Owners Manual

Operator/Installation

Controller

PowerCommand®1302

English
Original Instructions

6-2014

900–0661 (Issue 10)

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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

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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 1302 series control. This manual includes information for the following types of installations.

- Kit 541−1414−01 is for Hydro Mechanical (HM) engines.
- Kit 541−1414−02 is for Full Authority Electronic (FAE) engines. FAE engines have an external Electronic Control Module (ECM).

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 1302 series 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.

CERTIFICATIONS

The 1302 series control meets or exceeds the requirements of the following codes and standards.

- NFPA110 for level 2 or 3 systems
- 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 or Industrial Emissions
- EN 50082−1,2 Residential/light industrial or Industrial susceptibility
- ISO 7637−2, level 2; DC supply surge voltage test
- Mil Std 202C, Method 101 and ASTM B117: Salt Fog test

This 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 1302 series control.

- **J11, J25, and J20** − AMP 794758-1
- **J12** − AMP 794275−1 Interface seal and AMP 794276−1 Wire seal (both are required)
- **J17** − AMP 794269−1 Interface seal and AMP 794276−1 Wire seal (both are required)
- **J18** − AMP 794271−1 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

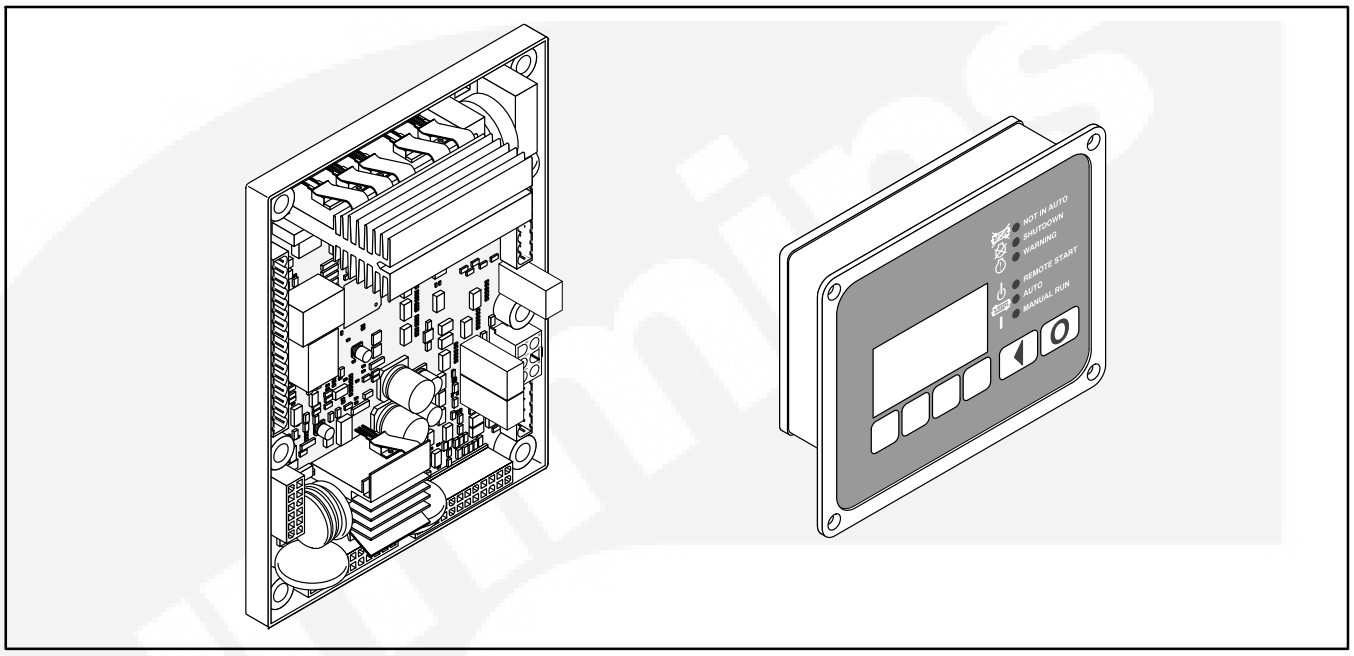


FIGURE 2-1. 1302 MAIN CONTROL BOARD AND OPERATOR PANEL (HMI211)

OVERVIEW

The PCC1302 controller is a microprocessor–based generator set (genset) monitoring, metering, and control system. The control provides a simple operator interface to the genset's digital voltage regulation, engine speed governing, remote start / stop control, and protective functions.

The PCC1302 control is suitable for use on hydro mechanical or FAE engines. It can be used in non-paralleling applications and it is compatible with reconnectable alternators up to 600VAC. The control can also be configured for various frequency (50 / 60 Hz operation), voltage, and power connection configurations from 190–600 VAC L-L.

The control is designed for mounting on the generator set. The 1302 series control is usually powered from the generator set starting batteries and works over a voltage range from 8 to 30 VDC.

The 1302 series control meets NFPA 110 requirements (with appropriate accessories) and is designed for connection to a 12 or 24 VDC control system.

An optional operator panel can be used as a user interface.

KIT DESCRIPTION

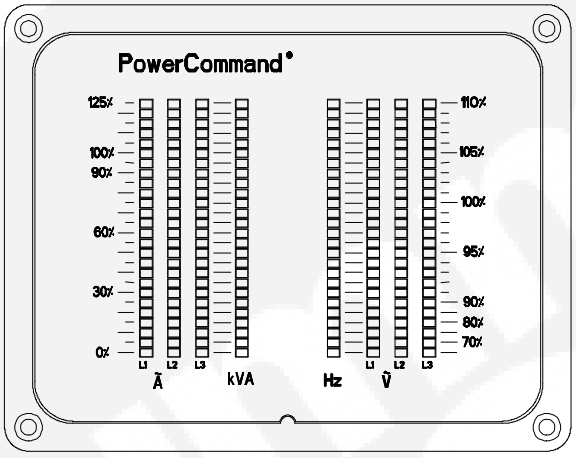
The 1302 genset control kits include the 1302 control board (12/24V control assembly with run and start relay drivers) and the operator panel shown in Figure 2-1. Also included in these kits are the following sensors and harnesses.

Description	Quantity	
	HM Kit 541–1414–01	FAE Kit 541–1414–02
Oil Pressure Sensor	1	—
Temperature Sensor	1	—
Coolant Temperature Sensor Harness	1	—
Oil Pressure Sensor Harness	1	—
Control Panel to PCC1302 Harness	1	1
Engine Harness	1	1
Genset AC Harness	1	1

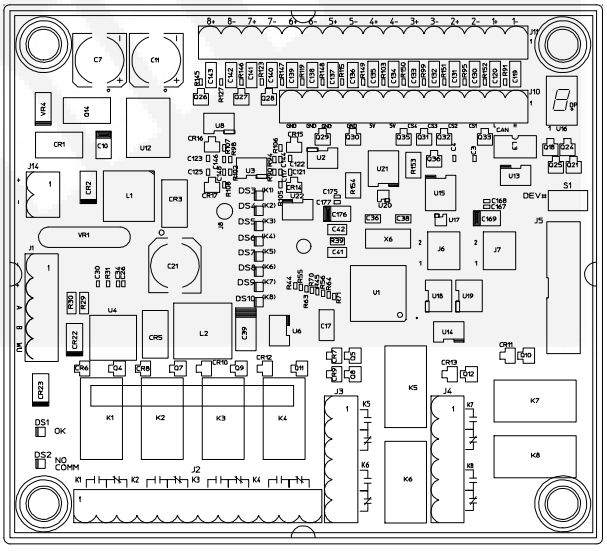
ADDITIONAL EQUIPMENT

Figure 2-1 shows the 1302 control module (327−1617−01) and the optional HMI211 digital display panel (300−6014). If your installation is to include any additional equipment (see Figure 2-2), the appropriate kit(s) must be purchased separately.

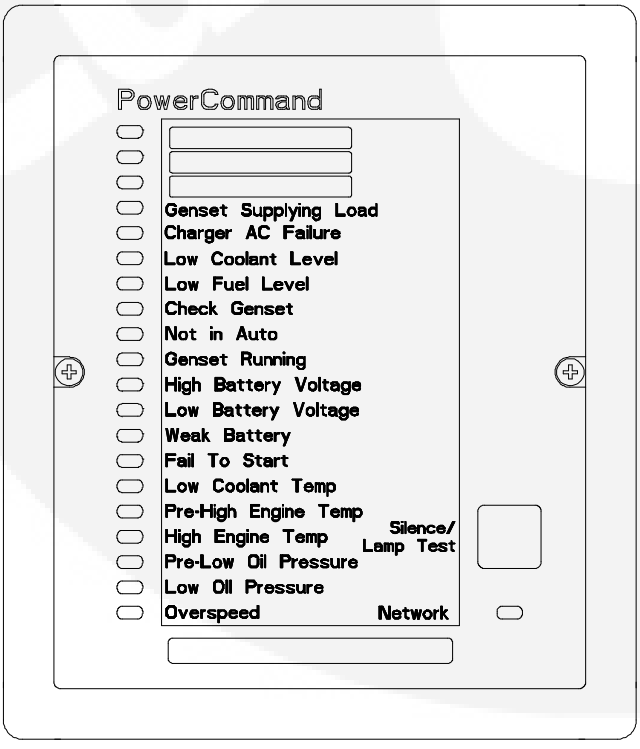
- HMI112 LED Bargraph − Kit 541−1319 (Includes Instruction Sheet C697)
- HMI113 Universal Annunciator − Kit 300−5929 (Includes Operator's Manual 900−0301)
- AUX101 System I/O Module − Kit 541−1291 (Includes Instruction Sheet C693)
- AUX104 External Governor Power Module − Kit 541−1231 (Includes Instruction Sheet C689)



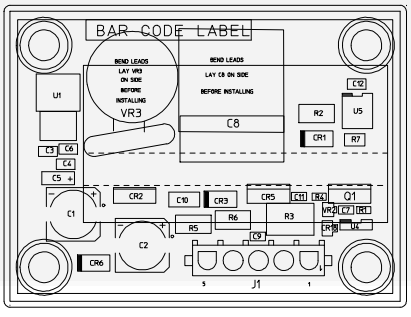
HMI112 LED BARGRAPH
(300−6050−02)



AUX101 SYSTEM I/O MODULE
(327−1536)



HMI113 UNIVERSAL ANNUNCIATOR
(300−5929)



AUX104 EXTERNAL GOVERNOR
POWER MODULE (327−1507)

FIGURE 2-2. ADDITIONAL EQUIPMENT

1302 CONTROL FEATURES

The 1302 series controller includes the following features.

- Operates on 12 or 24 VDC.
- Electronic Governor Enable/Disable (via an external Governor Power Module).
- FAE Engine support utilizing partial PGI CAN protocol support.
- Automatic Voltage Regulator (AVR) Enable/ Disable.
- PMG or Shunt Excitation methods supported.
- PCCNet Communications.
- ModBus Communications.
- Digital speed governing.
- Digital voltage regulation.
- Low power sleep mode, with configurable Wake-In-Auto mode.
- Phase voltage and current sensing. Wye and Delta voltage sensing single phase. Current sensing with an external 0–5 amp current transformers.
- Engine relay drivers.
- Generator set monitoring. Display status of all critical engine and alternator generator set functions.
- Genset protection – Engine and Alternator protection features.
- Operator Panel Display (optional). Provides easy to use operator display of critical genset parameters and operating history.
- Advanced serviceability using a PC based software service tool.
- Environmental protection. The control system is designed for reliable operation in harsh environments. The core control board is potted module that is fully protected from the elements.
- Configurable Inputs and Outputs. Four discrete configurable inputs and two dry contact relay outputs.
- Relay driver output for glow plug or spark igniter controller, switched B+, FSO, Starter, Ready to Load, Local Status, and Keyswitch control.

Current Requirements

The 1302 series control consumes 0.150 Amps of current while in idle mode. While in the running mode, it consumes 0.75 Amps of current. This doesn't include other application specific devices such as the optional operator panel, external actuators, relay coils, or display lamps.

1302 CONTROL SYSTEM

Control Module

The basic control system for the generator set consists of a single control board with an external control switch and status indicator.

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, 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. When in OFF mode, all active faults are reset.

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 1302 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 2-3). 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.

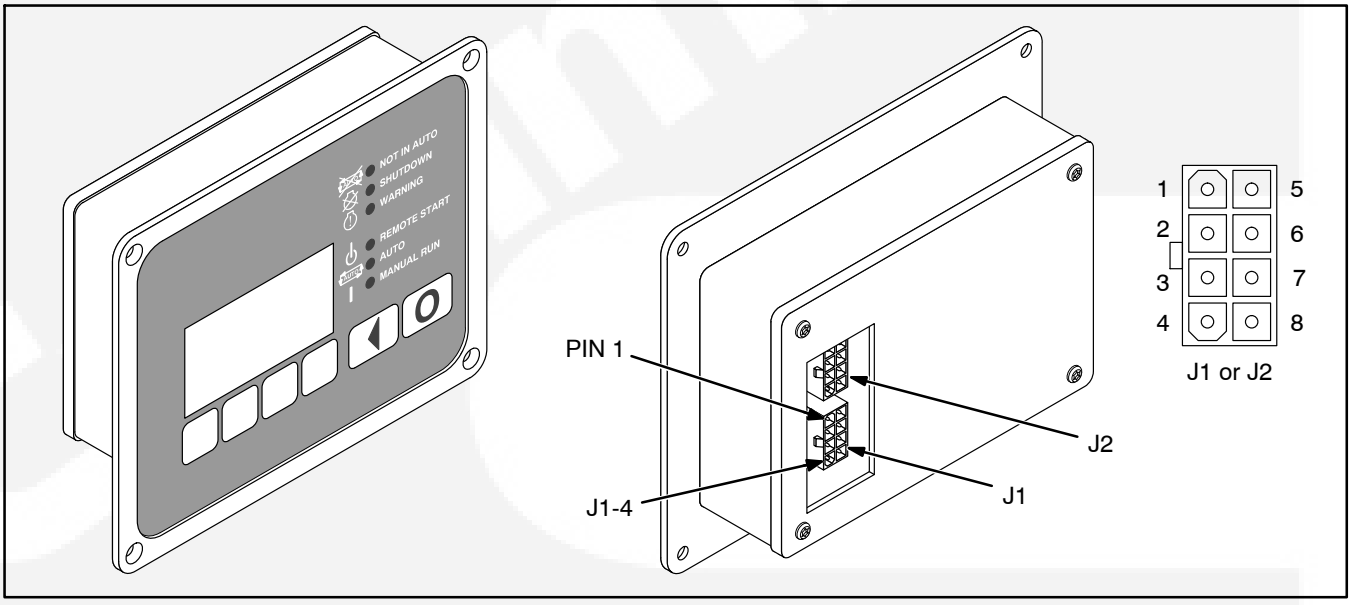


FIGURE 2-3. 1302 OPERATOR PANEL

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	PCCNet System Wake Up	System Wakeup
J1-5	Return	Network Supply Return
J1-6	Run Output	
J1-7	Auto Output	
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
- Local emergency stop
- Coolant temperature signal
- Lube oil pressure signal
- Battery voltage signal
- PCCNet System Wake Up Input
- Magnetic pick up signal
- Starter disconnect signal
- Single or three-phase current transformers (CTs)
- Single or three phase line-to-neutral voltage
- Configurable inputs – The control includes four inputs that have configurable functions. Once mapped, each configurable input can be used as a fault input, remote fault reset input, battleshort input, or disabled.

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 low 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 – This communication port (TB15) allows 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) via the ModBus protocol.
  - PCCNet – This communications port (TB1) allows for connection from the control to the optional operator panel, universal annunciator, LED bargraph, and system I/O module.
- Local status – Refer to “Local Status Output Indicator” on page 4-1.
- Battery charging alternator – Alternator flash connection
- Fuel shut-off relay driver
- Starter relay driver
- Keyswitch relay driver
- Glow plug relay driver
- Governor drive PWM command
- Field coil – AVR PWM command
- Excitation source – Input power for field coil
- Alternator line voltage sensing – 600 VAC RMS max
- Switched B+ driver

PROTECTION AND FAULTS

The 1302 series control features genset protection functions and fault detection.

Upon operation of a protective function, the control will indicate a fault by flashing the fault code on the local status lamp driver (J25–1). On systems with an optional operator panel, the warning or shutdown LED lights and the fault symbol and code is displayed on the display. The nature of the fault and time of occurrence is logged in the control. The service manual and PC based service tool provide service keys and procedures based upon the service codes provided.

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 1302 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 1302 series control accepts up to four 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.
- **Dead Battery Voltage Shutdown** –Indicates battery voltage drop during cranking which resets control for three consecutive times (This feature is available in 1302 calibration version 3.0 onwards)
- **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.
- **Overcurrent Warning/Shutdown** – Implementation of the thermal damage curve with an instantaneous trip level is calculated based on the Current Transformer Ratio and the Application Power Rating (see Figure 2-4).

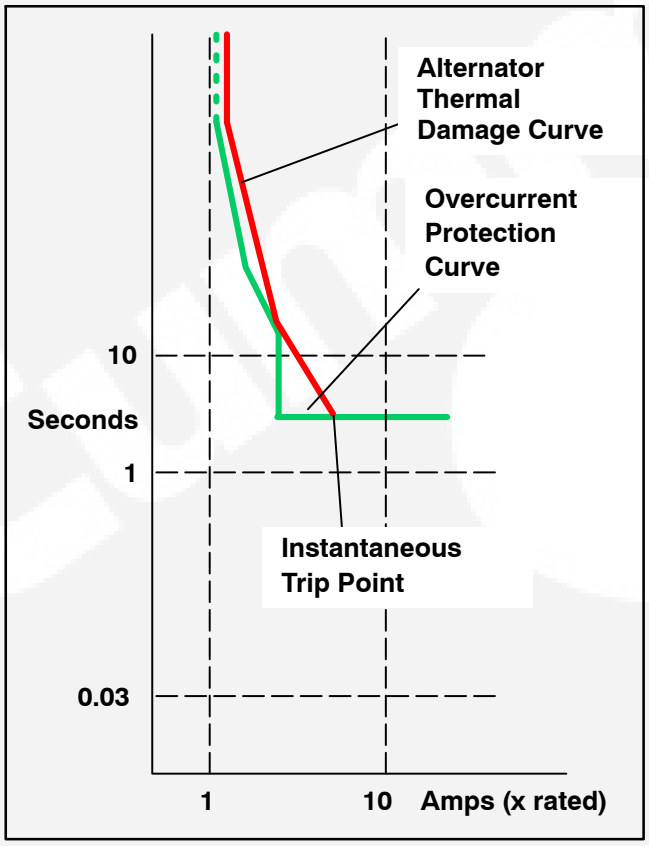


FIGURE 2-4. ALTERNATOR PROTECTION THERMAL DAMAGE CURVE

- **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. This fault will also be the primary way to detect short circuit conditions.
- **Overexcitation Shutdown** – Overexcitation is used to detect short circuit alternator faults.

CURRENT DRAW

The current draw information below is for the 1302 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 1302 series control consumes .750 amps of current.

Parade Rest Mode

Parade Rest mode is when the 1302 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 1302 series control enters Sleep mode after five minutes in the Off or Auto mode. During Sleep mode, the control consumes 60 milliamps of current.

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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 re-attached, 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 optional 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 optional 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 or 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.

1302 Main Control Board

The main control board is designed to withstand vibration levels of 50 mm / sec in the 20–100 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.

1302 Operator Panel

The optional operator panel is designed to withstand vibration levels of 40 mm / sec in the 4–100 Hz range and 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.

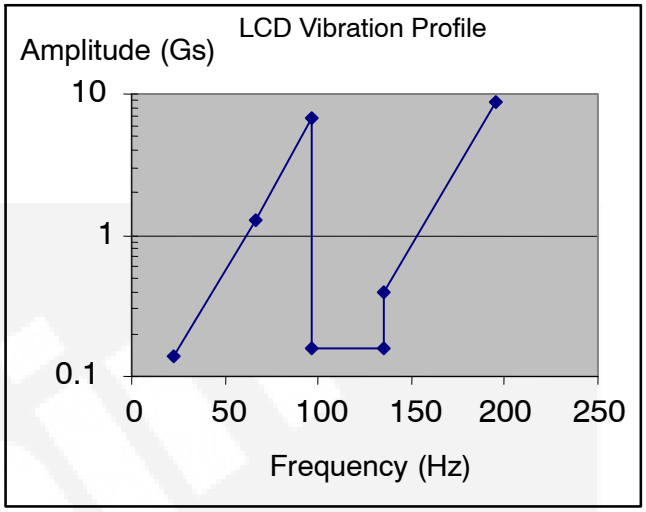


FIGURE 3-1. OPERATOR PANEL VIBRATION LIMITS

CONTROL WIRING INFORMATION

- For connecting the Magnetic Pickup, use minimum 0.8 sq. mm (18 gage), 2 conductors, twisted shielded cable. Connect the shield at J11-8 and leave the shield un-connected at the magnetic pickup side of the cable.
- For connection the ECM CAN, use minimum 0.8 sq. mm (18 gage), 2 conductors, twisted shielded cable. Connect the shield at J11-17and leave the shield un-connected at the ECM side of the cable.
- For connecting the PCCNet, use minimum 0.8 sq. mm (18 gage), 2 conductors, twisted cable.
- For connecting the battery supply, use two twisted pair wires (16 AWG).
- For connecting current transformers, use three twisted pair wires minimum (16 AWG).
- 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 1302 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 1302 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

NOTE: in PCC1302,if trim parameter *Current Multiplier* 2X Enable is enabled and only one of the two alternator winding phase cables is routed through CT, then the current measurement calculation will be multiplied by 2 to show the correct reading of the load current.

Current Transformer Selection

Current transformers (CTs) used in 1302 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 Maximum 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 1302 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: To check the actual genset output, True (calibrated) RMS meter should be used The 1302 series control automatically doubles the entered CT ratio when switching from high nominal voltage (above 300V) to lower nominal voltage (below 300V).

When entering a CT ratio the following rules apply:

- Two Lead CT, above 300V application – Enter CT ratio as read from the CT.
- Two Lead CT, below 300V 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.

Two Lead CT Setup Example:

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

Operator Panel

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

Manufacturing Tool

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

PC-Based Service Tool

- Above 300V applications – Enter 1500 into the Primary CT Current parameter, using the PC-based service tool (e.g. InPower).
- Below 300V applications – Enter 750 into the Primary CT Current parameter, using the PC-based service tool (e.g. InPower).

In PCC1302 Control, Voltage Calibration procedure is divided into three processes as described below:

1. Meter Calibration: There are two sets of AC inputs on the 1302: L1–N, L2–N, and L3–N (or L1–2, L2–3, L3–1 for delta) AND 3 phase average voltage. The metering calibration will calibrate L1–N, L2–N, L3–N., which is used for display and diagnostic purposes. Method: Verify each phase on PCC matches external calibrated meter. This calibration should be done first.
2. Regulation Calibration: This calibrates the 3 phase average voltage, which is used for regulation. Method: Verify the 3 phase average voltage of the genset matches an external meter's voltage. Special note: When changing the regulation feedback calibration, the PCC's feedback will appear to say the same, and the external meter's value will change. This is because the PCC regulator is active, and is making what the PCC sees be the PCC's Setpoint.
3. Voltage Adjust: Once both the metering and voltage calibration is done, you use the voltage adjust to modify the PCC's voltage Setpoint (i.e. for example: If the user wants the PCC to output 215VAC instead of 220VAC)

Procedure of calibrating the Alternator Voltages is as follows:

Safety Precautions:

1. Contacting high voltage components can cause electrocution, resulting in severe personal injury or death. Calibration and adjustment must be performed by technically qualified personnel only. Read and observe all the Warnings and Cautions in your generator set manuals.
2. Improper calibration and adjustment of the PCC can cause equipment malfunction or damage. Calibration and adjustment must be performed by technically qualified personnel only.

One or more of the PCC's internal circuits may need to be calibrated, in which case you should calibrate the internal circuits in the following order listed in the table shown below:

NOTE: To check the actual genset output, True (calibrated) RMS meter should be used.

TABLE 3-1. CALIBRATION

Component to be calibrated	Calibration method	
	PC based service tool	**Operating panel**
Meter Calibration or Voltage measurement for display	1. Connect to the control with your PC based service tool. 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. 3. With the genset OFF, attach a calibrated Voltmeter to the AC Output from L1 to L2. (L1 to Neutral for single phase alternators). 4. Start the genset and allow it to reach normal operating speed. 5. Calibrate voltage reading for L1 by adjusting the trim Alternator L1–N 50Hz Voltage Display Adjust or Alternator L1–N 60Hz Voltage Display Adjust trim for your application, so that the reading on the display agrees with the calibrated voltmeter. 6. Shut the generator set OFF. 7. Repeat Step 3 to Step 6 for L2 and L3 (In Step 3 attach meter to the AC output from L2 to L3 to calibrate L2 and L3 to L1 to calibrate L3) by adjusting the trims Alternator L2–N 50Hz Voltage Display Adjust or Alternator L2–N 60Hz Voltage Display Adjust trim and Alternator L3–N 50Hz Voltage Display Adjust or Alternator L3–N 60Hz Voltage Display Adjust trim respectively. 8. 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 operating menus. 2. Select item 1, ”Setup Menu”. 3. Enter Setup menu password ”574”. 4. Select item 1, ”Genset Service”. 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. 6. Press the back button to return to service menu. 7. With the genset OFF, attach a calibrated Voltmeter to the AC Output from L1 to L2. (L1 to Neutral for single phase alternators). 8. Start the genset and allow it to reach normal operating speed. 9. Select item 3, ”Meter Calib”. 10. Press the down arrow twice to scroll down to the ”Metering Voltage Adjust” 11. Adjust the three parameters one by one listed so that the reading on the display agrees with the calibrated voltmeter. 12. Shut the generator set OFF. 13. Repeat Step 7 to Step 12 for L2 and L3 (In Step 3 attach meter to the AC output from L2 to L3 to calibrate L2 and L3 to L1 to calibrate L3) by adjusting the trims Alternator L2–N 50Hz Voltage Display Adjust or Alternator L2–N 60Hz Voltage Display Adjust trim and Alternator L3–N 50Hz Voltage Display Adjust or Alternator L3–N 60Hz Voltage Display Adjust trim respectively. 14. Save the adjustment by pressing the ”Save” button.

Regulation Calibration or Voltage measurement for regulation	1. Connect to the control with your PC based service tool. 2. Verify the nominal voltage trim is set to the desired value. 3. With the genset OFF, attach a calibrated Voltmeter to the AC Output from L1 to L2. 4. Start the genset and allow it to reach normal operating speed. 5. 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 will lower the regulated voltage, and decreasing the trim will raise the regulated voltage. The monitored Regulated Voltage will match with the reading on the attached external calibrated meter and the Regulated Feedback Voltage (Alternator Voltage) matches the desired Nominal voltage. 6. Shut the generator set OFF. 7. 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 operating menus. 2. Select item 1, ”Setup Menu”. 3. Enter Setup menu password ”574”. 4. Select item 1, ”Genset Service”. 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. 6. Press the back button to return to service menu. 7. Start the genset and allow it to reach normal operating speed. 8. Select item 3, ”Meter Calib”. 9. Press the ”Adjust” button and change the ”Reg Volt Adj” value. The effect of this trim is Inverse on the regulated voltage. Increasing the trim will decrease the regulated voltage. Decreasing the trim will increase the regulated voltage. 10. Save the adjustment by pressing the ”Save” button.
Voltage Setpoint Adjustment	1. Connect to the control with your PC based service tool. 2. Verify the nominal voltage trim is set to the desired value. 3. With the genset OFF, attach a calibrated Voltmeter to the AC Output from L1 to L2. 4. Start the genset and allow it to reach normal operating speed. 5. Adjust the trim Voltage Adjust which shall move the voltage Setpoint either in positive direction or in negative direction as per your requirement.	Not Applicable.
NOTE: 1. Meter Calibration is what all the diagnostics use and the display shows, while Regulator Calibration it the feedback going to the AVR. Thus Meter Calibration and the Regulator calibration shall be done when the PCC1302 control is initially calibrated or if the boards are swapped / replaced with the new ones. 2.Voltage Setpoint adjustment shall be carried out as and when required to move the voltage Setpoint.		

Three Lead CT Setup Example

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 750 into the Primary CT Current parameter using a PC based service tool (e.g. InPower).

BATTERY CHARGING ALTERNATOR CONNECTIONS

The 1302 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.

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.

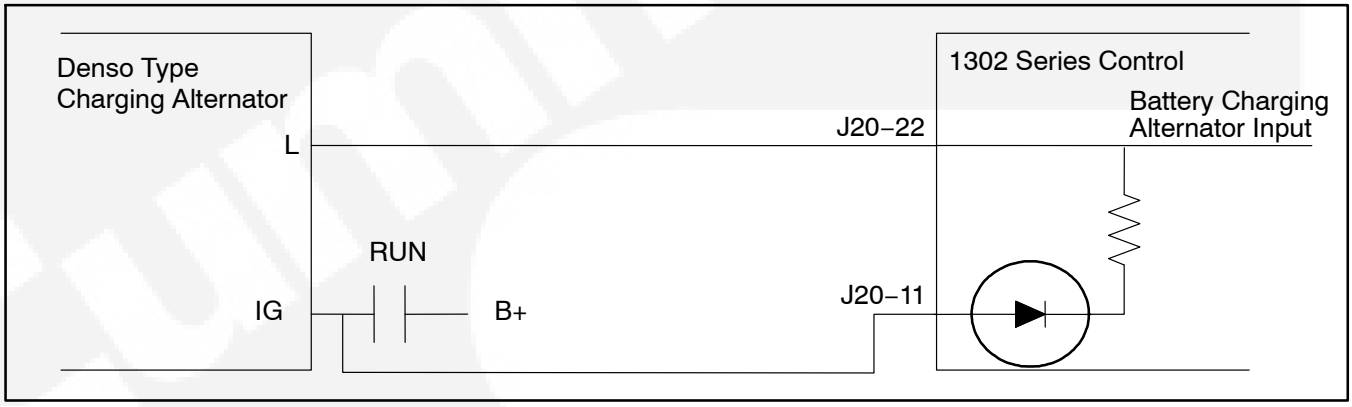


FIGURE 3-2. DENSO CHARGING ALTERNATOR WIRING DIAGRAM

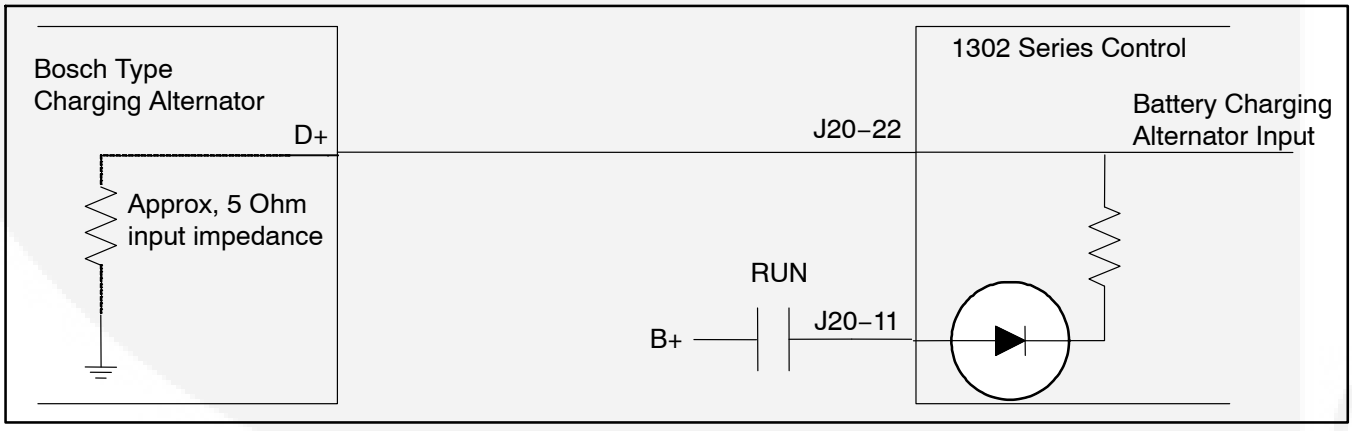


FIGURE 3-3. BOSCH CHARGING ALTERNATOR WIRING DIAGRAM

ALTERNATOR CONNECTIONS

A fast acting UL certified ceramic fuse with a rating of ten amperes shall be placed inline with the Excitation Inputs J18-1 and J18-2.

Series Star

Series star connection yields an output voltage of 220–277/380–480 volts. Figure 3-4 shows the correct series–star alternator connections.

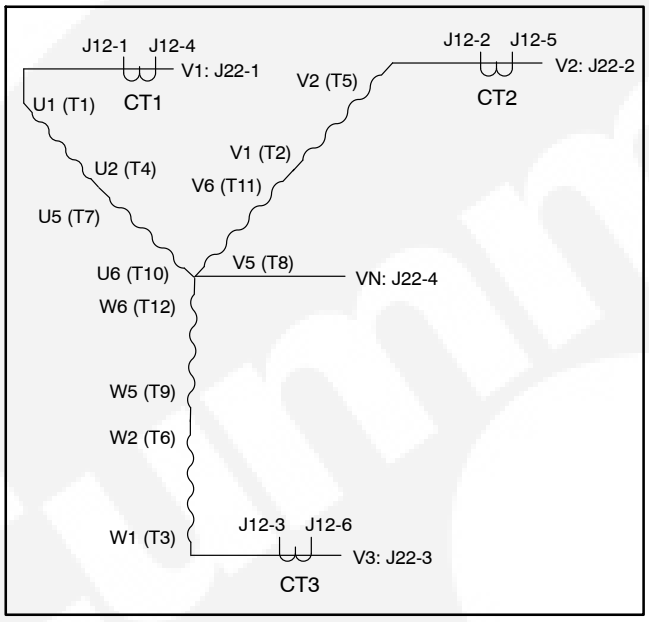


FIGURE 3-4. SERIES STAR CONNECTIONS

Series Delta

Series delta provides for an output voltage of 110–120/220–240 volts. Figure 3-5 shows the correct series delta connections.

NOTE: To check the actual genset output, True (calibrated) RMS meter should be used 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 3-6 illustrates the correct parallel star connections.

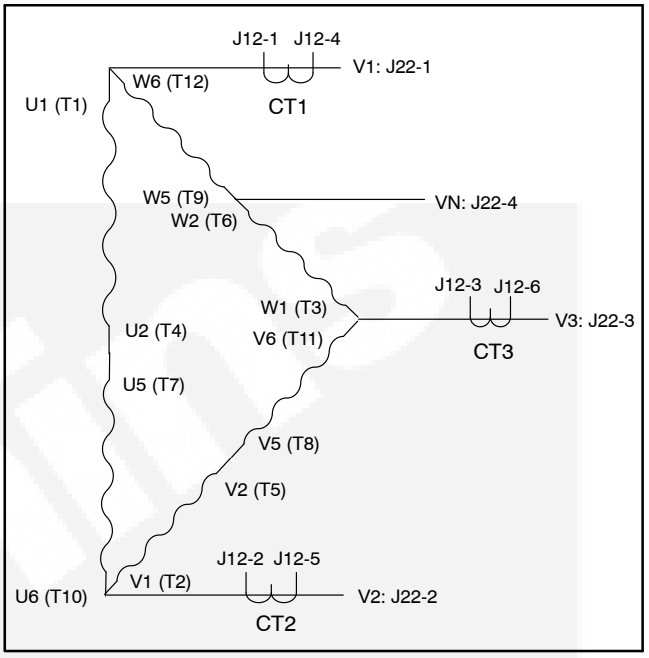


FIGURE 3-5. SERIES DELTA CONNECTIONS

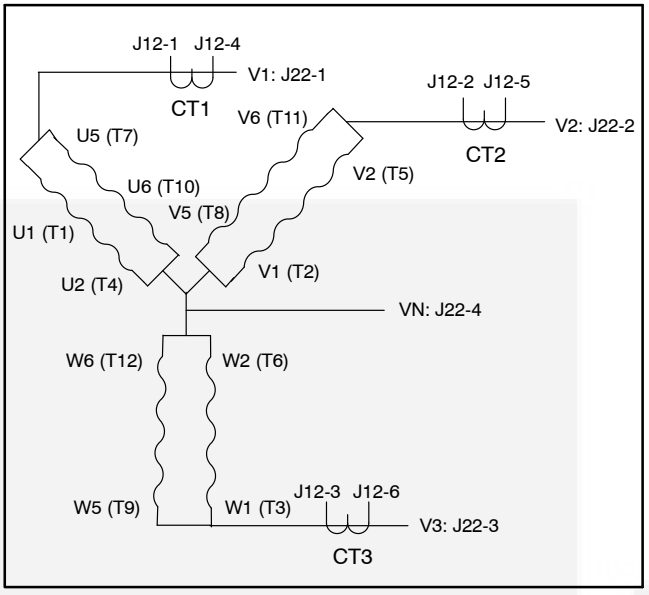


FIGURE 3-6. PARALLEL STAR CONNECTIONS

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 3-7.

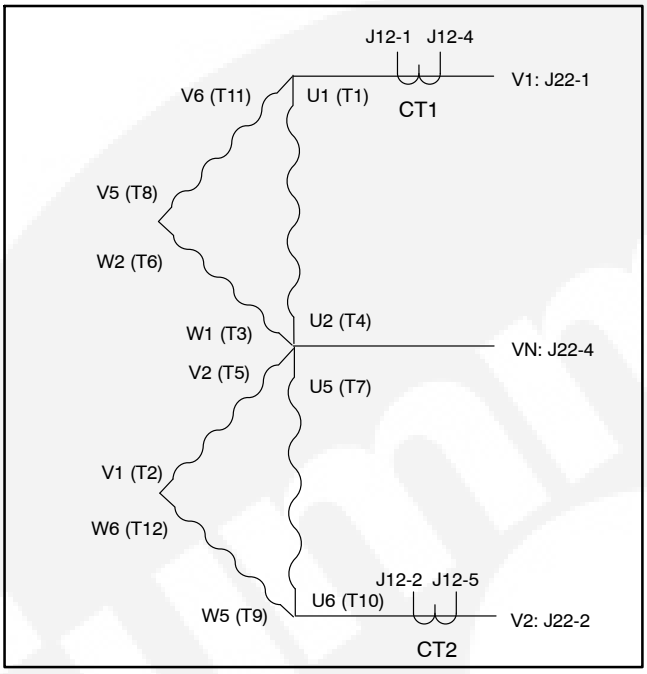


FIGURE 3-7. DOUBLE DELTA CONNECTIONS

Single Phase

Single phase provides for an output voltage of 110–120/220–240 volts. Single phase alternator connections are shown in Figure 3-8.

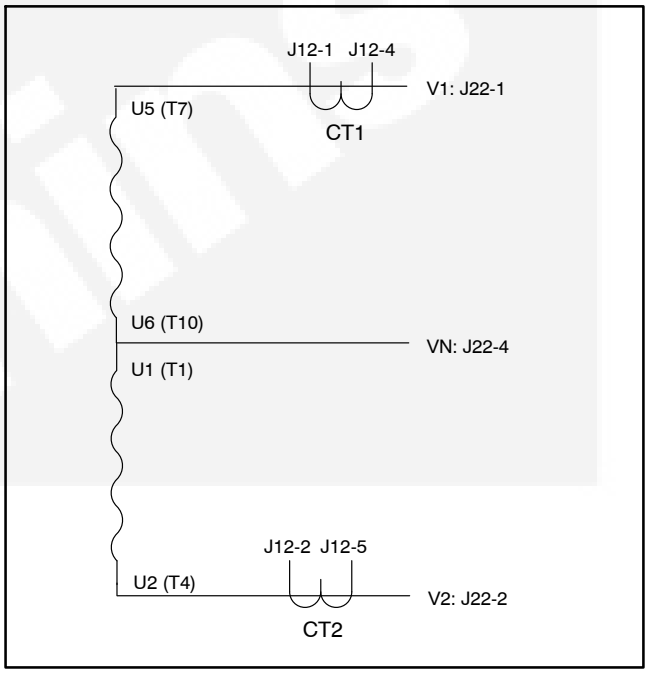


FIGURE 3-8. SINGLE PHASE CONNECTIONS

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 1302 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 1302 series control can be programmed for either oil pressure sensors or switches. The trim parameter for this is: Lube Oil Pressure Sensor Type = Sensor, Switch. If the type is set to Sensor, the control can also be programmed for either 3-wire or 2-wire sensors. The trim parameter for this is Oil Pressure Sender Type = 3-wire, 2-wire. 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 5-43.

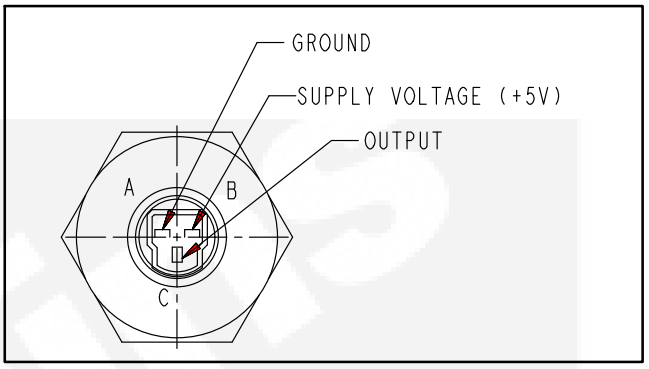


FIGURE 3-9. THREE-WIRE PRESSURE SENSOR CONNECTIONS

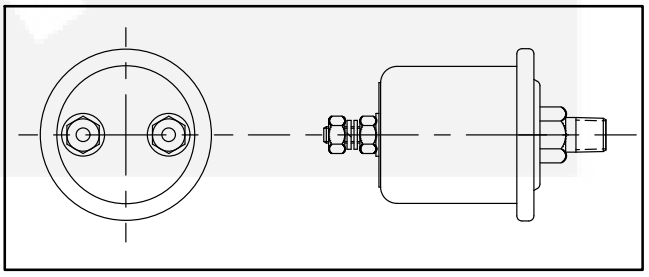


FIGURE 3-10. TWO-WIRE PRESSURE SENSOR CONNECTIONS

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
193–0430–02	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
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)
309–0641–XX	Stewart Warner	Pressure Switch			(See the following page)
A028X493	Kavlico P4055–5001–1	3-Wire Active Sender (Capacitive)	0–100 PSIG	0–5 VDC	Mating Connector 326–1666 (Packard 12065287) includes 323–1667 socket terminals (Packard 12103881)

Lube Oil Pressure Switch

The part number for the Lube Oil Pressure Switch is 309–0641–XX. The XX portion of the 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 operator 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 5-43.

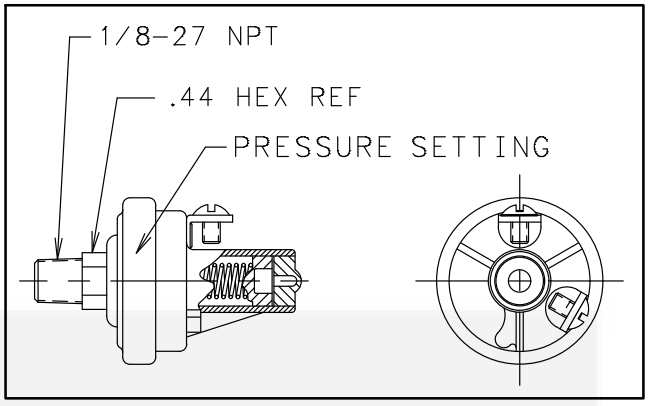


FIGURE 3-11. PRESSURE SWITCH

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 1302 control board includes the following connectors (see Figure 3-12).

