can be used to adjust governor settings.

### *Governor Crank Fuel Menu*

The Governor Crank Fuel menu allows for setting the Initial Crank Fuel Duty Cycle, the Initial Crank Fueling Period, the Crank Fuel Ramp Rate, and the Maximum Crank Fuel Duty Cycle.

- *Initial DC:* The Initial Crank Fuel Duty Cycle is the initial value assigned to the Governor Duty Cycle parameter when cranking begins. This value can be set from 0 to 50 percent (default = 25%).
- *Initial Time:* The Initial Crank Fueling Period is the amount of time for which the value of Initial Crank Fuel Duty Cycle is assigned to the governor duty cycle after cranking begins. This value can be set from 0 to 10 seconds (default = 2 seconds).
- *Ramp Rate:* The Crank Fuel Ramp Rate is the rate at which the value of the Governor Duty Cycle is ramped up by during the Crank State, after expiration of the Initial Crank Fueling Period. This value can be set from 5 to 100 (default = 25).
- *Max DC:* The Maximum Crank Fuel Duty Cycle is the maximum level to which the Governor Duty Cycle should be limited to during a crank state. This value can be set from 50 to 100% (default = 100%).

### *Electronic Governor Regulator Menu*

The Electronic Governor Regulator menu allows for setting proportional Gain, Integral Gain, and Damping values.

- *Gain:* The proportional governor gain (K1) multiplier can be set from 5 to 1000% (default = 100%). This allows for a scale factor of 0.05 to 10.0.
- *Int:* The integral governor gain (K2) multiplier can be set from 5 to 1000% (default = 100%).
- *D:* The governor Damping adjustment can be set from 95 to 105% (default = 100%).

### *Electronic Governor Menu*

The Electronic Governor menu allows for setting Crank Exit Fuel DC, Dither Factor, and Damping values. This menu is displayed only if the governor has been enabled with the Engine Electronic Governor Enable menu.

- *Crank Exit Fuel DC:* The Crank Exit Fuel Duty Cycle is the value at which the governor duty cycle is held after disengaging the starter until the governor is enabled. This value can be set from 0 to 100% (default = 25%).
- *Dither Factor:* Dither is a signal that is superimposed on the PWM (pulse with modulation) duty cycle to prevent the actuator valve from sticking. The Dither Factor is the dither percent added to the current duty cycle. The Dither Factor can be set from 0 to 30% (default = 15%). The dither function is disabled when the dither factor is set to 0%.
- *Ramp Time:* This feature is used to set the minimum governor speed reference ramp rate. The governor Ramp Time can be set from 0.00 to 30.0 seconds, in 0.01 second increments (default = 0.25 seconds).

### *Electronic Governor Enable Speed Menu*

These menus allow for setting the minimum and maximum governor duty cycle.

- *Min. Gov DC*: The Minimum Governor Duty Cycle can be set from 0 to 100% (default = 5%).
- *Max. Gov DC*: The Maximum Governor Duty Cycle (with dithered value) can be set from 0 to 100% (default = 95%).

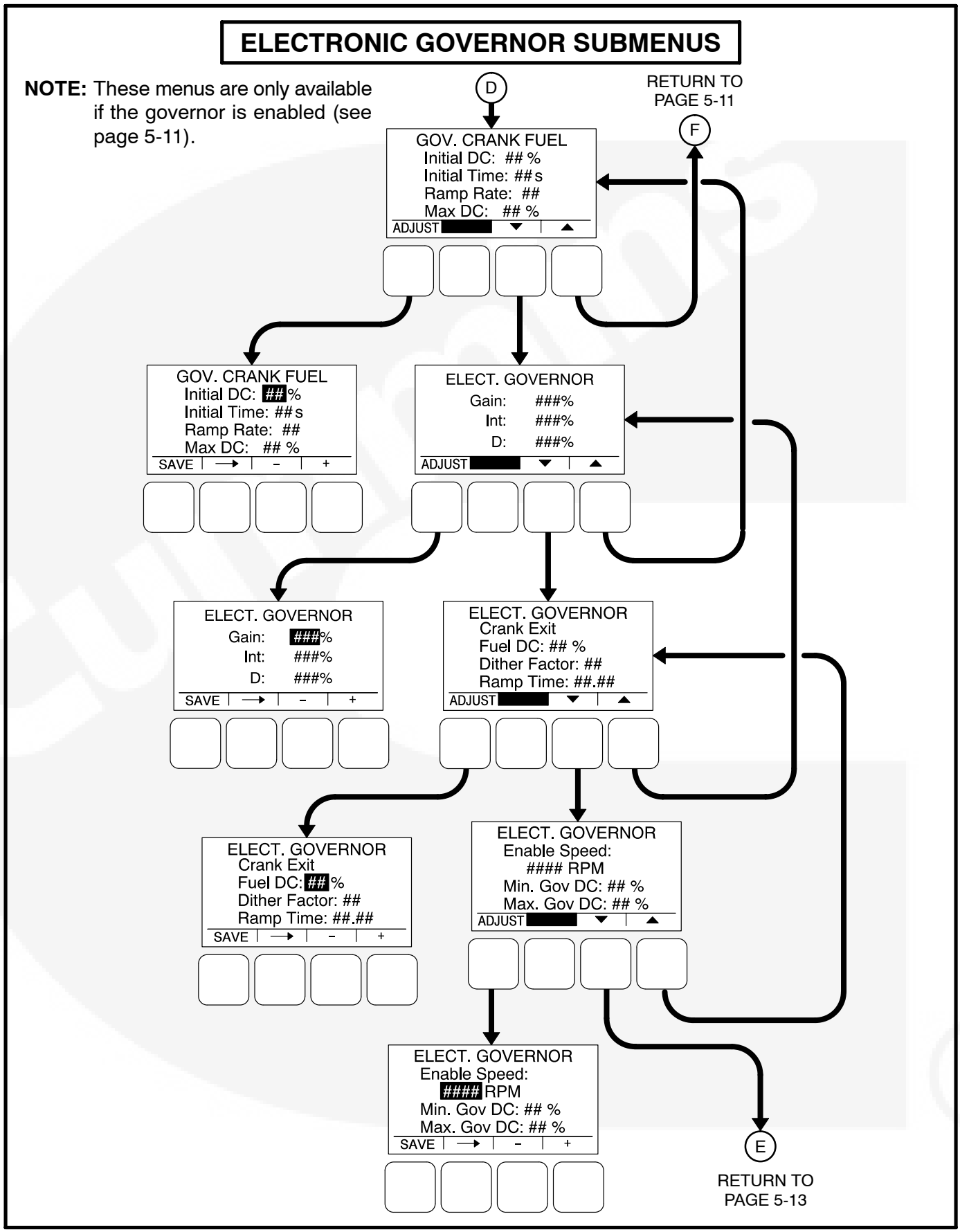


**FIGURE 5-8. ELECTRONIC GOVERNOR SUBMENUS**

## Customer I/O Submenus

The Customer I/O menus are available by pressing the **(2)** button on the first Genset Service menu (see Figure 5-3 or Figure 5-4).

Four Customer I/O menus (see Figure 5-9) can be used to define customer input messages and output maps.

### *Customer Inputs*

The Customer Input Text message menus are used to enter an event type and description for two events.

- *Type:* Enter the event type (Warning, Shutdown or Event, default = Warning).
- Enter a brief description of the event (up to 32 characters).

### *Customer Outputs*

Two Customer Outputs are configurable to display common warning alarms. The two Customer Output Map menus allow for entering a fault number and fault name to be displayed for the two configurable customer outputs.

- *Number:* Enter a code number (0–255, default = 0) for the event.
- A brief description of the event is automatically displayed.

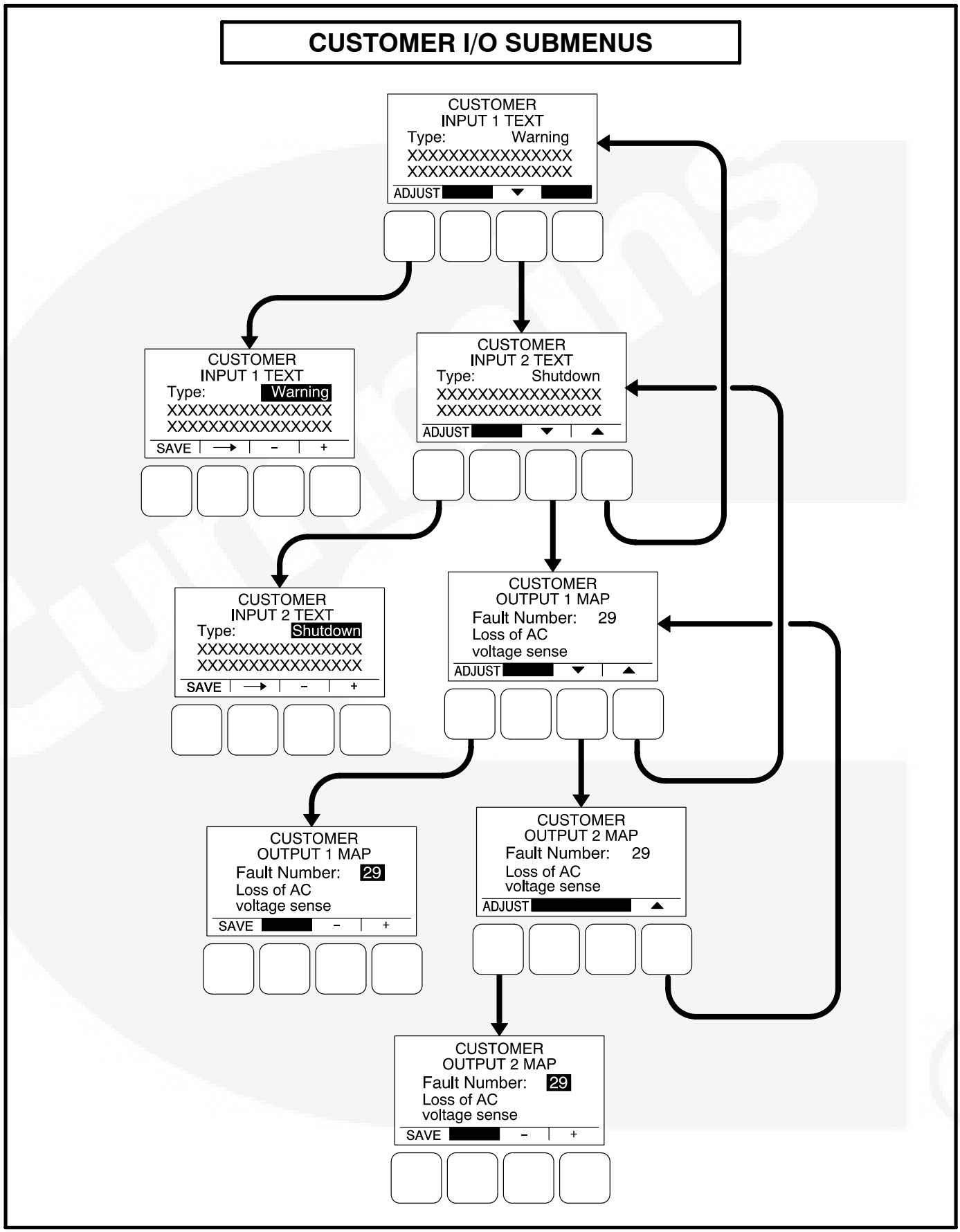


**FIGURE 5-9. CUSTOMER I/O SUBMENUS**

## Metering Submenus

The Metering submenus are available by pressing the **(3)** button on the first Genset Service menu (see Figure 5-3 or Figure 5-4).

Three Metering submenus (see Figure 5-10) can be used to adjust regulated voltage, frequency, line-to-neutral voltage, and line current settings.

### *Meter Calib Menu*

The Meter Calib menu allows for adjusting the actual output voltage of the genset. The percentage can be set from 90 to 110% (default = 100%). The alternator voltage is also shown on this menu.

### *Freq. Adjust Menu*

The Frequency Adjust menu allows for adjusting the genset frequency. The frequency can be adjust from –6.0 to +6.0 Hz (default = 0.0 Hz). The actual frequency is also shown on this menu.

### *Metering Voltage Adjust Menu*

The Metering Voltage Adjust menu allows for adjusting metered line voltage.

### *Metering Current Adjust Menu*

The Metering Current Adjust menu allows for adjusting metered amps.