⚠ CAUTION ***Reversing the power supply connections on TB1 and/or TB15 can permanently damage the control. Refer to drawing 630–3270 for proper connections.***

- TB1 – Customer connections (see Table 3-5 and sheet 3 of Figure 7-1)
- TB15 – Tools interface connections (see Table 3-6 and sheet 3 of Figure 7-1)
- J11 – Engine connections (see Table 3-7)
- J12 – Genset CT connections (see Table 3-8)
- J17 – Field winding connections (see Table 3-9)
- J18 – Field power connections (see Table 3-10)
- J20 – Genset connections (see Table 3-11)
- J22 – Alternator voltage sense connections (see Table 3-12)
- J25 – Display connections (see Table 3-13)

Mating connector and connector pin part numbers for the control board are listed in Table 3-14.

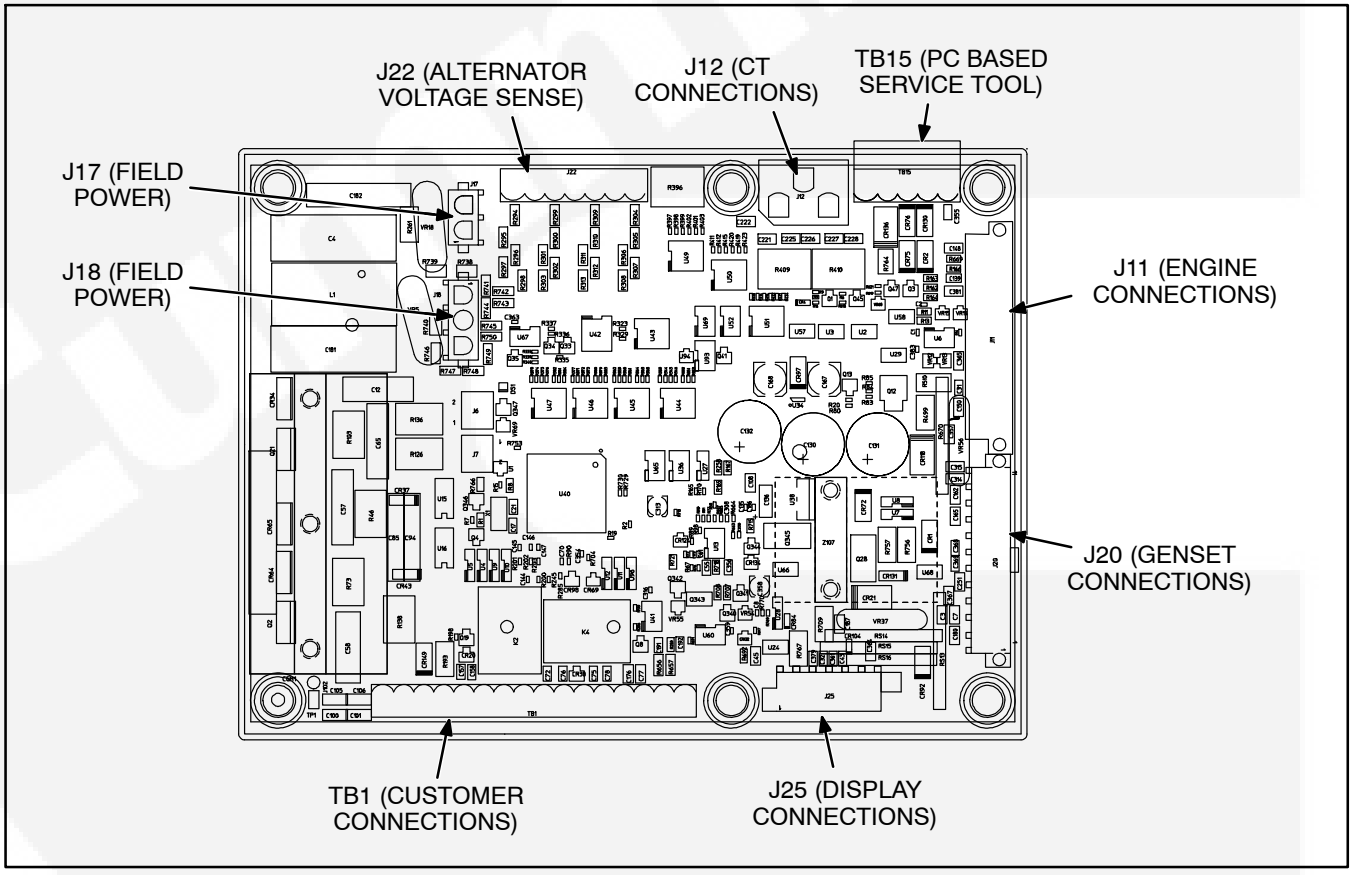


FIGURE 3-12. CONTROL BOARD CONNECTIONS

TABLE 3-5. TB1 – CUSTOMER CONNECTIONS

Pin	Signal Name	Connect To
TB1-1	PCCNet A	Network Data A
TB1-2	PCCNet B	Network Data B
TB1-3	PCCNet Shield / B+ Return	
TB1-4	Ready to Load	20ma Low Side Relay Driver
TB1-5	B+ Output (5A)	
TB1-6	Configurable Relay 1 – A	
TB1-7	Configurable Relay 1 – B	
TB1-8	Configurable Relay 2 – A	
TB1-9	Configurable Relay 2 – B	
TB1-10	Remote Start Return	
TB1-11	Remote Start	
TB1-12	Configurable Input 1	Pull to TB1-13 to activate input. Remove from TB1-13 to deactivate input.
TB1-13	Configurable Input – Common	Common for the two fault inputs
TB1-14	Configurable Input 2	Pull to TB1-13 to activate input. Remove from TB1-13 to deactivate input.
TB1-15	Remote E-STOP Return	Remote normally closed E-STOP switch
TB1-16	Remote E-STOP	Remote normally closed E-STOP switch

TABLE 3-6. TB15 – TOOLS INTERFACE CONNECTIONS

Connector Pin	Signal Name	Connect To
TB15-1	Return	Network Power Supply Return
TB15-2		
TB15-3	RS-485 Data A	Network Data A
TB15-4	RS-495 Data B	Network Data B
TB15-5	PCCNet System Wakeup	

TABLE 3-7. J11 – ENGINE CONNECTIONS

Connector Pin	Signal Name	Connect To
J11-1	Oil Pressure Sender (Active) +5V	
J11-2	Oil Pressure Sender or Switch Return	
J11-3	Oil Pressure Sender	
J11-4	Governor Drive –	Governor PWM low side driver
J11-5	Governor Drive +	Governor drive + (for low side driver)
J11-6	Relay Coil B+	Coil for glow plug relay
J11-7	Glow Plug / Ignition Control Relay Driver	Low side of the relay coil
J11-8	Magnetic Pickup Shield	
J11-9	Magnetic Pickup Supply	
J11-10	Magnetic Pickup Return	
J11-11	Coolant Temperature Sender	
J11-12	Coolant Temperature Sender Return	
J11-13	NA	
J11-14	NA	
J11-15	NA	
J11-16	NA	
J11-17	ECM CAN Shield	
J11-18	B+ Return for ECM	
J11-19	ECM CAN Low	
J11-20	ECM CAN High	
J11-21	Keyswitch Low Side Driver	Low side of keyswitch relay coil
J11-22	Keyswitch Relay Coil B+	High side of keyswitch relay coil
J11-23	NA	
J11-24	NA	

TABLE 3-8. J12 – GENSET CT CONNECTIONS

Connector Pin	Signal Name	Connect To
J12-1	CT1	
J12-2	CT2	
J12-3	CT3	
J12-4	CT1 Common	
J12-5	CT2 Common	
J12-6	CT3 Common	

TABLE 3-9. J17 – FIELD WINDING CONNECTIONS

Connector Pin	Signal Name	Connect To
J17-1	Field +	X+ (F1)
J17-2	Field –	XX– (F2)

TABLE 3-10. J18 – FIELD POWER CONNECTIONS

Connector Pin	Signal Name	Connect To
J18-1	PMG 1 / Shunt L1	240 Vmax Excitation Source
J18-2	PMG 2 / Shunt L2	240 Vmax Excitation Source
J18-3	NC	

TABLE 3-11. J20 – GENSET CONNECTIONS

Connector Pin	Signal Name	Connect To
J20-1	Chassis ground	
J20-2	B+ Return	
J20-3	Switched B+ Low Side Driver	
J20-4	B+ Return	
J20-5	Discrete Input Return	
J20-6	Discrete Input Return	
J20-7	B+ Return	
J20-8	Discrete Input Return	
J20-9	B+ Input	
J20-10	B+ Input	
J20-11	Starter Disconnect Input	Charging alternator
J20-12	B+ Return	
J20-13	Relay Coil B+ Supply	Switched B+ (Switched B+ might be connected to E–Stop B+ instead)
J20-14	FSO Relay Driver	Low Side of FSO Relay Coil
J20-15	Starter Relay Driver	Low Side of Starter Relay Coil
J20-16	NA	
J20-17	Configurable Input #3	Defaulted to Low Coolant Level Switch
J20-18	Configurable Input #4	Defaulted to Low Fuel Level Switch
J20-19	NA	
J20-20	B+ Input	
J20-21	B+ Input	
J20-22	Alt Flash Input	

TABLE 3-12. J22 – GENSET VOLTAGE SENSING CONNECTIONS

Connector Pin	Signal Name	Connect To
J22-1	L1	600 Vmax L1 Source
J22-2	L2	600 Vmax L2 Source
J22-3	L3	600 Vmax L3 Source
J22-4	LN	600 Vmax LN Source

TABLE 3-13. J25 – DISPLAY CONNECTIONS

Connector Pin	Signal Name	Connect To
J25-1	Local Status	Low side of local status lamp
J25-2	Local E-Stop	Normally closed local E-Stop switch
J25-3	PCCNet B	Network Data B
J25-4	PCCNet A	Network Data A
J25-5	System wakeup	
J25-6	Discrete Input Return	
J25-7	Discrete Input Return	
J25-8	B+ Return	
J25-9	B+ Return / PCCNet	
J25-10	Manual	
J25-11	Auto	
J25-12	B+	

TABLE 3-14. 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	323–2466	Amp/Tyco / 770904–1/ 770988–1/171637–1
J12	323–1932	Amp/Tyco / 1–480704–0	323–1200	Amp/Tyco / 350536–1/350550–1
J17	323–2098	Amp/Tyco / 1–480698–0	323–1200	Amp/Tyco / 350536–1/350550–1
J18	323–2444	Amp/Tyco / 1–480700–0	323–1200	Amp/Tyco / 350536–1/350550–1
J25	323–2445	Amp/Tyco / 770581–1	323–2466	Amp/Tyco / 770904–1/ 770988–1/171637–1
J22	323–2226–03	Amp/Tyco / 282809–4		
J20	323–2466	Amp/Tyco / 770586–1	323–2466	Amp/Tyco / 770904–1/ 770988–1/171637–1

ELECTRONIC GOVERNOR CONNECTIONS

This section describes the installation of the optional Electronic Governor Power Module.

A description of the Governor Power Module connections are listed in Table 3-15. Module connector pat numbers are listed in Table 3-16.

The electronic fuel actuator is driven by the output of the Governor Power Module. Use twisted pair wires minimum 1 sq mm (16 Gage). Power to the Governor Power Module is derived from the genset starting battery but should be connected to the Governor Power Module as indicated in the diagrams “Applications without FSO” (see Figure 3-13) and “Applications with FSO” (see Figure 3-14) as appropriate.

TABLE 3-15. GOVERNOR MODULE CONNECTIONS

Connector Pin	Signal Name	Comments
P1-1	Gov drive –	
P1-2	Gov drive +	
P1-3	B+	Battery +
P1-4	Actuator	Low side of actuator
P1-5	Return	GND

TABLE 3-16. CONNECTOR PART NUMBERS FOR THE GOVERNOR MODULE CONNECTIONS

	Connector Housing		Connector Pins	
Ref	Internal P/N	Man / P/N	Internal P/N	Man / P/N
P1	0323–2216	Amp/Tyco / 1–480763–0	0323–1200	Amp/Tyco / 770008–3

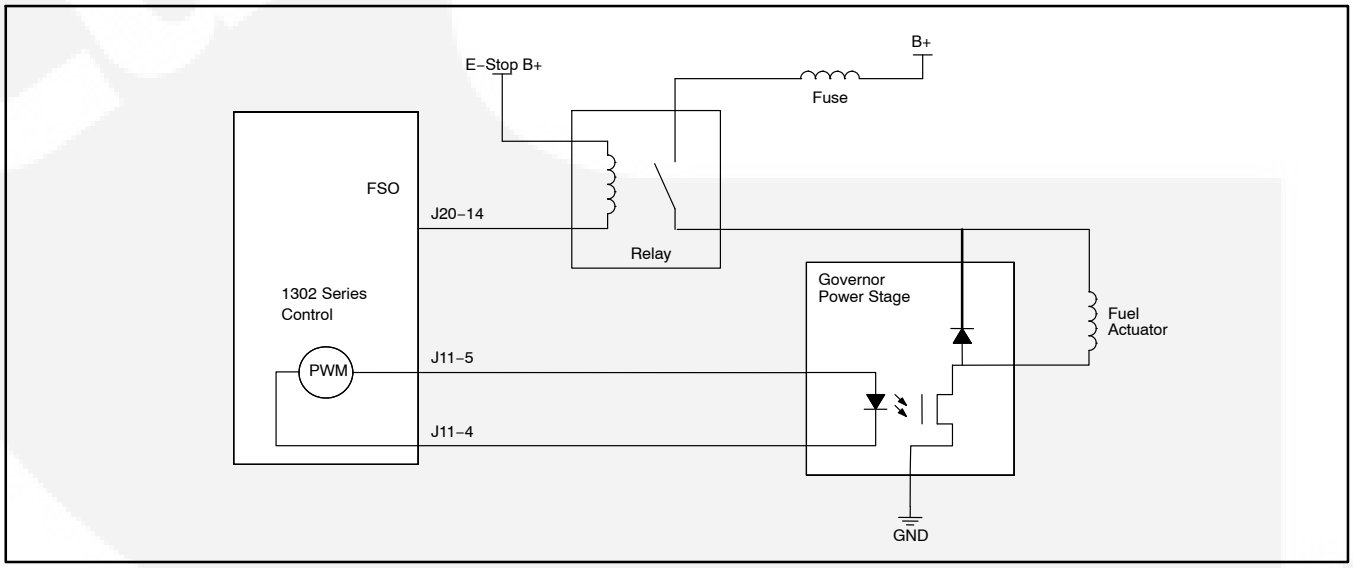


FIGURE 3-13. ELECTRONIC GOVERNOR CONNECTIONS FOR APPLICATIONS WITHOUT FSO

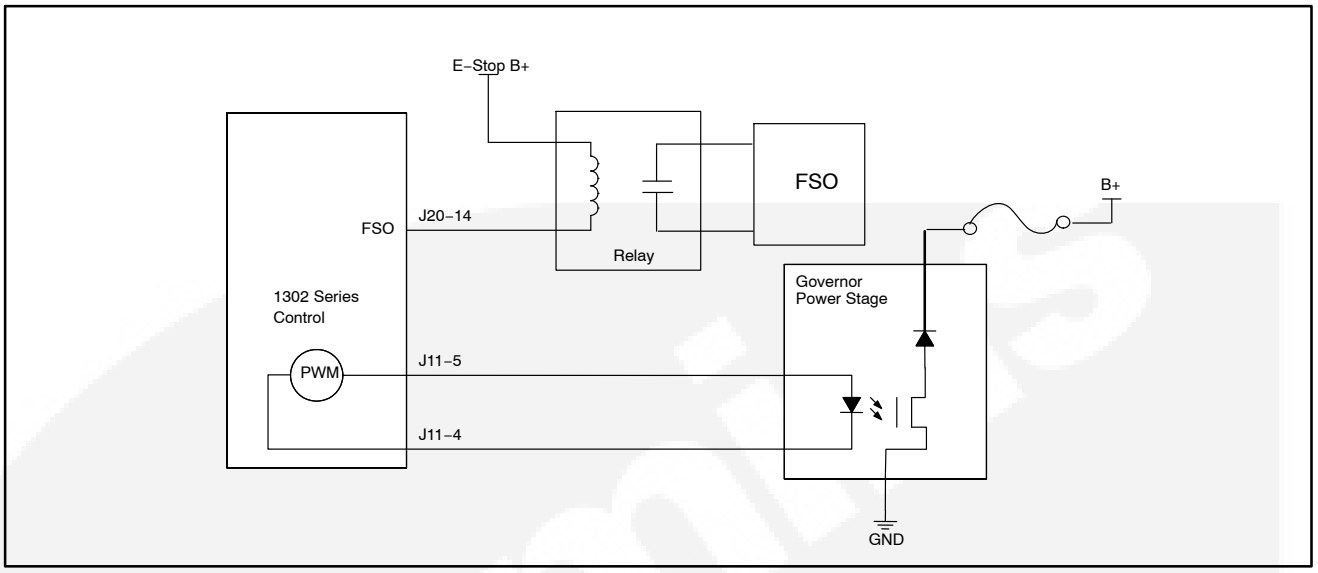


FIGURE 3-14. ELECTRONIC GOVERNOR CONNECTIONS FOR APPLICATIONS WITH FSO

KIT INSTALLATION

Refer to the control wiring diagram included in Section 7 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: To check the actual genset output, True (calibrated) RMS meter should be used Mounting hardware for the 1302 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 1302 control board using M4 hardware. Figure 3-15 shows the control board dimensions. The outside dimensions do not include necessary clearance for wire connections.

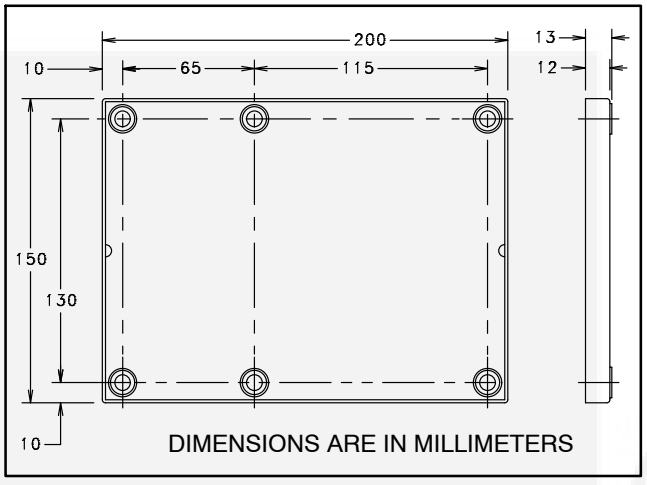


FIGURE 3-15. 1302 CONTROL FOOTPRINT

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 (see Figure 3-17). Plug the P1 connector into the display (either J1 or J2) and plug the P25 connector into the J25 connector on the control board.

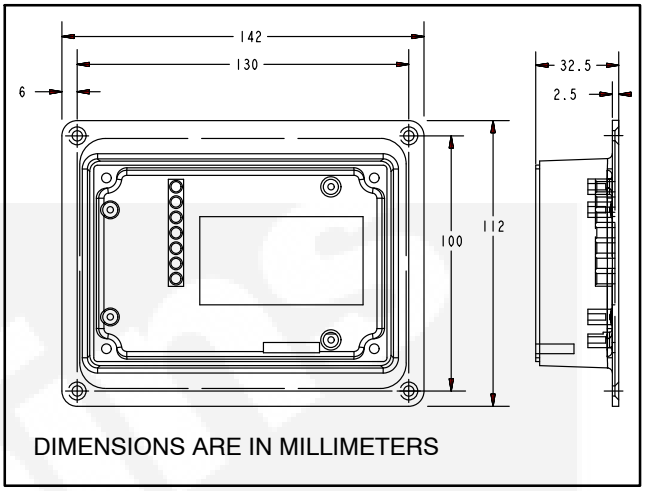
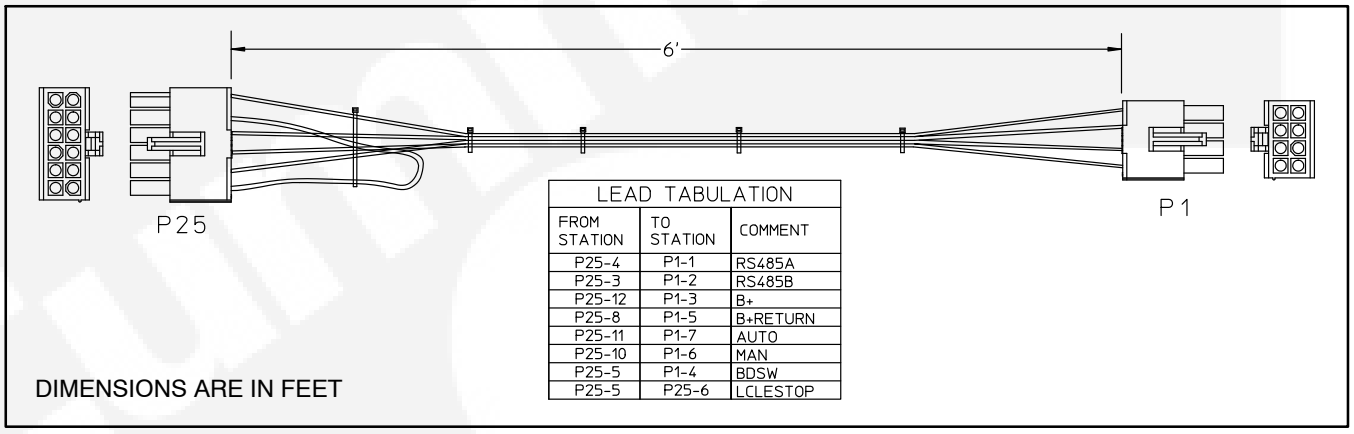


FIGURE 3-16. OPERATOR PANEL FOOTPRINT



LEAD TABULATION

FROM STATION	TO STATION	COMMENT
P25-4	P1-1	RS485A
P25-3	P1-2	RS485B
P25-12	P1-3	B+
P25-8	P1-5	B+RETURN
P25-11	P1-7	AUTO
P25-10	P1-6	MAN
P25-5	P1-4	BDSW
P25-5	P25-6	LCLESTOP

FIGURE 3-17. OPERATOR PANEL HARNESS

4. Install the genset harness (see Figure 3-18).

   a. Make sure the current transformers installed are appropriate for use with a 1302 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 3-8.

   c. Make sure the alternator connections are appropriate for your installation (see “Alternator Connections” on page 3-9).

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

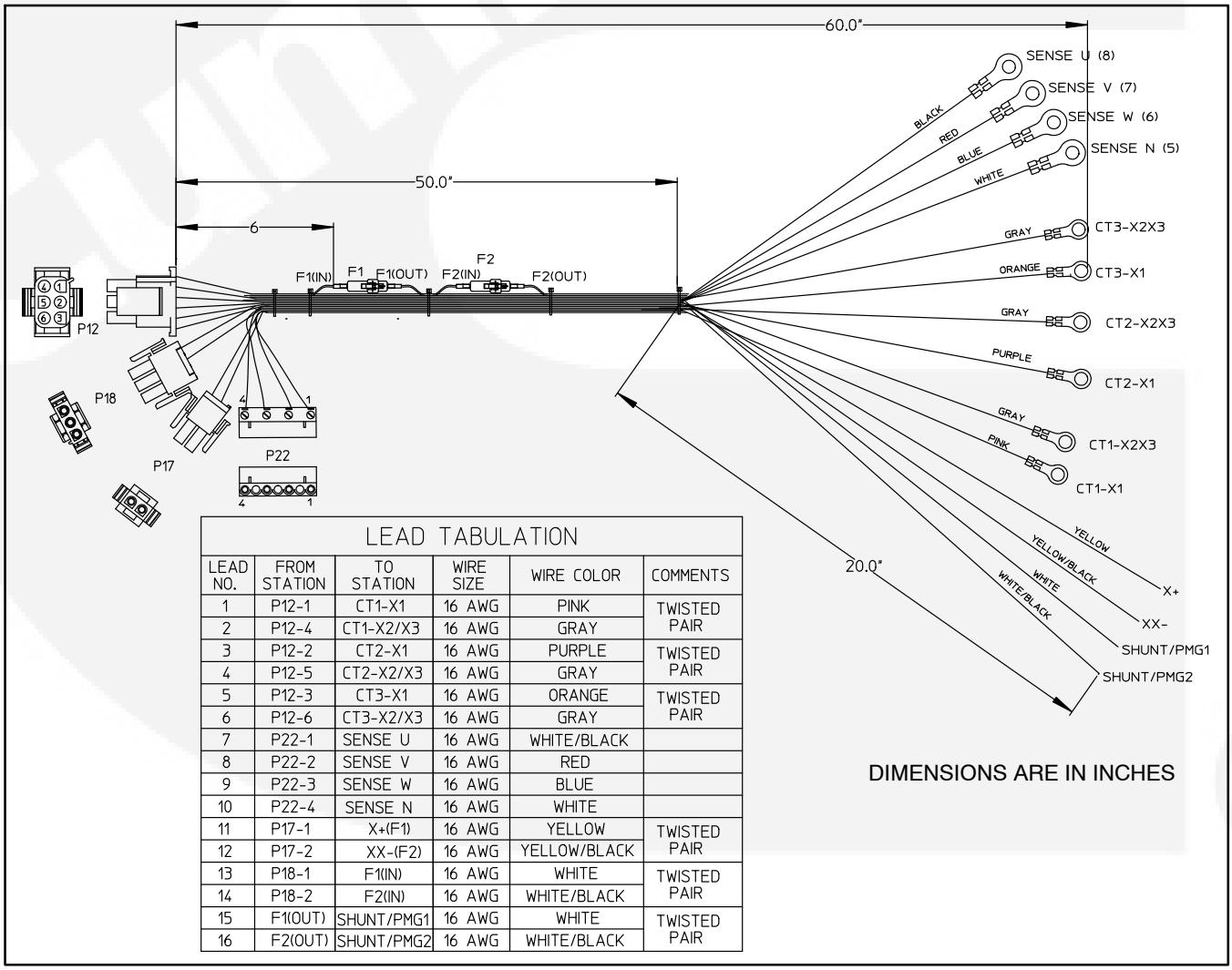
   e. Connect the four harness sense wires to the alternator.

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

   g. Make the connections for the excitiation source (shunt or PMG). For shunt applications, connect J18-1 and J18-2 to the low side of L1 and L2. For PMG applications, connect J18-1, J18-2, and 18-3 to P2, P3, and P4 on the permanent magnet. J18-1 and J18-2 are 240V maximum inputs.

   ⚠ CAUTION ***Do not connect J18-1 directly to L1 in 480V applications. Making this connection will blow up the 1302 control board.***

   h. Connect the harness P12, P17, P18, and P22 connectors to the mating connectors on the 1302 control board.



LEAD TABULATION

LEAD NO.	FROM STATION	TO STATION	WIRE SIZE	WIRE COLOR	COMMENTS
1	P12-1	CT1-X1	16 AWG	PINK	TWISTED PAIR
2	P12-4	CT1-X2/X3	16 AWG	GRAY	
3	P12-2	CT2-X1	16 AWG	PURPLE	TWISTED PAIR
4	P12-5	CT2-X2/X3	16 AWG	GRAY	
5	P12-3	CT3-X1	16 AWG	ORANGE	TWISTED PAIR
6	P12-6	CT3-X2/X3	16 AWG	GRAY	
7	P22-1	SENSE U	16 AWG	WHITE/BLACK	
8	P22-2	SENSE V	16 AWG	RED	
9	P22-3	SENSE W	16 AWG	BLUE	
10	P22-4	SENSE N	16 AWG	WHITE	
11	P17-1	X+(F1)	16 AWG	YELLOW	TWISTED PAIR
12	P17-2	XX-(F2)	16 AWG	YELLOW/BLACK	
13	P18-1	F1(IN)	16 AWG	WHITE	TWISTED PAIR
14	P18-2	F2(IN)	16 AWG	WHITE/BLACK	
15	F1(OUT)	SHUNT/PMG1	16 AWG	WHITE	TWISTED PAIR
16	F2(OUT)	SHUNT/PMG2	16 AWG	WHITE/BLACK	

FIGURE 3-18. GENSET HARNESS

5. Install the engine harness.

   a. Connect the engine harness wires marked P11-2 and P11-3 to the oil pressure harness wires marked J11-5, J11-6, and J11-17 (see Figure 3-20).

   b. Connect the engine harness wires marked P11-11 and P11-12 to the coolant temperature sensor harness wires marked P11-11 and P11-12 (see Figure 3-21).

   c. If installed, connect the engine harness wires marked P11-8, P11-9, and P11-10 to the magnetic pickup sensor on the engine. If not installed, tie the wires back.

   d. Connect the remaining engine harness wires to the appropriate locations indicated in Figure 3-19.

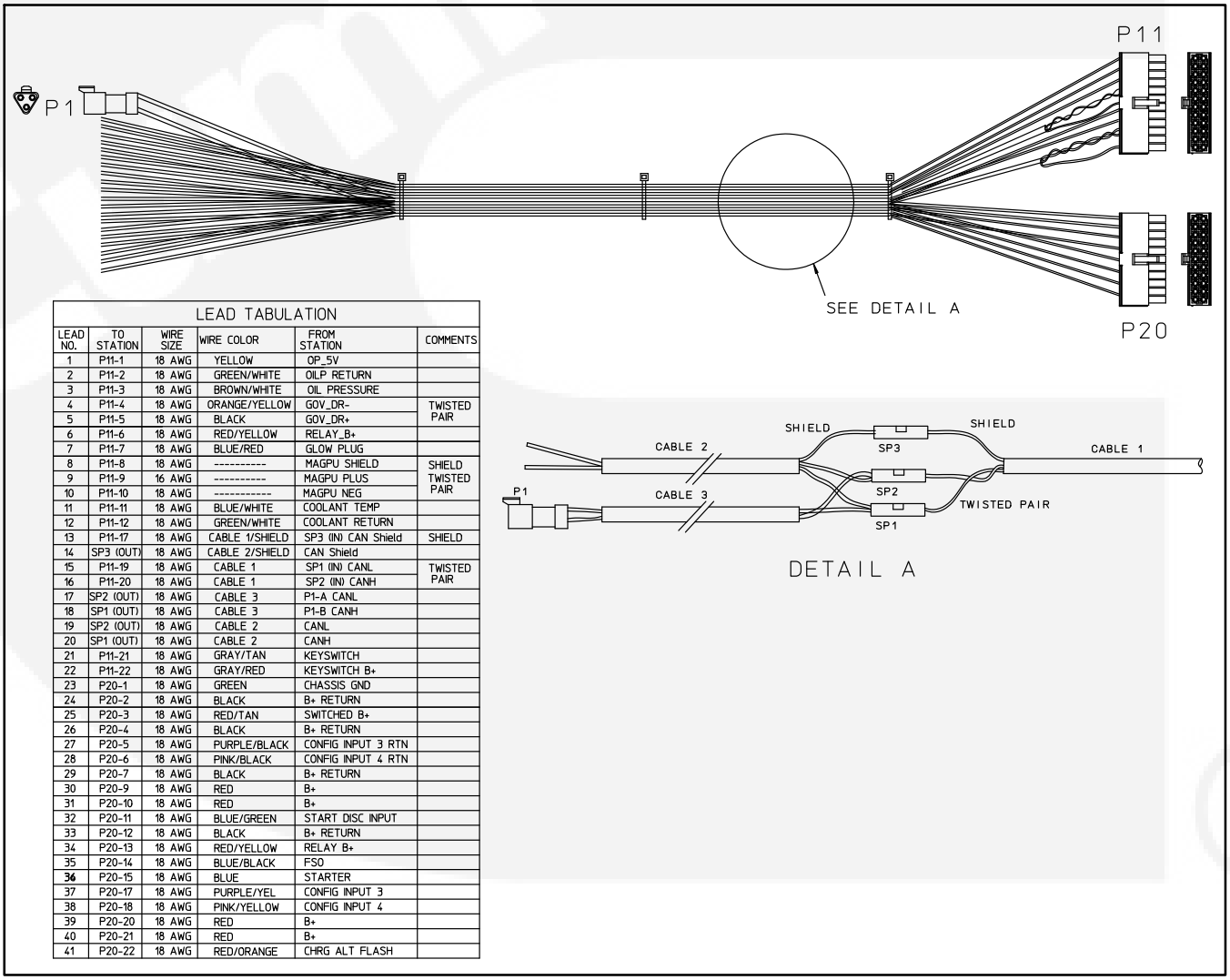
   NOTE: If your installation does not include an electronic governor, tie back the wires marked P11-4 and P11-5.

   e. Connect the engine harness P11 and P20 connectors to the 1302 control board J11 and J20 connectors.

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.



LEAD TABULATION

LEAD NO.	TO STATION	WIRE SIZE	WIRE COLOR	FROM STATION	COMMENTS
1	P11-1	18 AWG	YELLOW	OP_5V	
2	P11-2	18 AWG	GREEN/WHITE	OILP RETURN	
3	P11-3	18 AWG	BROWN/WHITE	OIL PRESSURE	
4	P11-4	18 AWG	ORANGE/YELLOW	GOV_DR-	TWISTED PAIR
5	P11-5	18 AWG	BLACK	GOV_DR+	
6	P11-6	18 AWG	RED/YELLOW	RELAY_B+	
7	P11-7	18 AWG	BLUE/RED	GLOW PLUG	
8	P11-8	18 AWG	----------	MAGPU SHIELD	SHIELD TWISTED PAIR
9	P11-9	16 AWG	----------	MAGPU PLUS	
10	P11-10	18 AWG	----------	MAGPU NEG	
11	P11-11	18 AWG	BLUE/WHITE	COOLANT TEMP	
12	P11-12	18 AWG	GREEN/WHITE	COOLANT RETURN	
13	P11-17	18 AWG	CABLE 1/SHIELD	SP3 (IN) CAN Shield	SHIELD
14	SP3 (OUT)	18 AWG	CABLE 2/SHIELD	CAN Shield	
15	P11-19	18 AWG	CABLE 1	SP1 (IN) CANL	TWISTED PAIR
16	P11-20	18 AWG	CABLE 1	SP2 (IN) CANH	
17	SP2 (OUT)	18 AWG	CABLE 3	P1-A CANL	
18	SP1 (OUT)	18 AWG	CABLE 3	P1-B CANH	
19	SP2 (OUT)	18 AWG	CABLE 2	CANL	
20	SP1 (OUT)	18 AWG	CABLE 2	CANH	
21	P11-21	18 AWG	GRAY/TAN	KEYSWITCH	
22	P11-22	18 AWG	GRAY/RED	KEYSWITCH B+	
23	P20-1	18 AWG	GREEN	CHASSIS GND	
24	P20-2	18 AWG	BLACK	B+ RETURN	
25	P20-3	18 AWG	RED/TAN	SWITCHED B+	
26	P20-4	18 AWG	BLACK	B+ RETURN	
27	P20-5	18 AWG	PURPLE/BLACK	CONFIG INPUT 3 RTN	
28	P20-6	18 AWG	PINK/BLACK	CONFIG INPUT 4 RTN	
29	P20-7	18 AWG	BLACK	B+ RETURN	
30	P20-9	18 AWG	RED	B+	
31	P20-10	18 AWG	RED	B+	
32	P20-11	18 AWG	BLUE/GREEN	START DISC INPUT	
33	P20-12	18 AWG	BLACK	B+ RETURN	
34	P20-13	18 AWG	RED/YELLOW	RELAY B+	
35	P20-14	18 AWG	BLUE/BLACK	FSO	
36	P20-15	18 AWG	BLUE	STARTER	
37	P20-17	18 AWG	PURPLE/YEL	CONFIG INPUT 3	
38	P20-18	18 AWG	PINK/YELLOW	CONFIG INPUT 4	
39	P20-20	18 AWG	RED	B+	
40	P20-21	18 AWG	RED	B+	
41	P20-22	18 AWG	RED/ORANGE	CHRG ALT FLASH	

FIGURE 3-19. ENGINE HARNESS

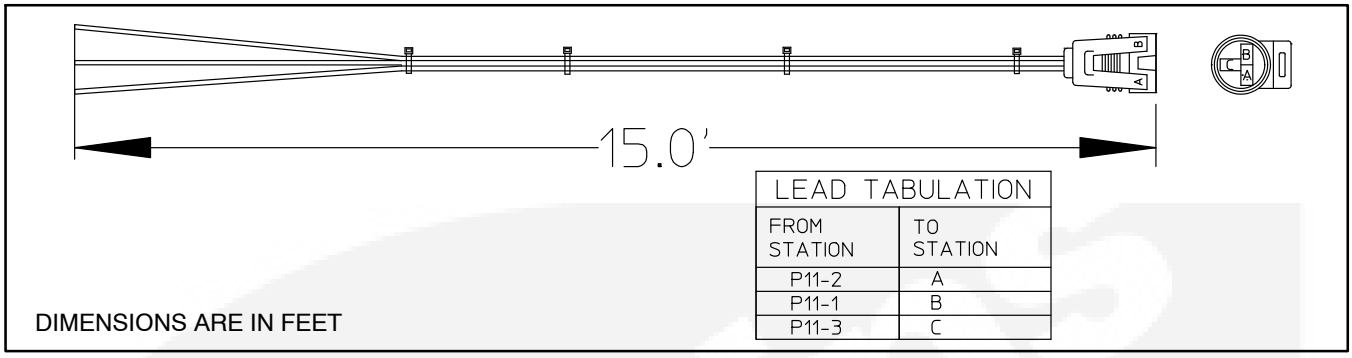


FIGURE 3-20. OIL PRESSURE SENSOR HARNESS

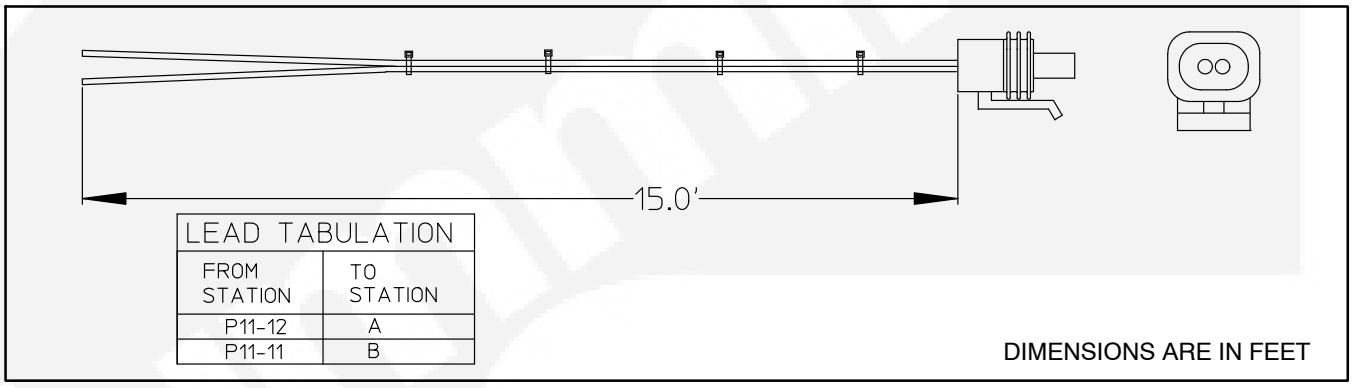


FIGURE 3-21. COOLANT TEMPERATURE SENSOR HARNESS

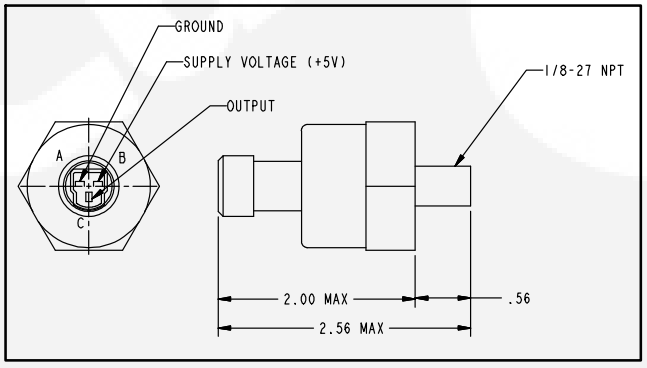


FIGURE 3-22. OIL PRESSURE SENSOR

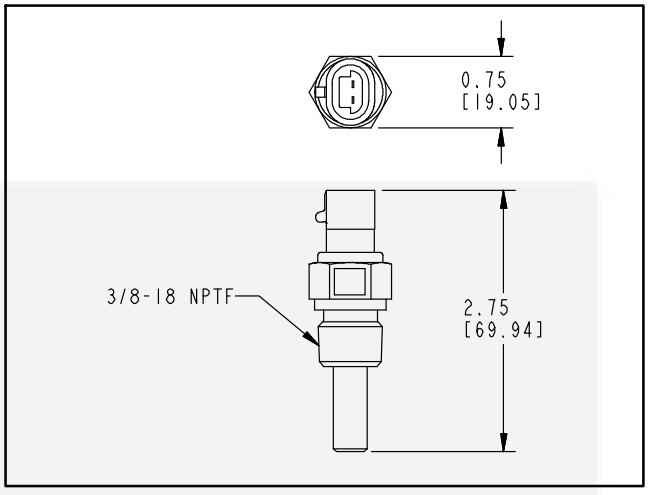


FIGURE 3-23. COOLANT TEMPERATURE SENSOR

7. Install the coolant temperature sensor and harness.
   a. Install the sensor on the radiator.
   b. Connect the harness connector to the temperature sensor.
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 3-26.

b. Follow the setup procedures for current transformers listed on page 3-4.

c. For information on alternator control adjustments, see page 3-36.

d. For information on genset tuning, see page 3-36.

e. For information on other control functions, see page 3-46. 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 3-55.

12. Place the generator set Run/Off/Auto switch in the desired position.

SETUP, TRIMS, AND ADJUSTMENTS

While applying a 1302 series control to a new application, make sure the parameters listed in Table 3-17 have appropriate values. Many of these can be adjusted using the operator panel but some require use of a genset Manufacturing Tool or a PC based service tool.

NOTE: To check the actual genset output, True (calibrated) RMS meter should be used Section 5 includes information on all of the Service menus that are used to adjust parameters using the 1302 operator panel. The last column in Table 3-17 lists the page references in Section 5 where you can find information on how to adjust each parameter.

Configurable / Model Specific features like nominal voltage, frequency, KVA rating, Engine protection values Alternator Protection values, AVR and Governor Gains, CT Ratio, etc have to be assigned appropriate values at manufacturing time.

TABLE 3-17. 1302 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 Time Delay (V2.79 and prior with HMI211 7.10 or prior)	X	X	0	300	Sec	5-8
	Start Time Delay (V2.80 and later with HMI211 7.20 or later)	X	X	0	3600	Sec	5–8
Adjustment	Stop Time Delay	X	X	0	600	Sec	5-8
	V/Hz Knee Frequency	X	X	0	10	Hz	5-17
	V/Hz Rolloff Slope	X	X	0	5	%	5-17

TABLE 3-17. 1302 CONTROL PARAMETERS (CONT.)