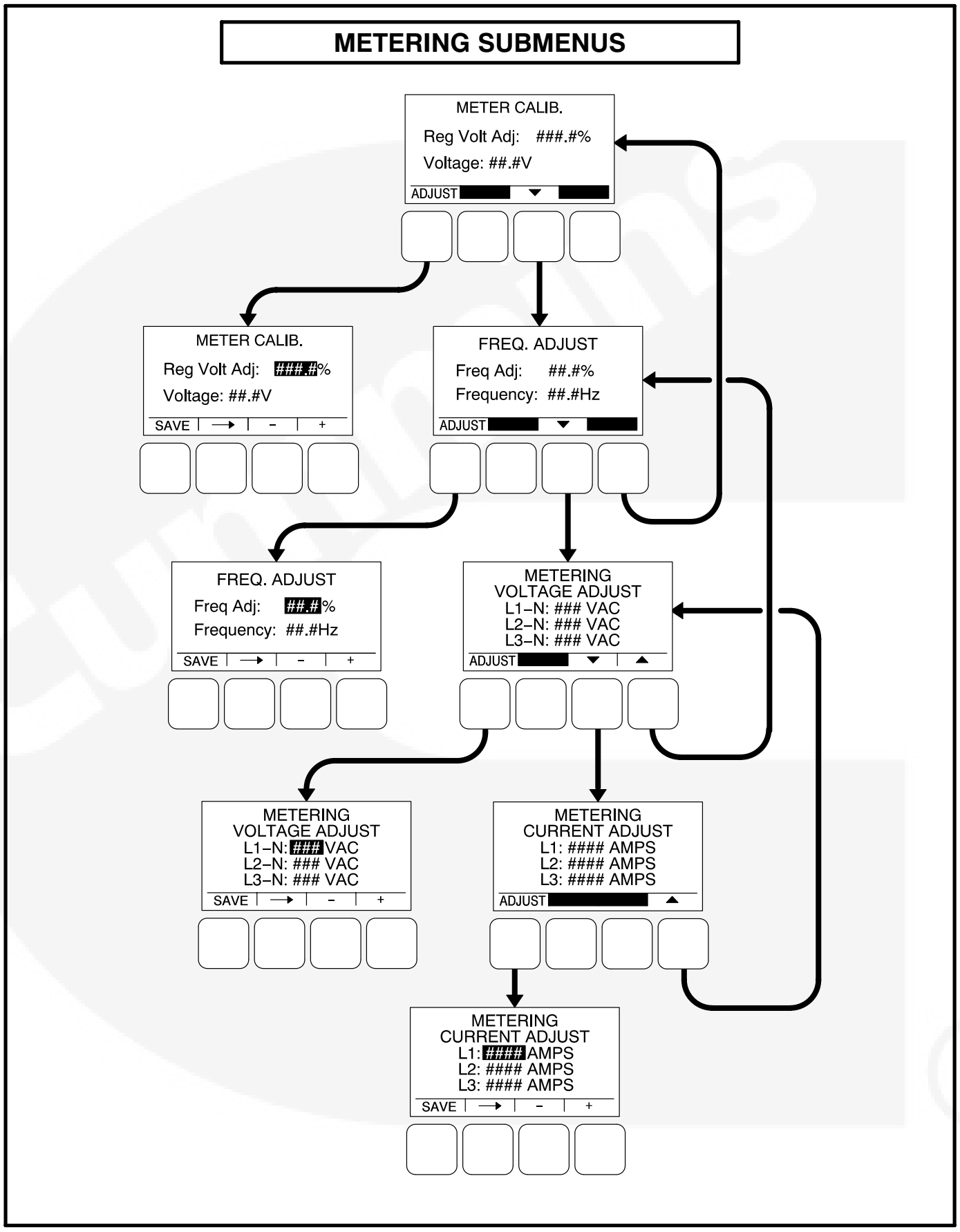


**FIGURE 5-10. METERING SUBMENUS**

## Annunciator Submenus

The Annunciator submenus are available by pressing the **(4)** button on the second Genset Service menu (see Figure 5-3 or Figure 5-4).

Seven annunciator submenus (see Figure 5-11) can be used to define three Annunciator Fault Text messages and four Annunciator Output Maps.

### *Annunciator Inputs*

The annunciator has three possible customer-defined fault conditions that can be shown on the 1301 series control display. The Annunciator Fault Text message menus are used to enter an event type and description for those three customer-defined annunciator faults.

- *Type:* Enter the event type (Warning, Shutdown, or Event, default = Warning).
- Enter a brief description of the event (up to 32 characters).

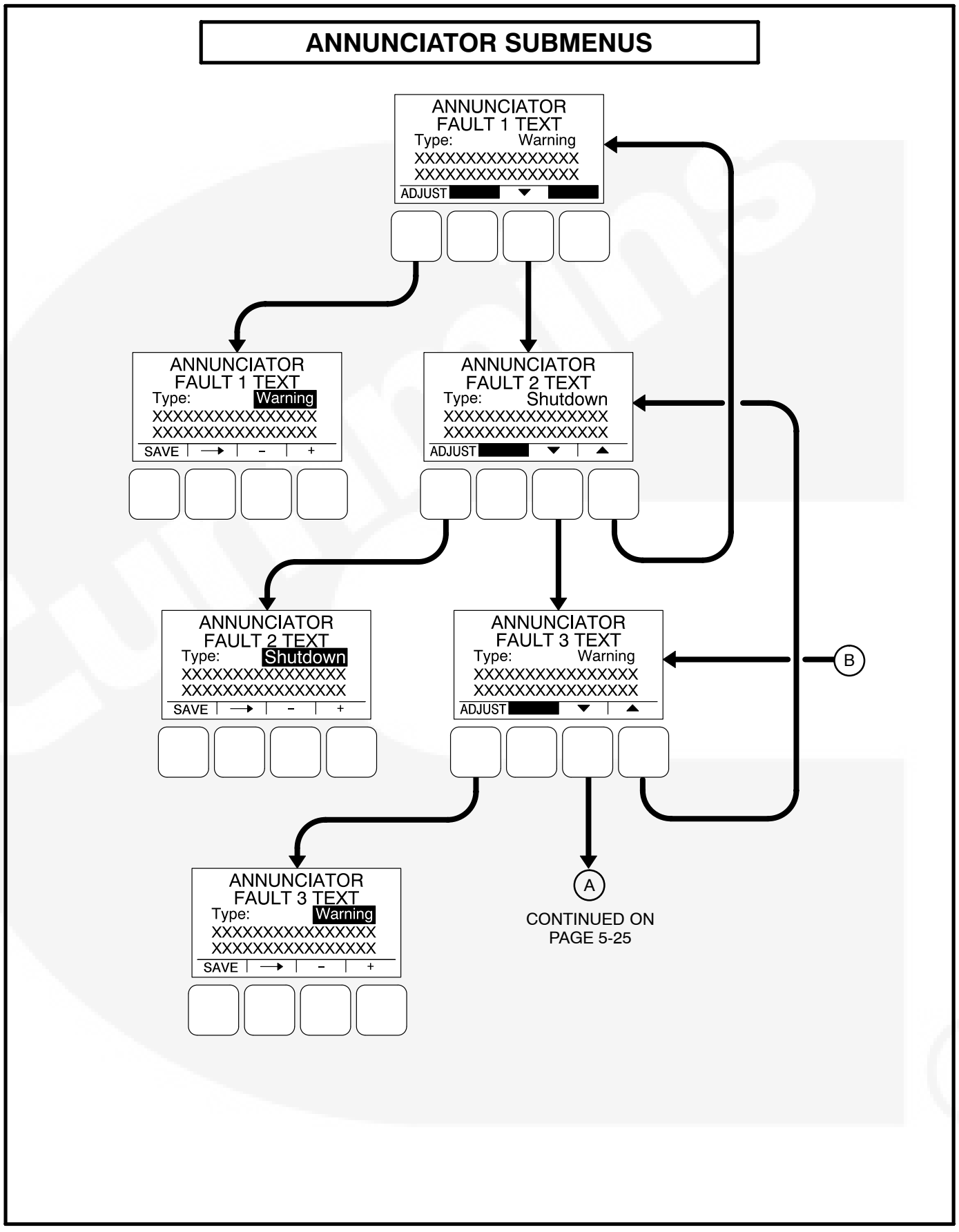


**FIGURE 5-11. ANNUNCIATOR SUBMENUS (SHEET 1 OF 2)**

### *Annunciator Outputs*

An annunciator has four custom (N.O.) relays that can be controlled by the 1301 series control. When a specified event becomes active, a message can be sent by the 1301 series control to the annunciator to turn the relay on or off. Only one event per relay is allowed.

The four annunciator outputs of the 1301 series control are configurable to display common warning alarms. The four Annunciator Output Map menus allow for entering a fault number and fault name to be displayed for the configurable annunciator outputs.

- *Number:* Enter a code number (0–255, default = 0) for the event.
- A brief description of the event is automatically displayed.

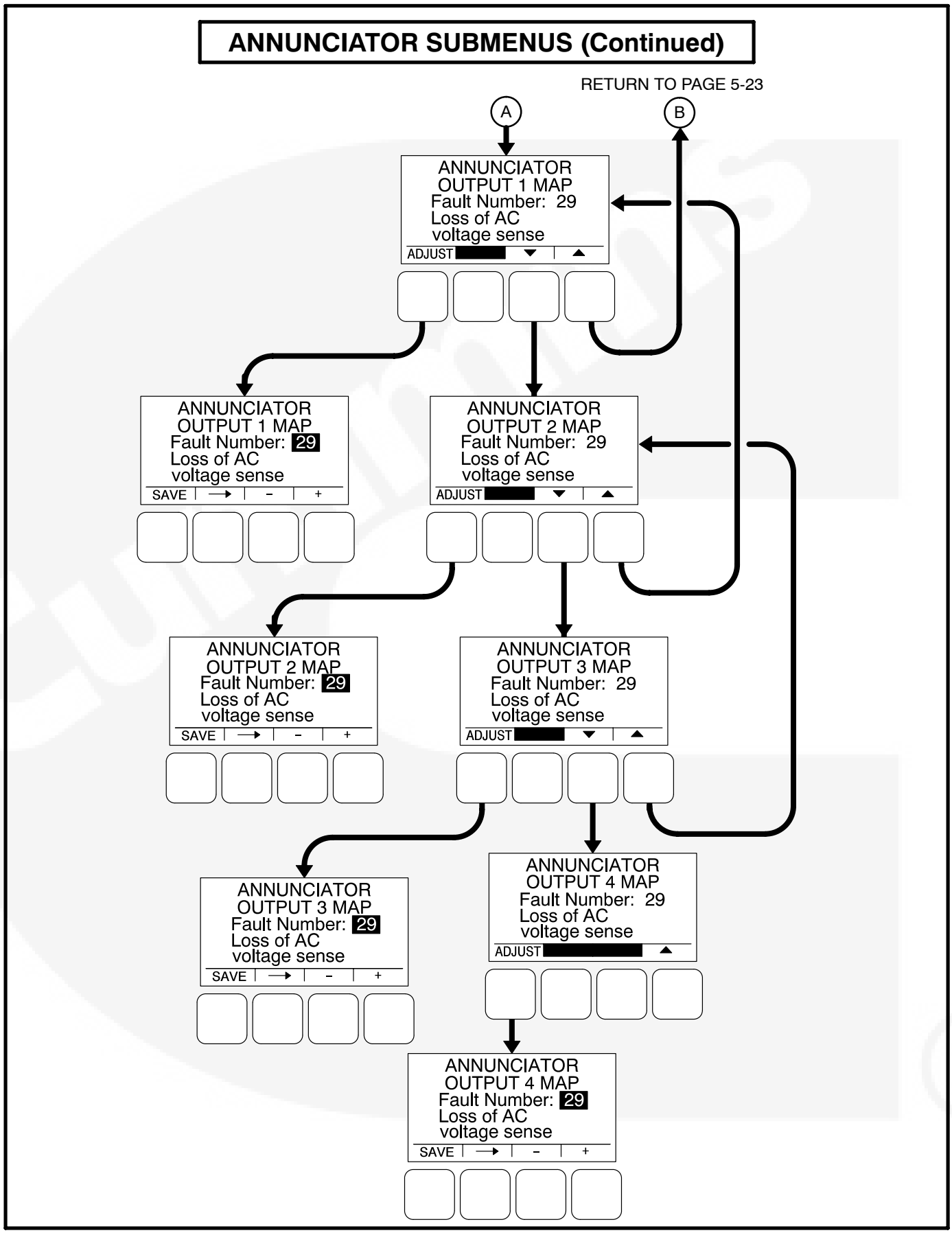


**FIGURE 5-11. ANNUNCIATOR SUBMENUS (SHEET 2 OF 2)**

## Modbus Submenus

The Modbus submenus are available by pressing the **(5)** button on the second Genset Service menu (see Figure 5-3 or Figure 5-4).

### *Modbus Enable Menu*

The Modbus Enable menu allows for enabling or disabling the Modbus feature (default = No).

If set to “Yes,” the Modbus Setup menu is made available.

### *Modbus Setup Menu*

The Modbus Setup menu allows for setting a numeric address and a baud rate. The parity value is automatically displayed.

- *Address:* Enter a numerical value (up to three digits, default = 2) for the address.
- *Baud Rate:* Select one of the four available baud rates (2400, 4800, 9600, or 19200, default = 19200).
- *Parity:* This value is automatically displayed.

# MODBUS SUBMENUS

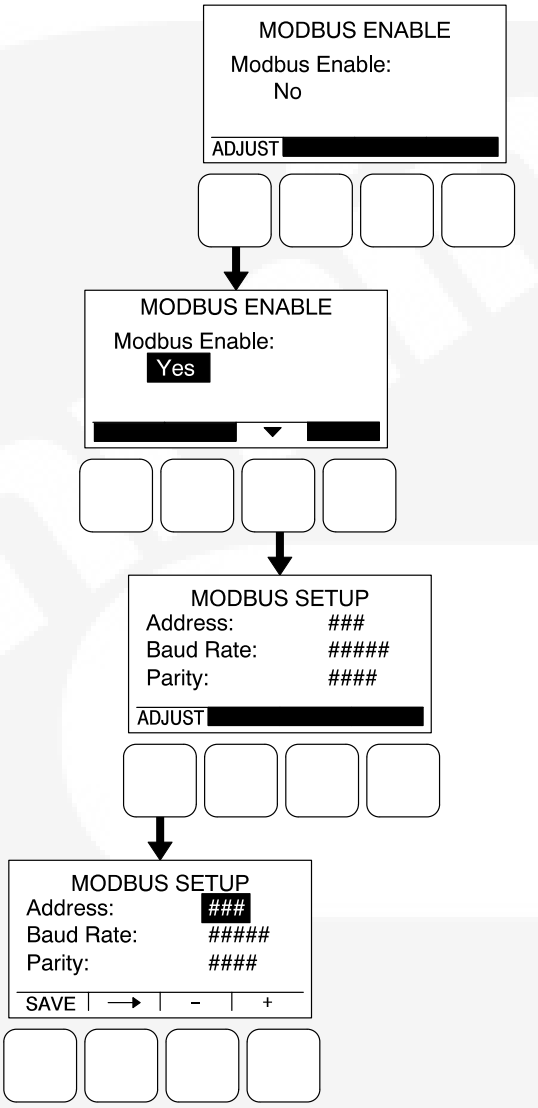


**FIGURE 5-12. MODBUS SUBMENUS**

## GENSET SETUP SUBMENUS

The first Setup menu is displayed when the **(1)** button is pressed on the Service Menu. From the Setup Password menu, a Setup Menus menu is displayed that provides access to the following two categories of genset menus.

- Genset Service menus – Go to page 5-3
- Genset Setup menus

This section covers Genset Setup menus only. A password does not need to be entered on the Setup Password menu in order to view or adjust the Genset Setup submenus.

When the **(2)** button is selected to access Genset Setup menus, a second password menu (Genset Setup Password) is displayed (see Figure 5-13). If a password is entered on the Genset Setup Password, the settings in the Genset Setup menus can be adjusted. However, if a password is not entered, these menus can still be viewed.

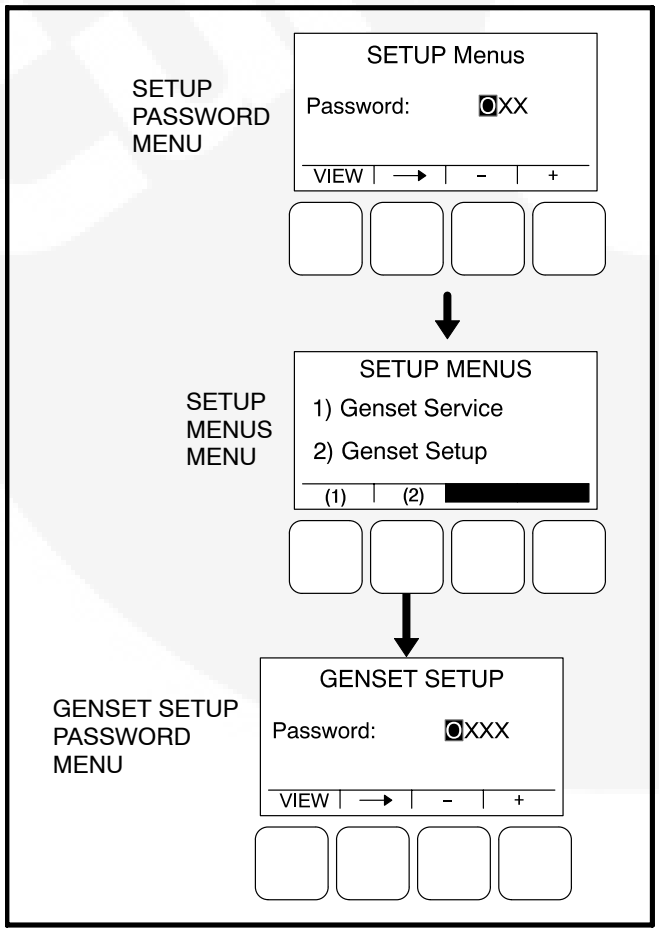


**FIGURE 5-13. SETUP PASSWORD MENUS**

### Viewing Only

Figure 5-14 is a block representation of the Genset Setup menus that are available when a password is not entered (or an incorrect password is entered) in the Genset Setup Password menu.

The first Genset Setup Menu provides access to the following menus:

- Genset
- Voltage Protection
- Current Protection

The second Genset Setup Menu provides access to the following menu:

- Engine Protection

The Genset Setup submenus can be viewed by selecting the **VIEW** button on the Genset Setup Password menu. When the VIEW button is selected without entering the correct password, the **ADJUST** button is not displayed on any of the Genset Setup menus; therefore, no adjustments can be made.

#### *Menu Navigation*

1. Press the buttons above the ▲ and ▼ symbols in the digital display to navigate between submenus.
2. To return to the genset Setup Menus menu from any of the submenus, press the ◀ button.
3. To return to the Service Menu from the genset Setup Menus menu, press the ◀ button.

# GENSET SETUP MENUS (Viewing Only)

**NOTE:** When the VIEW button is selected from the Genset Setup Password menu without entering a password, the ADJUST button is not available on any of the menus shown in Figures 5-16 thru 5-19.

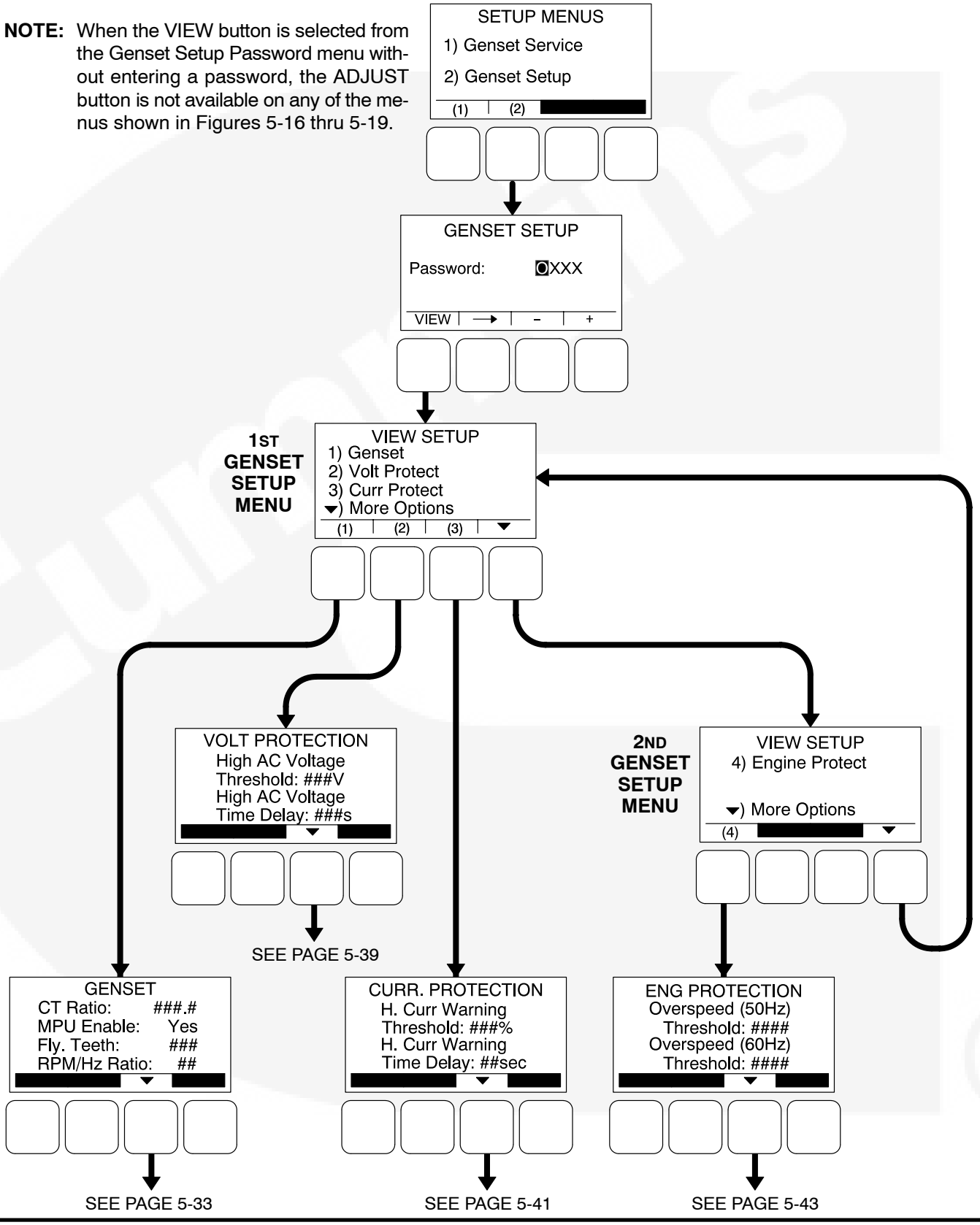


**FIGURE 5-14. GENSET SETUP MENUS (VIEWING ONLY)**

## Viewing and Adjusting

Figure 5-15 is a block representation of the Genset Setup menus that are available after the correct password has been entered in the Genset Setup Password menu. The **ADJUST** button is available on these submenus; therefore, adjusting the settings is allowed.

The first Genset Setup Menu provides access to the following menus:

- Genset
- Voltage Protection
- Current Protection

The second Genset Setup Menu provides access to the following menu:

- Engine Protection

## Genset Setup Password Submenu

Adjusting the Genset Setup menus is restricted to service personnel and a password must be entered to modify these menus.

Once the Genset Setup button **(2)** is selected on the Setup Menus menu, the Genset Setup Password menu is displayed.

When the Genset Setup Password menu is displayed, the first numeric character (0) is highlighted (see Figure 5-15).

**NOTE:** When selected (highlighted), each character initially turns to "0" and the remaining characters turn to "X".

**NOTE:** Make sure that each numeric character is correct before you move to the next character. If a wrong character is entered, you will not be able to go back and correct it. If the wrong password is entered, you will be able to view the Genset Setup menus but you won't be able to change them.

To enter the password:

1. With the first character highlighted, press the button below to the + or – symbols until the value reads "1."
2. Press the arrow selection button ⟶ to move to the next numeric character.
3. Press the button below the + or – symbols until the value reads "2."
4. Press the arrow selection button ⟶ to move to the next numeric character.
5. Press the button below the + or – symbols until the value reads "0."
6. Press the arrow selection button ⟶ to move to the next numeric character.
7. Press the button below the + or – symbols until the value reads "9."
8. After you have completed entering the password, press the arrow selection button ⟶. The first main Setup menu is displayed.

After the correct password is entered, it will be remembered until five minutes of button inactivity has elapsed. If five minutes of button inactivity has elapsed, you will have to re-enter the password to access and change Genset Setup menus.

## Adjusting Values/Parameters

Once the correct password has been entered on the Genset Setup Password menu, the first Genset Setup submenu is displayed.

1. Press the buttons above the ▲ and ▼ symbols in the digital display to navigate between submenus.
2. Press the **ADJUST** selection button to select the first parameter or value to be changed.
3. Press the **+** or **–** selection buttons to adjust values or select parameters.
4. Press the arrow selection button ⟶ to navigate to the next or previous adjustable value or parameter.
5. After adjusting values/selecting parameters, press the **SAVE** button to save your settings.

   **NOTE:** If the ◖ button is pressed before pressing the SAVE button, the changes are not saved.

6. Press the ◖ button to return to the genset Setup Menus menu.
7. To return to the Service Menu from the genset Setup Menus menu, press the ◖ button.