Group	Parameter Name	Adjusted Using		Limits		Units	Pg Ref
		PC Based Service Tool	Operator Panel	Lower Limit	Upper Limit		
Setup – Genset	Nominal Battery Voltage	X	X	12	24	VDC	5-41
	AVR Enable	X	X	Enable or Disable	NA	NA	5-11
	Excitation Source	X	X	Shunt or PMG			5-39
	Excitation / Line Frequency Gain	X	X	1,2,4			5-39
	Nominal Voltage	X	X	190	480	V AC	5-8
	Alternator Nominal Frequency	X	X	50 or 60	N/A	Hz	5-8
	Single Phase 60Hz Standby kVA Rating	X	X	0	2000	KVA	5-39
	Three Phase 60Hz Standby kVA Rating	X	X	0	2000	KVA	5-39
	Single Phase 50Hz Standby kVA Rating	X	X	0	2000	KVA	5-39
	Three Phase 50Hz Standby kVA Rating	X	X	0	2000	KVA	5-39
	Single Phase 60Hz Prime kVA Rating	X	X	0	2000	KVA	5-41
	Three Phase 60Hz Prime kVA Rating	X	X	0	2000	KVA	5-41
	Single Phase 50Hz Prime kVA Rating	X	X	0	2000	KVA	5-41
	Three Phase 50Hz Prime kVA Rating	X	X	0	2000	KVA	5-41
	Frequency to Speed Gain Select	X	X	20, 30, or 60	N/A	RPM/Hz	5-39
	Oil Pressure Switch Polarity	X		Active Low or Active High	N/A	N/A	5-43

TABLE 3-17. 1302 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)	Oil Pressure Sensor Type	X	X	2 or 3 wire	N/A	N/A	5-43
	Electronic Governor Enable	X		Enable or Disable	NA	NA	—
			X	Yes or No	N/A	N/A	5-11
	Glow Plug Enable	X		Enable or Disable	N/A	N/A	—
			X	Yes or No	N/A	N/A	5-8
	Fuel System	X	X	Diesel or Gas	N/A	N/A	5-8
	Fuel Burn Time Delay	X	X	0	10	Sec	5-8
	Magnetic Pickup Enable	X		Enable or Disable	None	N/A	—
			X	Yes or No	None	N/A	5-13
	Flywheel Teeth	X	X	0	255	Teeth	5-39
	Dither Factor	X	X	0	30	%	5-19
	Maximum Governor Duty Cycle	X	X	0	100	%	5-19
	AVR Gain Adjust	X	X	5	1000	%	5-17
	AVR K2 Gain Adjust	X	X	5	1000	%	5-17
	AVR D Gain Adjust	X	X	95	105	%	5-17
	K1 (Regulator Gain 50Hz)	X		0	65535	NA	—
	K1 (Regulator Gain 60Hz)	X		0	65535	NA	—
	K2 (Regulator Integral 50Hz)	X		0	65535	NA	—
	K2 (Regulator Integral 60Hz)	X		0	65535	NA	—
	K3 (Regulator K3 Gain 50Hz)	X		0	65535	NA	—
	K3 (Regulator K3 Gain 60Hz)	X		0	65535	NA	—
	Damping Effect (60Hz)	X		0.2	0.99	NA	—
	Damping Effect (50Hz)	X		0.2	0.99	NA	—
	Cycle Crank Attempts	X	X	1	7	Attempts	5-11
	Cycle Crank Engage Time	X	X	3	30	Sec	5-11
	Cycle Crank Rest Time	X	X	0	60	Sec	5-11
	Remote / Local Display	N/A	X	Remote or Local	N/A	N/A	5-15
	Battle Short Enable		X	Enable or Disable	NA	NA	5-11
	Battle Short Switch Input	X	X	Configurable input 1–4 or operator panel	N/A	N/A	5-11
	Governor Ramp Time	X	X	0	30	Sec	5-19

TABLE 3-17. 1302 CONTROL PARAMETERS (CONT.)

Group	Parameter Name	Adjusted Using		Limits		Units	Pg Ref
		PC Based Service Tool	Operator Panel	Lower Limit	Upper Limit		
Setup – ECM CAN	ECM CAN Enabled	X		Disable, J1939, PGI			—
	Keyswitch Reset Delay	X		1	10	Sec	—
	Keyswitch On Time Delay	X		1	10	Sec	—
	CAN Datalink Failure Retries	X		0	10	Times	—
	ECM Datasave Time	X		30	60	Sec	—
Setup – Configur-able I/O	Configurable Input #1–4 Function	X	X	Active open or Active closed	N/A		5-21
	Configurable I/P #1 AnnActive LED	X		NO_ANNUN_MAPPING, CUSTOMER_FAULT_1, CUSTOMER_FAULT_2, CUSTOMER_FAULT_3, GEN_SUPPLY_LOAD, CHARGER_AC_FAIL, LOW_COOLANT_LEVEL, LOW_FUEL_LEVEL	N/A		5-21
	Configurable I/P #2 AnnActive LED	X		NO_ANNUN_MAPPING, CUSTOMER_FAULT_1, CUSTOMER_FAULT_2, CUSTOMER_FAULT_3, GEN_SUPPLY_LOAD, CHARGER_AC_FAIL, LOW_COOLANT_LEVEL, LOW_FUEL_LEVEL	N/A		5-21

TABLE 3-17. 1302 CONTROL PARAMETERS (CONT.)

Group	Parameter Name	Adjusted Using		Limits		Units	Pg Ref
		PC Based Service Tool	Operator Panel	Lower Limit	Upper Limit		
	Configurable I/P #3 AnnActive LED	X		NO_ANNUN_MAPPING, CUSTOMER_FAULT_1, CUSTOMER_FAULT_2, CUSTOMER_FAULT_3, GEN_SUPPLY_LOAD, CHARGER_AC_FAIL, LOW_COOLANT_LEVEL, LOW_FUEL_LEVEL	N/A		5-21
	Configurable I/P #4 AnnActive LED	X		NO_ANNUN_MAPPING, CUSTOMER_FAULT_1, CUSTOMER_FAULT_2, CUSTOMER_FAULT_3, GEN_SUPPLY_LOAD, CHARGER_AC_FAIL, LOW_COOLANT_LEVEL, LOW_FUEL_LEVEL	N/A		5-21

TABLE 3-17. 1302 CONTROL PARAMETERS (CONT.)

Group	Parameter Name	Adjusted Using		Limits		Units	Pg Ref
		PC Based Service Tool	Operator Panel	Lower Limit	Upper Limit		
Setup – Configur-able I/O	Configurable Fault Input #1–4 Active State Select	X	X	Active open or Active closed	N/A		5-21
	Configurable Fault Input #1–4 Fault Level Response	X	X	Warning, Shutdown, or None			5-21
	Configurable #1–4 Input Text Line 1	X	X				5-21
	Configurable #1–4 Input Text Line 2	X	X				5-21
	Customer Output 1/2 Event	X	X	0	9999	Fault Code Numbers	5-25
Regulated Voltage Adjust	Voltage Regulator Calibration 50Hz	X	X	0.9	1.1	%	5-27
	Voltage Regulator Calibration 60Hz	X	X	0.9	1.1	%	5-27
	Alternator L1–N 50Hz Voltage Display Adjust	X	X	0.8	1.1	%	5-27
	Alternator L2–N 50Hz Voltage Display Adjust	X	X	0.8	1.1	%	5-27
	Alternator L2–N 50Hz Voltage Display Adjust	X	X	0.8	1.1	%	5-27
	Alternator L1–N 60Hz Voltage Display Adjust	X	X	0.8	1.1	%	5-27
	Alternator L2–N 60Hz Voltage Display Adjust	X	X	0.8	1.1	%	5-27
	Alternator L2–N 60Hz Voltage Display Adjust	X	X	0.8	1.1	%	5-27
	Alternator L1 50Hz Current Adjust	X	X	0.8	1.2	%	5-27
	Alternator L2 50Hz Current Adjust	X	X	0.8	1.2	%	5-27
	Alternator L2 50Hz Current Adjust	X	X	0.8	1.2	%	5-27

TABLE 3-17. 1302 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)	Alternator L1 60Hz Current Adjust	X	X	0.8	1.2	%	5-27
	Alternator L2 60Hz Current Adjust	X	X	0.8	1.2	%	5-27
	Alternator L2 60Hz Current Adjust	X	X	0.8	1.2	%	5-27
	High AC Voltage Threshold	X	X	105	125	%	5-45
	High AC Voltage Delay	X	X	1	10	Sec	5-45
	Low AC Voltage Threshold	X	X	50	95	%	5-45
	Low AC Voltage Delay	X	X	2	20	Sec	5-45
	Under Frequency Threshold	X	X	2	10	Hz	5-45
	Under Frequency Delay	X	X	500	2000	1/2 cycles	5-45
	Overfrequency Enable	X		Enable or Disable	N/A	NA	—
	Overfrequency Threshold	X	X	2	10	Hz	5-45
	Overfrequency Delay	X	X	100	2000	1/2 cycles	5-45
	High AC Current Shutdown Delay	X	X	2	60	Sec	5-45
Protection – Engine	Overspeed Shutdown Threshold 50Hz	X	X	0	8192	Rpm	5-49
	Overspeed Shutdown Threshold 60Hz	X	X	0	8192	Rpm	5-49
	LOP Shutdown Threshold	X	X	0	100	Psig	5-51
	LOP Shutdown Delay	X	X	2	15	Sec	5-51
	LOP Warning Threshold	X	X	0	100	Psig	5-49
	LOP Warning Delay	X	X	2	15	Sec	5-49
	LCT Warning Threshold	X	X	32	100	deg f	5-53
	HCT Shutdown Threshold	X	X	180	300	deg f	5-51
	HCT Shutdown Delay	X	X	2	10	Sec	5-51
	HCT Warning Threshold	X	X	150	290	deg f	5-51
	HCT Warning Delay	X	X	2	10	sec	5-51
	12V Low Battery Threshold	X	X	11	13	VDC	5-41
	24V Low Battery Threshold	X	X	22	27	VDC	5-41
	Low Battery Fault Delay	X	X	2	60	Sec	5-43
	High Battery Fault Delay	X	X	14	17	VDC	5-41
	24V High Battery Threshold	X	X	28	34	VDC	5-41
	12V High Battery Threshold	X	X	2	60	Sec	5-43
	12V Weak Battery Threshold	X	X	6	10	VDC	5-41

TABLE 3-17. 1302 CONTROL PARAMETERS (CONT.)

Group	Parameter Name	Adjusted Using		Limits		Units	Pg Ref
		PC Based Service Tool	Operator Panel	Lower Limit	Upper Limit		
Protection – Engine (Continued)	24V Weak Battery Threshold	X	X	18	21	VDC	5-41
	Weak Battery Fault Delay	X	X	1	5	sec	5-43
Fault History	Reset Runs	X					—
	Reset Start Attempts	X					—

NFPA 110 Status Logical Bits 1–7, Annunciator Discrete Signals (Configurable via PCC1302

A universal annunciator connected in a network indicates and annunciates the active faults received from the PCC1302. The NFPA 110 Status Logical bits 1 to 7 (i.e. LEDs) of an annunciator can be mapped to indicate and annunciate the active faults corresponding to each of the four configurable inputs of PCC1302 as defined by the user. For this, the (trim) ”Configurable Input #n Function” (n = 1, 2, 3, or 4) should be set as ”Fault Input” and the LED should be mapped through (trim) ”Configurable I/P# n Ann Active LED” (n = 1,2,3 or 4), where, ”Configurable I/P# 1 Ann Active LED”) is applicable only for ”Configurable Input #1 Function”. ”Configurable I/P# 2 Ann Active LED” is applicable only for ”Configurable Input #2 Function”. ”Configurable I/P# 3 Ann Active LED” is applicable only for ”Configurable Input #3 Function”. ”Configurable I/P# 4 Ann Active LED” is applicable only for ”Configurable Input #4 Trim Function”

Each active fault corresponding to the respective configurable input of PCC1302 is annunciated and indicated according to the LEDs mapped by the user to the ”Configurable Input #n Function” (n = 1, 2, 3, or 4) set as ”Fault Input”:

Refer the table below for more information on setup and expected observations:

TABLE 3-18. 1302 CONTROL SETUP

Input #	”Configurable I/P# n Ann Active LED” (n = 1,2,3 or 4) set to one of the following	Active Condition (LED# indication) on Annunciator	Active Fault Condition	Active FC#
”Configurable Input #1 Function” = Fault Input and ”Configurable I/P# 1 Ann Active LED”	NO_ANNUN_MAPPING	No bit set = NONE	None	1311
	CUSTOMER_FAULT_1	Bit 1 set = LED 1	Annunciator Fault 1	
	CUSTOMER_FAULT_2	Bit 1 set = LED 2	Annunciator Fault 2	
	CUSTOMER_FAULT_3	Bit 1 set = LED 3	Annunciator Fault 3	
	GEN_SUPPLY_LOAD	Bit 1 set = LED 4	Genset Supplying Load	
	CHARGER_AC_FAIL	Bit 1 set = LED 5	Charger AC Failure	

TABLE 3-18. 1302 CONTROL SETUP (CONT.)

Input #	"Configurable I/P# n Ann Active LED" (n = 1,2,3 or 4) set to one of the following	Active Condition (LED# indication) on Annunciator	Active Fault Condition	Active FC#
"Configurable Input #1 Function" = Fault Input and "Configurable I/P# 1 Ann Active LED"	NO_ANNUN_MAPPING	No bit set = NONE	None	1312
	CUSTOMER_FAULT_1	Bit 1 set = LED 1	Annunciator Fault 1	
	CUSTOMER_FAULT_2	Bit 1 set = LED 2	Annunciator Fault 2	
	CUSTOMER_FAULT_3	Bit 1 set = LED 3	Annunciator Fault 3	
	GEN_SUPPLY_LOAD	Bit 1 set = LED 4	Genset Supplying Load	
	CHARGER_AC_FAIL	Bit 1 set = LED 5	Charger AC Failure	
	LOW_COOLANT_LEVEL	Bit 1 set = LED 6	Low Coolant Level	
	LOW_FUEL_LEVEL	Bit 1 set = LED 7	Low Fuel Level	
"Configurable Input #1 Function" = Fault Input and "Configurable I/P# 1 Ann Active LED"	NO_ANNUN_MAPPING	No bit set = NONE	None	1317
	CUSTOMER_FAULT_1	Bit 1 set = LED 1	Annunciator Fault 1	
	CUSTOMER_FAULT_2	Bit 1 set = LED 2	Annunciator Fault 2	
	CUSTOMER_FAULT_3	Bit 1 set = LED 3	Annunciator Fault 3	
	GEN_SUPPLY_LOAD	Bit 1 set = LED 4	Genset Supplying Load	
	CHARGER_AC_FAIL	Bit 1 set = LED 5	Charger AC Failure	
"Configurable Input #1 Function" = Fault Input and "Configurable I/P# 1 Ann Active LED"	NO_ANNUN_MAPPING	No bit set = NONE	None	1318
	CUSTOMER_FAULT_1	Bit 1 set = LED 1	Annunciator Fault 1	
	CUSTOMER_FAULT_2	Bit 1 set = LED 2	Annunciator Fault 2	
	CUSTOMER_FAULT_3	Bit 1 set = LED 3	Annunciator Fault 3	
	GEN_SUPPLY_LOAD	Bit 1 set = LED 4	Genset Supplying Load	
	CHARGER_AC_FAIL	Bit 1 set = LED 5	Charger AC Failure	

ALTERNATOR CONTROL ADJUSTMENTS

The 1302 series control includes an integrated line-to-line sensing voltage regulation system that is compatible with shunt or PMG excitation systems. The voltage regulation system is SCR type. Excitation power is derived either directly from the genset terminals or from a PMG stator. Power from either source is fed into the control thru J18. Positive volt-

age build up from residual levels is ensured by the use of efficient semiconductors in the power circuitry.

AVR Enable/Disable Feature

The 1302 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 5-11.

Digital Output Voltage Regulation

The 1302 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 5-17.

Battleshort Mode

The 1302 series control can be programmed to work in battleshort mode by loading the battleshort feature with a manufacturing tool or PC based service tool.

The controller then can accept Configurable Input 1–4 as battle short switch inputs. If an operator panel is used, it can be also selected as a source of input by selecting appropriate input source value for the trim.

Battleshort mode is designed to work only in critical load circumstances. While in battleshort mode the 1302 series control will ignore most warnings and shutdowns and will continue to operate as if no fault or shutdown exists on the system.

For information on enabling/disabling the battleshort feature using the operator panel, see page 5-11.

GENSET TUNING

The 1302 series control uses a standard 4 coefficient PID algorithm running at an execution rate of once per zero cross of the generator AC waveform. Standard values for the K1–K4 and damping terms for both 60 and 50Hz are listed in Table 3-19.

Consider the following before making any adjustments.

- The values of K3, K4, and the damping factor are set for basic stability reasons and should not need to be adjusted, but they can be adjusted if necessary.
- The useful range of values for K2 is 200 to 1500. The value of 1500 for K2 can be a little too high or aggressive for some applications and cause “ringing” upon recovering from a load acceptance or offload transient situation. A value of K2 below 200 can cause the regulator to hit an integrator windup limit and should be avoided if possible. Set the correct value for the application.
- The value of K1 should be adjusted to meet the specification for percent off rated voltage during a load acceptance, and prevent large voltage overshoots during offloads and during engine/alternator startup.
- The value of K2 should be adjusted to control the recovery characteristics of the voltage during large load acceptance and rejection transients. Values of K2 which are too high can cause unstable voltage performance and values too low can cause slow performance or steady state voltage offset errors.

In general, K1 increases and K2 decreases in value with increasing generator size, but can vary in different applications.

V/Hz Curve

The 1302 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: To check the actual genset output, True (calibrated) RMS meter should be used Note: There are only one 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 50Hz and 60Hz operation, it will be required to create separate software features for those applications.

For information on how to adjust the slope and knee frequency using the operator panel, see page 5-17.

TABLE 3-19. GOVERNOR GAINS FOR SMALL ENGINES

Newage BC/UC Generators Under 200Kw	
60Hz	**50Hz**
K1 = 1000	K1 = 1000
K2 = 650	K2 = 650
K3 = 10000	K3 = 10000
K4 = 36429	K4 = 36429
Damping = 0.8	Damping = 0.8

Governor

The 1302 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 3-20.

TABLE 3-20. GOVERNOR GAINS FOR SMALL ENGINES

60Hz	50Hz
GK1 = 1696	GK1 = 1200
GK2 = 240	GK2 = 300
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. Values of GK2 which are too high can cause unstable voltage performance and values 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, but also influence the overall speed of response of the governor 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 once to ensure that the best possible values for GK3 and the Damping term have been determined.

For information on how to adjust the GK1and GK2 values and the damping factor using the operator panel, see page 5-17.

Engine Startup

The 1302 series control applies fuel to the engine as described in the Speed Governor Algorithm and Adjustment section.

Alternator Startup

The alternator will be started up and brought to rated voltage when the engine speed reaches rated speed. The PWM command to the field coil will now be stepped through an AVR Boot Table until the sensed voltage goes above the value of the AVR Boot Threshold trim and if AVR feature is enabled. The regulator will now bring the voltage up to rated voltage.

The purpose of the AVR Boot Table is to aid alternator startup whilst preventing overvoltage conditions. 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. The AVR Boot Table has different values depending on value of the Excitation Source trim.

Setup for Gain Tuning

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

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.

Gain Tuning Parameters

This is a list of all of the parameters which affect genset performance. A correct value should be determined for each of the parameters listed.

NOTE: To check the actual genset output, True (calibrated) RMS meter should be used 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 3-21. GAIN TUNING PARAMETERS

Parameter	Value	Comments
AVR Parameters		
K1 (50Hz)		Sets overall AVR gain in 50Hz applications. This is a true proportional gain which is multiplied against the voltage error signal.
K2 (50Hz)		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 (50Hz)		Affects high frequency characteristics of the AVR algorithm in 50Hz applications. Adjust for voltage stability reasons.
Damping Effect (50Hz)		Affects high frequency characteristics of the AVR algorithm in 50Hz applications. Adjust for voltage stability reasons.
K1 (60Hz)		Sets overall AVR gain in 60Hz applications. This is a true proportional gain which is multiplied against the voltage error signal.
K2 (60Hz)		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 (60Hz)		Affects high frequency characteristics of the AVR algorithm in 60Hz applications. Adjust for voltage stability reasons.
Damping Effect (60Hz)		Affects high frequency characteristics of the AVR algorithm in 60Hz applications. Adjust for voltage stability reasons.
Engine Governing Parameters		
GK1 (50Hz)		Sets overall governor gain in 50Hz applications. This is a true proportional gain which is multiplied against the frequency error signal.
GK2 (50Hz)		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 (50Hz)		Affects high frequency characteristics of the governor algorithm in 50Hz applications. Adjust for frequency stability reasons.
Governor Damping Effect (50Hz)		Affects high frequency characteristics of the governor algorithm in 50Hz applications. Adjust for frequency stability reasons.
GK1 (60Hz)		Sets overall governor gain in 60Hz applications. This is a true proportional gain which is multiplied against the speed error signal.
GK2 (60Hz)		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 (60Hz)		Affects high frequency characteristics of the governor algorithm in 60Hz applications. Adjust for frequency stability reasons.
Governor Damping Effect (60Hz)		Affects high frequency characteristics of the governor algorithm in 60Hz applications. Adjust for frequency stability reasons.

TABLE 3-21. GAIN TUNING PARAMETERS (CONT.)

Parameter	Value	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 the Initial Crank Fueling Period
Maximum Crank Fueling		The level to which the Governor Duty Cycle is limited during Crank State
Crank Exit Fueling Command		The Value at which the Governor Duty Cycle is held after disengaging the starter until the Governor is enabled.
Governor Enable 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

Controller Calibration

The internal circuitry of the 1302 series control may need to be calibrated. There are three different components which may need this. They are:

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

The internal circuits must be calibrated in the order listed in Table 3-22.

TABLE 3-22. CONTROLLER CALIBRATIONS FOR GENSETS

Component to be Calibrated	Calibration Method	
	PC Based Service Tool	Operator Panel
Voltage Measurement for Regulation 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. 2. Verify the Nominal Voltage Trim is set to the desired value. 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. 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 3-24). 2. Select item 1, “Setup Menus”. 3. Enter setup menu password 574. 4. Select item 1, “Genset Service”. 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. 6. Press the back button to return to the service menu. 7. Select item 3, “Meter Calib.” 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. 9. Save the adjustments by pressing the “Save” button.
Voltage Measurement for Display	1. Connect to the control with your PC based service tool. 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. 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. 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). 2. Select item 1, “Setup Menus”. 3. Enter setup menu password 574. 4. Select item 1, “Genset Service”. 5. Select item 3, “Meter Calib.” 6. Press the down arrow twice to scroll down to the “Metering Voltage Adjust” 7. Adjust the three parameters listed so the display voltage matches the voltage being produced by the genset. 8. Save the adjustments by pressing the “save” button.

TABLE 3-22. 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. 2. Connect to the control with your PC based service tool. 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. 4. Adjust the LX 50Hz Current Adjust or LX 60Hz Current Adjust trim for your current application so the 1302 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. 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 3-26). 2. Select item 1, “Setup Menus”. 3. Enter service menu password 574. 4. Select item 2, “Genset Setup”. 5. Enter the setup menu password 1209. 6. Verify with the display that the CT ratios and power rating are correct by scrolling through the available screens. 7. Return to the Setup Menu screen by press the back arrow twice. 8. Select item 1, “Genset Service”. 9. Select item 3, “Meter Calib.” 10. Press the down arrow three times to scroll down to Metering Current Adjust. 11. Adjust the three parameters to match the current being displayed by the known current meter. 12. Save the adjustments by pressing the “Save” button.

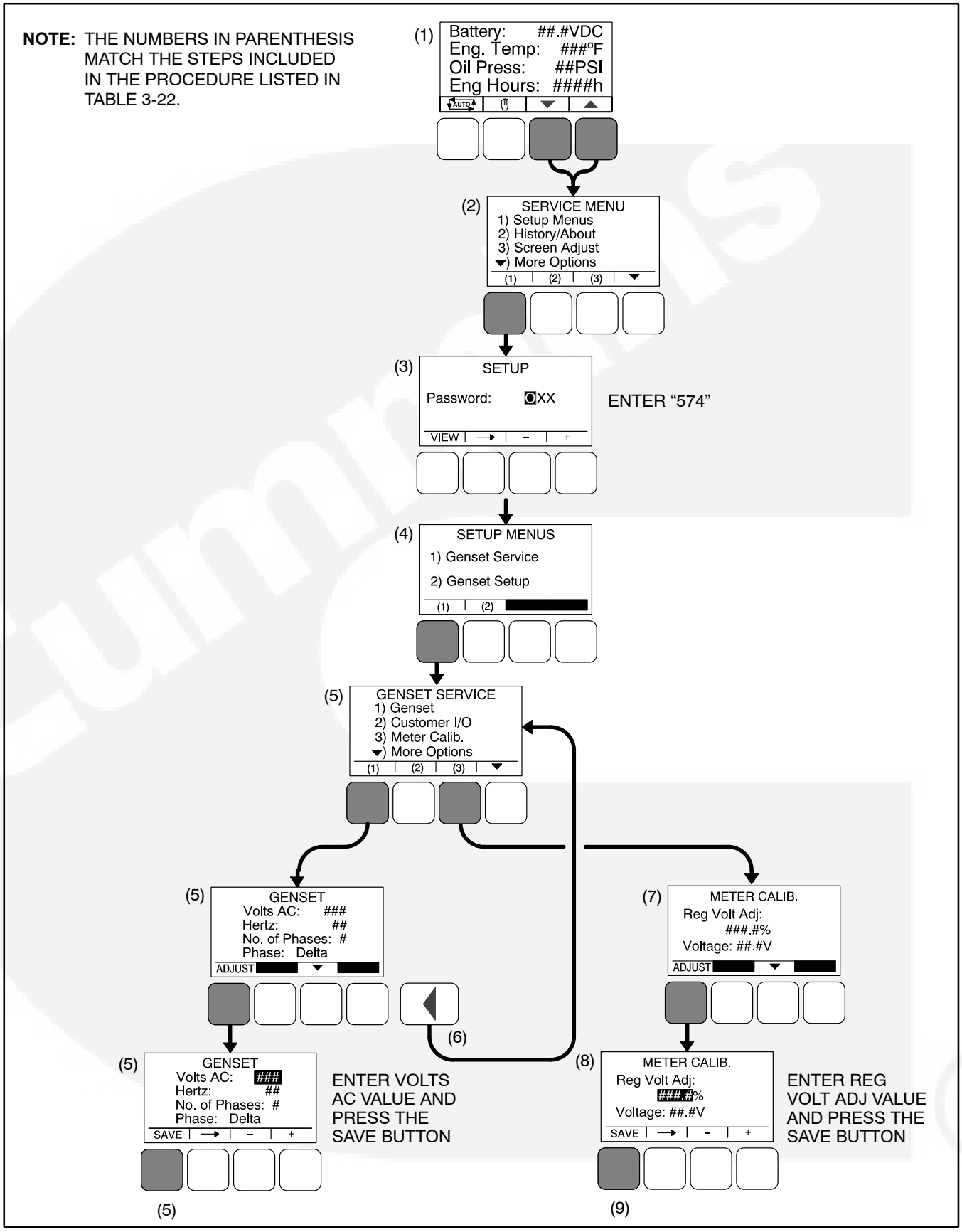


FIGURE 3-24. OPERATOR PANEL MENUS FOR CALIBRATING VOLTAGE MEASUREMENT FOR REGULATION

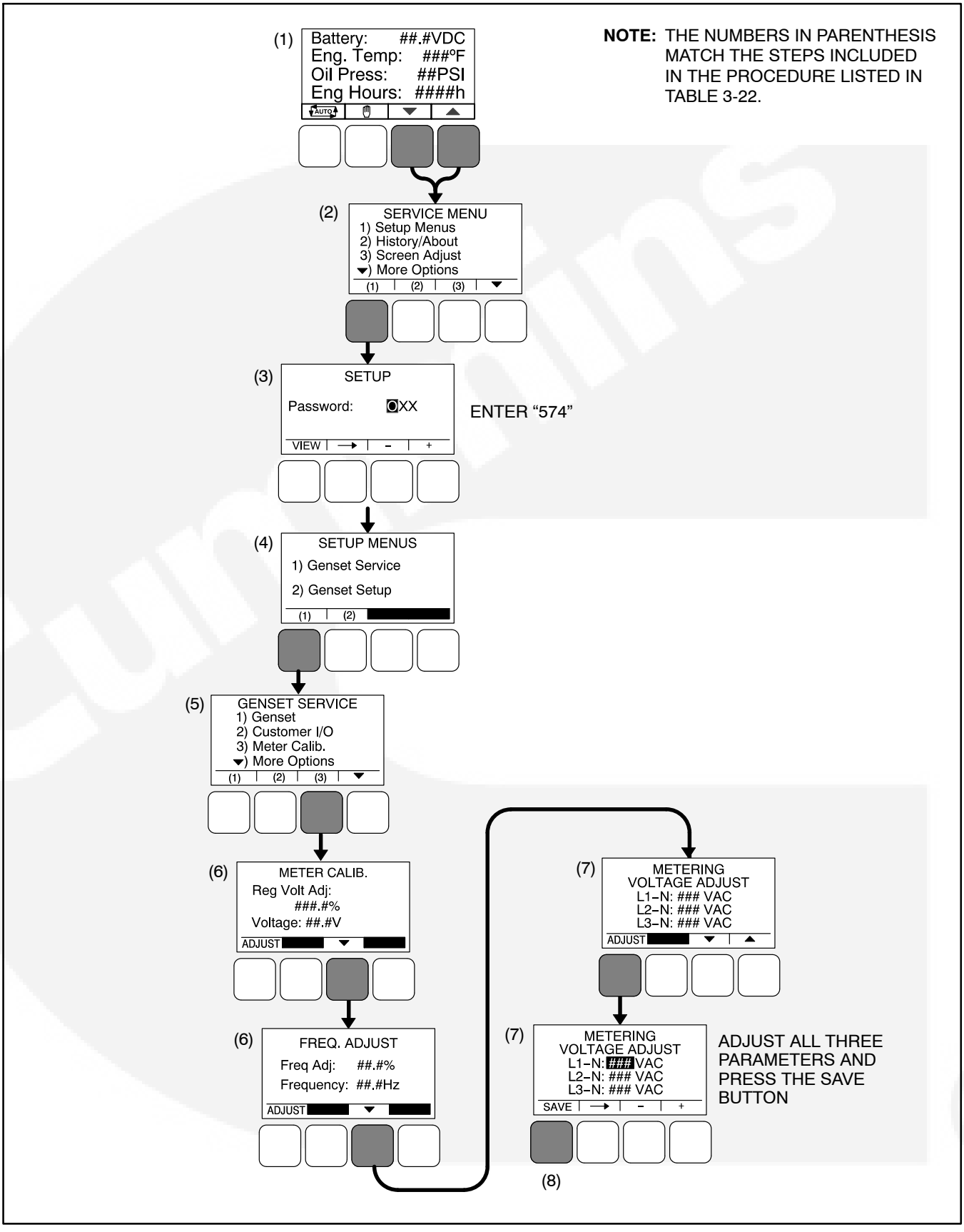


FIGURE 3-25. OPERATOR PANEL MENUS FOR CALIBRATING VOLTAGE MEASUREMENT FOR DISPLAY

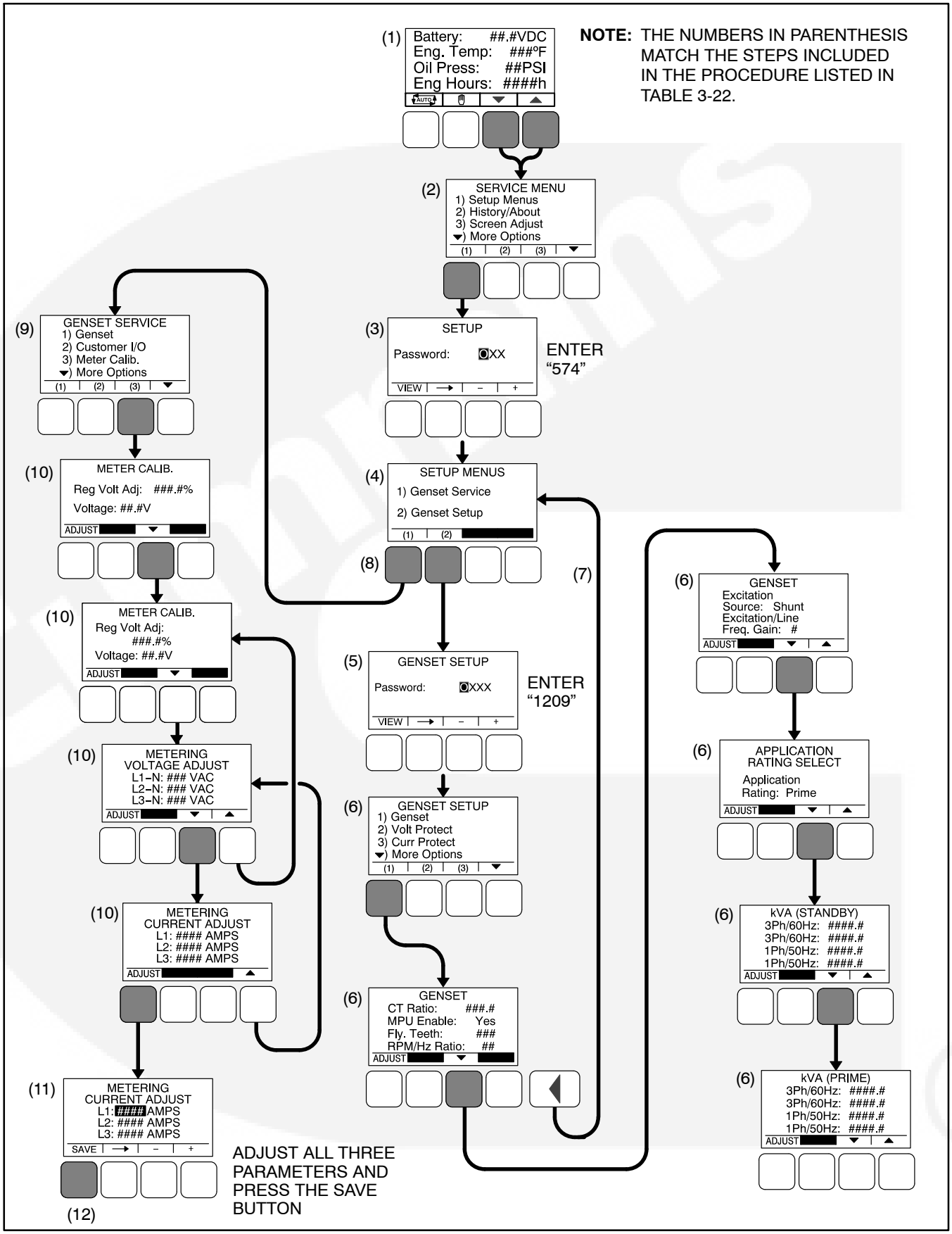


FIGURE 3-26. OPERATOR PANEL MENUS FOR CALIBRATING CURRENT MEASUREMENT FOR DISPLAY

1302 CONTROL FUNCTIONS

Remote Start Mode

The 1302 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.

Local Emergency Stop

For operation of the genset, a short between J25-2 and J25-6 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.

Emergency Stop

It is also required that there be a physical interruption of the FSO and the starter (and, optionally, switched B+) when an emergency stop is active. In order to do this, add a second E-stop contact in series with B+ and the FSO relay coil. Figure 3-27 illustrates one possible way to do this. Power to the fuel shutoff valve is provided serially through one contact of the two contact E-stop switch. The connection point is called E−Stop B+.

Referring to wiring diagram: 630−3270 for complete illustration.

12/24V Battery

The 1302 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.

The trim parameter for this is Nominal Battery Voltage and the default trim is set at 12 VDC.

For information on how to set the nominal battery voltage using the operator panel, see page 5-41.

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

The 1302 series control can be configured for the number of starting cycles (1 to 7) and duration of crank and rest periods. The control includes starter protection algorithms to prevent the operator from specifying a starting sequence that might be damaging.

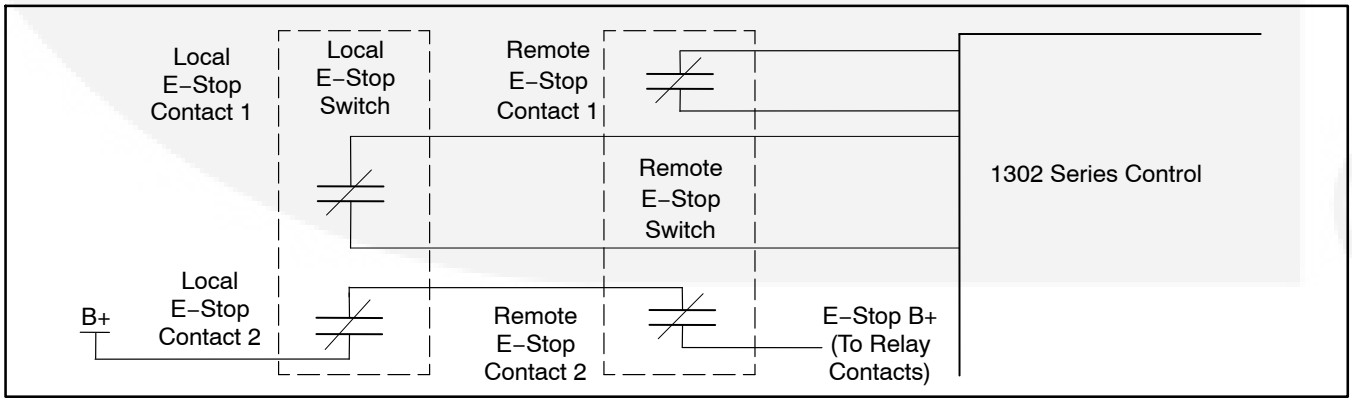


FIGURE 3-27. EMERGENCY STOP CONTACTS

For information on how to set the cycle crank attempts using the operator panel, see page 5-11.

Spark Ignition Power/Glow Plug Control

Pin J11-7 on the 1302 series control is dual purpose.

Glow Plug Control

Glow plug is used as a Cold starting aid. Glow plugs heat up the air going in for combustion for Diesel Engine. Glow plug is used to improve the starting ability of engines and to reduce the white smoke during cold start.

In PCC1302 when Glow Plug Enable = Enabled and Fuel System = Diesel the Glow Plug Function is enabled and control will preheat the engine starting glow plugs. Pin J11−7 on the PCC1302 control can be used to drive Glow Plugs via external Relay.

Setting Glow Plug Enable = Disabled or Fuel System = Gas, disables the Glow Plug Function.

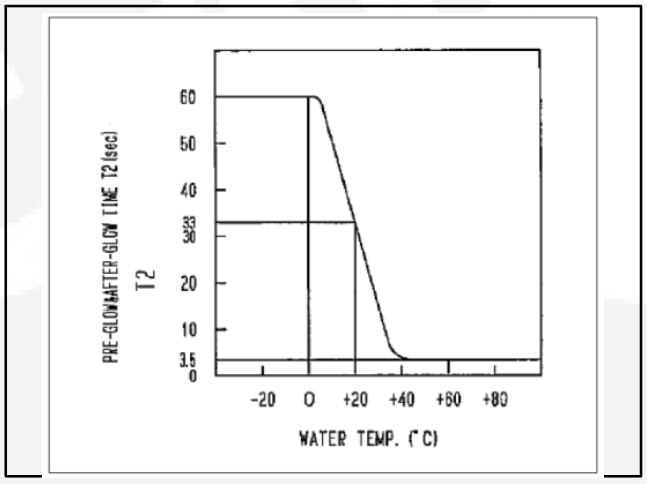


FIGURE 3-28. PRE−GLOW MEASUREMENT

Glow Plug Control implemented in PCC1302 consists of the following two processes:

a. Preheat Process (Pre−Glow Process)

b. Total Glow Process

Preheat Glow Time and Total Glow Time are determined by linear interpolation of Preheat Time and Total Glow Time respectively based on reading of Engine Coolant Temperature as shown in the graph above. Cranking will start after the Preheat Time has expired. The Glow Plug Output will remain on until the Total Glow Time has expired. The Control commands the glow plugs to enable when the control.

a. Detects that the genset has received a valid start command.

b. Determines teh preheat time and total glow times as the function of the Engine Coolant Temperature.

c. Turns off the glow plug during the normal stop or during the fault shutdown or during the cyclical crank attempts or if the total glow time has expired.

Preheat Processing

Preheat processing logic has three associated trims as shown in Table 3−22

TABLE 3-23. PREHEAT PROCESSING TRIMS TABLE

Sr. No	Name of the Trims	Default Value	Range
1	Preheat Time (Trim)(sec)	15 (sec)	0−30 (sec)
2	Preheat Temperature (Trim)(°F)	70 (°F)	0−100 (°F)
3	Preheat Knee Point (Trim)(°F)	0 (°F)	0−70 (°F)

Preheat Time = controls how many seconds the glow plug will preheat before cranking the engine.

Preheat Temperature = controls at which temperature the control defines a non−cold engine. The glow plugs will not preheat for engine coolant temperatures above the Preheat Temperature.

Total Glow Processing:

Total Glow processing logic has three associated trims as shown in Table 3−23.

TABLE 3-24. TOTAL GLOW PROCESSING TRIMS TABLE

Sr. No	Name of the Trims	Default Value	Range
1	Total Glow Time (Trim)(sec)	0 (sec)	0–60 (sec)
2	Total Glow Temperature (Trim)(°F)	70 (°F)	0–110 (°F)
3	Total Glow Knee Point (Trim)(°F)	0 (°F)	0–32 (°F)

Glow Plug Output Logic:

In PCC1302, Glow Plug Output depends upon Total Glow Time Value (Mon). The Glow Plug Output turns on when Fuel System (Trim) = Diesel and Total Glow Time Value (Mon) > 0. Glow Plug Driver Command remains on until the Total Glow Time Value (Mon) has expired. Glow Plug Output turns off, if any of the following conditions is valid:

a. When Total Glow Tiem Value (Mon) expires.

b. When Generator Set Control stops normally.

c. When Generator Set Control stops during emergency.

d. When Generator Set Control performs cyclical crank process.

When the trim parameter Fuel Type is set to Diesel and Glow Plug is Enabled, the control preheats the engine starting glow plugs. Two trim parameters may need to be adjusted in order for the glow plug preheat control logic to work effectively. The trim parameter Preheat Time = seconds controls how many seconds the glow plugs will preheat before cranking the engine. The trim parameter Preheat Temperature = degrees Fahrenheit controls at which temperature the control defines a non-cold engine. The glow plugs will not preheat for engine coolant temperatures above the Preheat Temperature. Adjusting both of the trims will allow for tailoring of the glow plug preheat logic for specific engine applications. Setting Glow Plug = Disabled disables the glow plug preheat logic.

When the trim parameter Fuel Type = Gas, pin J11-7 can be used to control an external spark ignition control module. Pin J11-7 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 is burned following a genset stop / shutdown. This removes the occasional fuel flash in the exhaust system after a stop / shutdown.

Refer to the wiring diagram for more information on how to configure the Remote Emergency Stop Switch for gas gensets to interrupt the ignition system power.

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)

The 1302 series control is configurable for a time delay of 0–300 seconds prior to starting after receiving a remote start signal, and for a time delay of 0–600 seconds prior to shut down after signal to stop in normal operation modes. The default for both time delay periods is 0.

0–3600 seconds (fron 1302 calibration version 2.80 and HMI211 calibration version 7.20). Earlier versions have 0–300 seconds.

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

Electronic Governor

The 1302 series control provides electronic governing capability for a generator set when a electronic governor option is installed on the genset. It has a field adjustment trim to enable or disable the electronic governing feature. It supports isochronous speed governing as defined below.