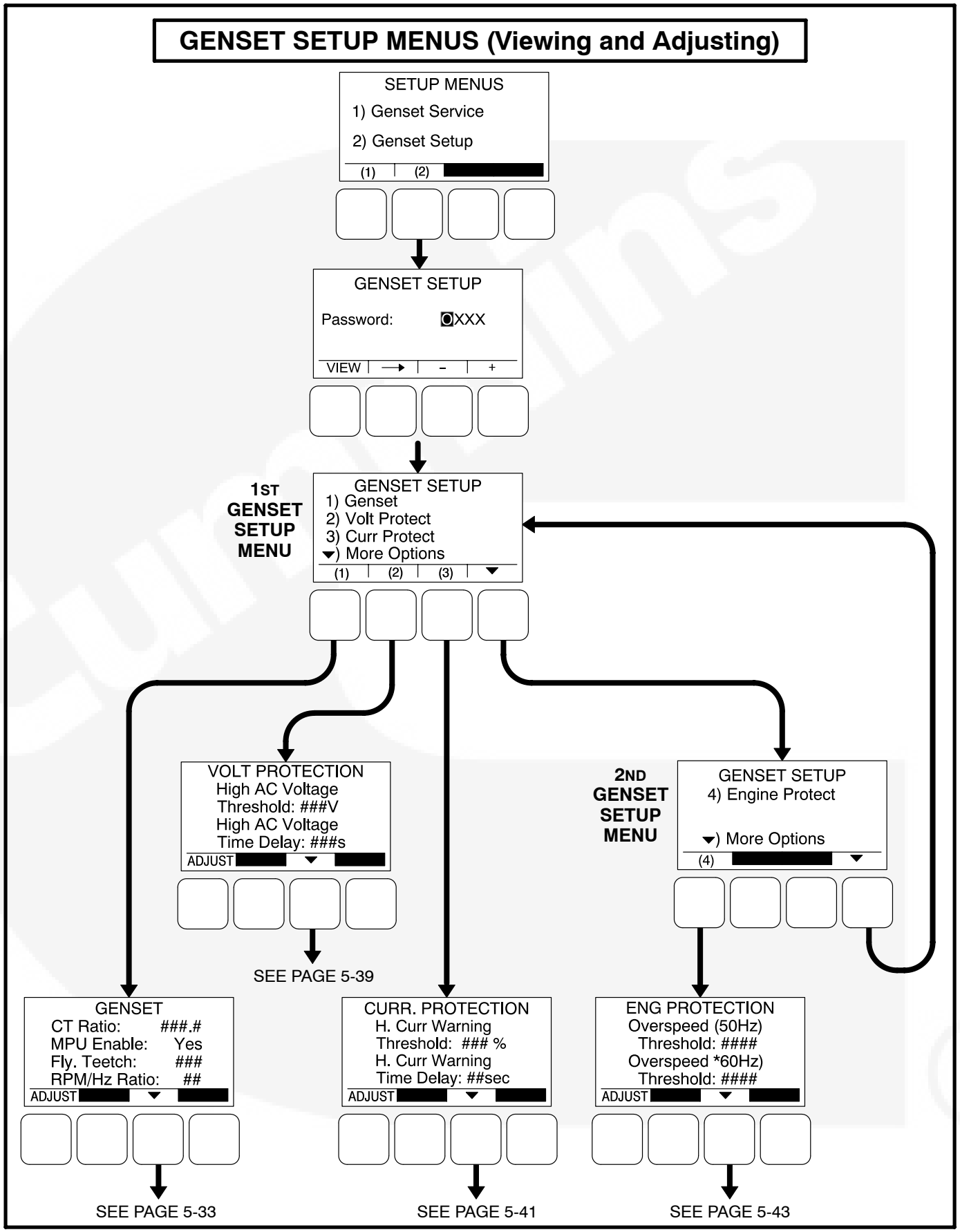


**FIGURE 5-15. GENSET SETUP MENUS (VIEWING AND ADJUSTING)**

## Genset Menus

The Genset submenus are available by pressing the **(1)** button on the first Genset Setup menu (see Figure 5-14 or Figure 5-15).

### *Genset Menu*

The Genset Setup menu is used to set the CT Ratio, enable the Magnetic Pickup Unit (MPU), set the number of teeth pulses per revolution on the Flywheel, and set the Speed/Frequency Ratio.

- *CT Ratio:* The CT Ratio value must be set to match the CT Ratio of the current transformers on the genset (default = 150.5). See “Current Transformer Selection” setting on page 3-3.
- *MPU Enable:* Displays whether or not the Magnetic Pickup Unit is installed (Yes or No, default = No).Enable or Disable can only happen if fuel is diesel.
- *Fly. Teeth:* The total number of teeth pulses per revolution on the flywheel (used for electronic governed systems) can be set from 0 to 255 (default = 110).
- *RPM/Hz Ratio:* Allows for setting the Speed/Frequency Ratio to 20, 30, or 60 RPM/Hz (default = 30).

### *Application Rating Select Menu*

The genset application rating can be set to either Standby or Prime (default = Standby).

### *Standby kVA Rating Menu*

The kVA Rating menu displays the kVA rating of single-phase or three-phase, 50 or 60 hertz standby genset systems. These value are used by the control to determine what is 100% load. The values must match the kVA rating of the genset application and cannot be more than 2000 kVA.

- *3Ph/50Hz:* The three phase, 50 Hertz rating can be set from 0 to 2000 kVA (default = 25 kVA).
- *3Ph/60Hz:* The three phase, 60 Hertz rating can be set from 0 to 2000 kVA (default = 25 kVA).
- *1Ph/50Hz:* The single phase, 50 Hertz rating can be set from 0 to 2000 kVA (default = 25 kVA).
- *1Ph/60Hz:* The single phase, 60 Hertz rating can be set from 0 to 2000 kVA (default = 25 kVA).

### *Prime kVA Rating Menu*

The kVA Rating menu displays the kVA rating of single-phase or three-phase, 50 or 60 hertz prime genset systems. These value are used by the control to determine what is 100% load. The values must match the kVA rating of the genset application and cannot be more than 2000 kVA.

- *3Ph/50Hz:* The three phase, 50 Hertz rating can be set from 0 to 2000 kVA (default = 25 kVA).
- *3Ph/60Hz:* The three phase, 60 Hertz rating can be set from 0 to 2000 kVA (default = 25 kVA).
- *1Ph/50Hz:* The single phase, 50 Hertz rating can be set from 0 to 2000 kVA (default = 25 kVA).
- *1Ph/60Hz:* The single phase, 60 Hertz rating can be set from 0 to 2000 kVA (default = 25 kVA).

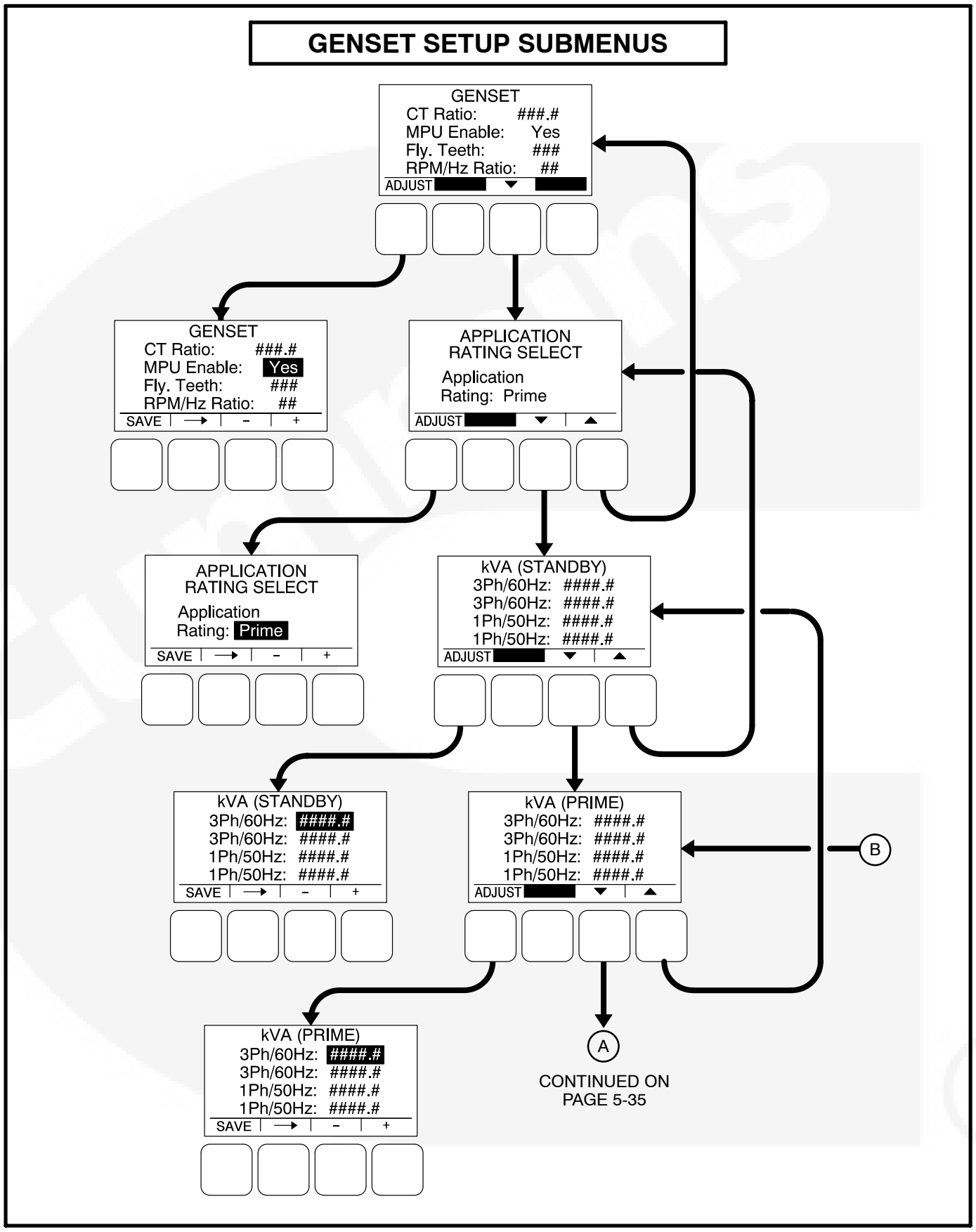


**FIGURE 5-16. GENSET SETUP SUBMENUS (SHEET 1 OF 3)**

### *Battery Select Menu*

The Battery Select menu is used to set the nominal battery voltage.

- *Nominal Battery Voltage:* Allows for setting the nominal battery voltage (12 or 24V, default = 12V).

### *Battery Thresholds Menu*

The Battery Thresholds menu is used to set the low and high voltage values to determine when the battery voltage is out of the set range during normal operation. This menu is also used to determine when the battery voltage is below weak battery thresholds during cranking. The Battery Thresholds menu that is displayed is dependent upon the battery voltage entered in the Battery Select menu.

- *Low Batt:* The low battery voltage threshold can be set from 11.0 to 13.0 VDC for 12 volt batteries (default = 12.0 VDC) and from 22.0 to 27.0 VDC for 24 volt batteries (default = 24.0 VDC), in 0.1 VDC increments.
- *High Batt:* The high battery voltage threshold can be set from 14.0 to 17.0 VDC for 12 volt batteries (default = 16.0 VDC) and from 28.0 to 34.0 VDC for 24 volt batteries (default = 32.0 VDC), in 0.1 VDC increments.
- *Weak Batt:* The weak battery voltage threshold can be set from 6.0 to 10.0 VDC for 12 volt batteries (default = 8.0 VDC) and from 12.0 to 20.0 VDC for 24 volt batteries (default = 14.4 VDC), in 0.1 VDC increments.

### *Battery Delay Setup Menu*

This menu is used to determine when, after determining that the battery condition is out of the preset operating range, a warning message is announced.

- *L. Batt TD:* A time delay from 2 to 60 seconds (default = 60 seconds) can be set before the Low Battery warning message (fault code 213) is announced.
- *H. Batt TD:* A time delay from 2 to 60 seconds (default = 60 seconds) can be set before the High Battery warning message (fault code 214) is announced.
- *Wk Batt TD:* A time delay from 1 to 5 seconds (default = 2 seconds) can be set before the Weak Battery warning message (fault code 221) is announced.