- The maximum allowed rated current for the actuator drive for the governor power stage is 6.0A continuous max; 10 Amps for 1 second.
- The governing system is suitable for use with Gensets using Cummins EFC normally closed actuators, Woodward, FORD Gas, or Barber-Coleman actuators with similar drive characteristics.
- It provides speed governor setpoints of 1500 RPM and 1800 RPM. The governor setpoint is a field adjustment (50 Hz or 60 Hz).

- The optional display allows the operator to adjust frequency within plus or minus 5% of rated speed.
- The controller provides ramping at startup and an ability to program the cranking fueling before the governor algorithm is enabled.

Engine Speed Sensing

For electronically governed gensets, the 1302 series control requires an engine speed input from a magnetic pickup speed sensor. The magnetic pickup signal needs to be calibrated for number of engine flywheel teeth. The table shown below lists the number of flywheel teeth for some common engine types.

TABLE 3-25. FLYWHEEL TEETH REQUIREMENTS

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

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

Speed Governor Algorithm and Adjustment

The 1302 series control supports the following speed governor algorithm characteristics:

- It uses a four-coefficient field adjustable closed loop PID control algorithm (Proportional–Integral–Derivative).
- It allows field tuning of the speed coefficients.
- The 1302 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%.

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 is initially set to the Initial Crank Fueling Duty Cycle value and remains at that value for the Initial Crank Fueling Period. After this period expires, the fuel command is 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 is ramped to rated speed in a time equal to the Governor Ramp Time. The diagram below illustrated these setpoints.

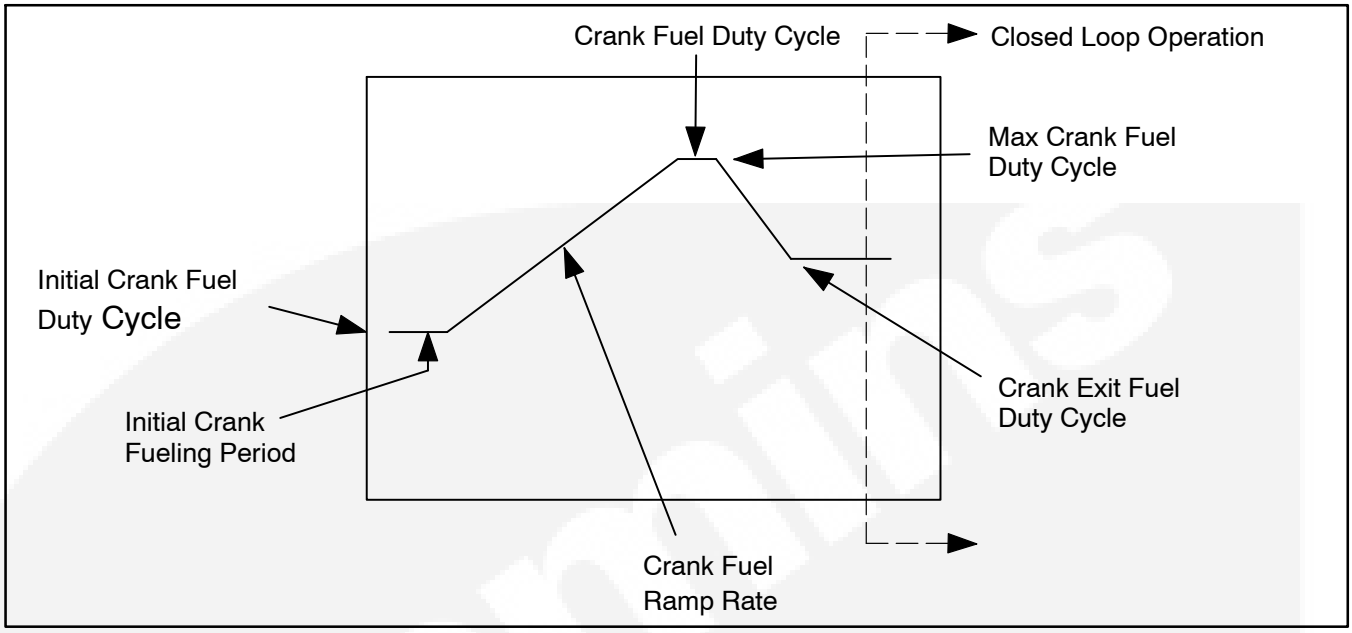


FIGURE 3-29. GOVERNOR RAMP TIME SETPOINTS

REAL TIME CLOCK

The PCC1302 control system includes a Real Time Clock (RTC) function used for automatic scheduler (exercise scheduler) feature. The Real Time Clock (RTC) in PCC1302 is NOT used for calculating controller on time, or for recording fault occurrence times, or for supporting factory test. Once PCC1302 is programmed and given a power cycle, the user should enter the correct time, date and clock cycle (AM/PM). Based on the time and date saved by the user, the real time clock accurately* calculates seconds, minutes, hours, date of the month, month, day of the week, and year with leap year compensation. The clock operates in 12 hour format with support for AM/PM.

When battery power is removed or the PCC1302 controller goes in sleep mode, the RTC parameters get reset to 00:00 (HH:MM) for Time and 00/00/00 (MM/DD/YY) for Date and AM for Clock Cycle. Under this condition, and with Scheduler Prog x Enable trim Enabled and Clock Diagnostic Enable trim Enabled, FC 1689 (Clock Not Set) will become active indicating that the date, time and AM/PM needs to be set by the user.

The RTC also supports Daylight Savings Time (DST), which is a convention used to advance the time by one hour so that afternoons have more daylight than mornings. The DST logic adds the DST Adjustment time to the current time when the current time is equal to the DST Start Time. The DST logic subtracts the DST Adjustment time from the current time when the current time is equal to the DST End Time. To enable DST, the trim Daylight Savings Time Enable needs to be set to Enabled. To setup DST, specify the values for the following trims. These trims can be set via PCTools or HMI211 or HMI211RS or via Modbus utility.

TABLE 3-26. TRIM RANGE VALUES

Trim	Range	Meaning
Daylight Savings End Day	Monday – Sunday	Calendar Day in which DST Ends
Daylight Savings End Hour	01– 12 hours (it is always AM)	Hour (12 Hr) in which DST Ends
Daylight Savings End Month	1 – 12 months	Month in which DST Ends
Daylight Savings End Week Occ Month	Default – Fifth Occurrence	Occurrence of Daylight Savings End Day in which DST Ends
Daylight Savings End Day	Monday – Sunday	Calendar Day in which DST Starts
Daylight Savings End Hour	01– 12 hours (it is always AM)	Hour (12 Hr) in which DST Ends
Daylight Savings Start Month	1 – 12 months	Month in which DST Starts
Daylight Savings Start Week Occ Month	Default – Fifth Occurrence	Occurrence of Daylight Savings End Day in which DST Starts
Daylight Savings Time Adjustmenty	0 – 120 minutes	Amount of time to be added or subtracted from current time for DST adjustment.

For Example: If DST Ends on the 1st Wednesday in April at 02:00 AM every year, and DST Starts on the 2nd Thursday in September at 3:00 AM every year, and DST Adjusts the clock by 1 hour each time, the parameters should be set to the following values.

TABLE 3-27. TRIM VALUES

Trim	Value
Daylight Saving End Day	Wednesday
Daylight Saving End Hour	02
Daylight Saving End Month	4
Daylight Saving End Week Occurrence in Month	First Occurrence
Daylight Saving Start Day	Thursday
Daylight Saving Start Hour	3
Daylight Saving Start Month	9
Daylight Saving Start Week Occurrence in Month	Second Occurrence
Daylight Saving Time Adjustment	60

NOTE: The software accuracy of real time clock is +/– hour over a period of 1 calendar year. The real time clock function is available from 1320 calibration version 2.76 and above and HMI211 calibration version 6.90 and above.

EXERCISE SCHEDULER

The exercise scheduler is a feature that automatically starts the genset for exercise. This feature prevents common problems which result from mechanical equipment being not in operation for long periods of time. In order for the automatic exerciser to work, the PCC1302 control system needs to be in 'Auto' mode, the RTC needs to be set (Fault 1689 is not active), and the trim Scheduler Prog x Enable needs to be set to Enable.

SLEEP mode will be disabled if the user enables the exercise scheduler. This is because sleep mode will reset the clock (RTC) in PCC 1302 and exercise function will not work.

The PCC1302 can be programmed to run only 1 program, which is a repeating event. Furthermore, the program can be programmed to exercise the genset at rated condition and at 'No Load' condition. No exceptions can be set in PCC1302.

The exercise program has the following trims which establish its behavior where currently x always denotes 1.

TABLE 3-28. TRIM SCHEDULE VALUE

Trim	Value	Meaning
Scheduler Prog x Enable	Enable – Disable	Enables or Disables Schedule x=1
Scheduler Prog Start Minute	0 – 59	Specifies at what minute Program with start
Scheduler Prog Start Hour	1 – 12	Specifies at what hour Program will start
Scheduler Prog Start Day	Monday – Sunday	Specifies at what day Program will start
Scheduler Prog Start Period	AM – PM	Specifies at what period Program will start
Scheduler Prog Repeat Interval	Weekly,Bi_Monthly,Monthly,Quarterly,Semi–Annual	Specifies the repeating behavior of Program
Scheduler Prog Duration (Mins)	5 – 15	Specifies how many minutes Program will run

For example, if it was desired to have a Program that ran on every Monday at 8:12 AM for 15 Minutes, the trims should be defined in Table 3–28

TABLE 3-29. EXAMPLE TRIM VALUE

Trim	Value
Scheduler Prog x Enable	Enable
Scheduler Prog Start Minute	12
Scheduler Prog Start Hour	8
Scheduler Prog Start Day	Monday
Scheduler Prog Start Period	AM
Scheduler Prog Repeat Interval	Weekly
Scheduler Prog Duration (Mins)	15

TABLE 3-30. EXCERISER SCHEDULE

	Scheduler Program Enable	Scheduler Program Start Day	Start Time		Scheduler Program Duration	Schedular Program Start Period AM/PM	Schedule Repeat Interval
			Hr	Min	Min		Weekly Bi–monthy, Monthly, Quarterly Semi–Annual
Program 1							

The following are the set of rules for exercise scheduler

1. While in Exercise mode, genset will start if in AUTO mode, and run at rated condition and at 'No Load'
2. While in Exercise mode, 'Exercise Scheduler On' message will be displayed on both HMI 211 and HMI 211 RS.
3. This message screen will be displayed for 1 sec when in Info screens of the HMI and will toggle with the Info screens at a frequency of 3 sec.
4. While in Exercise mode, the user cannot edit the Clock parameters, the Exercise Scheduler parameters and the Daylight Savings parameters except for the trim "Scheduler Prog x Enable".
5. If the user tries to edit these trims except "Scheduler Prog x Enable", following message, "Can Not Edit Exercise On" will be displayed on both HMI 211 and HMI 211 RS.

While in exercise scheduler mode, i.e. a scheduled program is active and control system is in 'Auto' mode, if the PC1.1 control system receives a remote start command via HMI or from PCTools or from external transfer switch, the exercise scheduler mode will be terminated and the Scheduler Prog Duration (Mins) timer will become 0. However, the genset will continue to run in 'Auto' mode and will follow ATS operation if ATS functionality is enabled. If remote start command is removed then the genset will stop running.

NOTE: The excerise scheduler function is available from 1320 calibration version 2.76 and above and HMI211 calibration version 6.90 and above.

ATS Control

Automatic Transfer Switch is used to transfer power from Utility to Genset and vice–versa. A trim Auto Mains Failure Enable is provided to enable/ disable the ATS functionality in PCC1302. There are settable delay timers incorporated for transferring and re–transferring the load from Utility to Genset and vice–versa. In addition, diagnostic faults of ATS functionality and its corresponding FCs/ symbols are supported in HMI211 and HMI211RS.

PCC 1302 has four configurable inputs, out of which two Configurable Inputs can be used for checking the feedback of the switch positions i.e. on Genset side or Utility side. The configurable inputs will remain locked for ATS functionality when AMF feature is enabled and the trim Transfer Switch Feedback Enable is enabled.

TABLE 3-31. CONFIGURABLE INPUTS

Pin	Signal Name
TB1–12	Configurable Input 1
TB1–13	Configurable Input 1 – Common
TB1–14	Configurable Input 2

Configurable Input 1 is used for Utility switch position status and Configurable Input 2 is used for Genset switch position status.

For transferring the load from Utility to Genset or vice–versa, PCC1302 will use low side driver Ready to Load/ ATS Output only.

ATS functionality will only be enabled when Auto Mains Failure Enable is enabled with the condition that Genset control is running in Auto mode.

NOTE: When Exercise is active and if Utility lost condition is received (remote start signal is active), Genset Control discards the Exercise and continues with

the ATS functionality. The excerise scheduler function is available from 1320 calibration version 2.76 and above and HMI211 calibration version 6.90 and above.

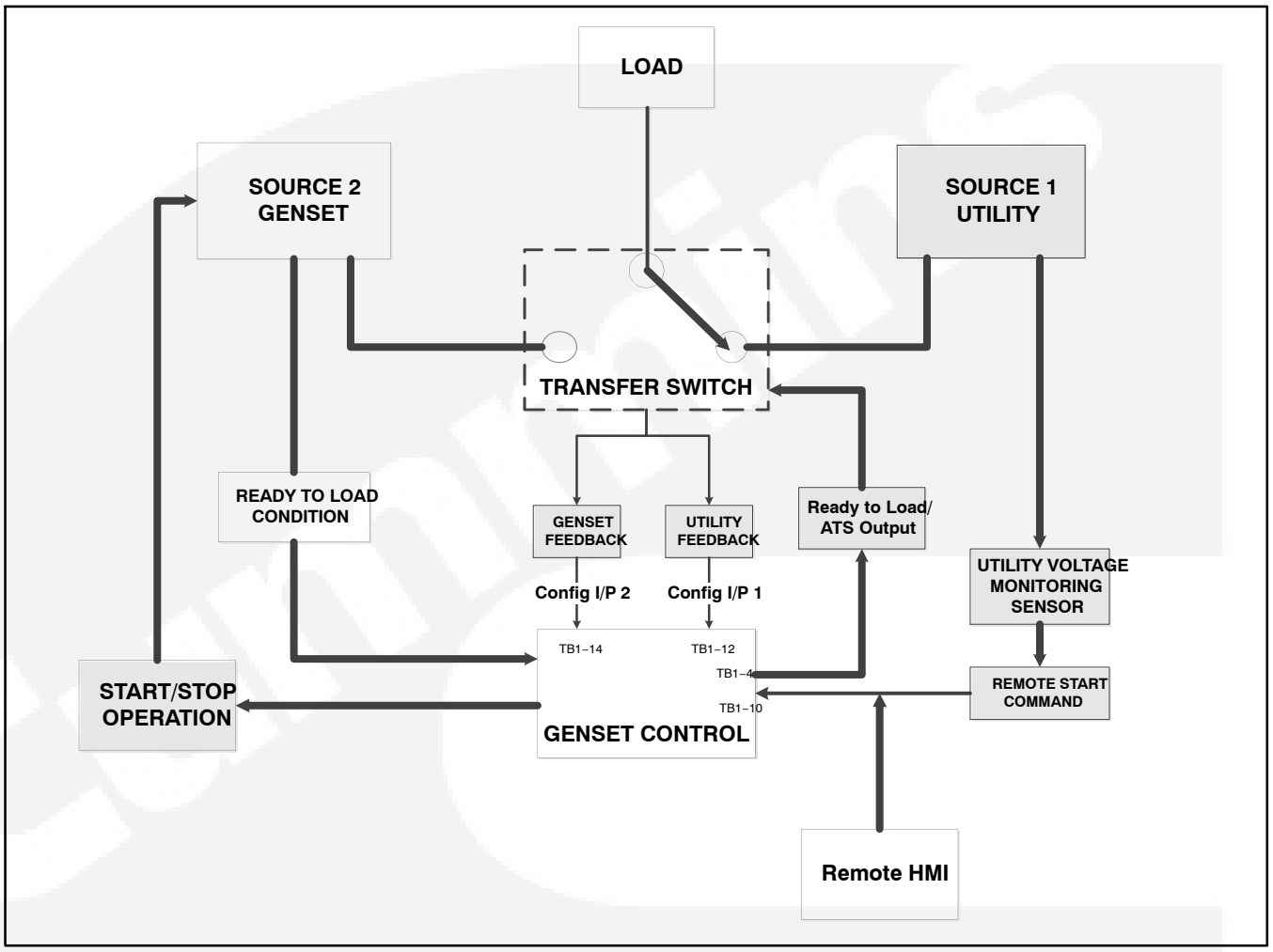


FIGURE 3-30. PCC1302 BLOCK DIAGRAM

- As per the block diagram shown above, Genset Control (PCC1302) monitors the status of the Utility (Failing and Returning condition) directly through Remote Start Command (Active or Inactive) condition.
- When Utility voltage monitoring sensor senses that the voltage has gone below Drop–out Voltage, it will activate the Remote Start Command input.
- When Utility voltage monitoring sensor senses that the voltage has gone above the Pickup Voltage, it will de–activate the Remote Start Command input.
- When Genset control receives the Remote Start active input command, the control will do the following when Control Switch Position is in Auto.
  a. Genset Control gives the start command to Genset after the Start Time delay is completed.
  b. After starting the Genset, when Genset Control reaches the ”Running” condition, it starts the Transfer Delay (trim) if Auto Mains Failure Enable is enabled.
  c. When Genset Control reaches the Ready to Load condition and Auto Mains Failure Enable is enabled and Transfer Delay is completed, Genset Control will activate the Ready to Load/ATS output (Customer Ready to load driver output) to initiate the

transfer process of the load from Utility source to Genset source.

d. After activating the Ready to Load/ATS output, Genset Control starts Transfer Delay Timer. Genset control will check for Configurable Input 1 Status = Inactive (Utility Open) and Configurable Input 2 Status = Active (Genset Close) feedback. If the feedback is not received for specified period of time (Transfer to Genset Delay Timer), Genset Control will declare the Shutdown fault "Genset Failed To Close".

- When Genset Control receives the Remote Start Inactive Input Command, the Control will do the following

  a. When Genset Control receives the Remote Start Inactive Input Command and Auto Mains Failure Enable is enabled, Genset Control starts Re−Transfer Delay (Trim).

  b. When Genset Control receives the Remote Start Inactive Input Command and Auto Mains Failure Enable is enabled, Genset Control starts Re−Transfer Delay (Trim).

  c. After de−activating the output and Auto Mains Failure Enable is enabled, Genset Control will check for the Configurable Input 2 Status = Inactive (Genset Open) and Configurable Input 1 Status = Active (Utility Close) feedback. If the feedback is not received for specified period of time (Re−Transfer to Utility Delay Timer), Genset Control will declare the Warning fault "Utility Failed To Close".

  d. Genset Control will initiate the Stop Time delay only when the feedback is received otherwise Genset will continue to be in running state. After the completion of the Stop Time delay, Genset Control will give the command to stop the Genset.

- If Transfer Switch is at unknown position, Genset Control will declare the Warning fault "Transfer Switch Status Unknown Position".

  NOTE: In Genset Control, if Auto Mains Failure Enable = Enabled and Transfer Switch Feedback Enable = Enabled, then transferring and retransferring process depends upon Feedback Logic and Ready to Load/ ATS Output automatically. In Genset Control, if Auto Mains Failure Enable = Enabled and Transfer Switch Feedback Enable = Disabled, then transferring and retransferring process depends upon Ready to Load / ATS Output status only.

  NOTE: The ATS control function is available from 1320 calibration version 2.76 and above and HMI211 calibration version 6.90 and above.

Dual Fuel

The PCC1302 has the ability to determine the status of the Fuel System and notify the user and the ECM.
When Fuel Type = Gas and Engine Application Type = FAE (ECM CAN Enable = Enabled), user will be able to set the trim parameter Gas Fuel Type as Natural Gas (Default) or Propane or Dual.
When Gas Fuel Type is selected as Dual, the control system has the ability to transfer the fuel source from Natural Gas to Propane in case a low fuel condition is sensed for Natural Gas.

BATTLE SHORT MODE OPTION

The 1302 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 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 an Operator Panel

To activate the Battle Short feature for installations that include the operator panel (see Figure 3-31),

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 five 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 5-21 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 an 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 1302 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 5-12). In addition, Battle Short mode must be enabled (set to Active) in the Battle Short submenu (see page 5-12).

When Battle Short mode is enabled, the Warning status indicator lights, and **Fault Code 1131 – 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 1416 – 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 234, Fault Code 1992 and Fault Code 3131
  - Emergency Stop – Fault Code 1433 or 1434
  - Speed Signal Lost (Loss of Speed Sense) – Fault Code 121
  - Excitation Fault (Loss of Voltage Sense) – Fault Code 2335
- 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 5-12) and select “Inactive.” **Fault Code 1123 – 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 234 or 1992 or 3131
  - Emergency Stop – Fault code 1433 or 1434
  - Speed Signal Lost (Loss of Speed Sense) – Fault code 121
  - Excitation Fault (Loss of Voltage Sense) – Fault code 2335
- 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 1123 – Shutdown After Battle Short**.

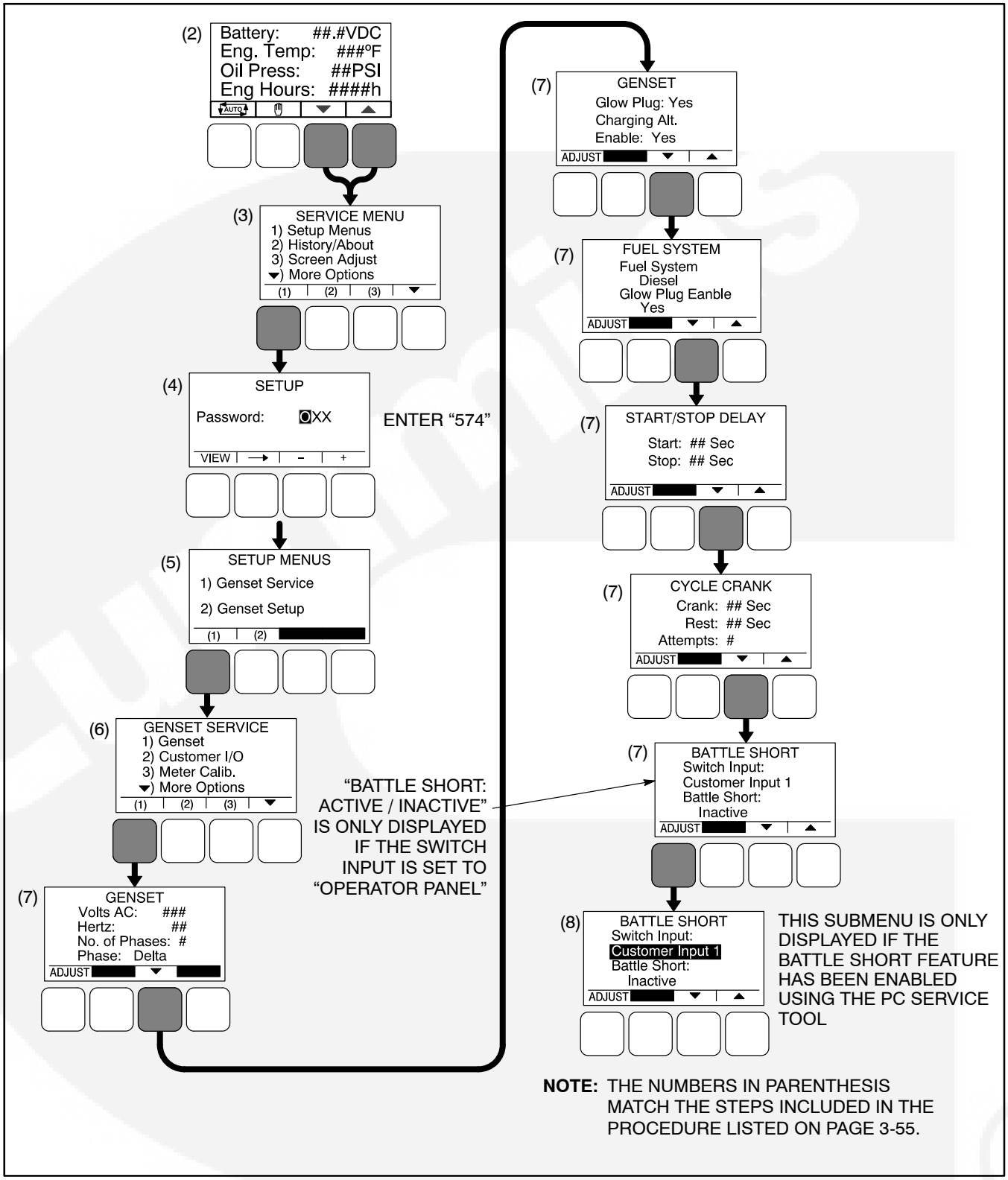


FIGURE 3-31. OPERATOR PANEL MENUS FOR CALIBRATING BATTLE SHORT MODE

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4. Operator Panel Operation

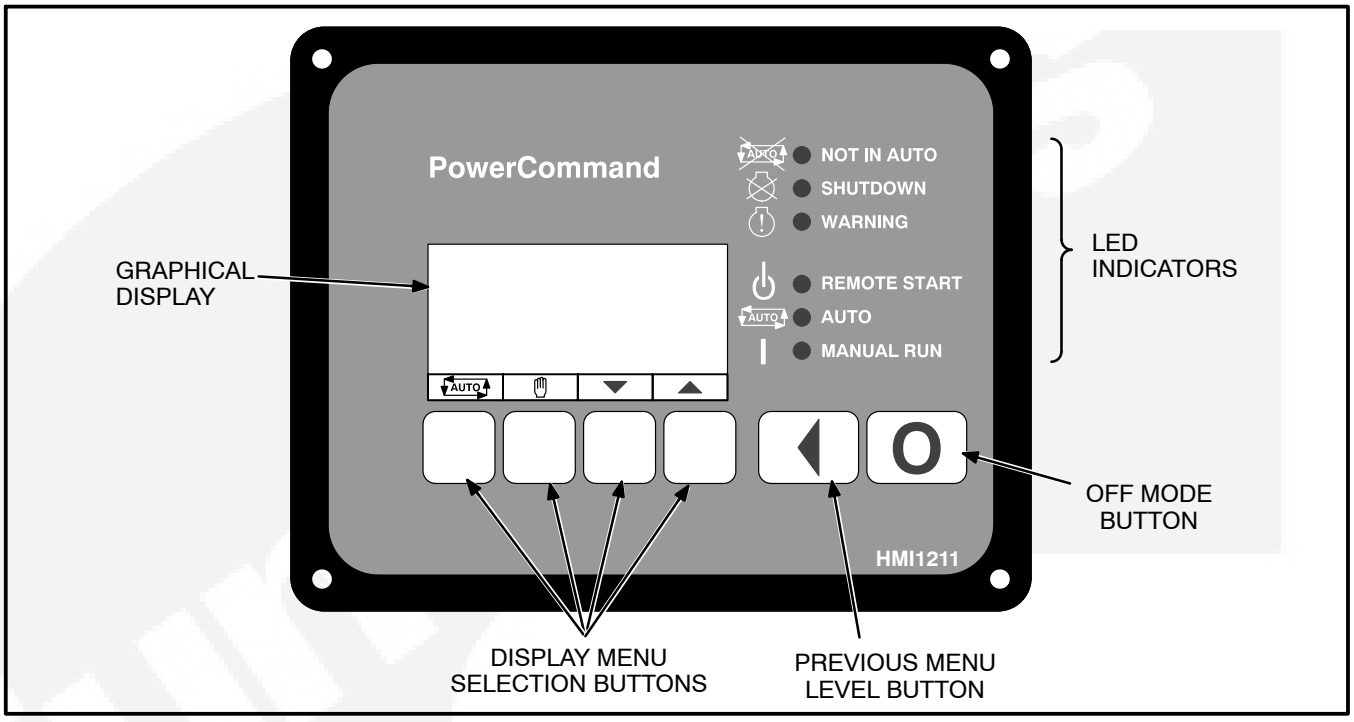


FIGURE 4-1. 1302 OPTIONAL OPERATOR PANEL

INTRODUCTION

This section includes information on the following.

- Local Status Output Indicator
- Operating Modes
- Operator Panel Description
- Operator Panel System Messages
- Description of Fault and Status Codes
- Adjusting Values and Saving the Changes
- Basic Operator Menus
- Selecting Auto, Manual Run, and Off Modes
- Service Menus
- History/About Menus
- Fault History Menu
- Screen Adjust Menu

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.

  For **four-digit shutdown fault codes**, the first digit in the code is flashed, followed by a half-second pause, then the second digit is flashed, followed by a half-second pause, then the third digit is flashed, followed by a half-second pause, and then the fourth 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 1302 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. When in Off mode, all active faults are reset.

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 the time delay start and time delay preheat (if programmed) are 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 **Fault Code 1433 or 1434 – Emergency Stop** is either displayed (installations with a operator panel) or flashed (installations with a status indicator lamp).

To reset the control, close (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 1302 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 (configurable).

Sleep mode can only be disabled by installing a jumper between TB15-1 and TB15-5 (the TB15 connector is shown in Figure 4-2).

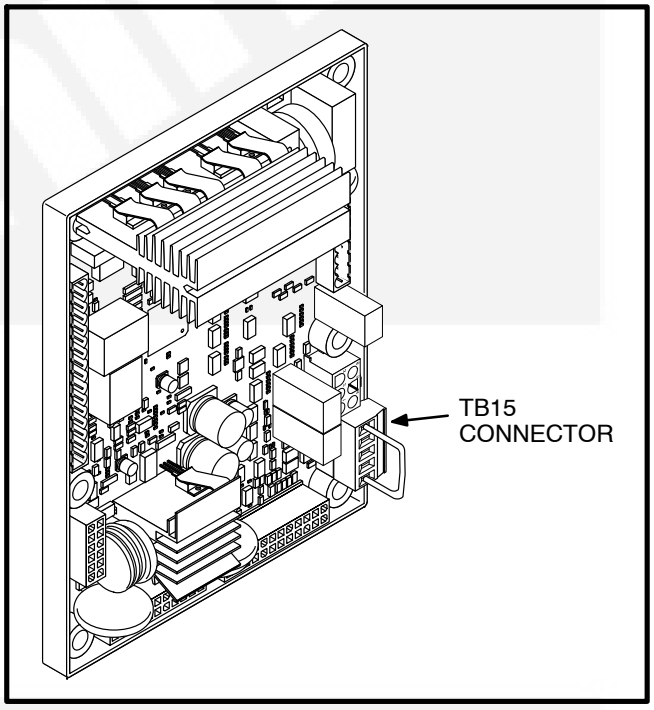


FIGURE 4-2. TB15 CONNECTOR WITH JUMPER

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

Once in sleep mode, the 1302 series control will wake up when one of the following wakeup signals are received.

- Local E-Stop – Active when switch is open
- Remote E-Stop – Active when switch is open
- Manual Start
- PCCNet System Wakeup
- Remote Start
- Auto Mode (If Configured)
- Configurable Input #3
- Configurable Input #4

Installations with an Operator Panel

Sleep mode is automatically enabled on the operator panel. To awaken the operator panel, press any button.

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 (if configured) is selected.

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 4-6.

Display Text / Symbolic Versions

Using the Display Setup Service submenu (see page 5-15), 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
	Voltage Alternating Current (VAC)
	Voltage Direct Current (VDC)
	AC Current
	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.

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

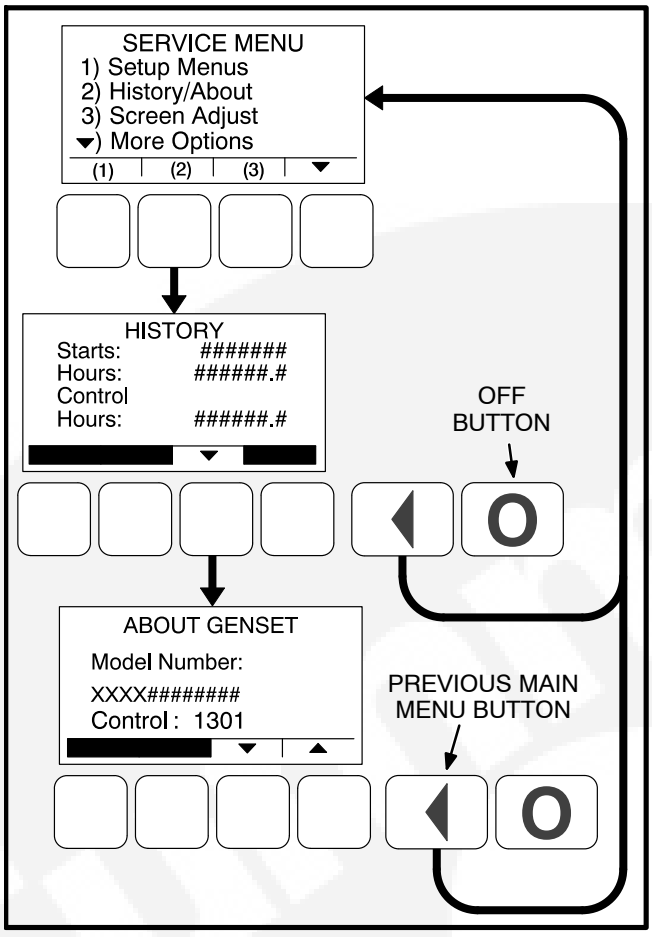


FIGURE 4-3. PREVIOUS MAIN MENU AND OFF BUTTONS

Off Button

Press the O button to switch to the **Off** mode. The Off mode disables the control Auto or Manual Run modes.

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

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 performing a fault reset. 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 start 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 or the event has expired. 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 4-4). This menu also displays the screen’s software number and version.

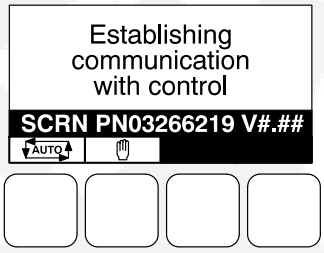


FIGURE 4-4. ESTABLISHING COMMUNICATIONS MESSAGE

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 4-5). The LEDs then return to the state determined by the control.

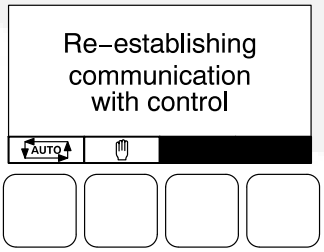


FIGURE 4-5. RE-ESTABLISHING COMMUNICATIONS MESSAGE

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 4-6).

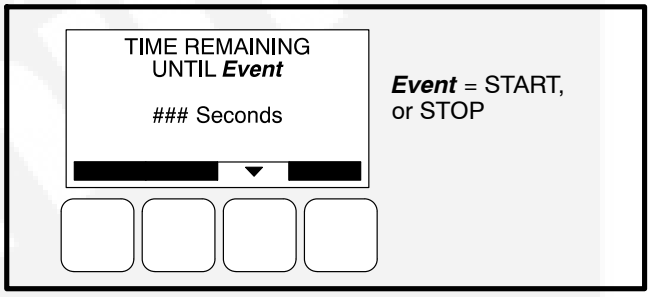


FIGURE 4-6. EVENT MESSAGE

Status Messages

Status messages for some events are displayed on the optional control 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.

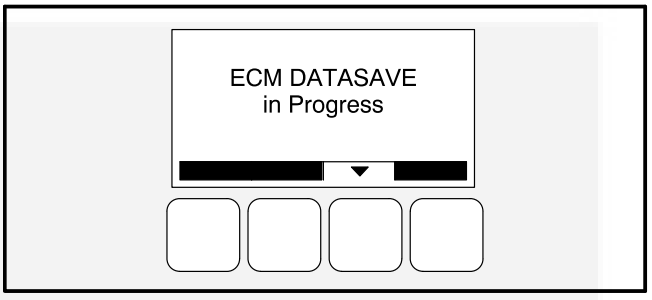


FIGURE 4-7. DATASAVE STATUS MESSAGE

On Full Authority Electronic engines, the engine controller saves data after each run. During this time, the display displays the message shown in Figure 4-7. The generator can still be started while the ECM Datasave is in progress.

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 4-8). Symbolic fault messages include the fault code number and symbols, indicating the type of fault (see Figure 4-9). 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).

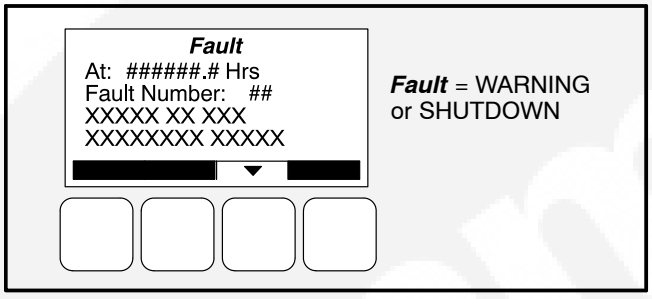


FIGURE 4-8. FAULT MESSAGE – TEXT VERSION

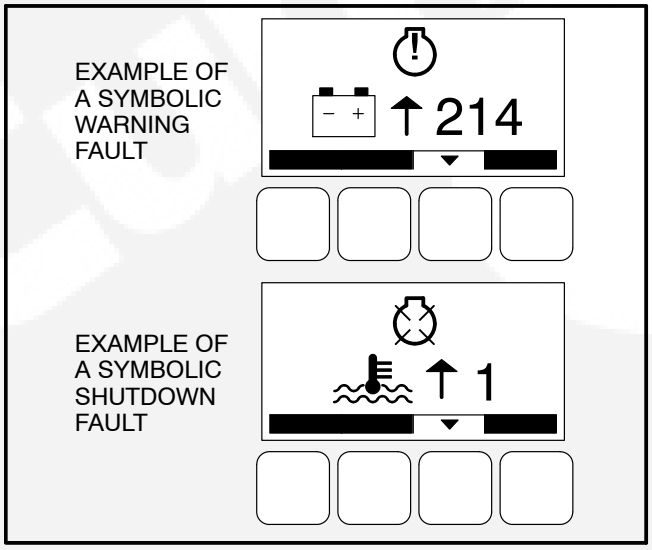


FIGURE 4-9. FAULT MESSAGES – SYMBOLIC VERSION

Fault Reset / Acknowledgement

Shutdown faults must be acknowledged after the fault condition has been corrected. Shutdown faults are usually acknowledged by one of the following methods.

- If the control is equipped with an operator panel, press the O button.
- If the control is not equipped with and operator panel, place the Auto/Off/Manual Run switch in the Off position.

Shutdown faults can also be acknowledged when in Auto mode by using an external customer-supplied remote fault reset switch. This ability must be enabled by setting the Remote Fault Reset Enabled trim to “Enabled” (disabled by default) using InPower.

The remote fault reset switch must be wired into one of the four configurable inputs. The chosen configurable input should have its function mapped to the “Fault Reset” function. To reset the fault, the remote start command must be removed prior to the remote fault reset switch being activated.

Faults are removed from the display when they are cleared.

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

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.

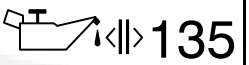
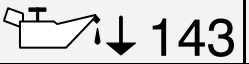
Category C Fault Codes: Consist of faults that do not affect generator set performance but require qualified service personnel to repair. These codes indicate a defective harness or wiring problem.

These codes can also indicate a defective engine sensor, leaving no ingine protection. (Engine damage can occure without detection.) **Continued operation may void the generator set warranty if damage occures that relates to the fault condition.**

Category D 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 E 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	
A	121	Shutdown	SPEED SIGNAL LOST		Indicates that no magnetic pickup pulses were sensed for a Loss of Speed delay. If a magnetic pickup is disabled, this fault is not activated.
C	135	Warning	OIL PRESS SENSOR OOR HIGH		Indicates the oil pressure sensor output is out of range (OOR), high.
C	141	Warning	OIL PRESS SENSOR OOR LOW		Indicates the oil pressure sensor output is out of range (OOR), low.
B	143 **	Warning	PRE-LOW OIL PRESSURE		Indicates that the engine oil pressure is approaching an unacceptable level.
C	144	Warning	COOLANT SENSOR OOR LOW		Indicates the coolant temperature sensor output is out of range (OOR), low.
C	145	Warning	COOLANT SENSOR OOR HIGH		Indicates the coolant temperature sensor output is out of range (OOR), high.
C	146 **	Warning	PRE-HIGH COOLANT TEMP		Indicates that the engine has begun to overheat and the engine coolant temperature has risen to an unacceptable level.

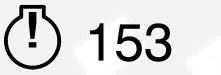
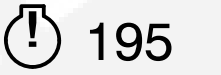
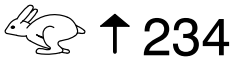
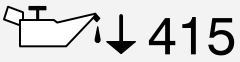
NOTE: Shutdown fault codes can also be announced with a local status lamp indicator.

***** For more information on these events, refer to the Battle Short Mode description on page 3-57.

****** 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 5-37).

^ These faults are available only 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	151 **	Shutdown	HIGH COOLANT TEMP		Indicates that the engine coolant temperature is above normal and has reached the shutdown trip point.
C	153	Warning	INTAKE MANIFOLD TEMP OOR HIGH		Indicates the intake manifold temperature sensor is out of range (OOR), high.
C	154	Warning	INTAKE MANIFOLD TEMP OOR LOW		Indicates the intake manifold temperature sensor is out of range (OOR), low.
D	155	Shutdown	INTAKE MANIFOLD TEMP HIGH		Indicates that the intake manifold temperature is above normal and has reached the shutdown trip point.
D	195	Warning	COOLANT LEVEL OOR HIGH		Indicates that a sensor on the radiator has detected that the coolant level is out of range (OOR), high.
D	196	Warning	COOLANT LEVEL OOR LOW		Indicates that a sensor on the radiator has detected that the coolant level is out of range (OOR), low.
D	197	Warning	COOLANT LEVEL LOW		Indicates that a sensor on the radiator has detected that the coolant level is below normal.
A	234 **	Shutdown	OVERSPEED		Indicates that the engine has exceeded normal operating speed. The default thresholds are 1725 RPM (50 Hz) or 2075 RPM (60 Hz).
A	285	Shutdown	ECM PGN TIMEOUT		Datalink failure. PCC control not responding to the engine control module.
A	286	Shutdown	ECM CONFIGURABLE ERROR		Indicates an engine control module configuration error – out of calibration.
D	359	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).
A	415	Shutdown	LOW OIL PRESSURE		Indicates the engine oil pressure has dropped below normal and has reached the shutdown trip point.
C	421 ^	Shutdown	OIL TEMP HIGH		Indicates that the engine oil temperature is above normal and has reached the shutdown trip point. (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 3-57.

****** 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 5-37).

^ These faults are available only 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	
––	418	NONE	N / A	N/A	Indicates water in fuel
B	425^	Shutdown	OIL TEMP OOR	425	Indicates the oil temperature sensor output is out of range (OOR), high or low. (I/O Module option)
A	426	Shutdown	DATA LINK ERROR	426	Datalink failure. No communications between the PCC control and the engine control module.
A	427	Warning	CAN LINK LOST	427	Datalink fault. Indicates that important data was lost between the PCC control and the engine control module.
D	441 **	Warning	LOW BATTERY	↓ 441	Indicates battery voltage supply to the control is approaching a low level at which unpredictable operation can occur.
D	442 **	Warning	HIGH BATTERY	↑ 442	Indicates battery voltage supply to the control is approaching a high level at which damage to the control can occur.
D	488^	Shutdown	INTAKE MANIFOLD TEMP HIGH	488	Indicates the intake manifold temperature is above normal and has reached the shutdown trip point. (I/O Module option)
A	689	Shutdown	ENGINE SPEED ERRATIC	689	Indicates a fault condition in the engine crankshaft sensor circuit.
A	781	Shutdown	CAN LINK LOST	781	Datalink failure. No communications between the PCC control and the engine control module.
D	1117	Warning	ECM POWER LOST	1117	Indicates battery voltage supply to the engine control module was lost.
B	1123 *	Shutdown	SHUTDOWN AFTER BS	1123	A shutdown fault occurred while the Battle Short mode was enabled.
D	1131 *	Warning	BATTLE SHORT ACTIVE	1131	Indicates that the control is in Battle Short mode – used to bypass several fault shutdowns for genset operation during emergencies.
C	1246	Warning	GENERIC ENGINE FAULT	1246	Engine control fault code not recognized by the PCC control.
E	1311	Configurable	Customer Fault Input 1	1311	The nature of the fault is an optional customer selection.
E	1312	Configurable	Customer Fault Input 2	1312	The nature of the 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 3-57.