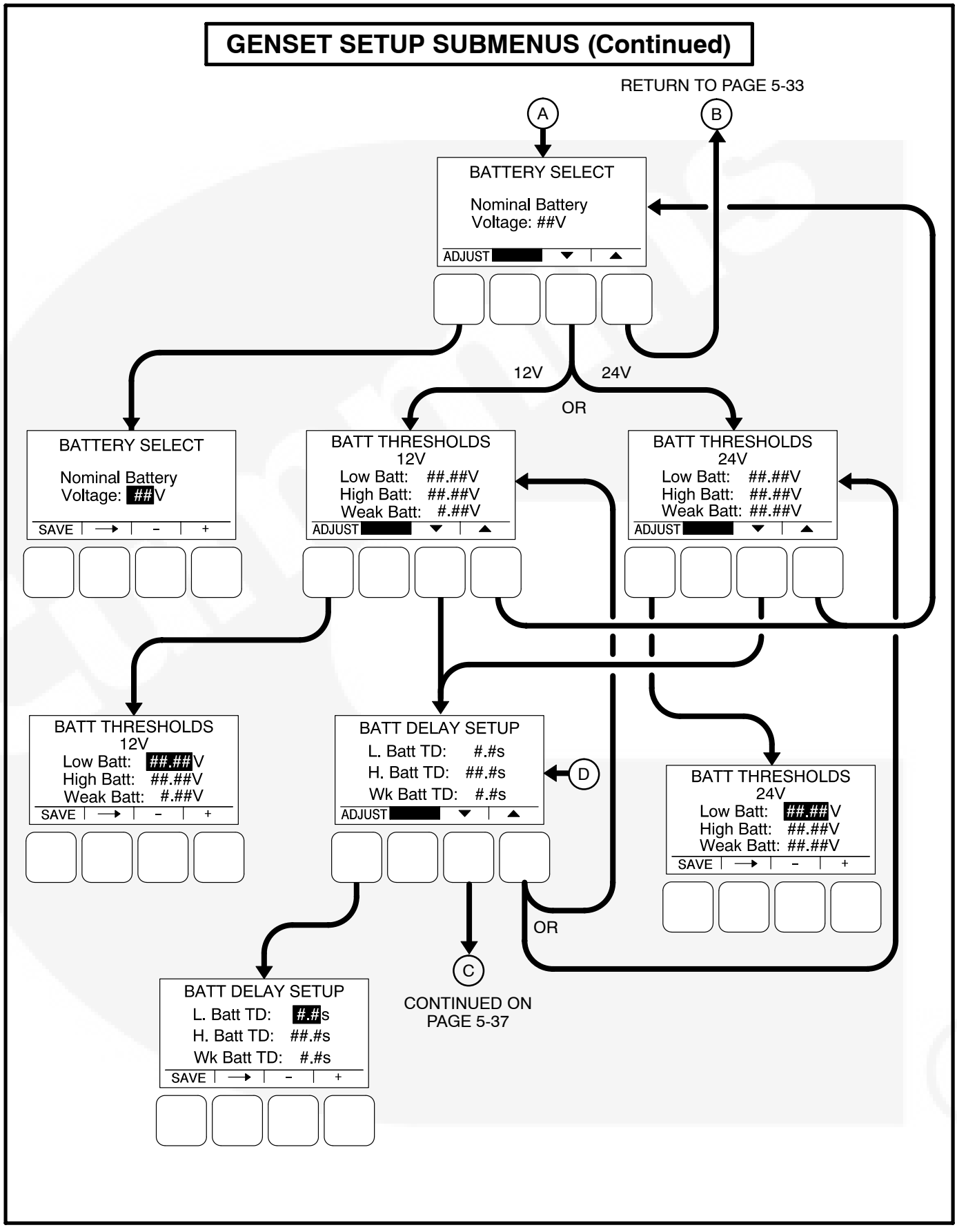


**FIGURE 5-16. GENSET SETUP SUBMENUS (SHEET 2 OF 3)**

***Oil Pressure Setup Menus***

A menu is available to set the sensor type. If the sensor type is Switch, then another menu is available to set the sensor polarity. If the sensor type is Sender, then another menu is available to set the sender type.

- *Sensor Type:* The sensor type can be set for either Switch or Sender (default = Switch).
- *Sensor Polarity:* This menu is displayed only if the sensor type is set to Switch. Sensor polarity can be set to either Active Low or Active High (default = Active Low).
- *Sender Type:* This menu is displayed only if the sensor type is set to Sender. The sender type can be set to either 2 Wire or 3 Wire (default = 2 Wire).

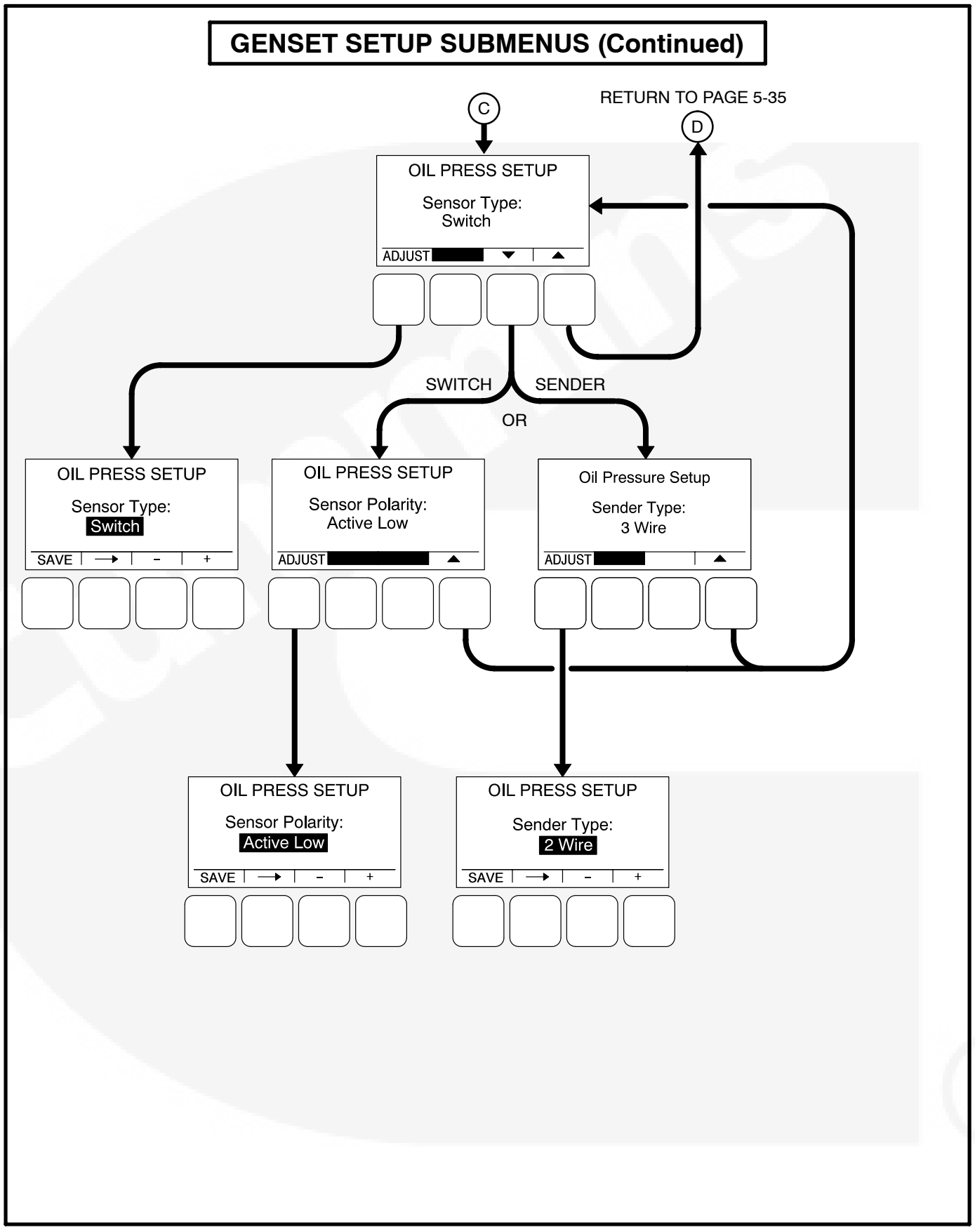


**FIGURE 5-16. GENSET SETUP SUBMENUS (SHEET 3 OF 3)**

## Voltage Protection Submenus

The Voltage Protection submenus are available by pressing the **(2)** button on the first Genset Setup menu (see Figure 5-14 or Figure 5-15).

Figure 5-17 is a block representation of the four Voltage Protection submenus that are available.

### *High AC Voltage Menu*

This menu is used to determine when a high AC voltage fault condition exists and for how long the fault condition should be present before the engine is shut down.

- *High AC Voltage Threshold:* This threshold is used to set the percentage of desired voltage necessary to activate a High AC Voltage fault condition. This value can be set from 105 to 125% (default = 110%).
- *High AC Voltage Time Delay:* A time delay of 1 to 10 seconds (default = 10 seconds) must expire before the engine shuts down because of a high AC voltage fault condition. If the fault condition is active for the duration of this time delay, the engine shuts down and the High AC Voltage shutdown message (fault code 12) is announced.

### *Low AC Voltage Menu*

This menu is used to determine when a low AC voltage fault condition exists and for how long the fault condition should be present before the engine is shut down.

- *Low AC Voltage Threshold:* This threshold is used to set the percentage of desired voltage necessary to activate a Low AC Voltage fault condition. This value can be set from 50 to 95% (default = 85%).
- *Low AC Voltage Time Delay:* A time delay of 2 to 20 seconds (default = 10 seconds) must expire before the engine shuts down because of a low AC voltage fault condition. If the fault condition is active for the duration of this time delay, the engine shuts down and the Low AC Voltage shutdown message (fault code 13) is announced.

### *Overfrequency Menu*

This menu is used to determine when an overfrequency fault condition exists and for how long the fault condition should be present before the engine is shut down.

- *Overfrequency Threshold:* This threshold is used to set the amount of Hertz that the alternator line frequency can be over to activate an Overfrequency fault condition. This value can be set from 2 to 10 Hz (default = 6 Hz).
- *Overfrequency Delay:* A time delay of 100 to 2000 half cycles (default = 1100 half cycles) must expire before the engine shuts down because of an overfrequency fault condition. If the fault condition is active for the duration of this time delay, the engine shuts down and the Overfrequency shutdown message (fault code 14) is announced.

### *Underfrequency Menu*

This menu is used to determine when an underfrequency fault condition exists and for how long the fault condition should be present before the engine is shut down.

- *Underfrequency Threshold:* This threshold is used to set the Hertz number that the alternator line frequency can be under to activate an Underfrequency fault condition. This value can be set from 2 to 10 Hz (default = 6 Hz).
- *Underfrequency Time Delay:* A time delay of 500 and 2000 half cycles (default = 1100 half cycles) must expire before the engine shuts down because of an underfrequency fault condition. If the fault condition is active for the duration of this time delay, the engine shuts down and the Underfrequency shutdown message (fault code 15) is announced.

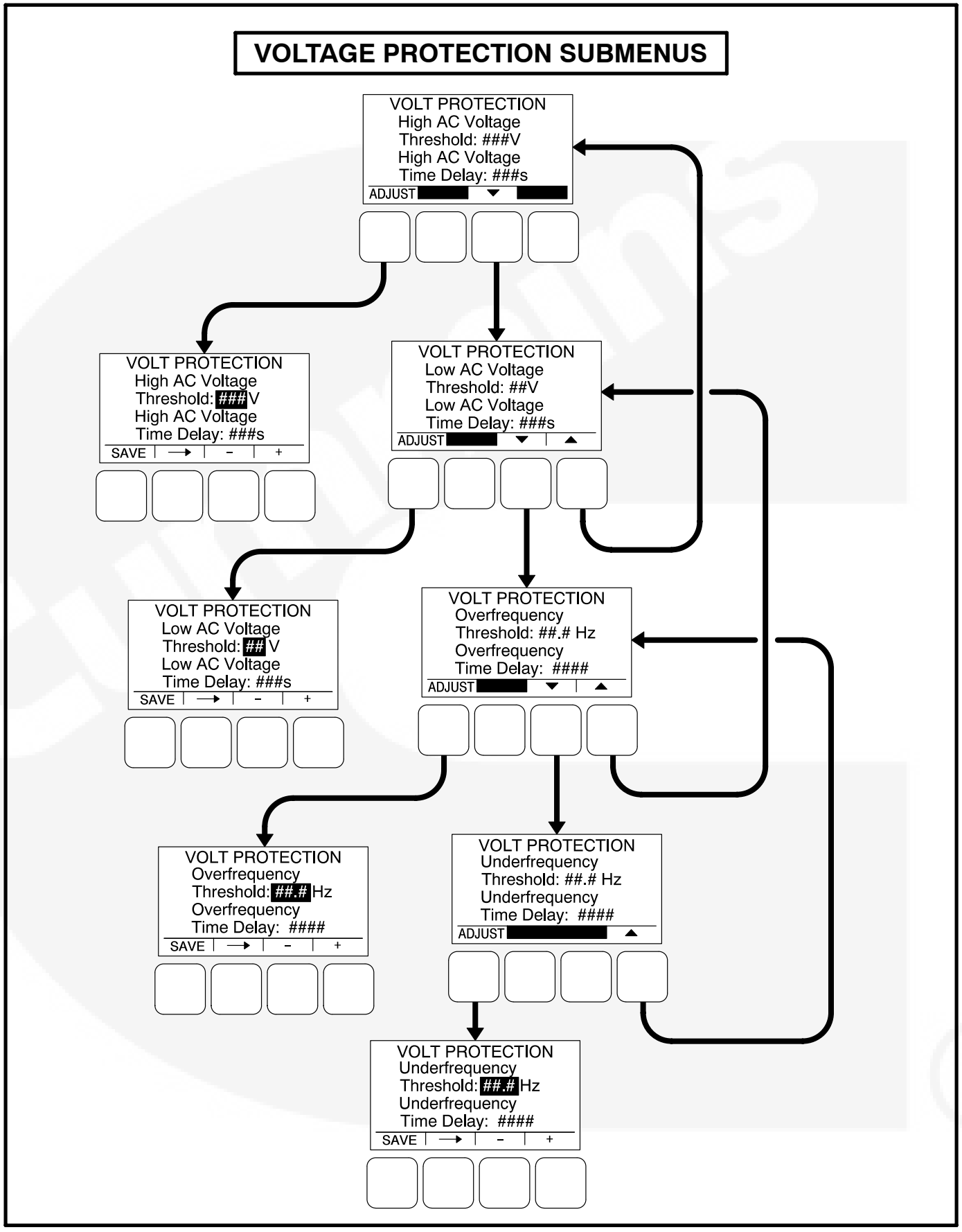


**FIGURE 5-17. VOLTAGE PROTECTION SUBMENUS**

## Current Protection Submenus

The Current Protection submenus are available by pressing the **(3)** button on the first Genset Setup menu (see Figure 5-14 or Figure 5-15).

Figure 5-18 is a block representation of the two Current Protection submenus.

### *High AC Current Warning Menu*

This menu is used to determine when a high AC current warning fault condition exists and for how long the fault condition should be present before the High AC Current warning message is announced.

- *H. Curr Warning Threshold:* This threshold is used to set the percentage of rated AC current at which the High AC Current warning fault condition becomes active. This value can be set from 110 to 130% (default = 110%).
- *H. Curr Warning Time Delay:* A time delay of 10 to 60 seconds (default = 60 seconds) must expire before a warning message is announced. If the fault condition is active for the duration of this time delay, the High AC Current warning message (fault code 216) is announced.

### *High AC Current Shutdown Menu*

This menu is used to determine when a high AC current shutdown fault condition exists and for how long the fault condition should be present before the engine is shut down.

- *H. Curr Shutdown Threshold:* This threshold is used to set the percentage of rated AC current at which the High AC Current shutdown fault condition becomes active. This value can be set from 130 to 190% (default = 150%).
- *H. Curr Shutdown Time Delay:* A time delay of 2 to 60 seconds (default = 10 seconds) must expire before the engine shuts down because of a high AC current fault condition. If the fault condition is active for the duration of this time delay, the engine shuts down and the High AC Current shutdown message (fault code 46) is announced.

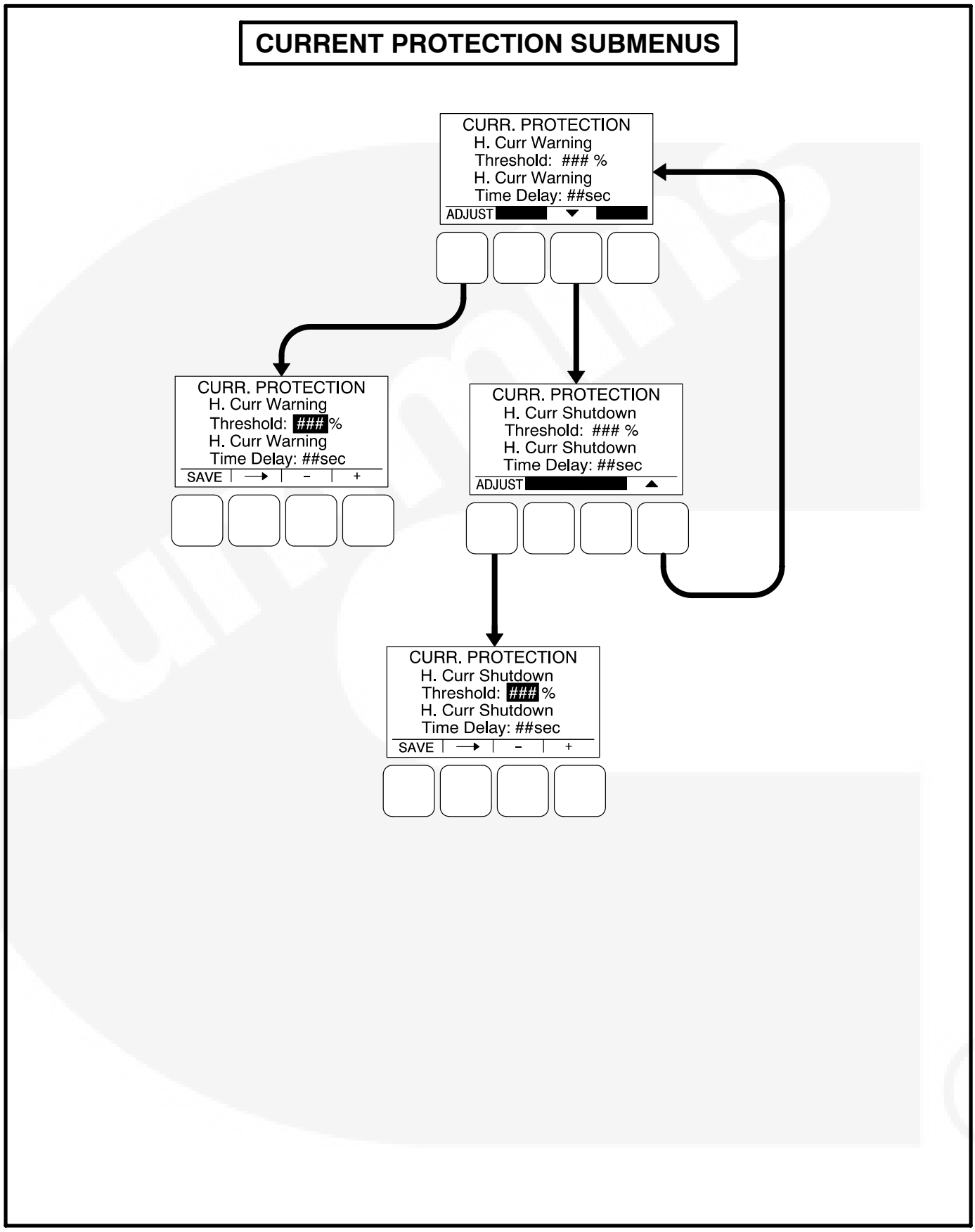


**FIGURE 5-18. CURRENT PROTECTION SUBMENUS**

## Engine Protection Submenus

The Engine Protection submenus are available by pressing the **(4)** button on the second Genset Setup menu (see Figure 5-14 or Figure 5-15).

The Engine Protection submenus (see Figure 5-19) are used to set thresholds to determine when engine fault conditions exist and time delays to determine how long a fault condition is present before the fault message is announced and, if necessary, shut down the engine.

### *Engine Protection Overspeed Menu*

This menu is used to set the value necessary to shut down the genset and activate an Overspeed shutdown message (fault code 31) on 50 and 60 Hz gensets, indicating that the engine has exceeded normal operating speed.

- *Overspeed (50Hz) Threshold:* This threshold is used to set the overspeed value necessary to activate an Overspeed shutdown fault condition on 50 Hz gensets. This value can be set from 0 to 8192 RPM, in 25 RPM increments (default = 1725 RPM).
- *Overspeed (60Hz) Threshold:* This threshold is used to set the overspeed value necessary to activate an Overspeed shutdown fault condition on 60 Hz gensets. This value can be set from 0 to 8192 RPM, in 25 RPM increments (default = 2075 RPM).

### *Engine Protection Speed/Frequency Menu*

This menu is used to determine when a speed/frequency conflict shutdown fault condition exists and for how long the fault condition should be present before the engine is shut down.

- *Speed/Freq Fault Threshold:* This threshold is used to set the value necessary to activate the speed/frequency conflict shutdown fault condition. This value can be set from 0.1 to 20.0 Hz (default = 2.0 Hz).
- *Speed/Freq Fault Time Delay:* A time delay of 0.2 to 10.0 seconds (default = 1 second) must expire before the warning message is announced because of a speed/frequency conflict shutdown fault condition. If the fault condition is active for the duration of this time delay, the genset is shut down and the Speed Hz Match shutdown message (fault code 71) is announced.

### *Low Oil Pressure Warning Menu*

This menu is used to determine when a low oil pressure warning fault condition exists and for how long the fault condition must be present before the warning message is announced.

- *LOP Warning Threshold:* This threshold is used to set the oil pressure value necessary to activate a Pre-Low Oil Pressure warning fault condition. This value can be set from 0 to 100 PSig (default = 35 PSig).
- *LOP Warning Time Delay:* A time delay of 2 to 15 seconds (default = 8 seconds) must expire before the warning message is announced because of a low oil pressure warning fault condition. If the fault condition is active for the duration of this time delay, the Pre-Low Oil Pressure warning message (fault code 215) is announced.

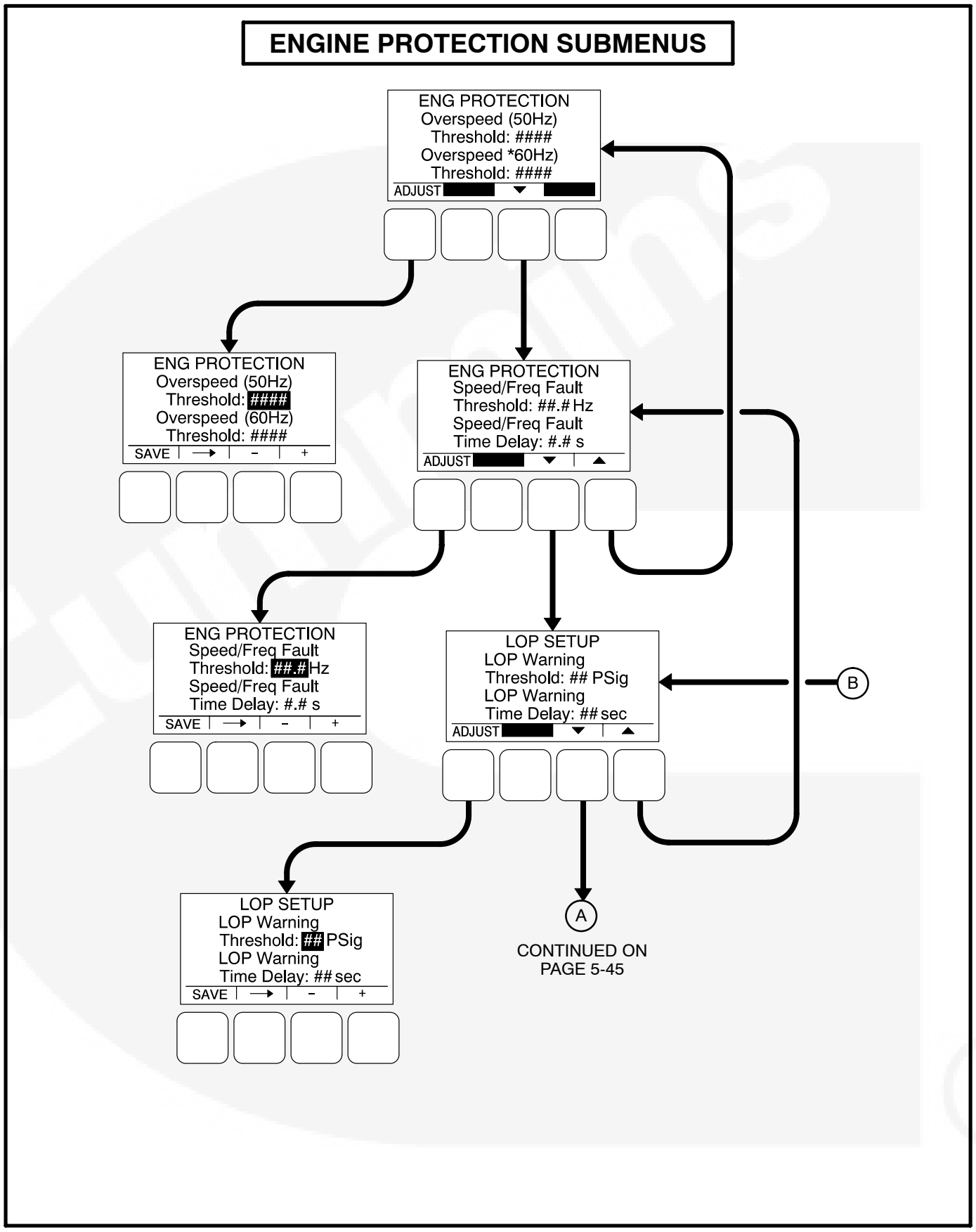


**FIGURE 5-19. ENGINE PROTECTION SUBMENUS (SHEET 1 OF 3)**

### *Low Oil Pressure Shutdown Menu*

This menu is used to determine when a low oil pressure shutdown fault condition exists and for how long the fault condition should be present before the engine is shut down.

- *LOP Shutdown Threshold:* This threshold is used to set the oil pressure value necessary to activate a Low Oil Pressure Shutdown fault condition. This value can be set from 0 to 100 PSig (default = 30 PSig).
- *LOP Shutdown Time Delay:* A time delay of 2 to 15 seconds (default = 8 seconds) must expire before the engine shuts down because of a low oil pressure fault condition. If the fault condition is active for the duration of this time delay, the engine shuts down and the Low Oil Pressure shutdown message (fault code 2) is announced.

### *High Coolant Temperature Warning Menu*

This menu is used to determine when a high coolant temperature warning fault condition exists and for how long the fault condition should be present before the warning message is announced.