****** 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 5-37).

^ These faults are available only 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	
E	1317	Configur-able	Customer Fault Input 3	1317	The nature of the fault is an optional customer selection.
E	1318	Configur-able	Customer Fault Input 4	1318	The nature of the fault is an optional customer selection.
B	1416 *	Warning	FAIL TO SHUTDOWN	1416	Indicates that a shutdown fault is active, but is being bypassed by Battle Short.
A	1417	Shutdown	FAILURE TO POWER DOWN	1417	Indicates the control is powered up after attempting to go to sleep.
D	1433	Shutdown	LOCAL EMERGENCY STOP	1433	Indicates a Local Emergency Stop has been activated.
D	1434	Shutdown	REMOTE EMERGENCY STOP	1434	Indicates a Remote Emergency Stop has been activated.
D	1435 **	Warning	LOW COOLANT TEMP	1435	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	1438	Shutdown	FAIL TO CRANK	1438	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.
D	1442 **	Warning	WEAK BATTERY	1442	Indicates that the genset battery voltage is below battery thresholds during cranking.
A	1443	Shutdown	DEAD BATTERY	1443	Indicates during cranking battery voltage has dropped below operating voltage of control resetting the control for three consecutive times.
A	1446 **	Shutdown	HIGH AC VOLTAGE	1446	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 0 seconds or 110% of nominal for 10 seconds.
A	1447 **	Shutdown	LOW AC VOLTAGE	1447	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.

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 3-57.

****** 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 5-37).

^ These faults are available only 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	1448 **	Shutdown	UNDER FREQUENCY	Hz↓ 1448	Indicates that the alternator frequency is 6 hertz under nominal frequency.
A	1449 **	Shutdown	OVER FREQUENCY	Hz↑ 1449	Indicates that the alternator frequency is 6 hertz above nominal frequency.
––	1463	NONE	N /A	N/A	Indicates Not in Auto.
––	1468	NONE	N / A	N/A	Indicates Ready to Load.
A	1469 **	Shutdown	SPEED HZ MATCH	N≠HZ	Indicates that measured engine speed and measured alternator AC output frequency do not agree.
B	1471* *	Warning	HIGH AC CURRENT	~A ↑ 1471	Indicates that the alternator output current (one or more phases) has exceeded safe operating limits.
A	1472 **	Shutdown	HIGH AC CURRENT	~A ↑ 1472	Indicates that alternator output current (one or more phases) has exceeded the alternator's current rating.
––	1483	NONE	N/ A	N/A	Indicates Common Alarm.
––	1540	NONE	N/ A	N/A	Indicates Common Warning.
––	1541	NONE	N/ A	N/A	Indicates Common Shutdown.
C	1845	Warning	WATER IN FUEL OOR HIGH	(!) 1845	Indicates the water in fuel sensor is out of range (OOR), high.
C	1846	Warning	WATER IN FUEL OOR LOW	(!) 1846	Indicates the water in fuel sensor is out of range (OOR), low.
D	1852	Warning	WATER IN FUEL	(!) 1852	Indicates that the water in fuel is above normal and has reached the warning trip point.
E	1853	Configur-able	Annunciator Fault 2	1853	The nature of the annunciator fault is an optional customer selection.
E	1854	Configur-able	Annunciator Fault 3	1854	The nature of the annunciator fault is an optional customer selection.
E	1855	Configur-able	Annunciator Fault 1	1855	The nature of the annunciator fault is an optional customer selection.
E	1944	Warning	ANNUNCIATOR OUTPUT CON-FIGURATION ERROR	1944	Indicates a mismatch in the configuration of one of the annunciator relay outputs.
D	1965 ^	Warning	EXHAUST TEMPERATURE OOR	(!) 1965	Indicates the exhaust temperature sensor is out of range (OOR), high or low. (Aux 101 I/O 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 3-57.

****** 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 5-37).

^ These faults are available only 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	
B	1992	Warning	ENGINE OVERSPEED	1992	Indicates that the engine has exceeded normal operating speed. The default thresholds are 1725 RPM (50 Hz) or 2075 RPM (60 Hz). (ECM fault code).
B	1689	Warning	CLOCK NOT SET	1689	Indicates real time clock is not set with exercise scheduler function enabled.
B	5186	Warning	GENSET FAILED TO CLOSE	5186	Indicates transfer switch has failed to close on generator side.
B	5187	Warning	UTILITY FAILED TO CLOSE	5187	Indicates transfer switch has failed to close on utility side.
B	5188	Warning	TRANSFER SWITCH STATUS UNKNOW POSITION	5188	Indicates transfer switch position is not known.
B	5365	Warning	ON SECONDARY SOURCE	5365	Indicates genset is running on secondary fuel source in dual fuel application.
B	2118	Warning	LOW FUEL PRESSURE	2118	Indicates low fuel pressure sensed for gaseous application.
B	5134	Warning	UNKNOWN SHUTDOWN AT IIDLE	5134	Indicates genset having ECM has shutdown with unknown fault before reaching rated condition.
B	254	Warning	FSO DRIVER FAILED	254	Engine Fuel Shutoff Valve Driver Circuit – Voltage Below Normal or Shorted.
B	1847	Warning	HIGH TEMPERATURE FAULT	1847	Indicates that engine coolant temperature is above normal and has reached the shutdown trip point.
B	1517	Warning	FAILED MODULE SHUTDOWN	1517	At least One Module of a Multi–module system has a severe fault.
B	1921	Warning	REGEN MANDATORY HIGH LEVEL	1921	Aftertreatment Diesel Particulate Filter Differential Pressure – Data Valid But Above Normal Operating Range – Moderately Severe Level. Need to initiate DPFprocess.

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 3-57.

****** 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 5-37).

^ These faults are available only 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	
B	1922	Warning	GENSET CRITICAL CALL TECHNICIAN		Aftertreatment Diesel Particulate Filter Differential Pressure – Data Valid But Above Normal Operating Range – Most Severe Level. Need to call Cummins technician to clear the fault.
B	175	Warning	AIR THROT DRIVE CCT OORH		Electronic Throttle Control Actuator Driver Circuit – Voltage Above Normal or Shorted to High Source.
B	176	Warning	AIR THROT DRIVE CCT OORH		Electronic Throttle Control Actuator Driver Circuit – Voltage Below Normal or Shorted to Low Source.
B	177	Warning	AIR THROT DRIVE MECH SYS ERROR		Electronic Throttle Control Actuator – Mechanical System Not Responding or Out of Adjustment.
B	3539	Warning	AIR THROT POSN SENSOR OORH		Engine Intake Throttle Actuator Position Sensor Circuit – Voltage Above Normal or Shorted to High Source.
B	3541	Warning	AIR THROT DRIVE CCT OORL		Engine Intake Throttle Actuator Position Sensor Circuit – Voltage Below Normal or Shorted to Low Source.
B	3542	Warning	AIR THROT POSN SENS DATA INCORR		Engine Intake Throttle Actuator Position Sensor – Data Erratic, Intermittent, or Incorrect.
B	5669	Warning	ENGINE COMBUSTION FAULT		Intake Manifold Over Pressure – Condition Exists.
C	2224 ^	Warning	FUEL LEVEL OOR		Indicates the fuel level sensor is out of range (OOR), high or low. (Aux 101 I/O option).
A	2335	Shutdown	EXCITATION FAULT		Indicates that a loss of voltage or frequency sensing from the generator has occurred.
C	2398 ^	Warning	AMBIENT TEMPERATURE OOR		Indicates the ambient temperature sensor is out of range (OOR), high or low. (Aux 101 I/O option).
C	2542 ^	Warning	VOLTAGE BIAS OOR		Indicates the voltage bias circuit output is out of range (OOR), high or low. (Aux 101 I/O option).
A	2545	Shutdown	KEYSWITCH RESET REQUIRED		Indicates a datalink failure. Communications are lost between the PCC control and the engine control module.

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 3-57.

****** 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 5-37).

^ These faults are available only 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	
E	2619 ^	Diagnostic	AUX101 ANALOG INPUT 1		The nature of the Base I/O Module event is an optional customer selection. (Aux101 I/O Module option) Each event function can be programmed (using InPower service tool or access to the Setup menu), as follows: • Change display name using up to 32 characters. • Select active low or high input.
E	2621 ^	Diagnostic	AUX101 ANALOG INPUT 2		See code 2619.
E	2622 ^	Diagnostic	AUX101 ANALOG INPUT 3		See code 2619.
E	2623 ^	Diagnostic	AUX101 ANALOG INPUT 4		See code 2619.
E	2624 ^	Diagnostic	AUX101 ANALOG INPUT 5		See code 2619.
E	2625 ^	Diagnostic	AUX101 ANALOG INPUT 6		See code 2619.
E	2626 ^	Diagnostic	AUX101 ANALOG INPUT7		See code 2619.
E	2627 ^	Diagnostic	AUX101 ANALOG INPUT 8		See code 2619.
E	2628 ^	Diagnostic	AUX102 DIGITAL INPUT 9		The nature of the Aux I/O Module event is an optional customer selection. (Aux102 I/O Module option) Each event function can be programmed (using InPower service tool or access to the Setup menu), as follows: • Change display name using up to 32 characters. • Select active low or high input.
E	2629 ^	Diagnostic	AUX102 DIGITAL INPUT 10		See code 2628.
E	2631 ^	Diagnostic	AUX102 DIGITAL INPUT 11		See code 2628.

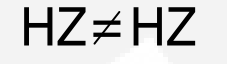
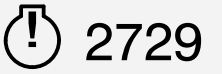
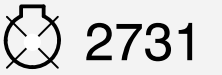
NOTE: Shutdown fault codes can also be announced with a local status lamp indicator.

***** For more information on these events, refer to the Battle Short Mode description on page 3-57.

****** 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 5-37).

^ These faults are available only 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	
E	2632 ^	Diagnostic	AUX102 DIGITAL INPUT 12		See code 2628.
A	2676	Shutdown	ALTERNATOR FREQUENCY CONFLICT		Indicates the measured alternator line frequency and measured alternator excitation frequency do not agree.
A	2677	Shutdown	FAIL TO STOP		The genset continues to run after receiving a stop command from the controller.
B	2678 **	Warning	CHARGER FAILURE		Indicates the battery charging alternator has not reached a acceptable voltage range within the selected time period (default = 120 seconds). 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.
C	2693 ^	Warning	SPEED BIAS OOR		Indicates the speed bias circuit output is out of range (OOR), high or low. (Aux 101 I/O Module option).
C	2694 ^	Warning	ALTERNATOR RTD OOR		Indicates the alternator RTD sensor is out of range (OOR), high or low. (Aux 101 I/O Module option).
A	2696 ^	Shutdown	ALTERNATOR RTD TEMP HIGH		Indicates the alternator temperature is above normal and has reached the shutdown trip point. (I/O Module option)
C	2729 ^	Warning	I/O MODULE LOST		Indicates an intermittent data link between the I/O module and the PCC control. (Aux 101 I/O Module option).
C	2731	Shutdown	I/O MODULE LOST		Indicates the data link between the I/O module and the PCC control is lost. (Aux 101 I/O Module option).
A	2897	Shutdown	FACTORY BLOCK CORRUPT		Indicates a fatal software error occurred in the PCC control.
A	2898	Warning	PERIODIC/ FAULT CORRUPT		Indicates a fatal software error occurred in the PCC control.
A	2899	Shutdown	USER BLOCK CORRUPT		Indicates a fatal software error occurred in the PCC control.

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 3-57.

****** 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 5-37).

^ These faults are available only 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	2911	Shutdown	TRIM BLOCK CORRUPT		Indicates a fatal software error occurred in the PCC control.
D	2964	Warning	INTAKE MANIFOLD TEMPERATURE HIGH		Indicates engine has begun to overheat (intake manifold temperature has risen to an unacceptable level). Increase in load or higher ambient temperature may cause Intake Manifold Temp High (**code 155**) shutdown.
A	2972 **	Shutdown	FIELD OVERLOAD		Indicates that the Field Voltage has been above 70V for 8 seconds.

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 3-57.

****** 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 5-37).

^ These faults are available only 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.

OPERATOR MENUS

Figures 4-10 and 4-11 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.

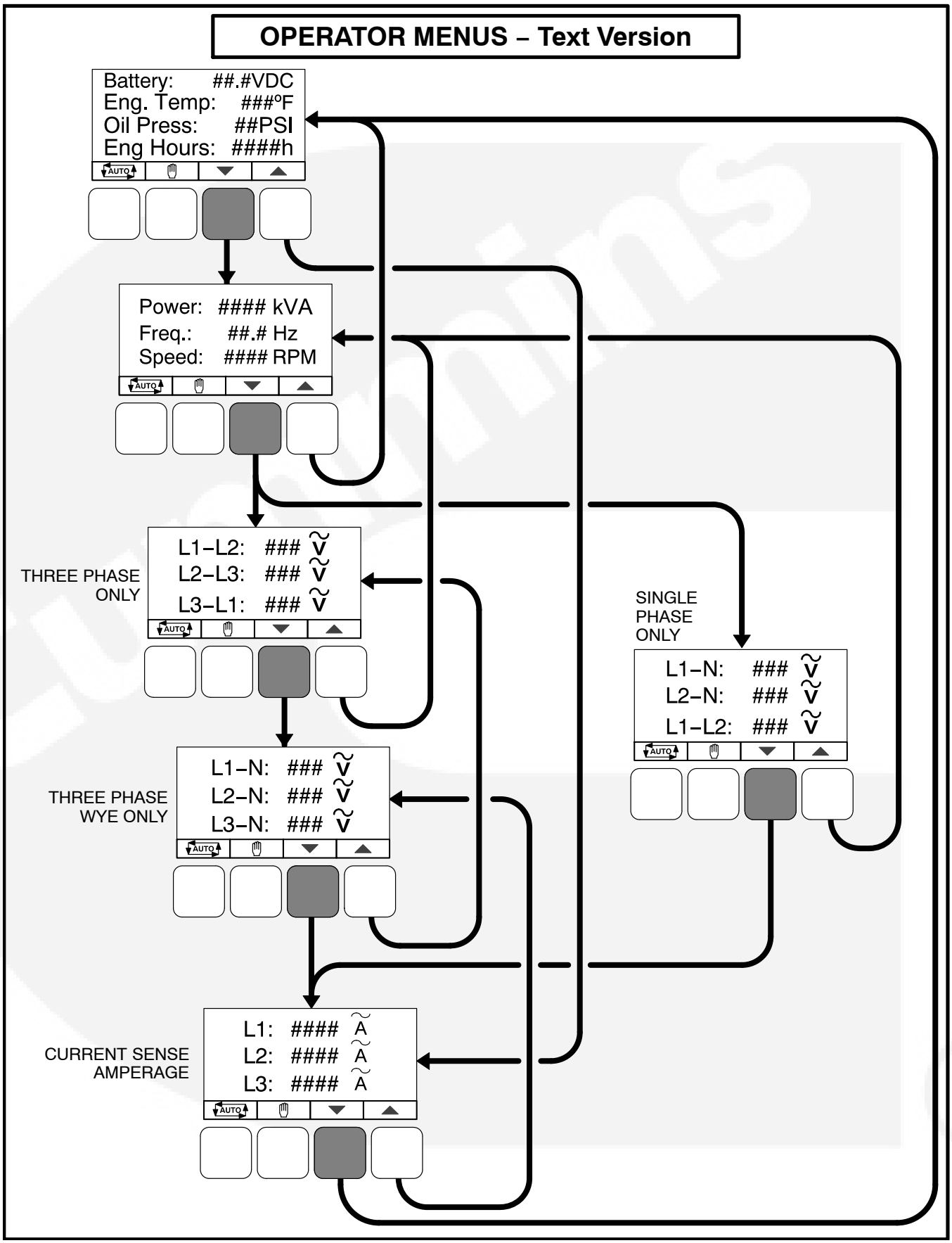


FIGURE 4-10. OPERATOR MENUS (TEXT VERSION)

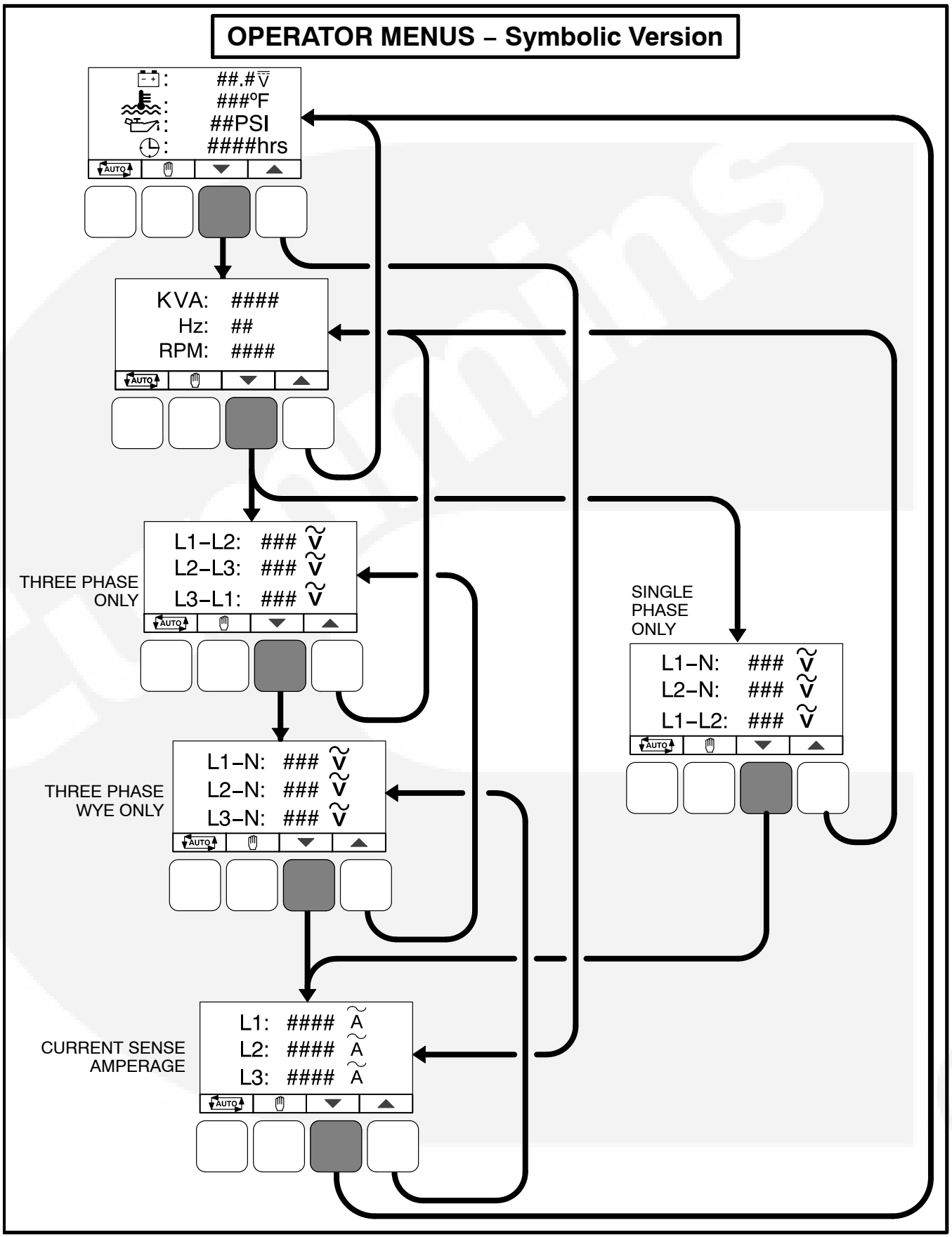


FIGURE 4-11. OPERATOR MENUS (SYMBOLIC VERSION)

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 5-15).

The Auto or Off mode switch status is saved in non-volatile memory when it changes. When the control panel powers up (after sleeping or upon battery removal), the switch status is restored to its previous saved state.

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 4-12.

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.

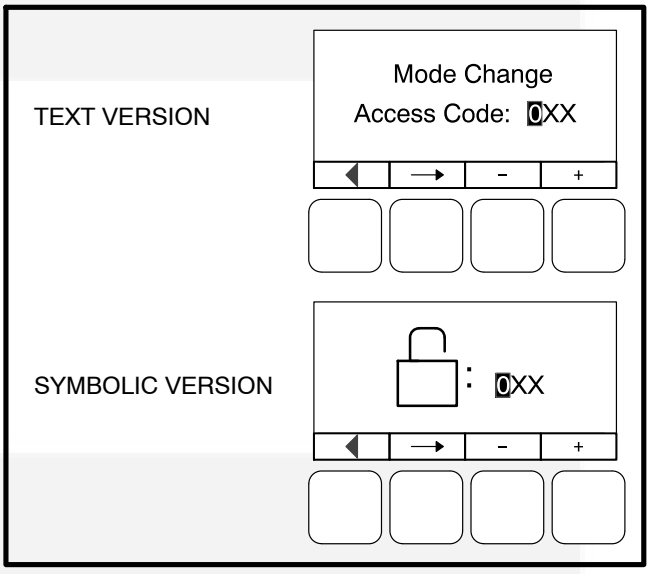


FIGURE 4-12. MODE CHANGE MENU

Selecting Auto Mode

To switch to Auto mode (see Figure 4-13),

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.

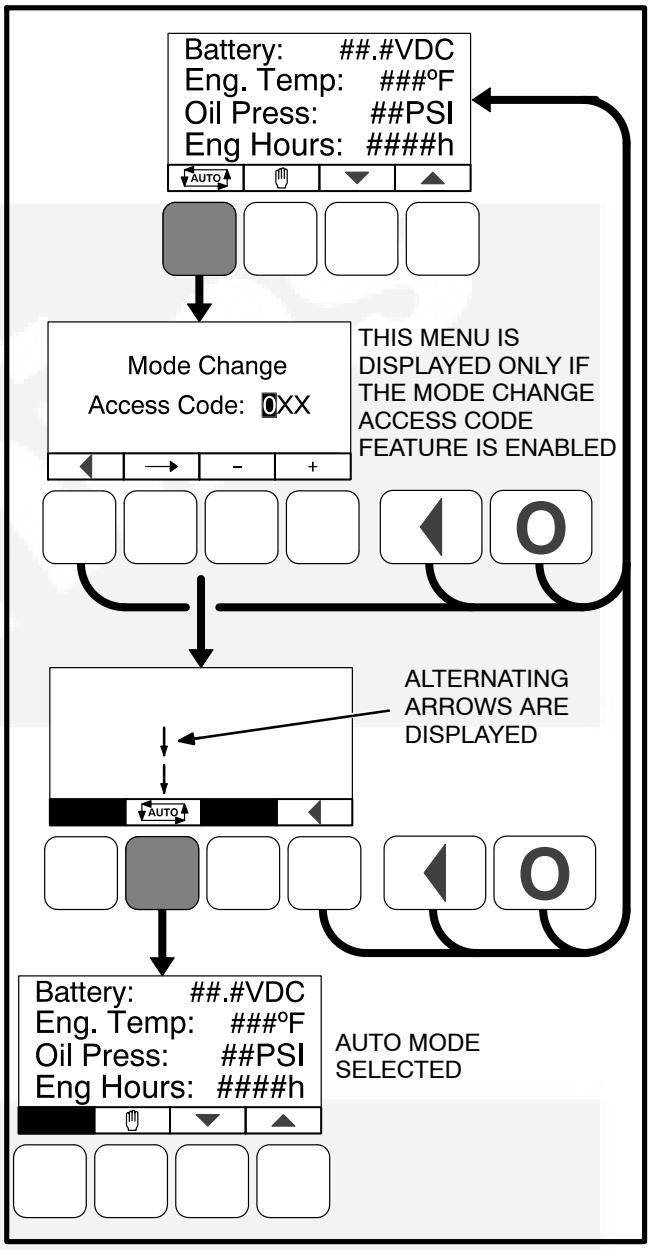


FIGURE 4-13. SELECTING AUTO MODE

Selecting Manual Run Mode

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

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

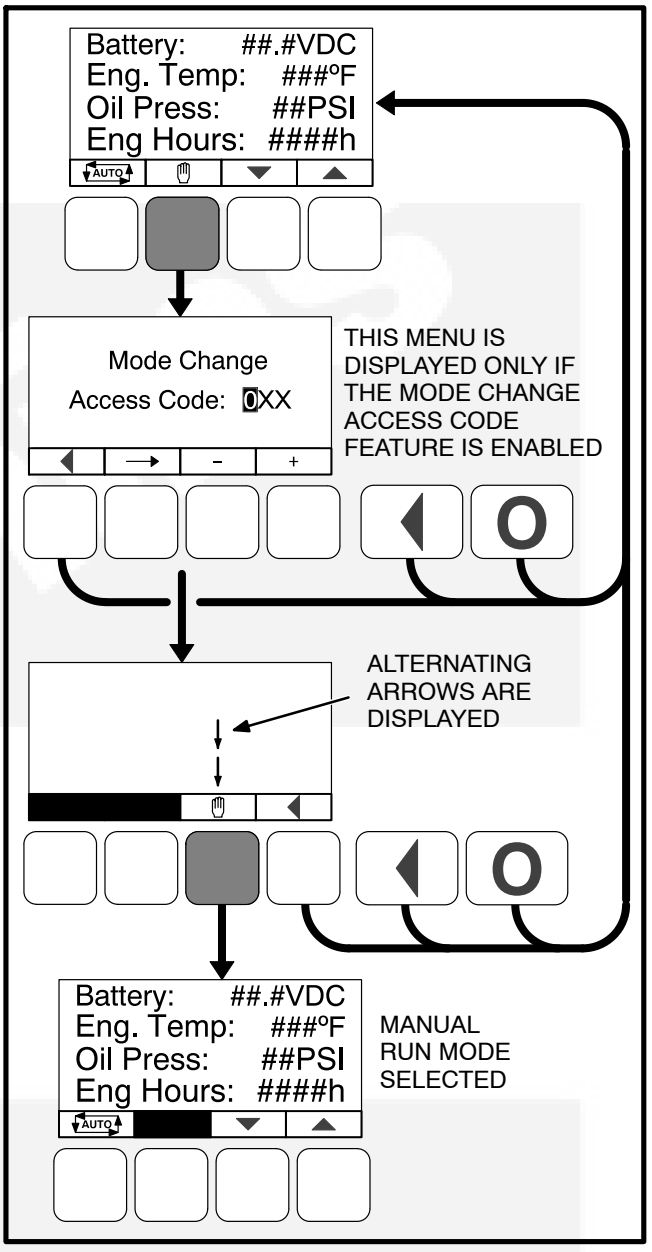


FIGURE 4-14. SELECTING MANUAL RUN MODE

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 4-5.

SERVICE MENUS

Figure 4-15 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 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.

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.

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

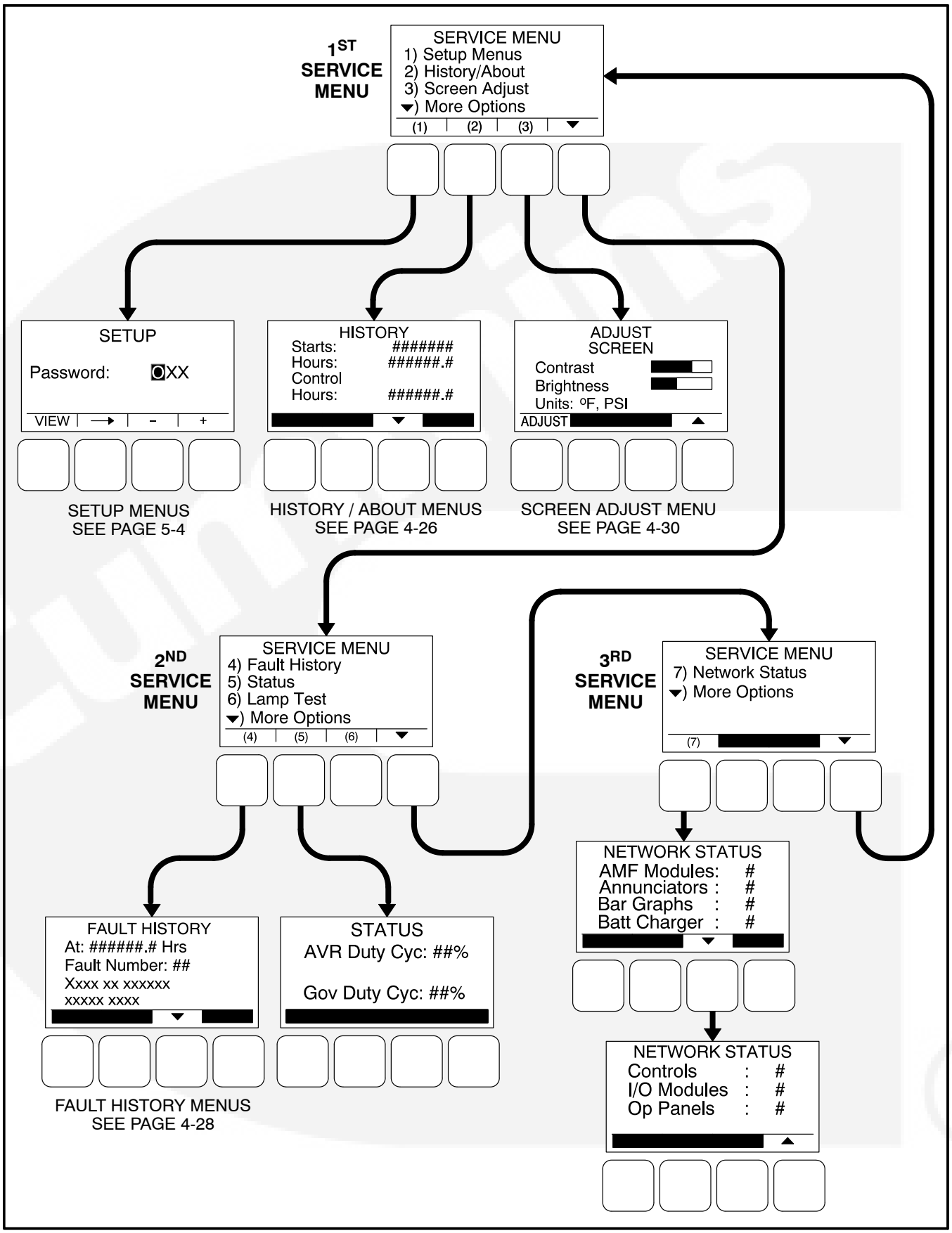


FIGURE 4-15. SERVICE MENUS

HISTORY / ABOUT MENUS

Figure 4-16 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 4-15).

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 control panel software part number, software version, screen part number, and screen version of the display.

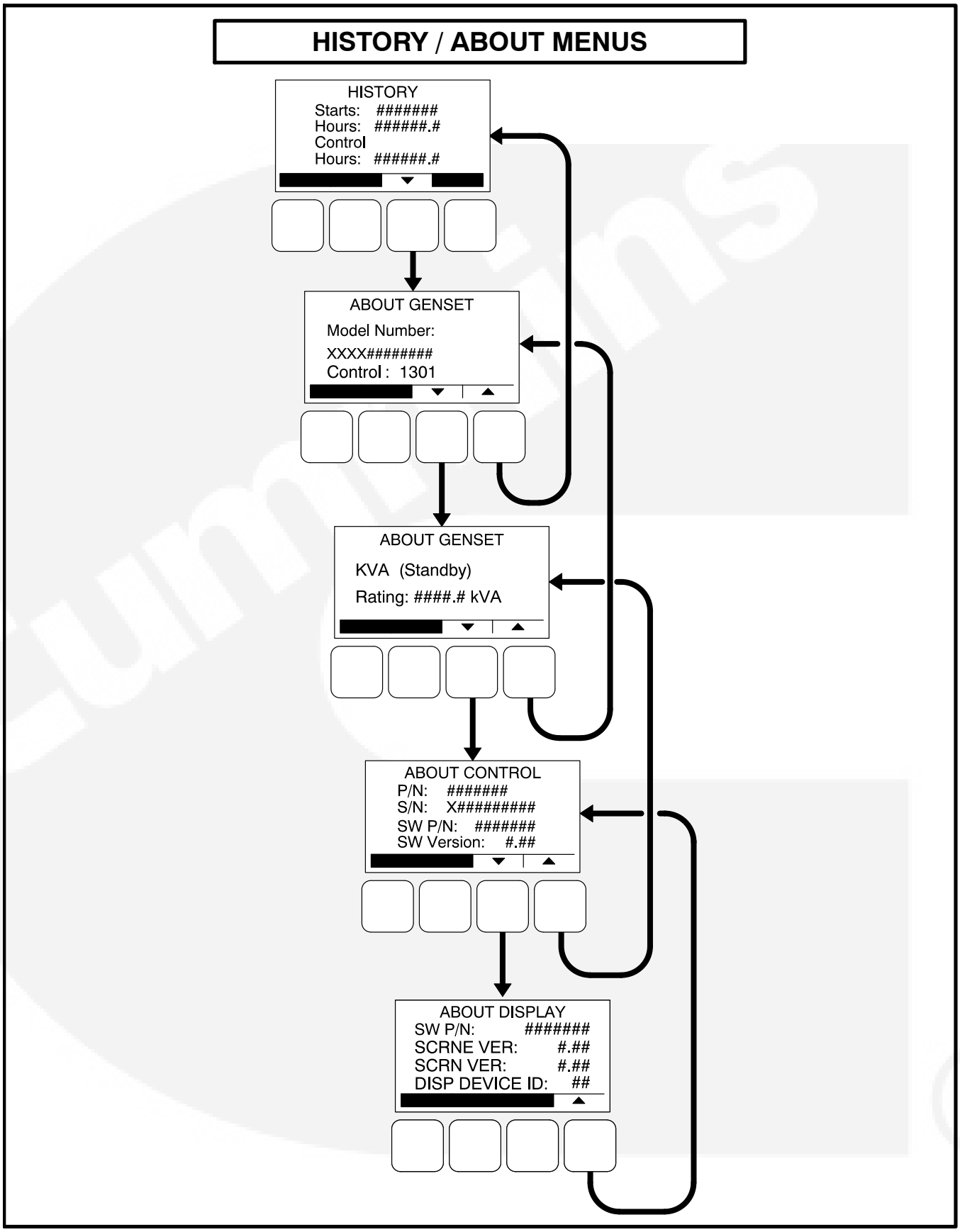


FIGURE 4-16. HISTORY / ABOUT MENUS

FAULT HISTORY MENU

Figure 4-18 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 4-15). 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 4-17.

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 4-8.

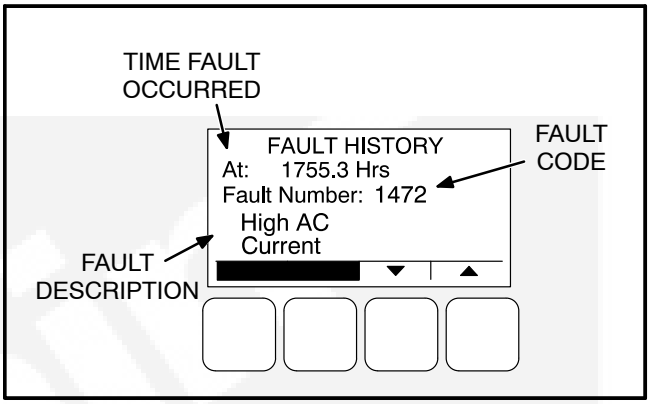


FIGURE 4-17. FAULT HISTORY MENU EXAMPLE

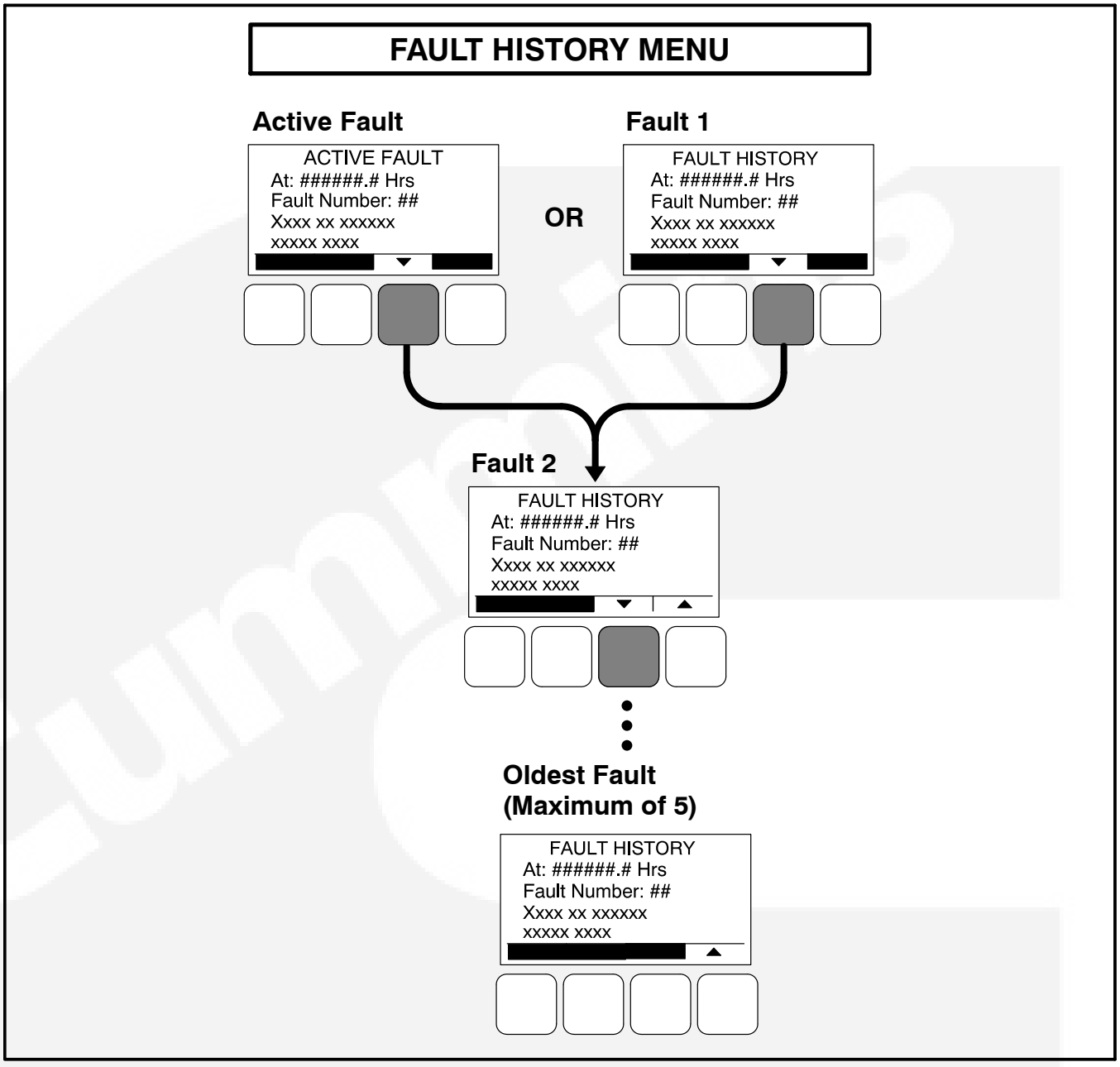


FIGURE 4-18. FAULT HISTORY MENU

SCREEN ADJUST MENU

Figure 4-19 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 4-15).

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.

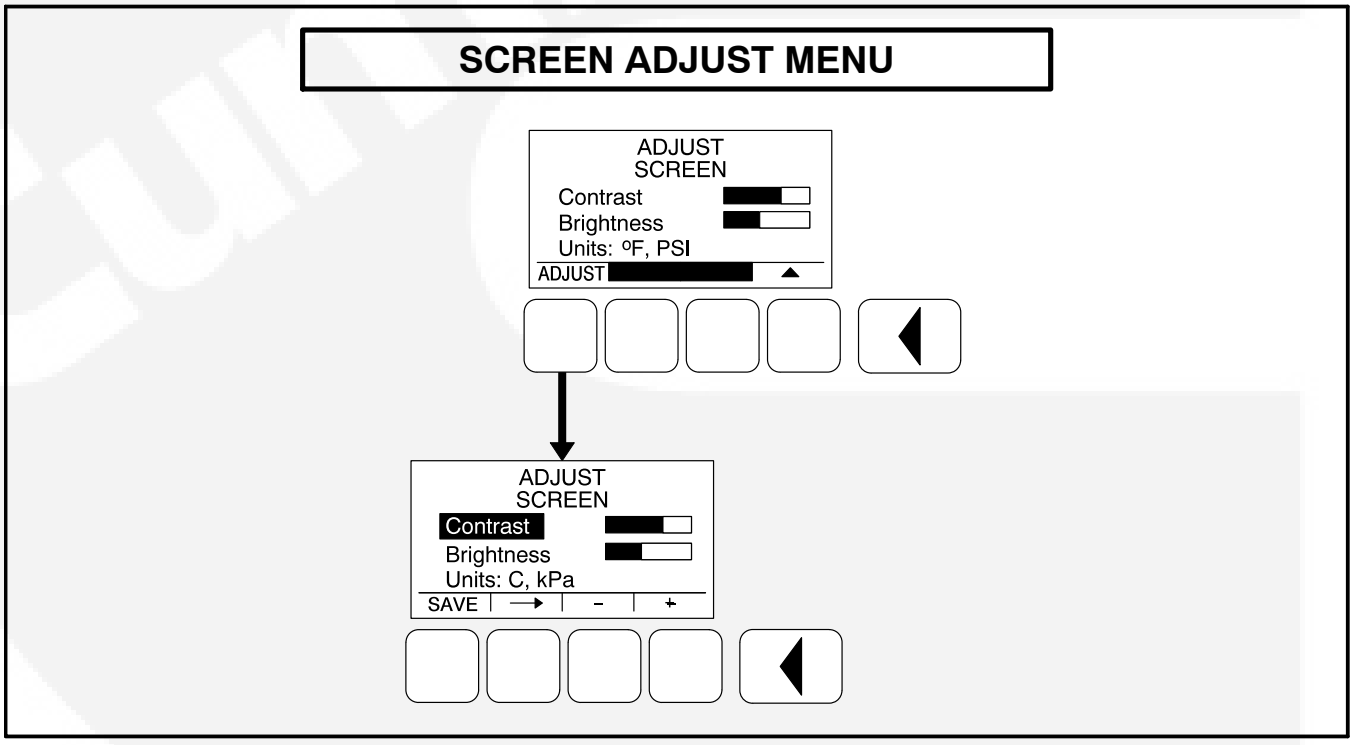


FIGURE 4-19. SCREEN ADJUST MENU

5. 1302 Control Panel Service Menus

SERVICE MENUS

NOTE: 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).

⚠ 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.