- *HCT Warning Threshold:* This threshold is used to set the temperature value necessary to activate a High Coolant Temperature Warning fault condition. This value can be set from 150 to 290 degrees F (default = 215 degrees F).
- *HCT Warning Time Delay:* A time delay of 2 to 10 seconds (default = 2 seconds) must expire before the warning message is announced. If the fault condition is active for the duration of this time delay, the High Coolant Temperature warning message (fault code 202) is announced.

### *High Coolant Temperature Shutdown Menu*

This menu is used to determine when a high coolant temperature shutdown fault condition exists and for how long the fault condition should be present before the engine is shut down.

- *HCT Shutdown Threshold:* This threshold is used to set the temperature value necessary to activate a High Coolant Temperature Shutdown fault condition. This value can be set from 180 to 300 degrees F (default = 223 degrees F).
- *HCT Shutdown Time Delay:* A time delay of 2 to 10 seconds (default = 2 seconds) must expire before the engine shuts down because of a high coolant temperature fault condition. If the fault condition is active for the duration of this time delay, the engine shuts down and the High Coolant Temperature shutdown message (fault code 1) is announced.

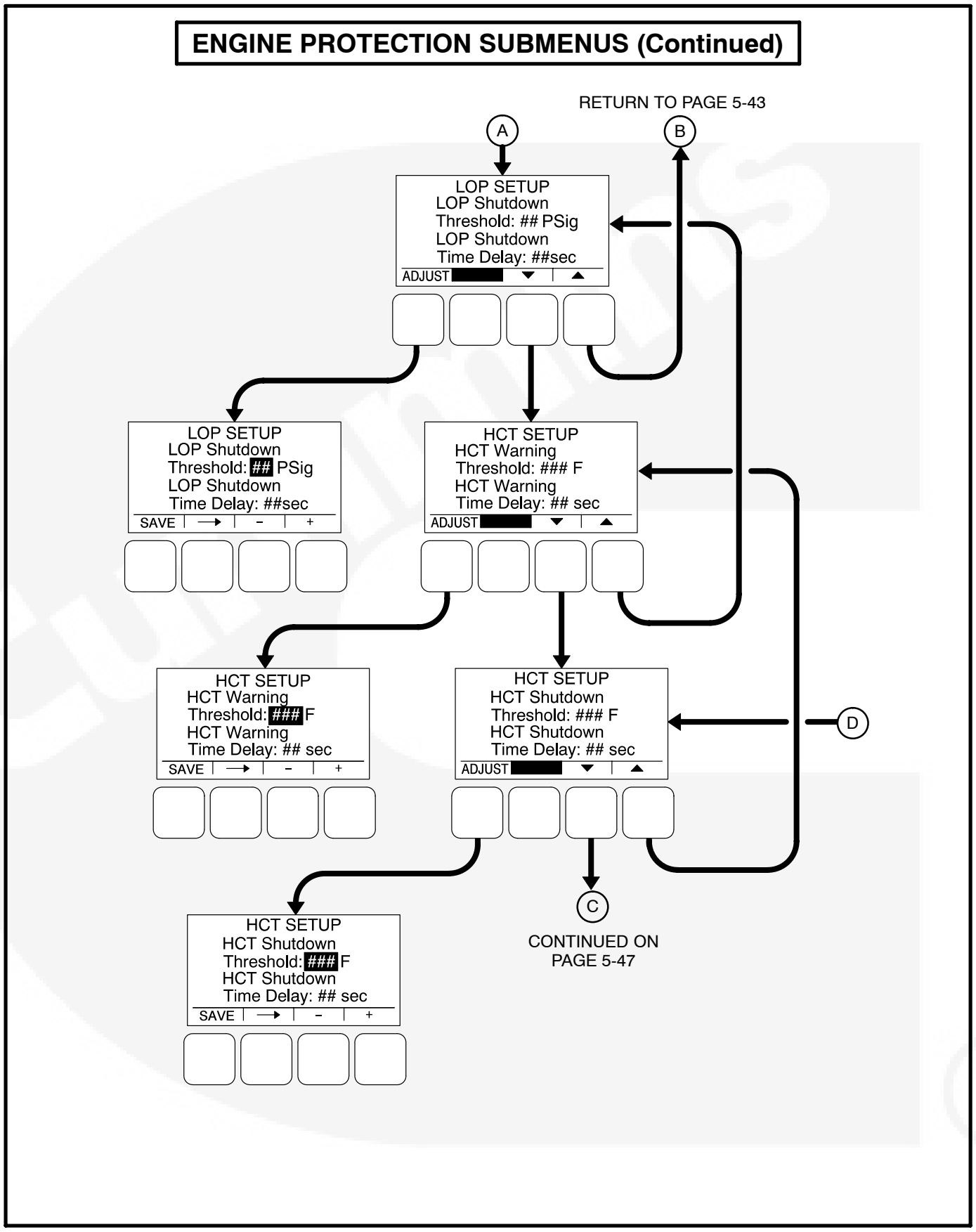


**FIGURE 5-19. ENGINE PROTECTION SUBMENUS (SHEET 2 OF 3)**

### *Engine Protection Low Coolant Temperature and Battery Charger Menus*

The low coolant temperature menu is used to determine when the genset's coolant temperature is too low and a Low Coolant Temperature warning message (fault code 203) is announced. This warning message is not announced unless the coolant temperature has been determined to be low for one minute.

- *LCT Warning Threshold:* This threshold is used to set the temperature value necessary to activate a Low Coolant Temperature Warning fault condition. This value can be set from 32 to 100 degrees F (default = 70 degrees F).

The battery charger menu is used to determine when the alternator charger failure condition exists and when the warning message should be announced. The fault condition exists when either the low or high threshold is reached.

- *Charger Failed H Threshold:* This threshold is used to set the high charging alternator voltage value. This value can be set from 13.0 to 20.0 VDC (default = 18.0 VDC) for 12V units and from 25.0 to 40.0 VDC (default = 32.0 VDC) for 24V units.

- *Charger Failed L Threshold:* This threshold is used to set the low charging alternator voltage value. This value can be set from 2.0 to 13.0 VDC (default = 5.0 VDC) for 12V units and from 2.0 to 25.0 VDC (default = 10.0 VDC) for 24V units.

- *Charger Failed Time Delay:* A time delay of 2 to 300 seconds (default = 120 seconds) must expire before the warning message is announced. If the fault condition is active for the duration of this time delay, the Charger Failure warning message (fault code 219) is announced.

## ENGINE PROTECTION SUBMENUS (Continued)

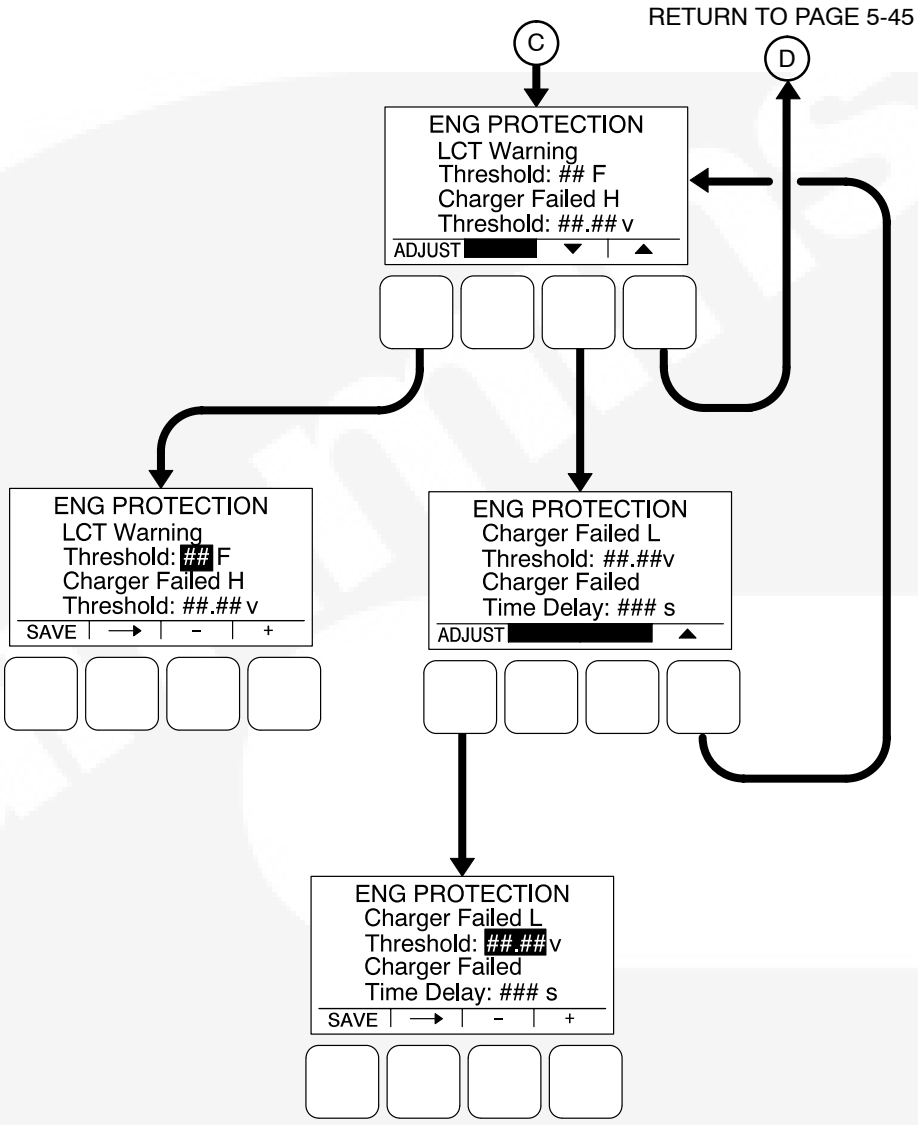


**FIGURE 5-19. ENGINE PROTECTION SUBMENUS (SHEET 3 OF 3)**

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# 6. 1301 Wiring Diagrams

## GENERAL

This section consists of the schematic and connection wiring diagrams referenced in the text. The following drawings are included.

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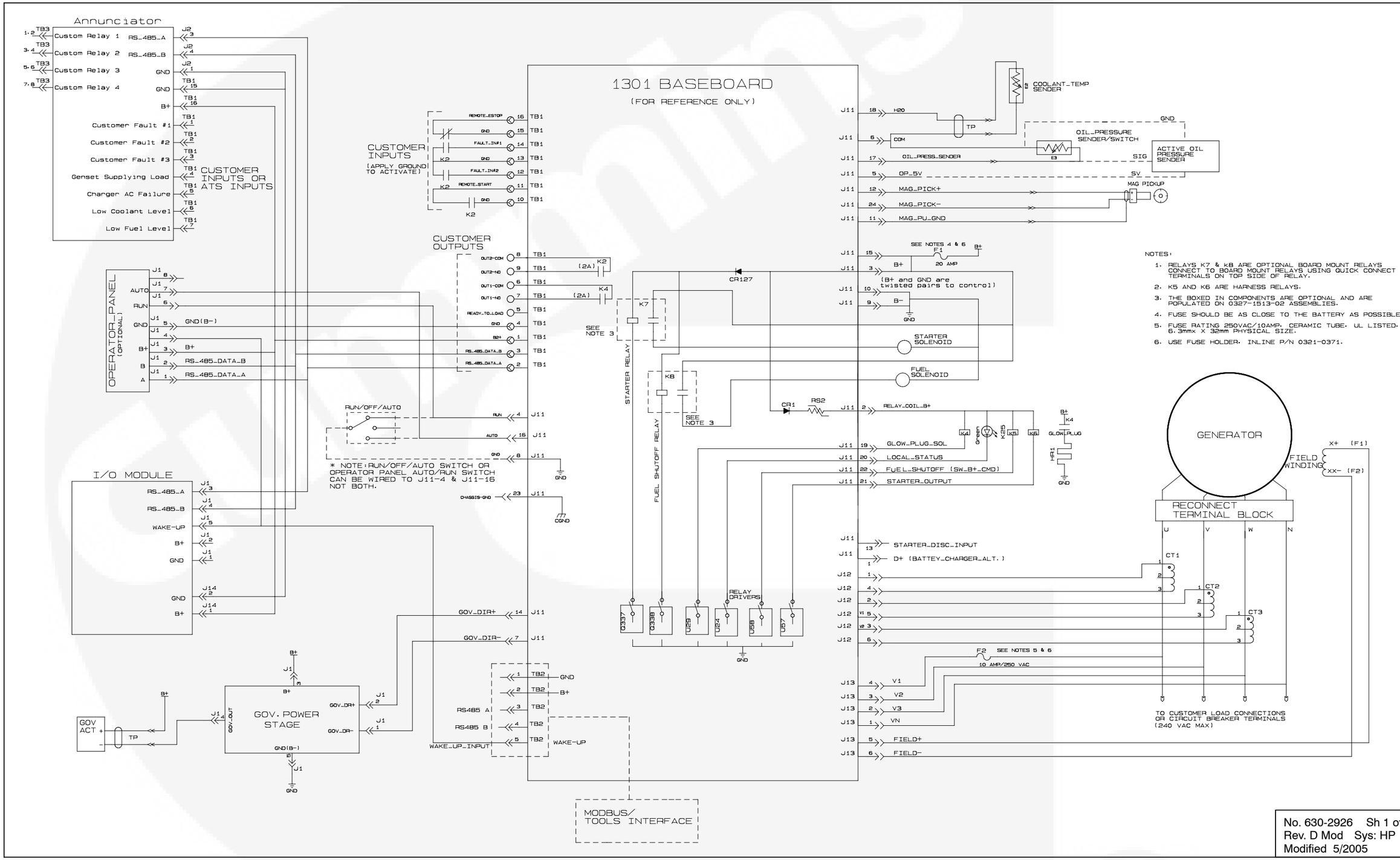