- Universal Annunciators
- Bar graphs
- Battery chargers
- Controls
- I/O modules
- Operator panels

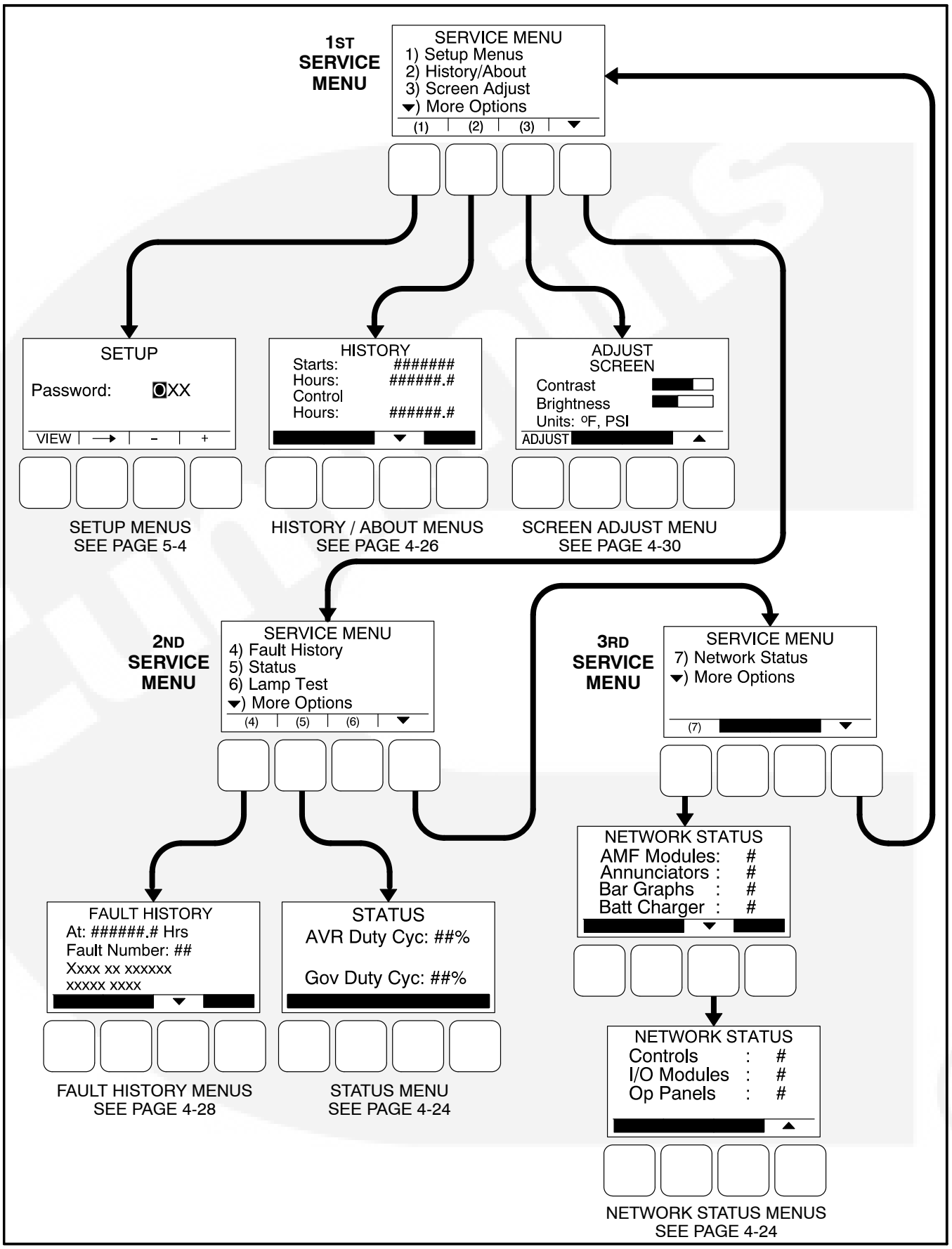


FIGURE 5-1. SERVICE MENUS

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 5-35

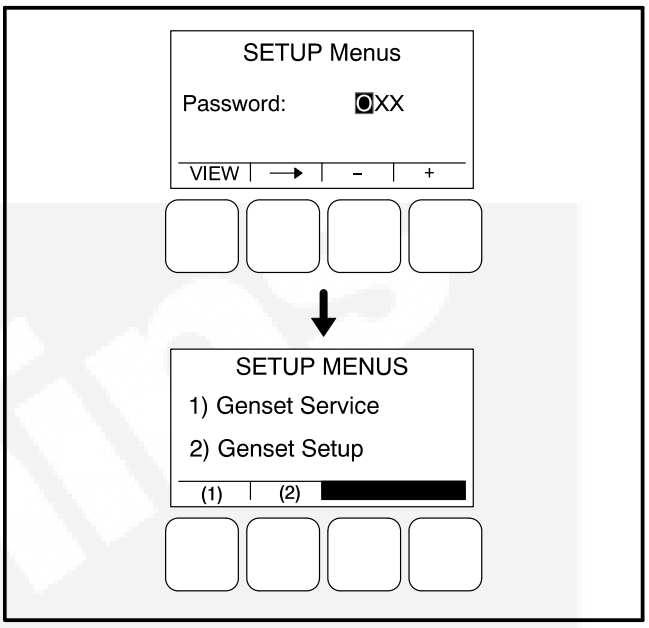


FIGURE 5-2. SETUP MENUS

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 5-35.

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

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.

GENSET SERVICE MENUS (Viewing Only)

NOTE: When the VIEW button is selected from the Setup Password menu without entering a password, the ADJUST button is not available on any of the menus shown in Figures 5-5 thru 5-14.

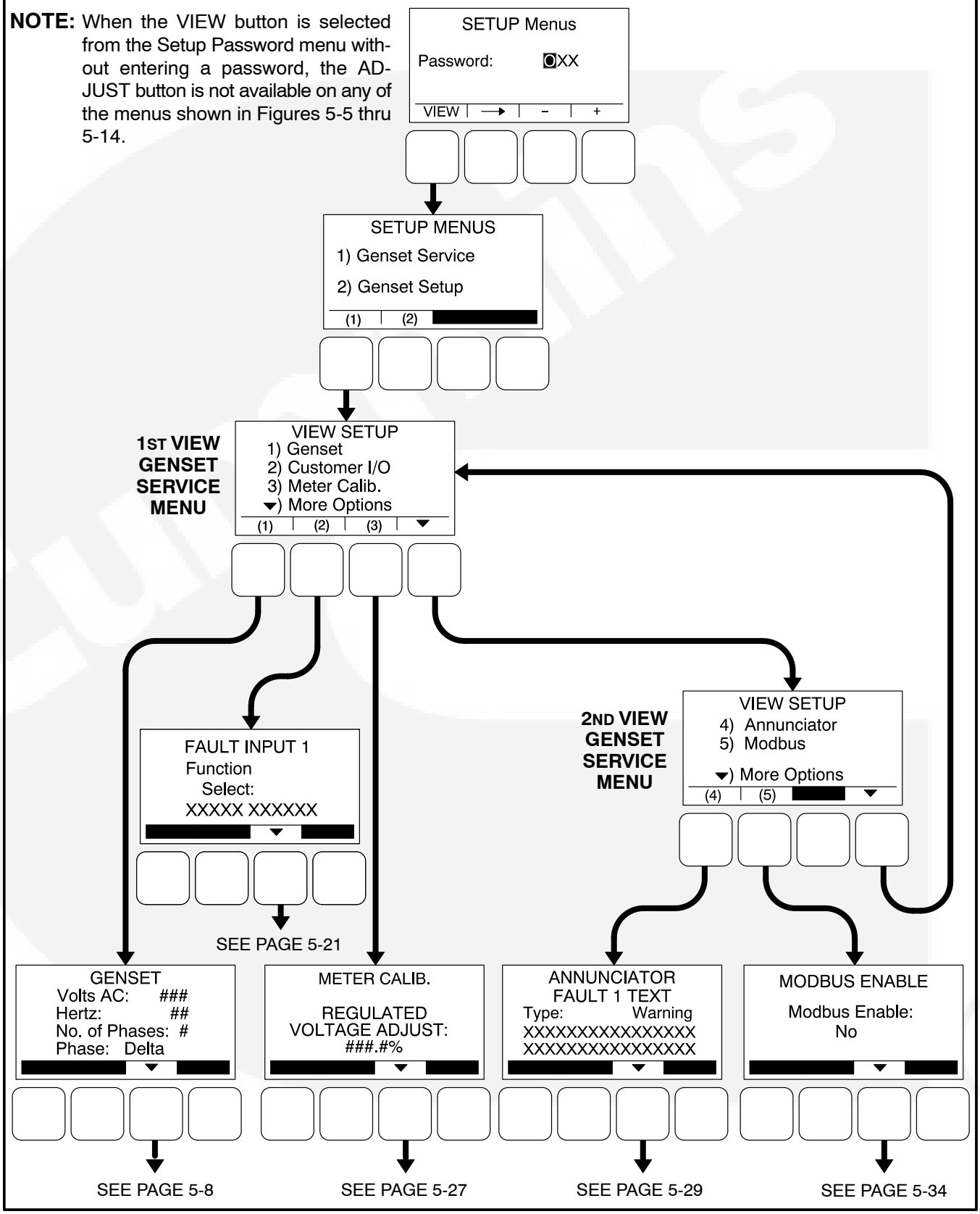


FIGURE 5-3. VIEWING GENSET SERVICE MENUS WITHOUT ENTERING A PASSWORD

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 menus:

- Annunciator
- ModBus

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.

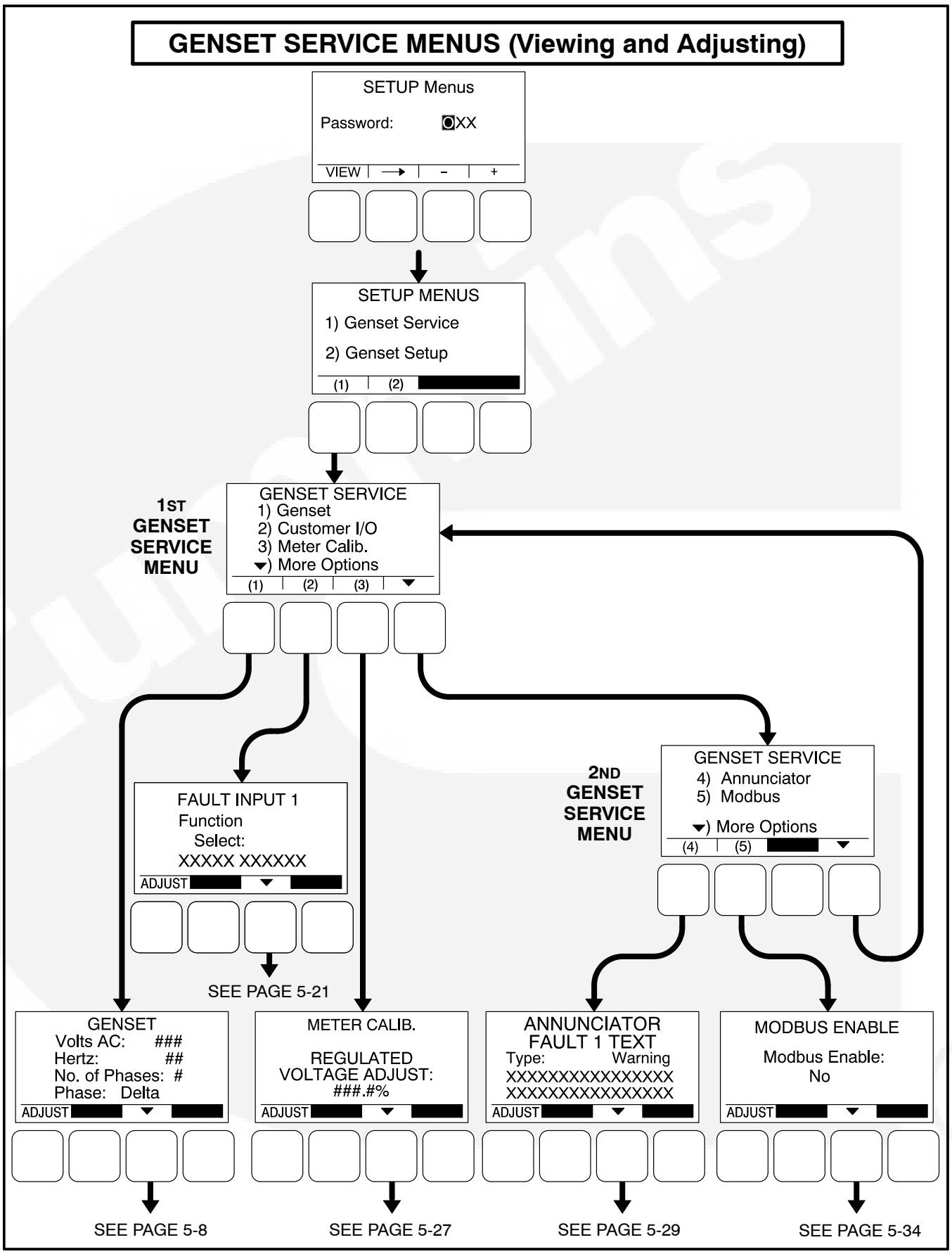


FIGURE 5-4. GENSET SERVICE MENUS

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 (if enabled)
- Automatic Voltage Regulator Setup*
- Electronic Governor*
- Genset Model and Serial Number
- Display Setup
- Volts and Hz Password

* 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, 480, or 600 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 2678**) 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) or 0 to 3600 seconds from 1320 calibration version 2.80, HMI211 calibration version 7.20 onwards.

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

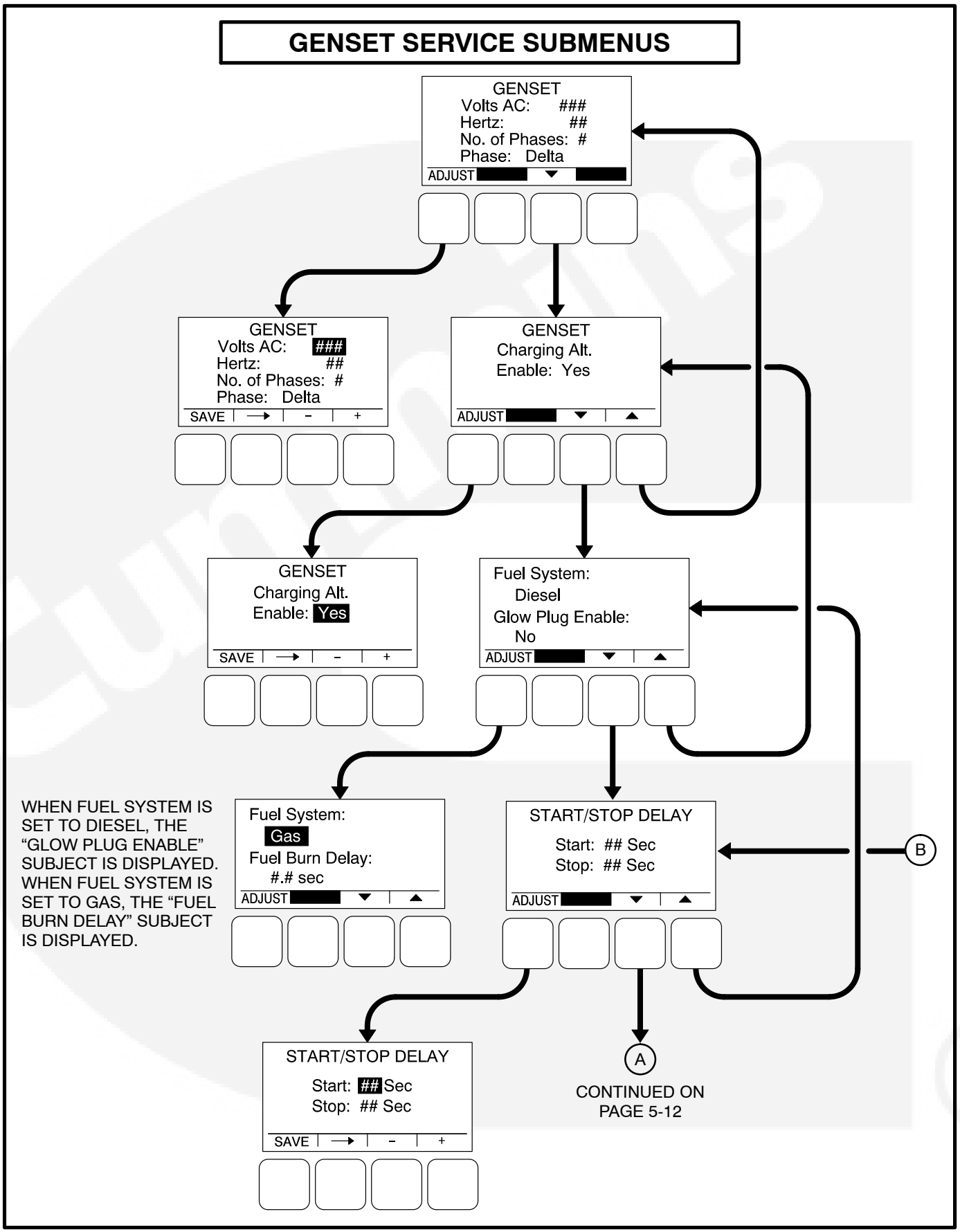


FIGURE 5-5. GENSET SERVICE SUBMENUS (SHEET 1 OF 4)

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 3-57 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 5-18).

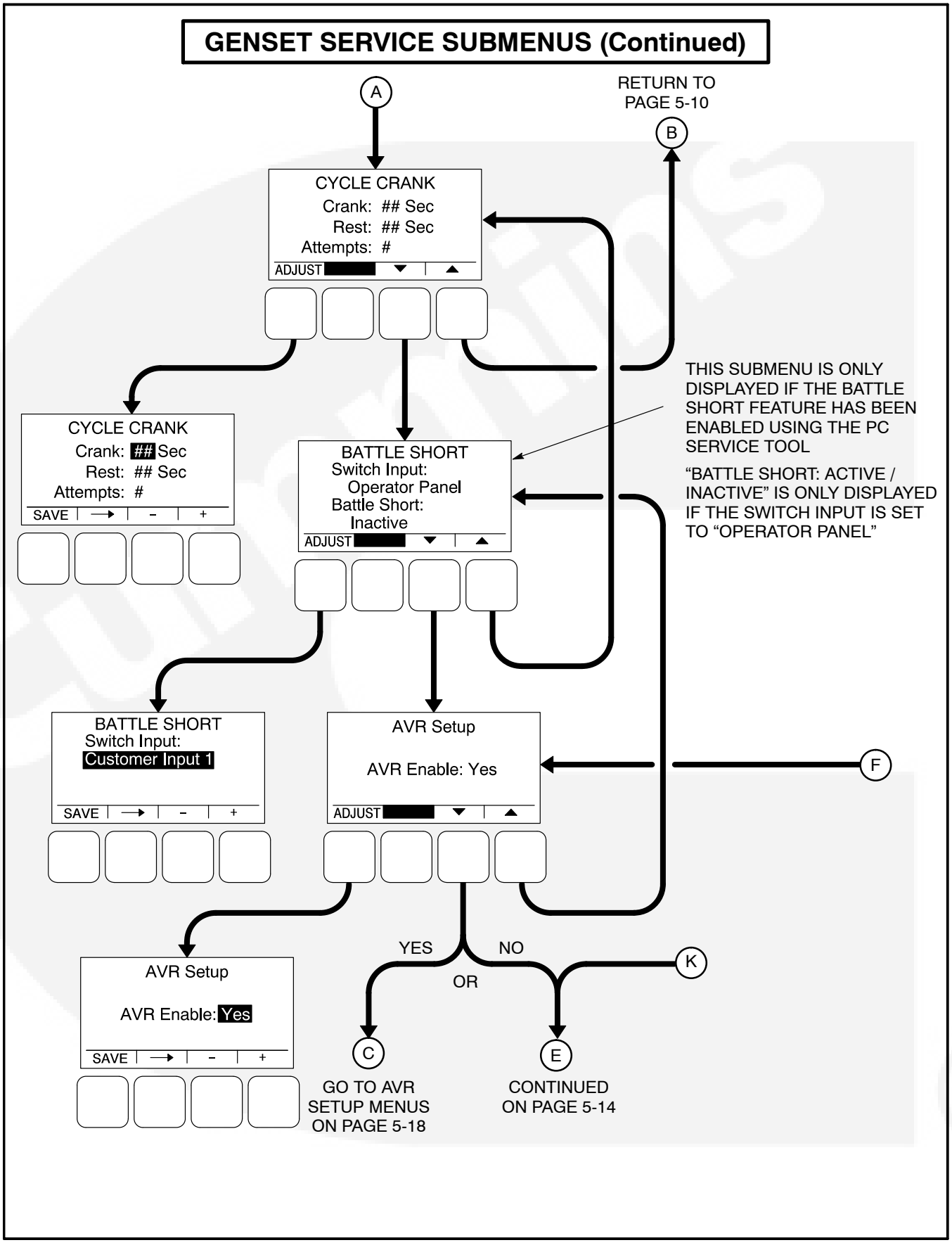


FIGURE 5-5. GENSET SERVICE SUBMENUS (SHEET 2 OF 4)

Electronic Governor Menu, Part 1

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 = Yes). If enabled (set to “Yes”), four additional menus are displayed that can be used to adjust governor settings (see page 5-20).

Electronic Governor Menu, Part 2

The Pre-Load Offset menu is used to enter a percentage of governor duty cycle that is first used when exiting cranking.

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.

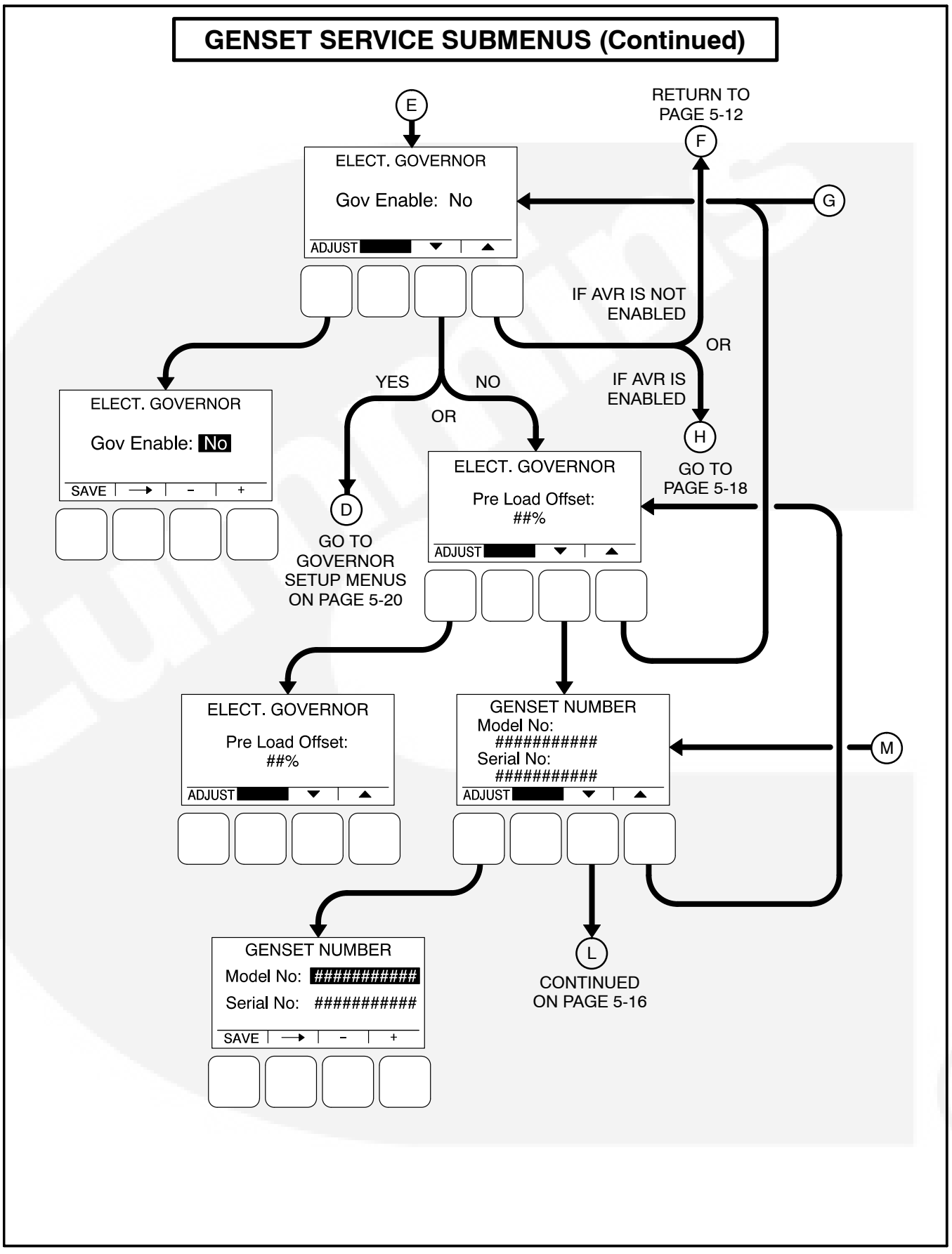


FIGURE 5-5. GENSET SERVICE SUBMENUS (SHEET 3 OF 4)

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).

Volts and Hertz Menu

The Volts and Hertz menu is used to select whether or not a password is required in order to change voltage and hertz settings outside of the Genset Service menus (default = Required).

GENSET SERVICE SUBMENUS (Continued)

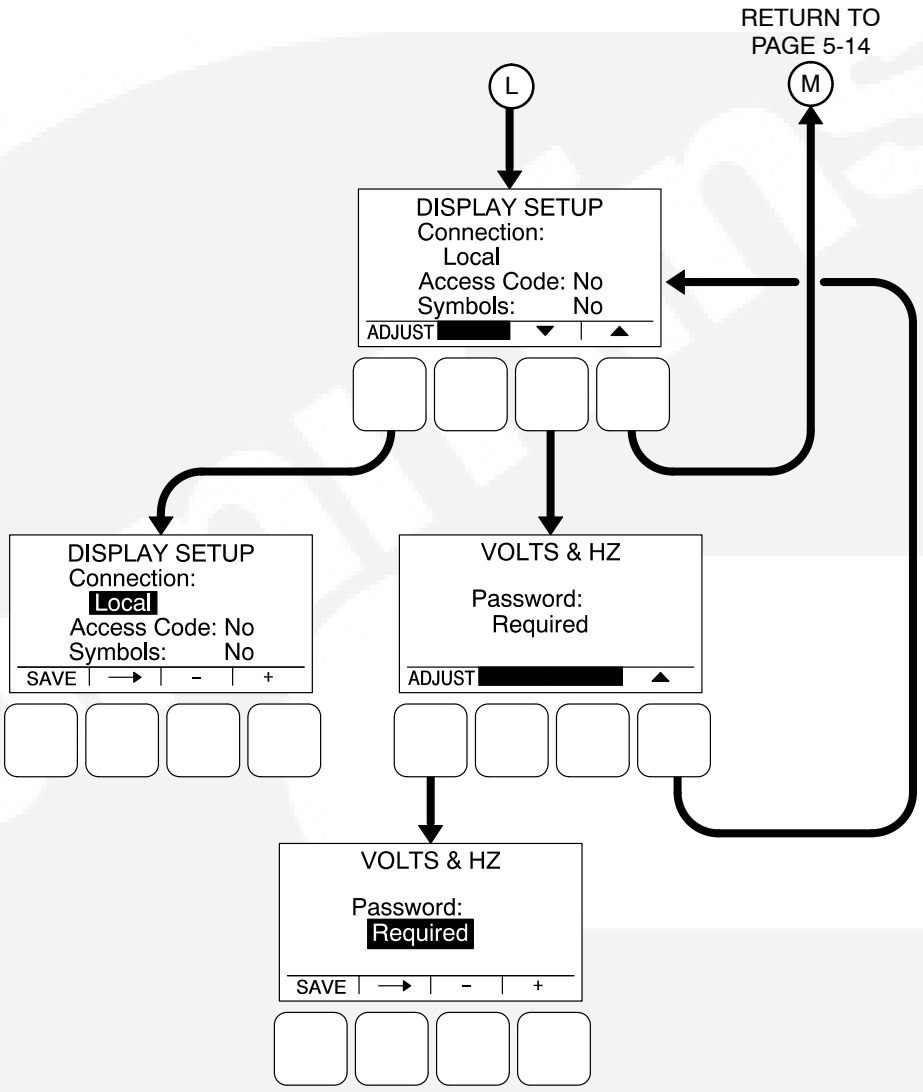


FIGURE 5-5. GENSET SERVICE SUBMENUS (SHEET 4 OF 4)

Automatic Voltage Regulator Submenus

The Automatic Voltage Regulator (AVR) submenus are available only if the AVR is enabled (see page 5-12).

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.

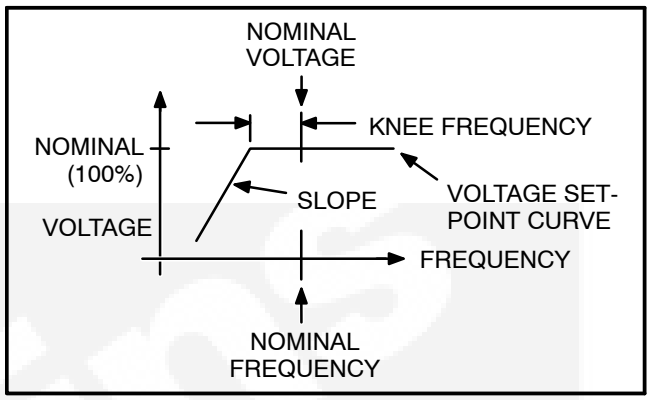


FIGURE 5-6. KNEE FREQUENCY AND SLOPE

- *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 5-12).

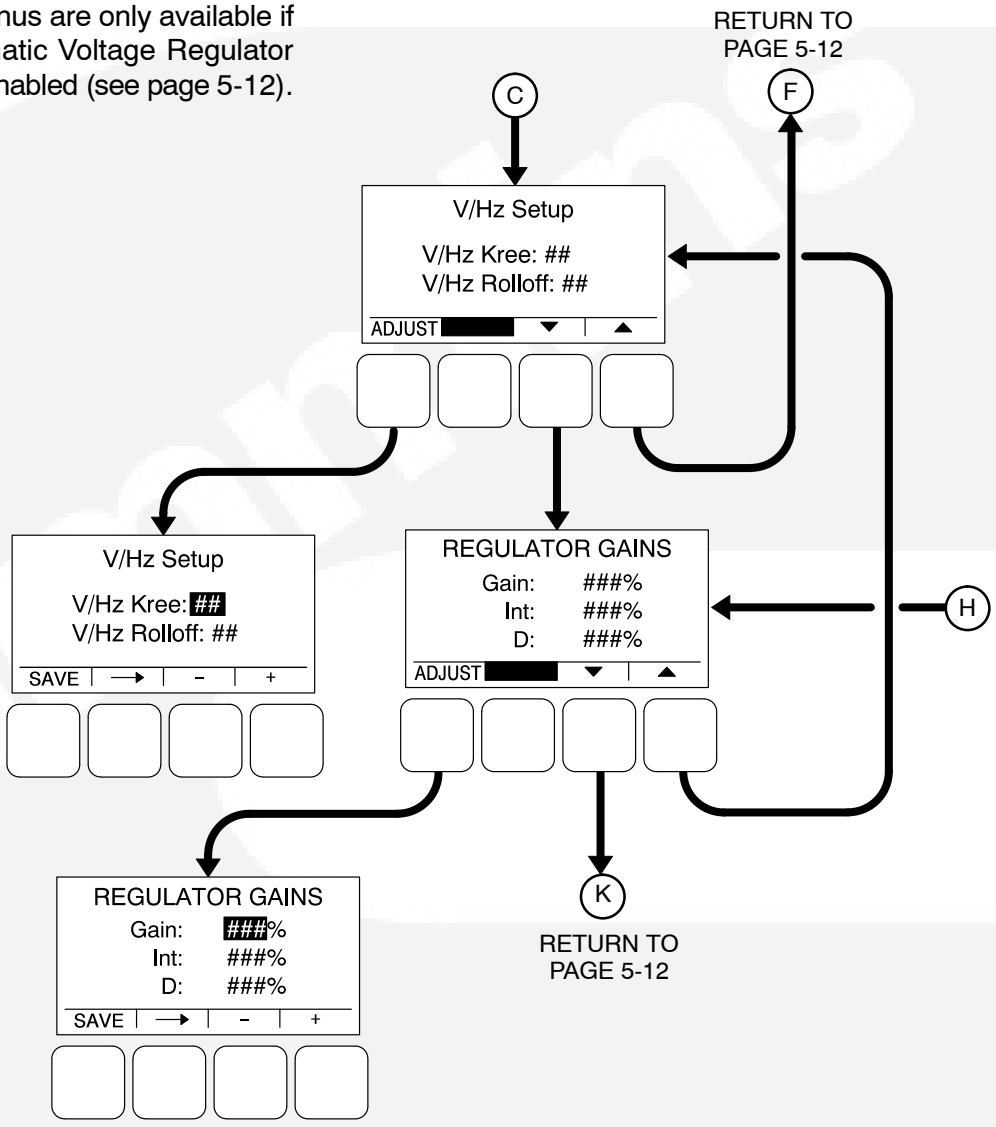


FIGURE 5-7. AUTOMATIC VOLTAGE REGULATOR SUBMENUS

Electronic Governor Submenus

The Electronic Governor submenus are available only if the governor is enabled (see page 5-12).

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%).

ELECTRONIC GOVERNOR SUBMENUS

NOTE: These menus are only available if the governor is enabled (see page 5-12).

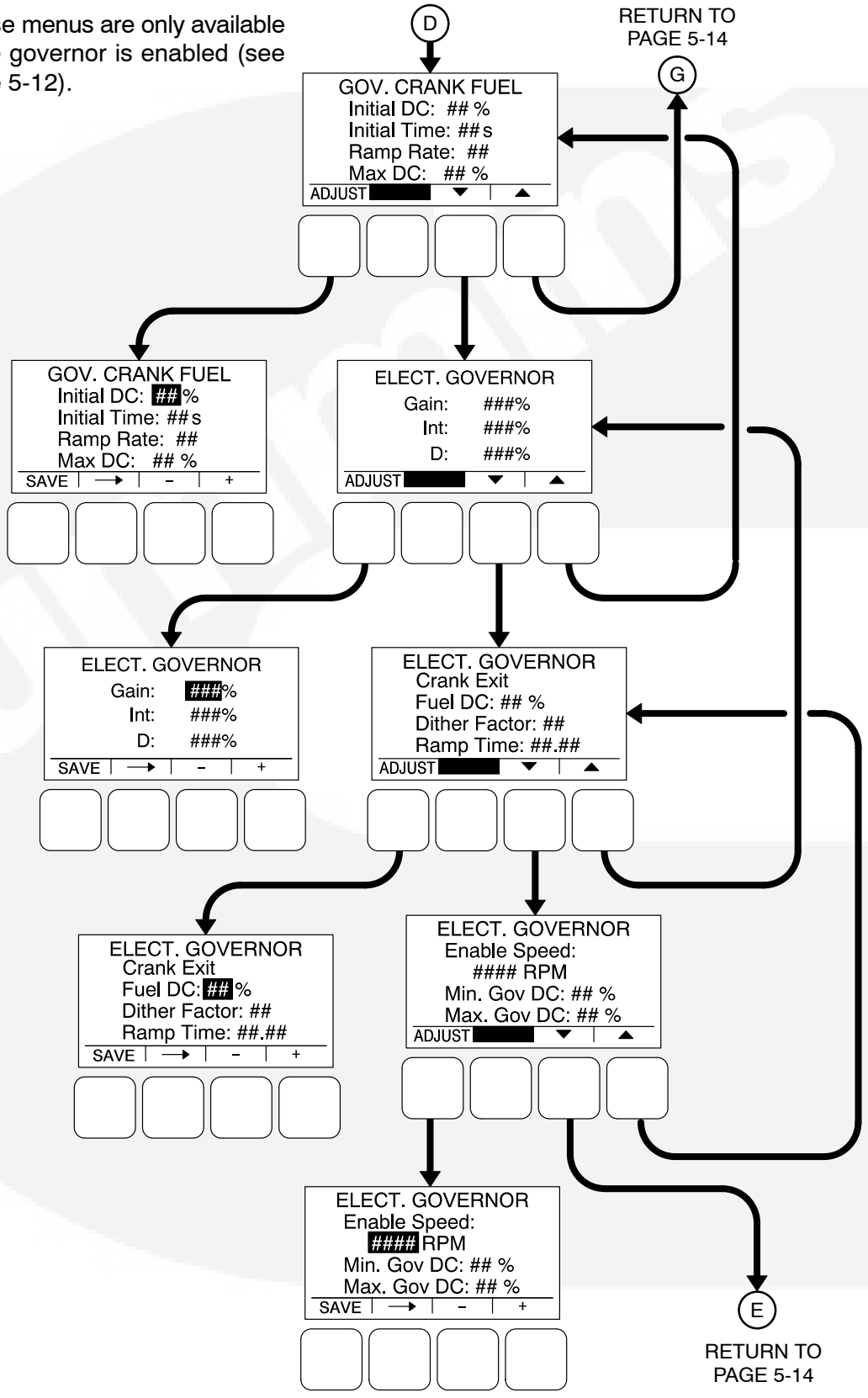


FIGURE 5-8. ELECTRONIC GOVERNOR SUBMENUS

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).

The Customer I/O menus (see Figures 5-9 thru 5-12) can be used to define customer input messages and output maps. The Customer I/O menus consist of four Fault Input Function Selection menus, four Customer Input Test message menus, four Fault Input Active State Selection menus, and two Customer Output Map menus.

Fault Input Function Selection

Each of the four configurable input functions can be set to Disabled, Fault Input, Fault Reset or Battle Short (the default is different for each input). See Figure 5-9.

Customer Inputs

The Customer Input Text message menus are used to enter an event type and description for up to four events. See Figure 5-10.

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

Fault Input Active State Selection

Each of the four fault input active states can be set to Active Closed or Active Open, (default = Active Open). See Figure 5-11.