**FIGURE 6-1. 1301 CONTROL WIRING DIAGRAM**

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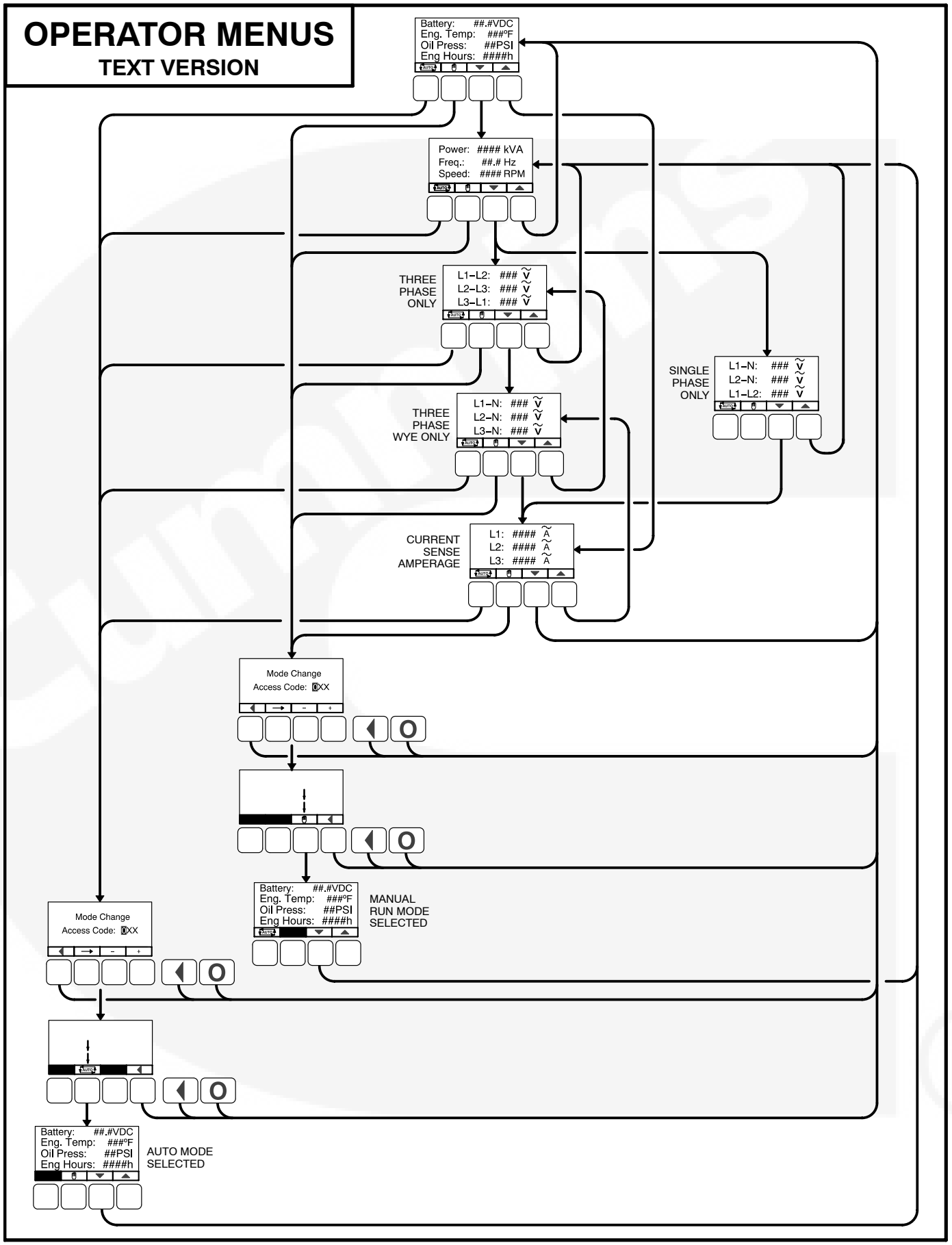
# Appendix A. 1301 Menu System Maps

The illustrations in this section show an overview of menu navigation. These illustrations can also be used to locate a submenu and determine how to access it.

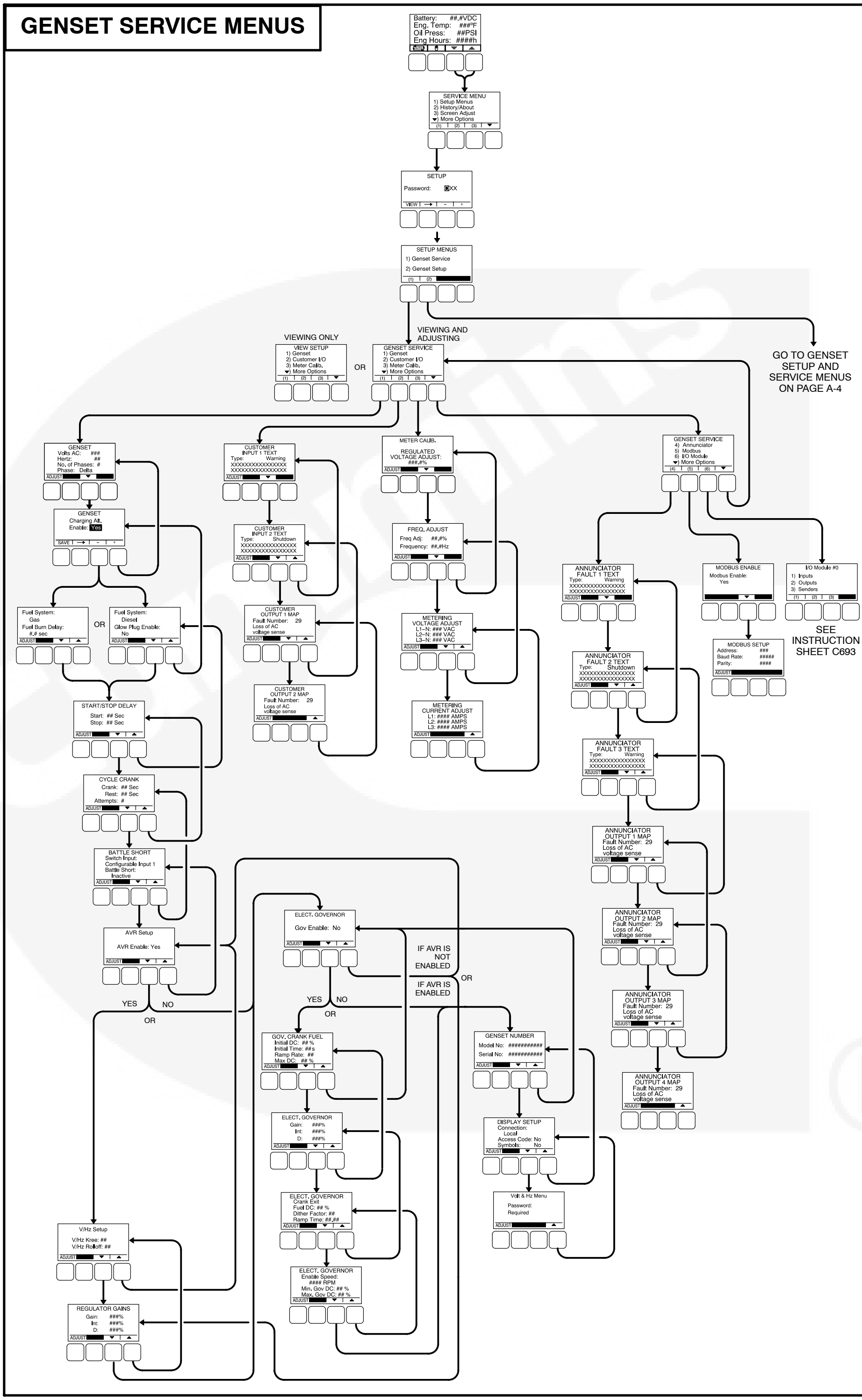
The first illustration shows the basic Operator Menus. The remaining two illustrations show the Service, Genset Setup, and Genset Service menus.

The illustrations only show the text versions of the menus. In addition, the menus shown in the setup and service menus reflect what is displayed if the appropriate passwords are entered for viewing and changing the menus.

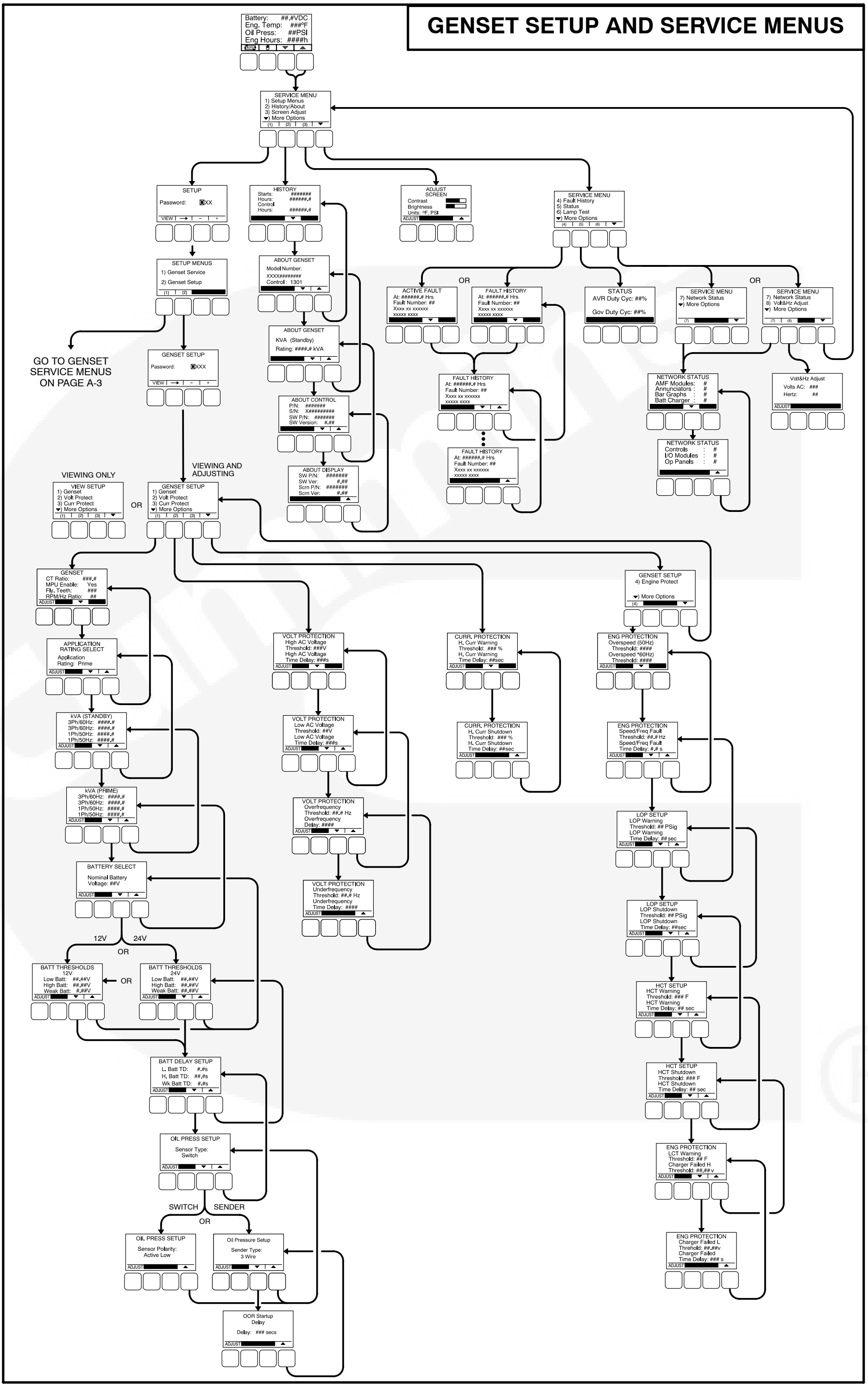
# OPERATOR MENUS
## TEXT VERSION



# GENSET SERVICE MENUS



# GENSET SETUP AND SERVICE MENUS



# Appendix B. Index

## GENERAL INFORMATION

## P



## R



## S



## T



## W

## A



## B



## C



## D



## E



## F



## G

## T



## U



## V

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