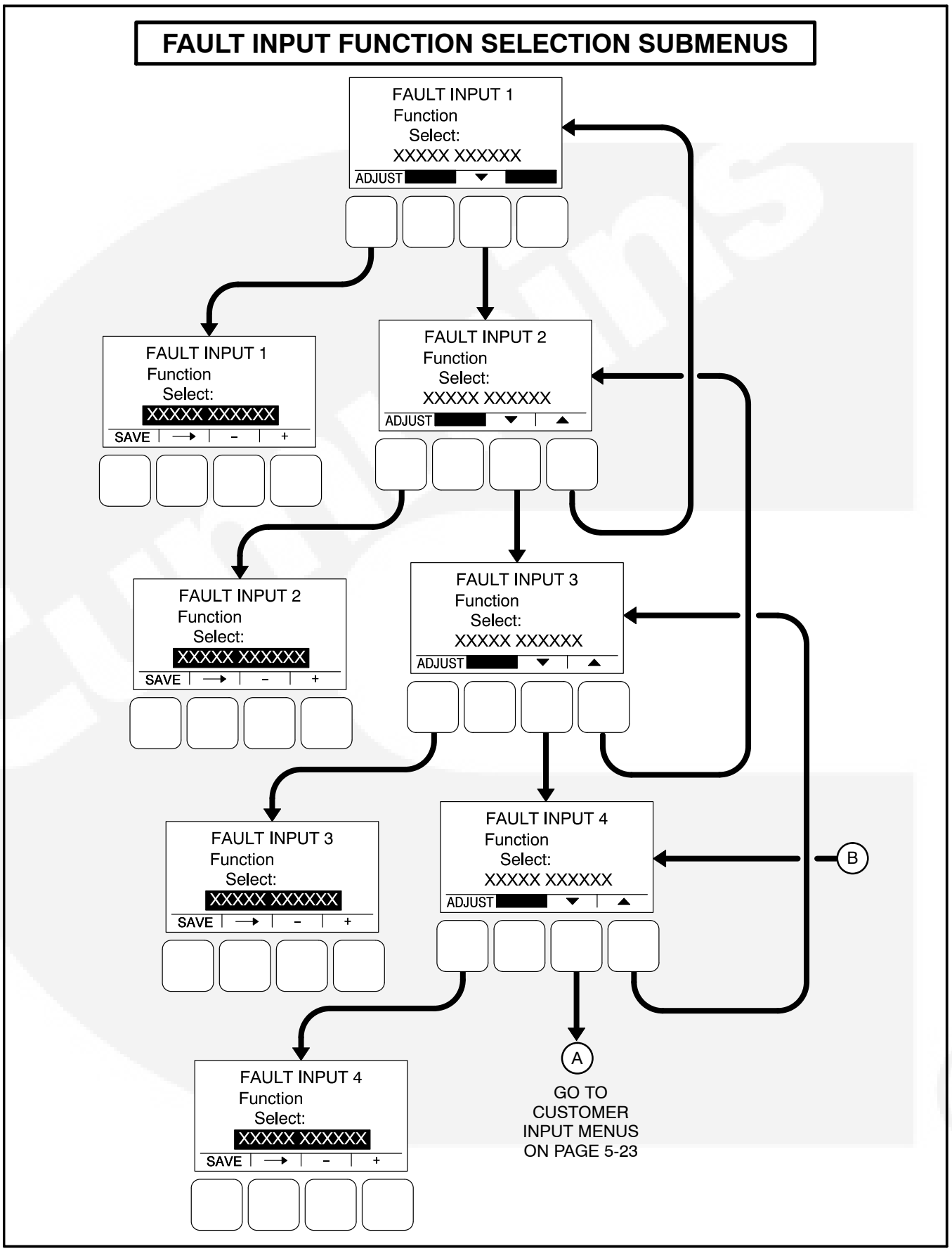


FIGURE 5-9. CUSTOMER I/O SUBMENUS (SHEET 1 OF 4)

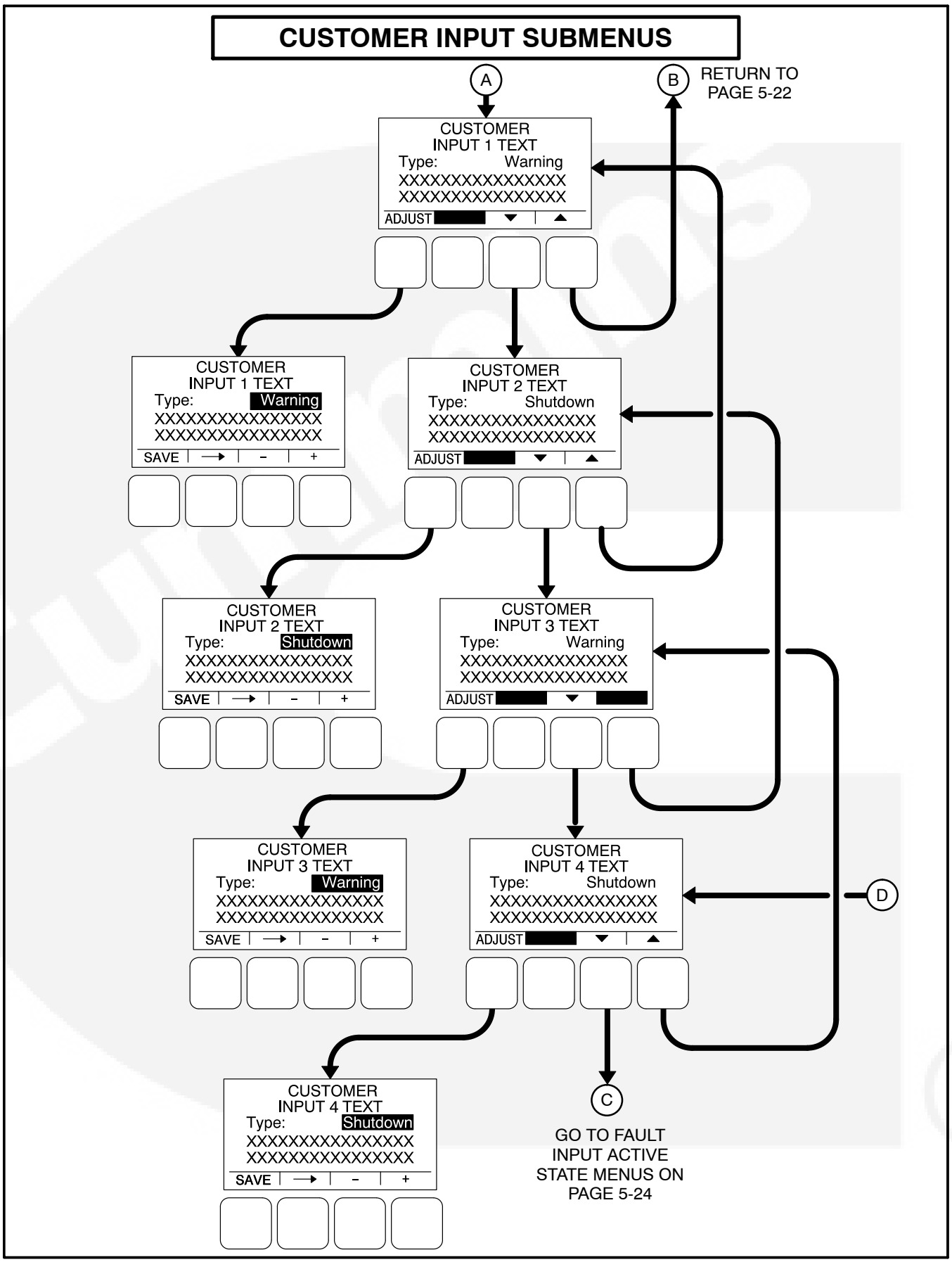


FIGURE 5-10. CUSTOMER I/O SUBMENUS (SHEET 2 OF 4)

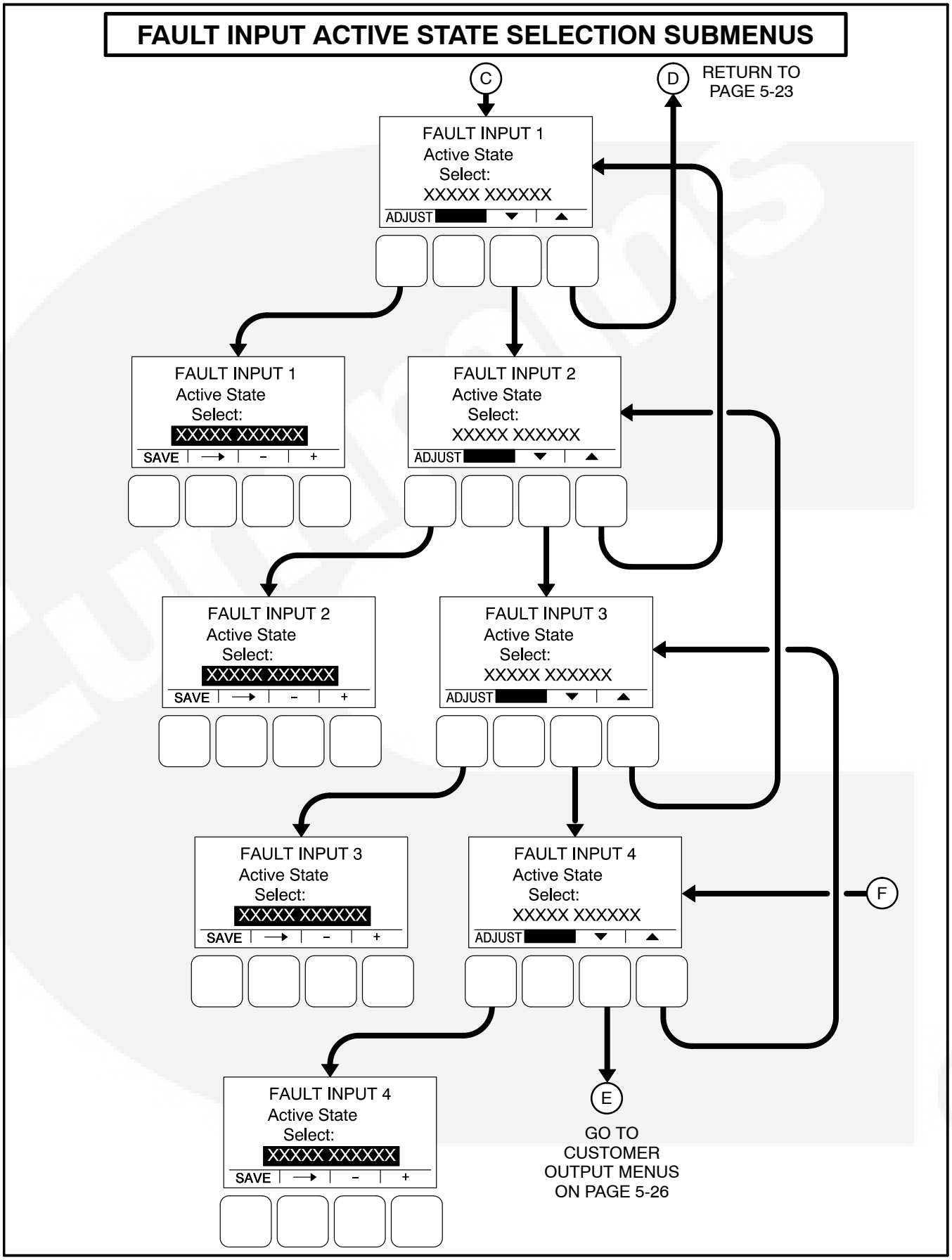


FIGURE 5-11. CUSTOMER I/O SUBMENUS (SHEET 3 OF 4)

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. See Figure 5-12.

- *Number:* Enter a valid code number (0–65535, default = 0) for the event.
- A brief description of the event is automatically displayed.

CUSTOMER OUTPUT SUBMENUS

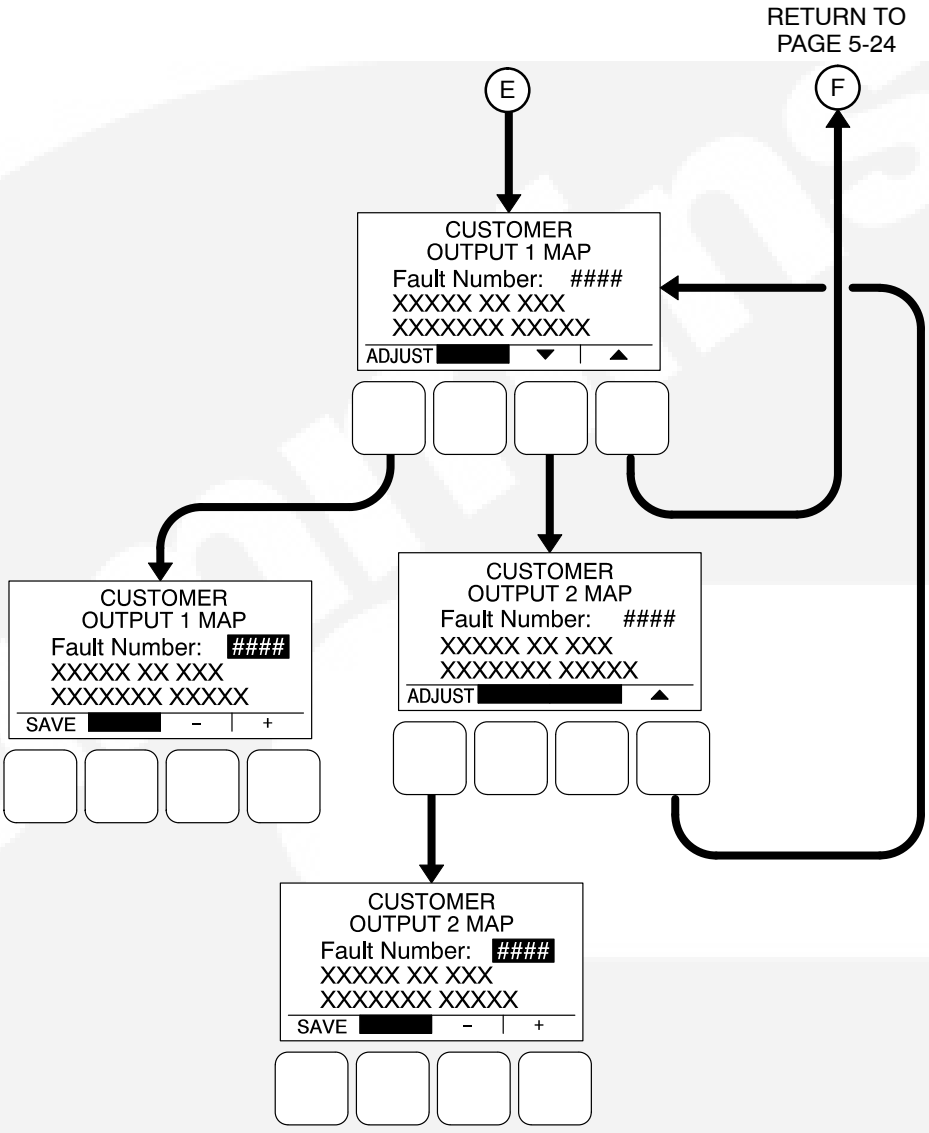


FIGURE 5-12. CUSTOMER I/O SUBMENUS (SHEET 4 OF 4)

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 5-13) 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.

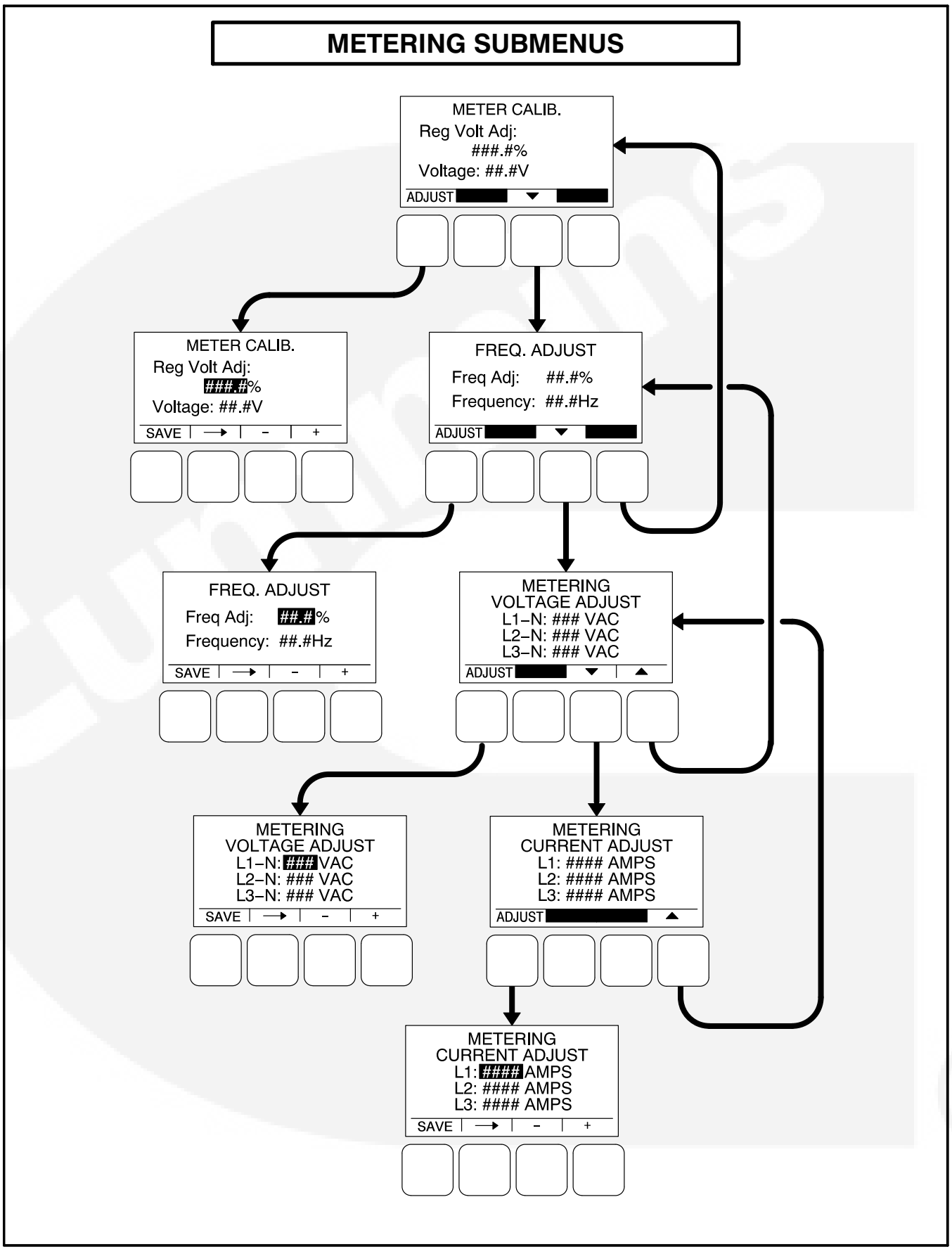


FIGURE 5-13. METERING SUBMENUS

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 5-14) 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 1302 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).

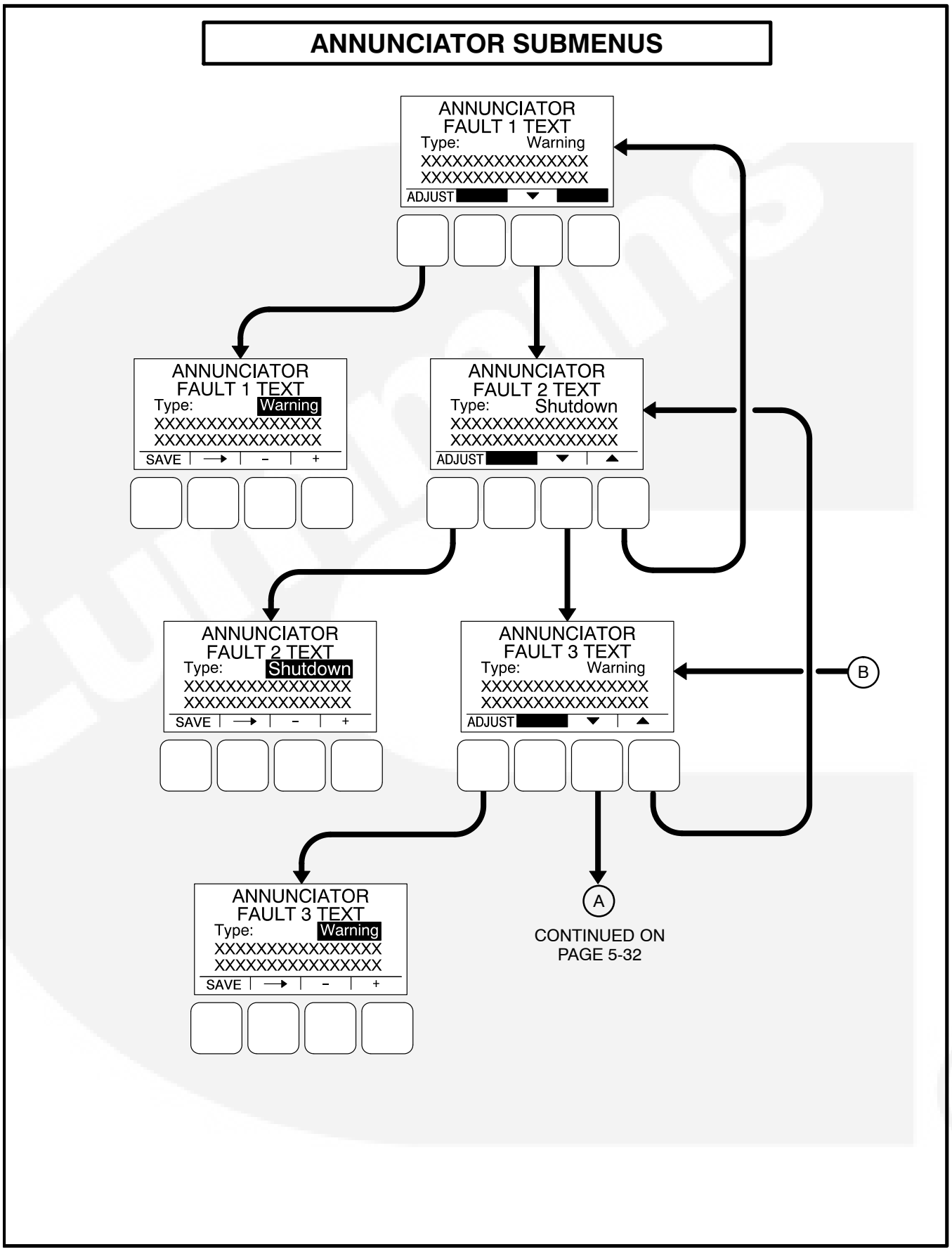


FIGURE 5-14. ANNUNCIATOR SUBMENUS (SHEET 1 OF 2)

Annunciator Outputs

An annunciator has four custom (N.O.) relays that can be controlled by the PCC 1302. When a specified event becomes active, a message can be sent by the PCC 1302 to the annunciator to turn the relay on or off. Only one event per relay is allowed.

The four annunciator outputs of the 1302 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 valid code number (0–65535, default = 0) for the event.
- A brief description of the event is automatically displayed.

NOTE: Output relays can be configured for events that are not displayed by the operator panel. If one of the events listed in the following table is configured, it will activate the relay when the event occurs.

TABLE 5-1. EVENT AND CODES

EVENT	CODE
Water In Fuel	418
Not In Auto	1463
Ready to Load	1468
Common Alarm	1483
Common Warning	1540
Common Shutdown	1541

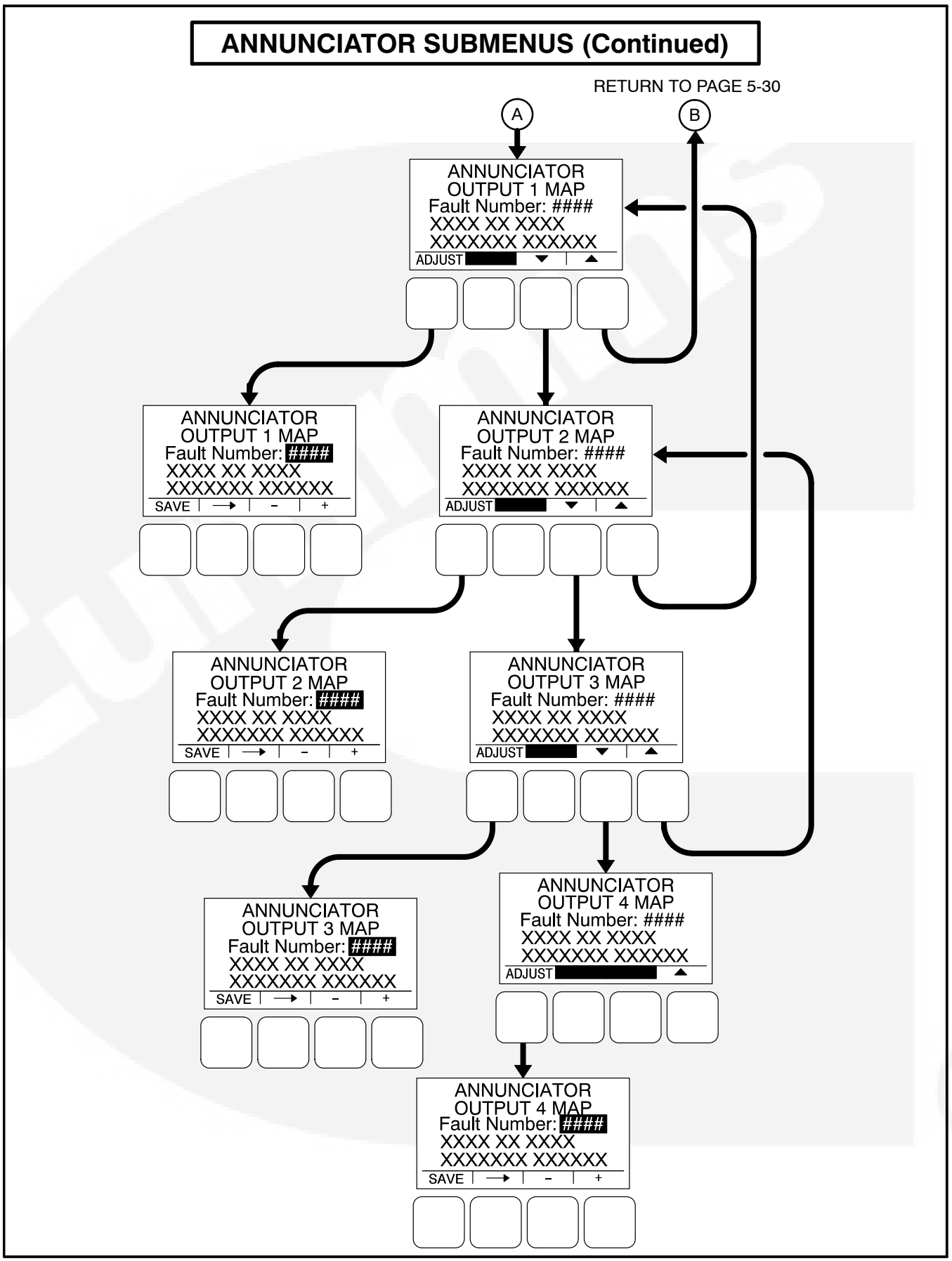


FIGURE 5-14. ANNUNCIATOR SUBMENUS (SHEET 2 OF 2)

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

The ModBus menu is used to enable or disable the ModBus feature (default = No).

ModBus Setup

The ModBus Setup menu is used to set the address, baud rate, and parity.

- *Address:* Enter the address of the control on the ModBus register (default = 1).
- *Baud Rate:* Enter the appropriate baud rate – 2400, 4800, 9600, or 19200 (default = 9600).
- *Parity:* The parity can be set to either odd or even (default = even).

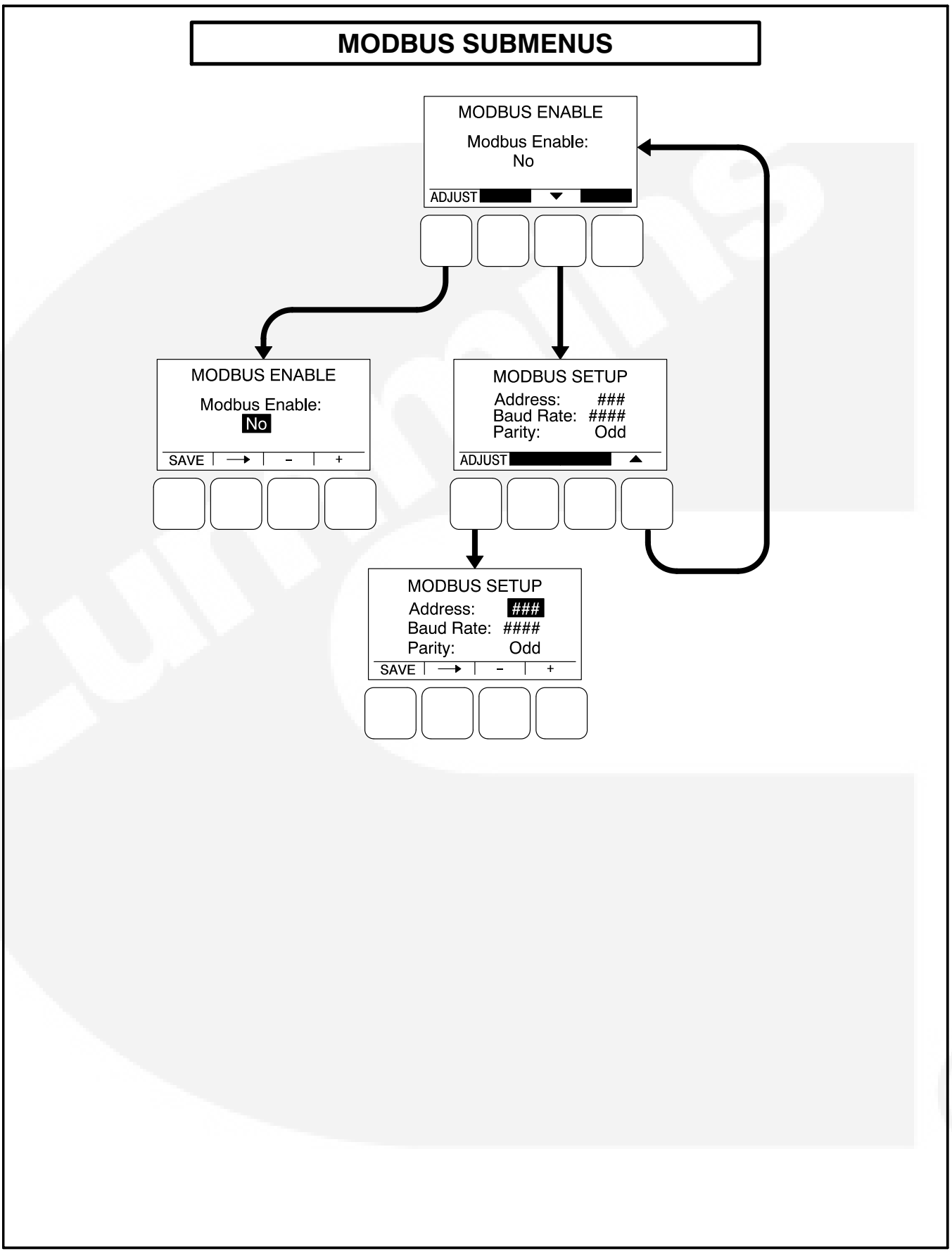


FIGURE 5-15. MODBUS SUBMENUS

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 5-16). 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.

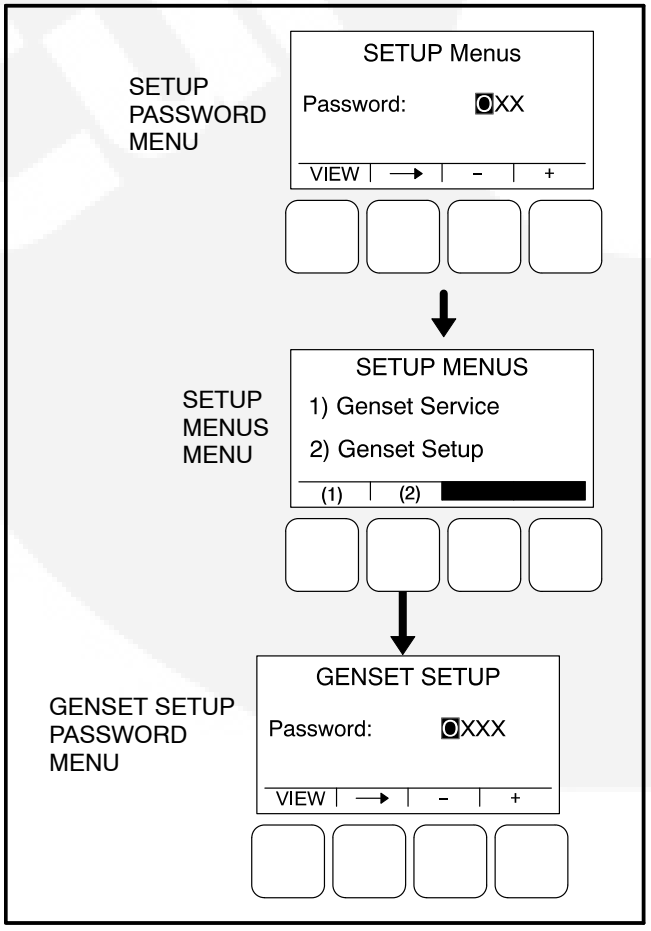


FIGURE 5-16. SETUP PASSWORD MENUS

Viewing Only

Figure 5-17 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 5-19 thru 5-22.

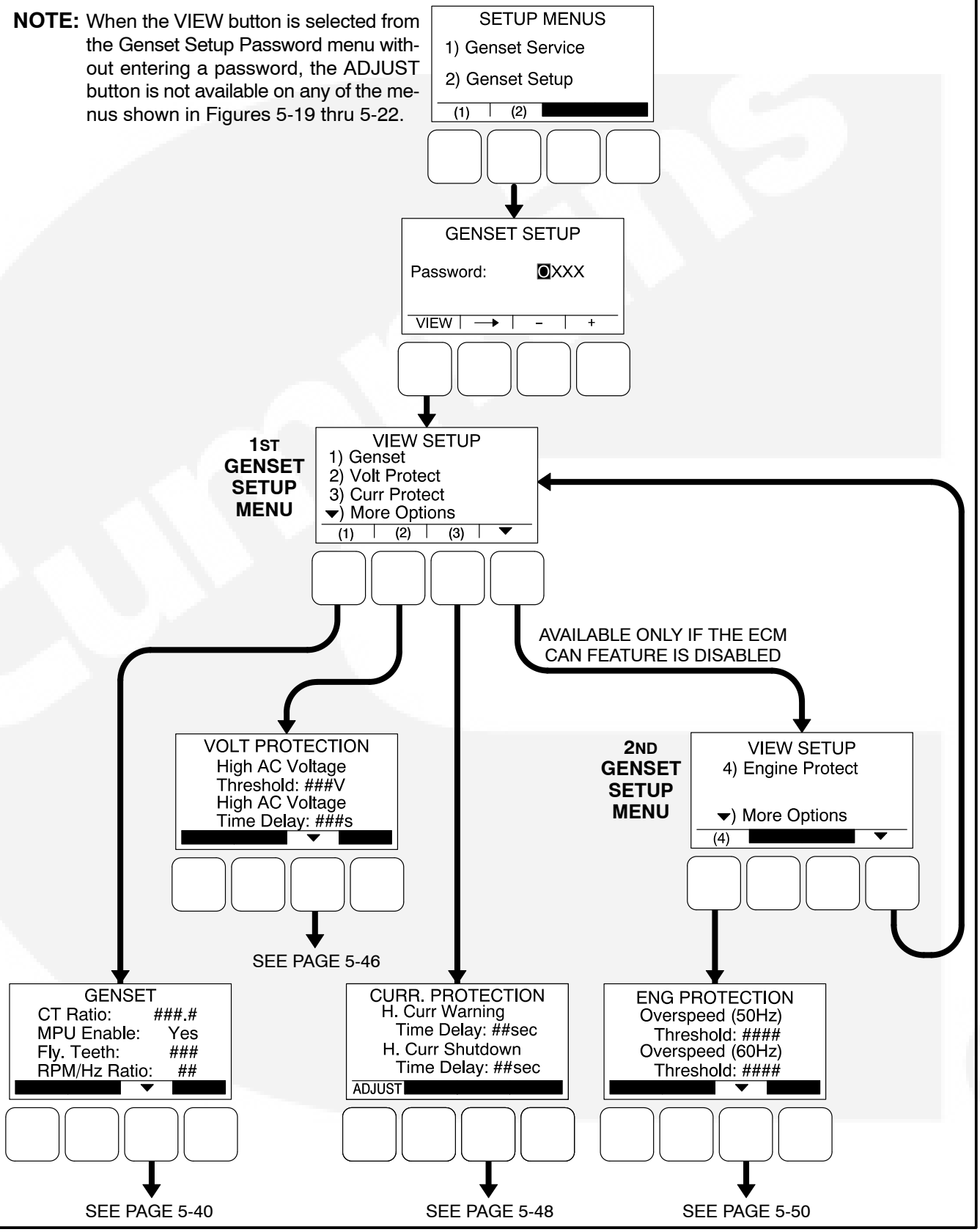


FIGURE 5-17. GENSET SETUP MENUS (VIEWING ONLY)

Viewing and Adjusting

Figure 5-18 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 5-18).

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.

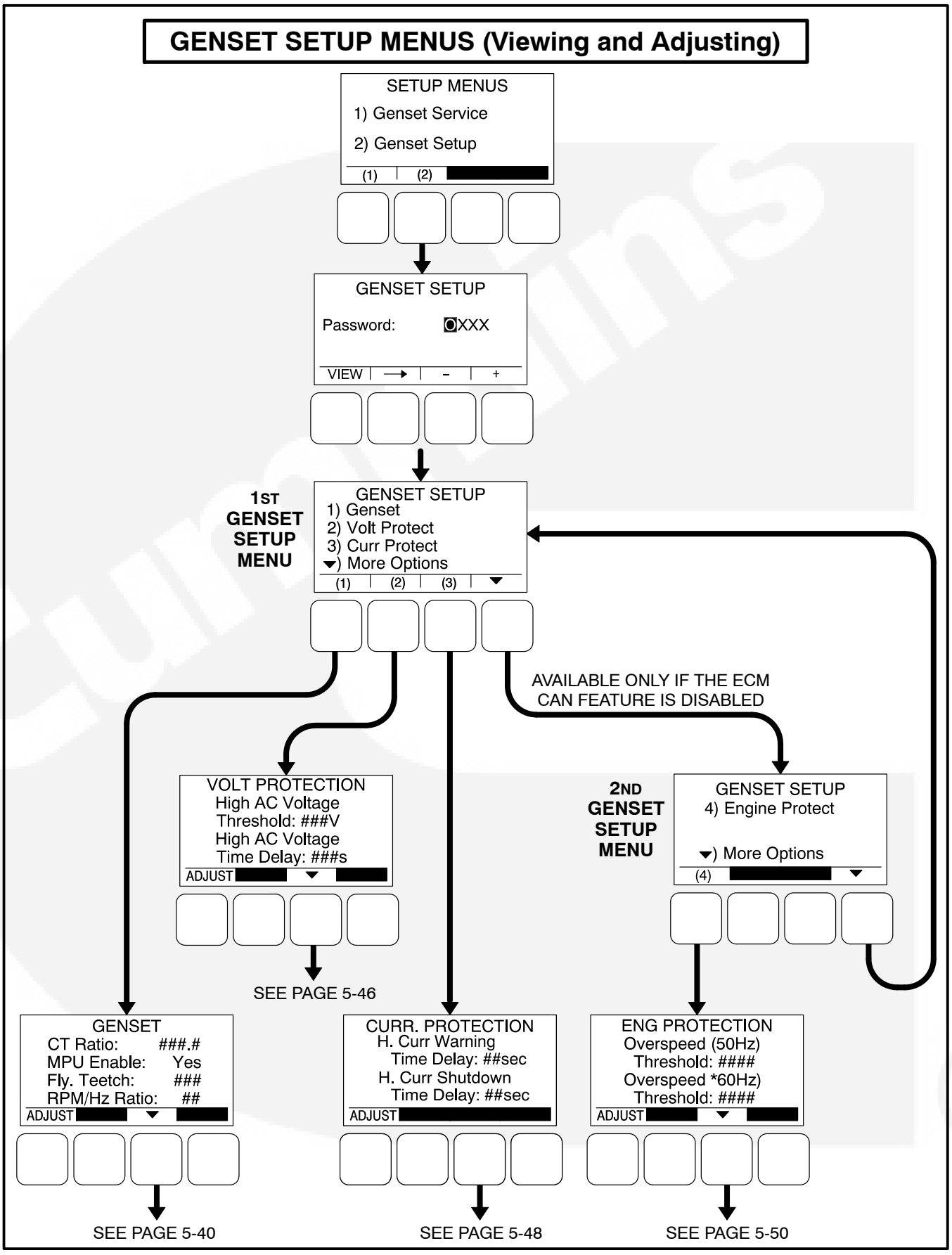


FIGURE 5-18. GENSET SETUP MENUS (VIEWING AND ADJUSTING)

Genset Menus

The Genset submenus are available by pressing the **(1)** button on the first Genset Setup menu (see Figure 5-17 or Figure 5-18).

Genset Menu 1

The first 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).
- *MPU Enable:* Displays whether or not the Magnetic Pickup Unit is installed (Yes or No, default = No).
- *Fly. Teeth:* The total number of teeth pulses per revolution on the flywheel (used for electronic governed systems) can be set from 0 to 256 (default = 110).
- *RPM/Hz Ratio:* Allows for setting the Speed/Frequency Ratio to 20, 30, or 60 RPM/Hz (default = 30).

Genset Menu 2

The second Genset Setup menu is used to set the excitation source and the excitation/line frequency gain.

- *Excitation Source:* Select Shunt or PMG Excitation, depending upon your application.
- *Excitation/Line Freq. Gain:* If the excitation source is set to “Shunt,” this value is automatically set to 1. If the excitation source is set to “PMG,” the value that should be entered is the excitation frequency multiplier of the PMG system. For example, enter a “2” if the PMG output is twice the main generator frequency (120 Hz excitation frequency).

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).

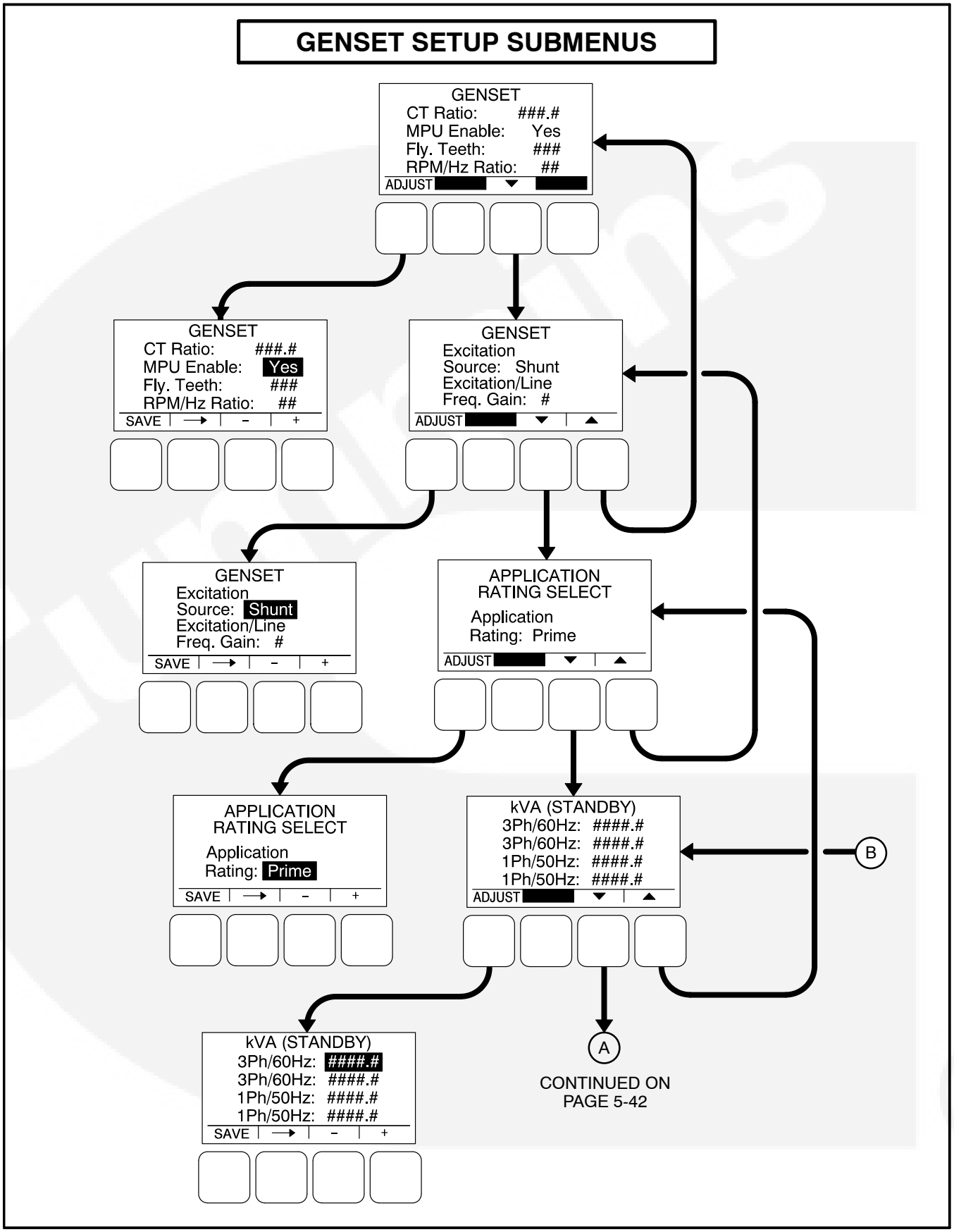


FIGURE 5-19. GENSET SETUP SUBMENUS (SHEET 1 OF 3)

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).

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 16.0 VDC for 24 volt batteries (default = 14.4 VDC), in 0.1 VDC increments.

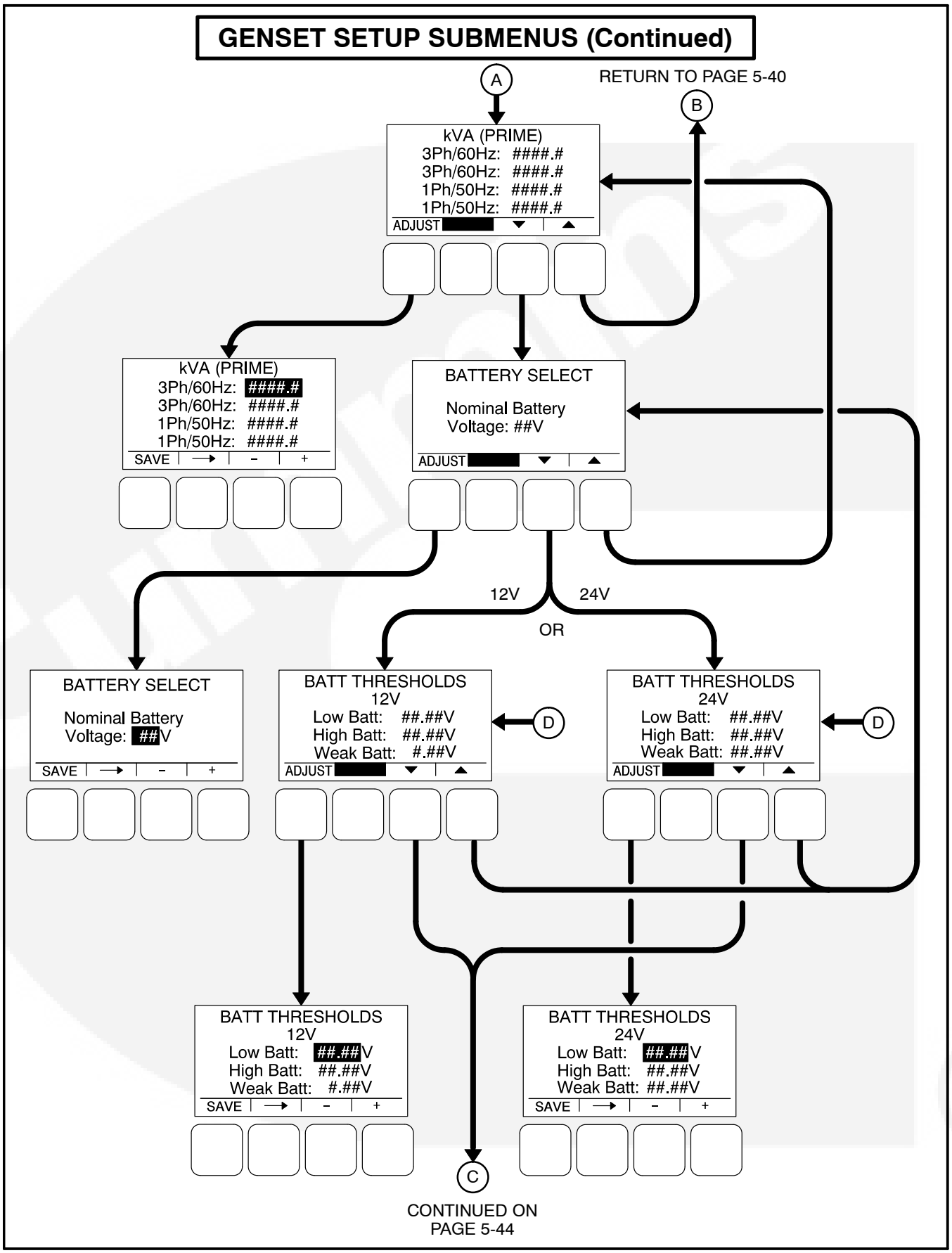


FIGURE 5-19. GENSET SETUP SUBMENUS (SHEET 2 OF 3)

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 441**) 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 442**) 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 1442**) is announced.

Oil Pressure Setup Menus

NOTE: The following menus are only available if the the ECM CAN feature is disabled.

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).

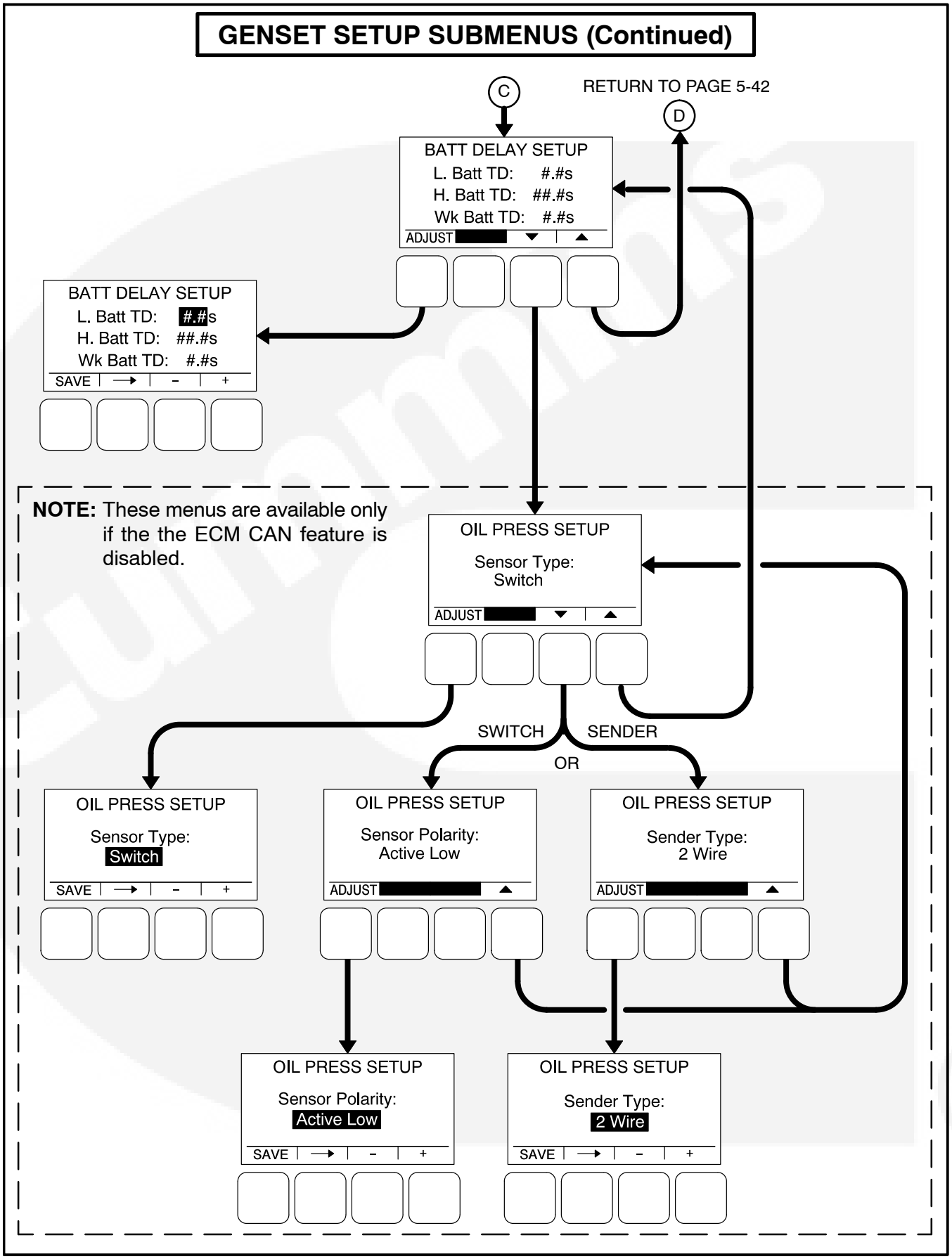


FIGURE 5-19. GENSET SETUP SUBMENUS (SHEET 3 OF 3)

Voltage Protection Submenus

The Voltage Protection submenus are available by pressing the **(2)** button on the first Genset Setup menu (see Figure 5-17 or Figure 5-18).

Figure 5-20 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 1446**) 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 1447**) 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 1449**) 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 1448**) is announced.

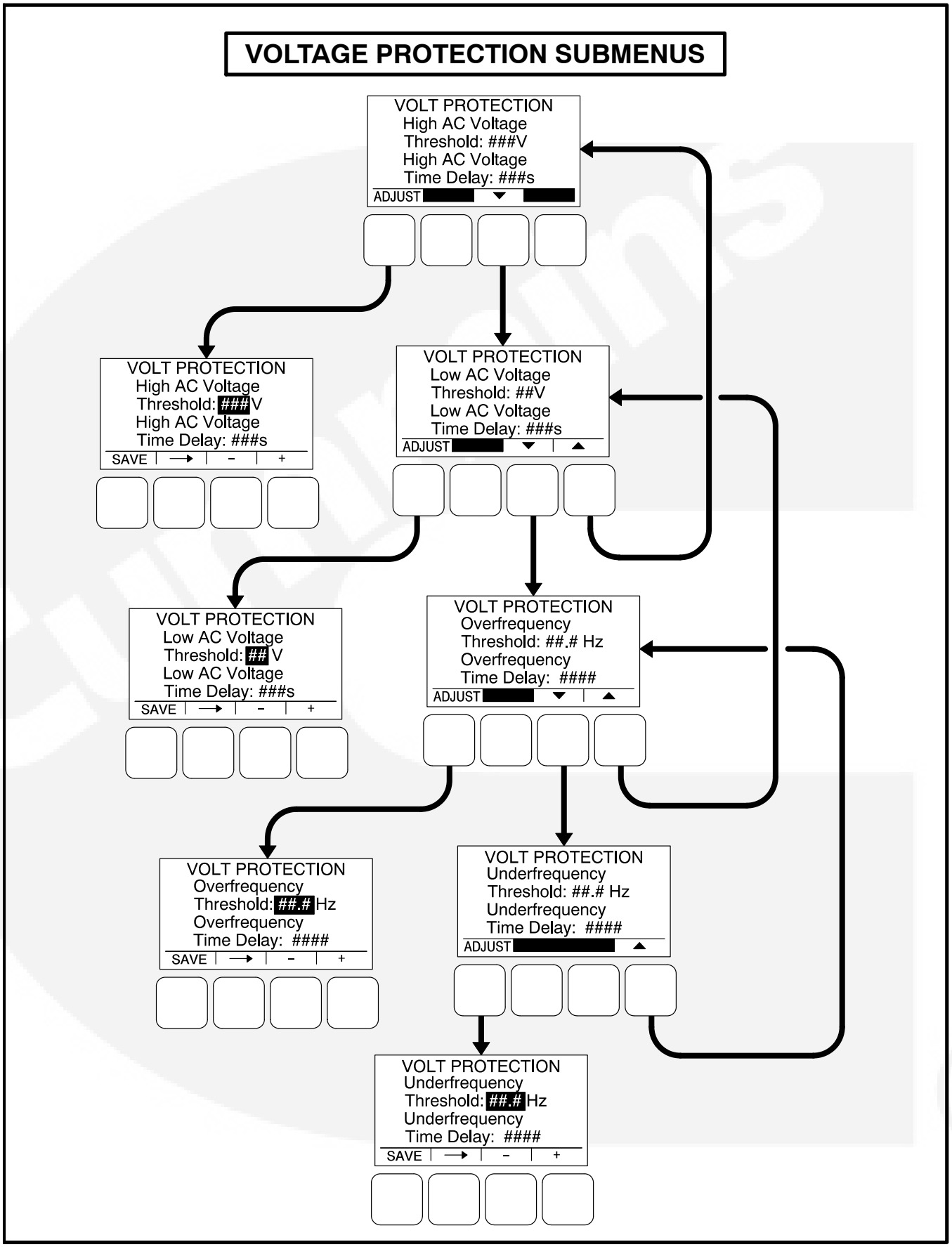


FIGURE 5-20. VOLTAGE PROTECTION SUBMENUS

Alternator Protection

The alternator protection feature protects the alternator as well as connected loads from conditions of High AC Voltage, Low AC Voltage, Loss of AC Sense, Field Overcurrent, Overfrequency, Underfrequency, and High AC Current.

Current Protection Submenus

The Current Protection submenus are available by pressing the **(3)** button on the first Genset Setup menu (see Figure 5-17 or Figure 5-18).

Figure 5-21 is a block representation of the Current Protection submenu.

High AC Current Menu

This menu is used to determine how long the fault condition should be present before the warning message is displayed and, if necessary, the shutdown message is displayed and the engine is shut down.

NOTE: If both the High Current Warning and High Current Shutdown faults are active at the same time, the High Current Shutdown fault is displayed.

- *H. Curr Shutdown Time Delay:* The High Current Shutdown Time Delay sets how long before the fault is greater than the instantaneous threshold. If the fault condition is active for the duration of this time delay (2 to 60 seconds, default = 10 seconds), the engine shuts down and the High AC Current shutdown message (**Fault Code 1472**) is announced.

CURRENT PROTECTION SUBMENUS

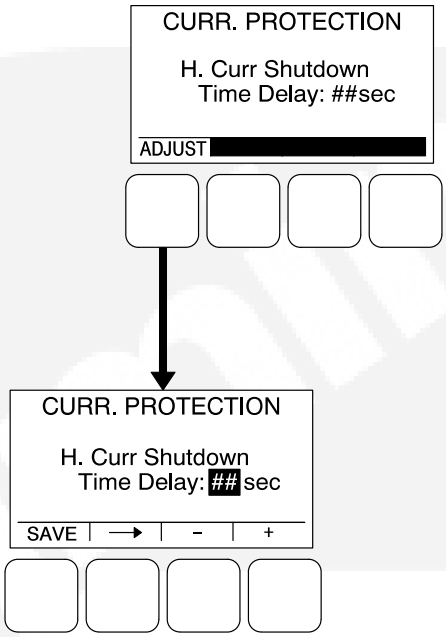


FIGURE 5-21. CURRENT PROTECTION SUBMENUS

Engine Protection Submenus

The Engine Protection submenus are available by pressing the **(4)** button on the second Genset Set-up menu (see Figure 5-17 or Figure 5-18).

The Engine Protection submenus (see Figure 5-22) 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 234**) 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 24,096 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 1469**) 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 143**) is announced.

ENGINE PROTECTION SUBMENUS

NOTE: These menus are available only if the the ECM CAN feature is disabled.

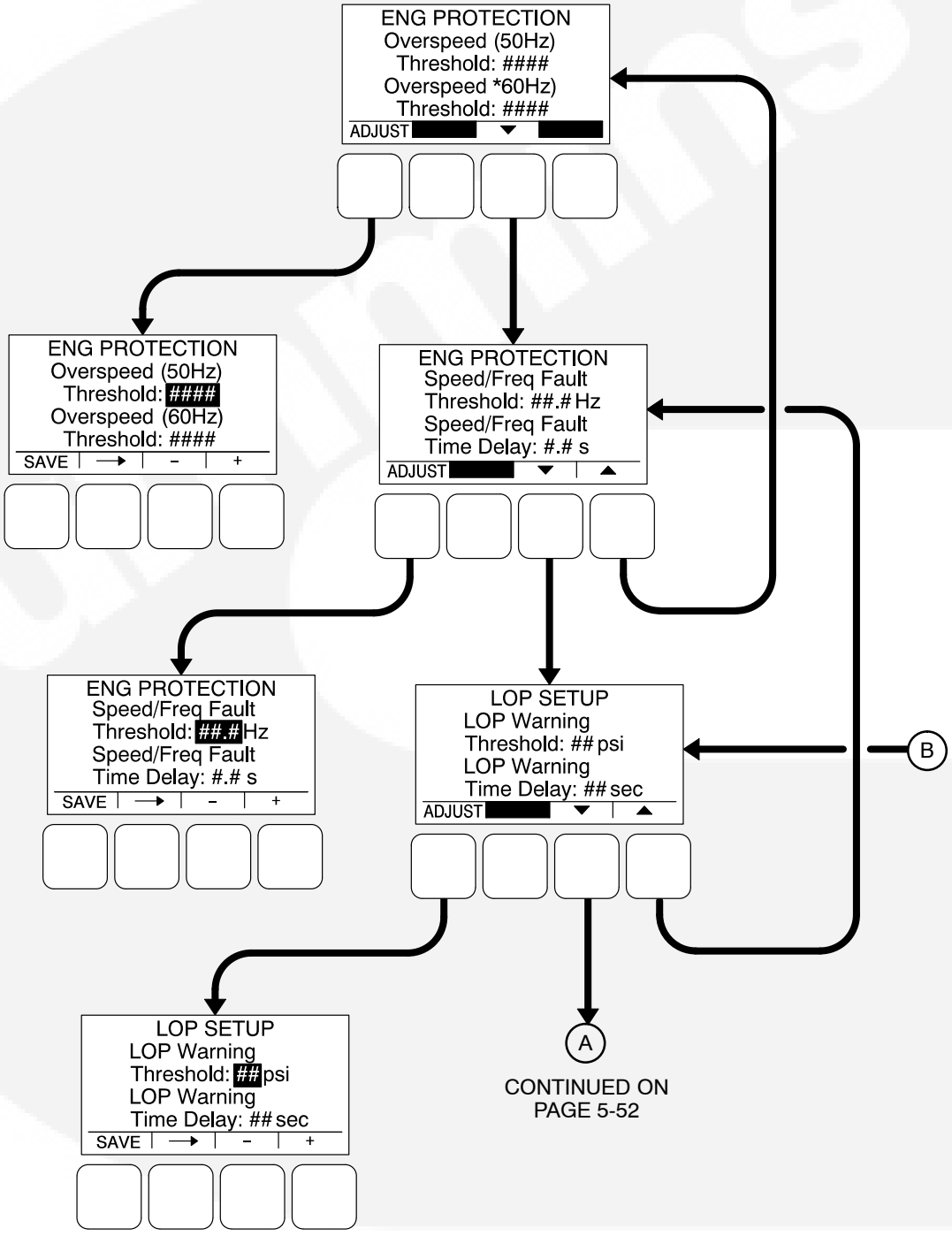


FIGURE 5-22. ENGINE PROTECTION SUBMENUS (SHEET 1 OF 3)

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 415**) 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 146**) 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 151**) is announced.

ENGINE PROTECTION SUBMENUS (Continued)

NOTE: These menus are available only if the the ECM CAN feature is disabled.

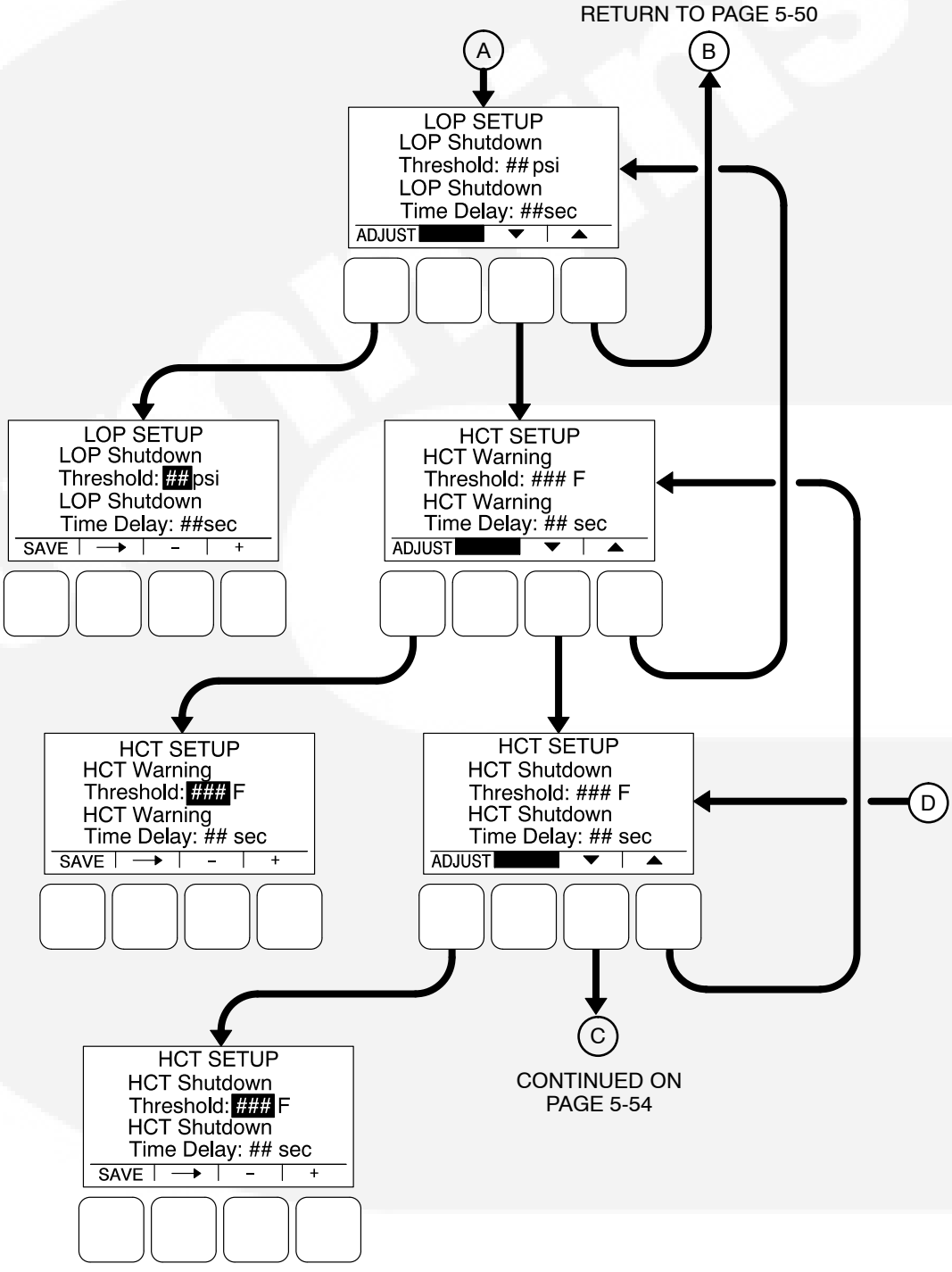


FIGURE 5-22. ENGINE PROTECTION SUBMENUS (SHEET 2 OF 3)

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 1435**) 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 2678**) is announced.

ENGINE PROTECTION SUBMENUS (Continued)

NOTE: These menus are available only if the the ECM CAN feature is disabled.

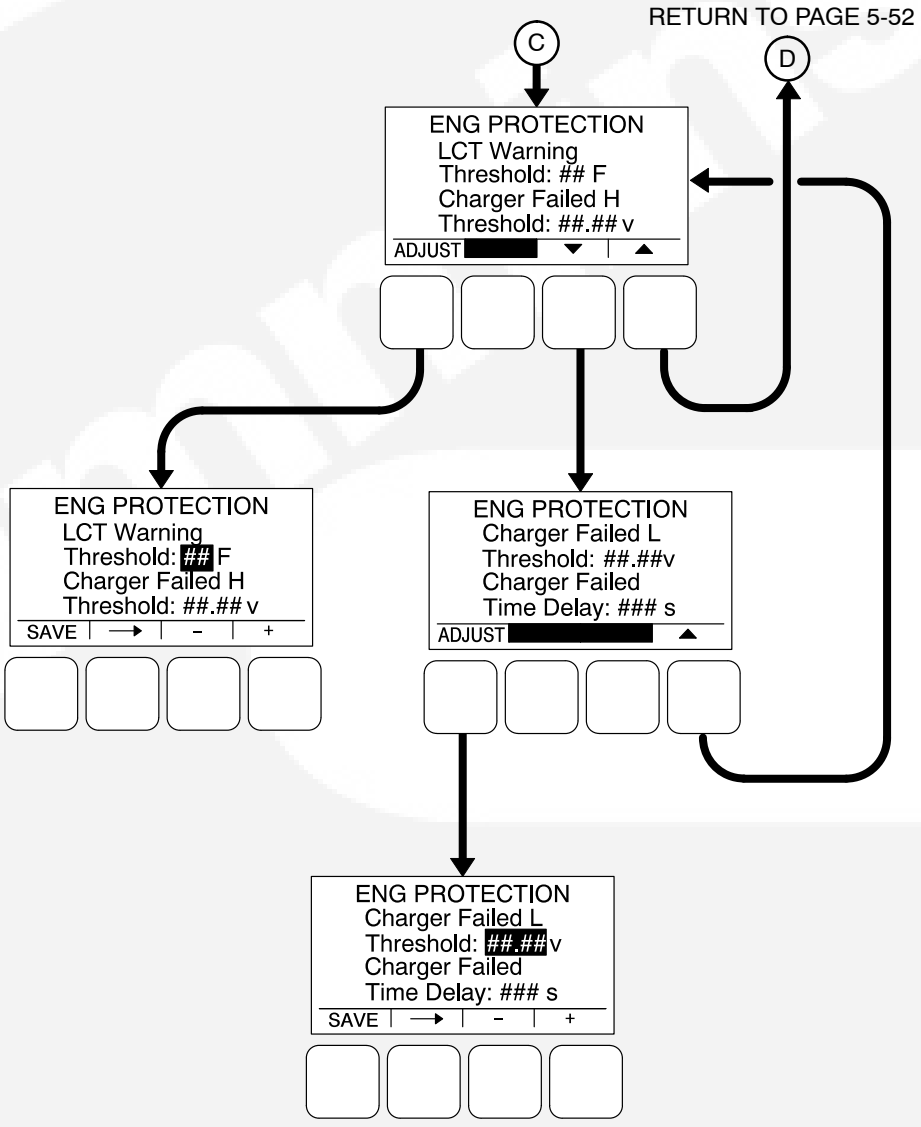


FIGURE 5-22. ENGINE PROTECTION SUBMENUS (SHEET 3 OF 3)

6. Troubleshooting

INTRODUCTION

The 1302 series control continuously monitors engine sensors for abnormal conditions, such as low oil pressure and high coolant temperature. If any of these conditions occur, the control (with graphical display) will light a yellow warning lamp or a red shutdown lamp and display a message on the graphical display. A control without the graphical display indicates a shutdown condition by intermittent flashing of the status indicator.

When the control is paired with a Cummins ECM on Full Authority Electronic the local engine inputs are ignored. Instead, the control receives all engine related faults and messages from the ECM. Fault codes are still shown on the HMI or status indicator as if they were local to the PCC1302 controller.

PC BASED SERVICE TOOL

The PC based service tool can be used in troubleshooting to perform tests, verify control inputs and outputs, and test protective functions.

When used improperly, a PC based service tool can cause symptoms like warnings and shutdowns that appear to be a defective base board. When these problems occur, always verify that a self-test or fault simulation (override) have not been left enabled with the tool. If you do not have a PC based service tool, or the enabled fault simulation(s) can not be found using the tool, disconnect battery power to disable the test or override condition.

Make sure that parameter adjustments and time delays, related to the fault condition, have been appropriately set for the application. It may be necessary to write the initial capture file to the device or update the calibration file. Updating a calibration file requires the a pro version of many of PC based service tools. Confirm that the installed calibration part number matches the serial plate information.

⚠ CAUTION ***Using the wrong calibration file can result in equipment damage. Do not swap Base boards from another genset model and only use the calibration file shown on the nameplate.***

Some features are not available until the hardware for that feature is installed and the PC based service tool is used to update (enable) that feature. Confirm that the feature is installed and enabled prior to troubleshooting the base board for symptoms related to a feature.

NETWORK APPLICATIONS AND CONFIGURABLE INPUTS

In applications with networks and remote configurable inputs, the genset may start unexpectedly or fail to crank as a result of these inputs. These symptoms may appear to be caused by the base board. Verify that the remote input is not causing the symptom or isolate the control from these inputs before troubleshooting the control.

SAFETY CONSIDERATIONS

⚠ WARNING ***Contacting high voltage components can cause electrocution, resulting in severe personal injury or death. Keep the output box covers in place during troubleshooting.***

⚠ 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 battery. Discharge static electricity from body before touching batteries by first touching a grounded metal surface.***

Ventilate battery area before working on or near battery—Wear goggles—Stop genset and disconnect charger before disconnecting battery cables—Disconnect negative (–) cable first and reconnect last.

⚠ CAUTION ***Disconnect battery charger from AC source before disconnecting battery cables. Otherwise, disconnecting cables can result in voltage spikes damaging to DC control circuits of the genset.***

⚠ WARNING ***Accidental starting of the generator set can cause severe personal injury or death. Prevent accidental starting by disconnecting the negative (–) cable from the battery terminal.***

When troubleshooting a generator set that is shut down, make certain the generator set cannot be accidentally restarted as follows:

1. For installations without the optional operator panel: Move the Start/Off/Auto switch on the control panel to the OFF position.

2. For installations with the optional operator panel: Press the button (0) to switch the control into the Off mode.

3. Turn off or remove AC power from the battery charger.

4. Remove the negative (–) battery cable from the generator set starting battery.

READING FAULT CODES

If the genset contains the graphical display and a fault occurs, the fault code/message can be viewed in the display. If the control does not contain the graphical display, the fault code is read from the control switch indicator.

After the fault is acknowledged and corrected, the recorded fault will be deleted from the control panel memory, but will remain in a data log to maintain a fault code history and fault code occurrence table. A PC-based service tool is required to view this data log.

Reading Fault Codes Using Optional Operator Panel

The warning or shutdown LED will light and the fault symbol, and code will be displayed on the display. Refer to the Fault Code List in the Protection and Faults section for the exact name of the fault.

Reading Fault Codes Using the Control Switch Indicator

1302 series control without display): The control panel rocker switch contains a status indicator lamp. This lamp is used to flash genset status and shutdown fault codes. (Only the last shutdown fault code is flashed.)

Warning fault codes are not displayed by the status indicator lamp. A PC based service tool is needed to read warning fault codes.

The following describes how to interpret the status indicator light.

Do not move the control switch to the OFF position before interpreting the fault code. Moving the switch to OFF will clear the fault indication.

- Constant Rate Flashing = Engine preheat /genset starting.
- Constant On = Genset running.
- Variable Rate Flashing = A genset Shutdown fault condition exists (Warning conditions are not displayed). All of the Shutdown faults described in section 14 can be announced with the status indicator lamp.

An example of a **four digit fault** code – first digit in the code is flashed, followed by a half–second pause, and then the second digit is flashed, followed by a half–second pause, followed by a half–second pause, and then the third digit is flashed, followed by a half–second pause, and then the fourth digit is flashed, followed by a one second pause.

TROUBLESHOOTING PROCEDURES

The following tables are a guide to help you evaluate problems with the generator set. You can save time if you read through the manual ahead of time and understand the system.

Voltage/Continuity Testing

Voltage and continuity tests are required in the following tables. In some cases, it is necessary to remove a plug to complete the test. Where required, the corrective action will mention when it is necessary to remove a plug for testing. In other cases, the plug cannot be removed for testing. When plug removal is not mentioned, testing must be performed by inserting a narrow meter probe into the back of the plug.

TABLE 6-1. ENGINE DOES NOT CRANK IN MANUAL MODE (NO FAULT MESSAGE)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***		
Reason: This indicates that the control has not received or recognized a manual start signal. **Effect:** Engine will not start.		
POSSIBLE CAUSE	**CORRECTIVE ACTION**	
ENGINE PLATFORM	**FAE Engines**	**HM Engines**
No power supplied to the control due to poor battery cable connections. Clean the battery cable terminals and tighten all connections.	1. Check wakeup conditions. 2. Check for poor battery cable connections. Clean the battery cable terminals and tighten all connections. 3. Remove connector P20 and check for B+ at P20-9 and P20-10 and GND at P20-2 and P20-4. If B+ or ground is missing, isolate to the harness and the TB BAT terminal mounted on the engine block. If B+ and ground check OK, cycle power to Base board by reconnecting P20 and retry operation.	1. Check wakeup conditions. 2. Check for poor battery cable connections. Clean the battery cable terminals and tighten all connections. 3. Remove connector P20 and check for B+ at P20 and P20-10 and GND at P20-2. If B+ or ground missing, isolate to harness and TB BAT terminal mounted on engine block. If B+ and ground check OK, cycle power to Base board by reconnecting P20 and retry operation.
1302 series control with display: No power supplied to front membrane panel.	Check for B+ at TB1-5 and GND at TB1-3. If ground is missing, the Base board is defective and must be replaced. If B+ is missing, then: 1. If B+ and ground check are OK, remove P1 from the back of the front membrane panel. 2. Check for B+ at P1-3 and ground at P1-5. If B+ or ground is missing, repair the harness.	Check for B+ at TB1-5 and GND at TB1-3. If ground is missing, the Base board is defective and must be replaced. If B+ is missing, then: 1. If B+ and ground check are OK, remove P1 from the back of the front membrane panel. 2. Check for B+ at P1-3 and ground at P1-5. If B+ or ground is missing, repair the harness.
Base board not properly calibrated or corrupt calibration.	Confirm that the installed calibration part number matches the serial plate information. Re-enter the calibration file if necessary.	Confirm that the installed calibration part number matches the serial plate information. Re-enter the calibration file if necessary.
The Remote Emergency Stop switch or wiring is defective.	With Emergency Stop push button not activated (switch closed), remove configurable leads from TB1-15 and TB1-16 and check for continuity between these two leads. If circuit is open, isolate to Emergency Stop switch and wiring. If there is continuity, go to the next step.	With Emergency Stop push button not activated (switch closed), remove configurable leads from TB1-15 and TB1-16 and check for continuity between these two leads. If circuit is open, isolate to Emergency Stop switch and wiring. If there is continuity, go to the next step.

TABLE 6-1. ENGINE DOES NOT CRANK IN MANUAL MODE (NO FAULT MESSAGE) (CONT.)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***		
Reason: This indicates that the control has not received or recognized a manual start signal. **Effect:** Engine will not start.		
POSSIBLE CAUSE	**CORRECTIVE ACTION**	
ENGINE PLATFORM	**FAE Engines**	**HM Engines**
The Local Emergency Stop switch or wiring is defective.	With the Emergency Stop push button not activated (switch closed), check for continuity between J25-2 and J25-6. If the circuit is open, isolate to the Emergency Stop switch and wiring. If there is continuity, go to the next step.	With the Emergency Stop push button not activated (switch closed), check for continuity between J25-2 and J25-6. If the circuit is open, isolate to the Emergency Stop switch and wiring. If there is continuity, go to the next step.
1302 series control without display: The Manual input signal is not getting from the Manual select switch (S12) to the Base board, indicting that the S12, Base board, or the harness is defective.	Remove connector P25 from the Base board. With Start switch in the Manual position, check for continuity between P25-10 (RUN) to P25-8 (GND). If there is no continuity, isolate to the switch and wiring. If there is continuity, the Base board is defective and needs to be replaced.	Remove connector P25 from the Base board. With the Start switch in the Manual position, check for continuity between P25-10 (RUN) to P25-8 (GND). If there is no continuity, isolate to the switch and wiring. If there is continuity, the Base board is defective and needs to be replaced.
1302 series control with display: The menu display Manual Run button, harness, or the Base board is defective.	Check for continuity between P25-10 (RUN) to P25-8. If there is no continuity when pressing the Manual Run button, isolate to the front membrane panel and wiring. If there is continuity, the Base board is defective and needs to be replaced.	Check for continuity between P25-10 (RUN) to P25-8. If there is no continuity when pressing the Manual Run button, isolate to the front membrane panel and wiring. If there is continuity, the Base board is defective and needs to be replaced.
Oil Pressure switch or wiring is defective		1. Remove the P11 connection and check wiring between P11-2 and P11-3 to the switch. 2. Verify control is configured for the type of switch installed. 3. Verify proper operation of the switch.
Oil Pressure sender, set-up on wiring is defective.		1. Remove the P11 connection and check wiring between P11-1, P11-2, and P11-3 (for 3-wire sender) to the sender. 2. Verify that the control is configured for the correct type of sender (see Figure 5-19, sheet 3). 3. Verify operation of the sender.
CAN Datalink Failed	Refer to **Fault Code 427** or **781**.	

TABLE 6-2. ENGINE DOES NOT CRANK IN REMOTE MODE (NO FAULT MESSAGE)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***	
Reason: This indicates that the 1302 series control has not received or recognized a remote start signal. **Effect:** Engine will not start in Remote mode, but starts in manual mode.	
POSSIBLE CAUSE	**CORRECTIVE ACTION**
The remote start switch or configurable wiring is defective.	1. Reset the control. Attempt to start the engine and check for ground at TB1-11. 2. If ground level is not present, isolate to the remote switch or configurable wiring. Repair as necessary. 3. If ground is present, go to the next step.
1302 series control without display: The Auto mode input is not getting from the Auto Select switch to the Base board, indicting that S12, the Base board, or the harness is defective.	1. Remove connector P11 from the Base board. 2. With S12 in Auto position, check for continuity from P25-11 (AUTO) to P25-8 (GND). 3. If there is no continuity, isolate to the switch or the wiring harness. If there is continuity, the Base board is defective and must be replaced.
1302 series control with display: The menu display Auto button, harness, or the Base board is defective.	1. Check for continuity between P25-11 (AUTO) and P25-8 (GND). 2. If there is no continuity when pressing the menu display Auto button, isolate to the front membrane panel or the wiring harness. If there is continuity, the Base board is defective and must be replaced.
For more information, see Table 6-1, Will Not Crank in Manual Mode.	

TABLE 6-2. WARNING AND SHUTDOWN CODES

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***		
FAULT CODE	**CORRECTIVE ACTION**	
ENGINE PLATFORM	**FAE Engines**	**HM Engines**
121 **SPEED SIGNAL LOST** Lamp: Shutdown	Not applicable on FAE engines.	Indicates that no magnetic pickup pulses are sensed for a Loss of Speed delay. If a magnetic pickup is not installed, then speed sensing is performed by monitoring AC line frequency and this fault cannot occur.
141. 135 **OIL PRESS SENSOR OOR L/H** Lamp: Warning	Indicates that the engine controller has sensed that the engine oil pressure sensor output is out of range (high or low). Consult the engine service manual and check the sender/connectors/wires.	Indicates that the control has sensed that the engine oil pressure sensor output is out of range (high or low). Check the sender/connectors/wires. This warning will only occur if the genset is equipped with an oil pressure sender.
143 **PRE-LOW OIL PRESSURE** Lamp: Warning	Indicates the engine oil pressure has dropped below the warning trip point programmed into the engine controller. If the generator is powering critical loads and cannot be shut down, wait until the next shutdown period and then follow the **Fault Code 415** procedure.	Indicates the engine oil pressure has dropped below the warning trip point. If the generator is powering critical loads and cannot be shut down, wait until the next shutdown period and then follow the **Fault Code 415** procedure. This warning will only occur if the genset is equipped with an oil pressure sender.
144, 145 **COOL SENSOR OOR LOW/HIGH** Lamp: Warning	Indicates that the engine controller has sensed that the engine coolant temperature sensor output is out of range (high or low). Consult the engine service manual and check the sender/connectors/wires.	Indicates that the control has sensed that the engine coolant temperature sensor output is out of range (high or low). Check the sender/connectors/wires.
146 **PRE-HIGH COOL TMP** Lamp: Warning	Indicates the engine is operating near its cooling system capacity. An increase in load or higher ambient temperature may cause a High Coolant Temp shutdown. Review **Fault Code 151** correction list for other possible causes.	Indicates the engine is operating near its cooling system capacity. An increase in load or higher ambient temperature may cause a High Coolant Temp shutdown. Review **Fault Code 151** correction list for other possible causes.

TABLE 6-2. WARNING AND SHUTDOWN CODES (CONT.)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***		
FAULT CODE	**CORRECTIVE ACTION**	
ENGINE PLATFORM	**FAE Engines**	**HM Engines**
151 **HIGH COOLANT TEMP** Lamp: Shutdown	Indicates the engine has overheated (coolant temperature has risen above the shutdown trip point set at the engine controller). Allow the engine to cool down completely before proceeding with the following checks: 1. Consult the engine service manual and reset the PCC1302. 2. Restart the generator after locating and correcting the problem.	Indicates the engine has overheated (coolant temperature has risen above the shutdown trip point). Allow the engine to cool down completely before proceeding with the following checks: 1. Check the coolant level and replenish if low. Look for possible coolant leakage points and repair if necessary. 2. Check for obstructions to the cooling airflow and correct as necessary. 3. Check the fan belt and repair or tighten if necessary. 4. Check the blower fan and circulation pumps on remote radiator installations. 5. Reset the control and restart the generator after locating and correcting the problem.
415 **LOW OIL PRESSURE** Lamp: Shutdown	Indicates the engine oil pressure has dropped below the shutdown trip point programmed into the engine controller. 1. Consult the engine service manual and reset the control. 2. Restart the generator after locating and correcting the problem.	Indicates the engine oil pressure has dropped below the shutdown trip point. 1. Check the oil level, lines, and filters. 2. If the oil system is OK but the oil level is low, replenish. 3. Reset the control and restart the genset. 4. If an oil switch is used, check switch performance.
234 **OVERSPEED** Lamp: Shutdown	Indicates the engine has exceeded normal operating speed. The default thresholds are preprogrammed in the engine controller. An engine service tool such as Insite or CalTerm III is required to change threshold settings. Possible causes are single step large block load removal or flammable vapors drawn into the intake air passage. Reset the control and restart after locating and correcting the problem.	Indicates engine has exceeded normal operating speed. The default thresholds are 1725 RPM (50 Hz) or 2075 RPM (60 Hz). Possible causes are single step large block load removal or flammable vapors drawn into the intake air passage. Reset the control and restart after locating and correcting the problem.

TABLE 6-2. WARNING AND SHUTDOWN CODES (CONT.)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***		
FAULT CODE	**CORRECTIVE ACTION**	
ENGINE PLATFORM	**FAE Engines**	**HM Engines**
359 **FAIL TO START** Lamp: Shutdown	Indicates a possible fuel system or air induction problem. (Engine cranks but fails to start) Consult the engine service manual for possible causes / solutions.	Indicates a possible fuel system or air induction problem. (Engine cranks but fails to start) 1. Check for an empty fuel tank, fuel leaks, or plugged fuel lines and correct as required. 2. Check for a dirty fuel filter and replace if necessary. 3. Check for a dirty or plugged air filter and replace if necessary. 4. Reset the control and restart after correcting the problem.
441 **LOW BATTERY** Lamp: Warning	Indicates the battery voltage supply to the control is approaching a low level at which an unpredictable operation will occur. 1. Discharged or defective battery. Check the battery charger fuse. Recharge or replace the battery. 2. Check for poor battery cable connections. Clean the battery cable terminals and tighten all connections. 3. Check the battery wiring/calibration. 4. Check the engine DC alternator. Replace the engine DC alternator if normal battery charging voltage is not obtained. 5. Check the battery charge voltage float level if applicable (raise float level).	
442 **HIGH BATTERY** Lamp: Warning	Indicates the battery voltage supply to the control is approaching a high level at which damage to the control can occur. Check the float level on the battery charger if applicable (lower float level). Check battery wiring/calibration.	
1123 **SHUTDOWN AFTER BATTLESHORT** Lamp: Shutdown	A shutdown fault occurred while the Battle Short mode was enabled. Check the fault history (see Figure 4-18) for faults that may have been bypassed.	
1131 **BATTLE SHORT ACTIVE** Lamp: Warning	Indicates that the control is in Battle Short mode – used to bypass several fault shutdowns, therefore allowing genset operation during emergencies.	
1311, 1312, 1317, 1318 **CONFIGURABLE INPUT 1, 2, 3, 4** Lamp: Configurable	The nature of the fault is an optional configurable selection. Example inputs: Low Fuel Day Tank, Water In Fuel, Ground Fault, etc. Each of the fault functions can be programmed (using a service tool or the operator panel), as follows: • Event or Warning or Shutdown level if Function Select = Fault Input • Change the display name using up to 32 characters.	

TABLE 6-2. WARNING AND SHUTDOWN CODES (CONT.)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***		
FAULT CODE	**CORRECTIVE ACTION**	
ENGINE PLATFORM	**FAE Engines**	**HM Engines**
1416 **FAIL TO SHUTDOWN** Lamp: Warning	The genset continues to run after receiving a shutdown command from the controller. The Battle Short feature is enabled – this is used to bypass several critical fault shutdowns, therefore allowing genset operation during emergencies.	
1433 **REMOTE EMERGENCY STOP** Lamp: Shutdown	Indicates a Remote Emergency Stop. To reset the Remote Emergency Stop button: 1. Close (disable) the remote Emergency Stop button. 2. Move the control switch to the OFF position or press the OFF button. 3. Select the desired operating mode (Manual or Auto). If the application has a remote fault reset, the fault can also be reset by closing the fault reset switch.	
1434 **LOCAL EMERGENCY STOP** Lamp: Shutdown	Indicates a Local Emergency Stop. To reset the Local Emergency Stop button: 1. Close (disable) Local Emergency Stop button. 2. Move the control switch to the OFF position or press the OFF button. 3. Select the desired operating mode (Manual or Auto). If the application has a remote fault reset, the fault can also be reset by closing the fault reset switch.	
1435 **LOW COOLANT TEMP** Lamp: Warning Set is not operating. Warning occurs when engine coolant temperature is 70°F (21°C) or lower. **NOTE: In applications where the ambient temperature falls below 40°F (4°C), Low Coolant Temp may be indicated even though the coolant heaters are operating.**	Indicates the engine coolant heater is not operating or is not circulating coolant. Check for the following conditions: • The coolant heater is not connected to the power supply. Check for a blown fuse or a disconnected heater cord and correct as required. • Check for low coolant level and replenish if required. Look for possible coolant leakage points and repair as required. • Check for an open heater element. Check the heater's current draw. The coolant temperature must be below 70°F (default setting) for one minute to activate a warning and must be above 70°F for one minute before the warning is cleared.	
1438 **FAIL TO CRANK** Lamp: Shutdown	The control has failed to receive engine speed from ECM during cranking. Consult the engine service manual for MPU diagnostic. See **Fault Code 427** or **781** for datalink health diagnostic.	The genset has failed to sense rotation for two start attempts. This indicates a possible fault with the control, speed sensing, or starting system. This fault can only occur in gensets with a magnetic pickup installed and enabled.
1442 **WEAK BATTERY** Lamp: Warning	Indicates that during cranking, the battery voltage is at or below the weak battery warning trip point for a time greater than or equal to the weak battery set time.	
1446 **HIGH AC VOLTAGE** Lamp: Shutdown	Indicates that one or more of the line-to-neutral phase voltages has exceeded 130% of nominal for 0 second, or has exceeded high AC voltage threshold of nominal for time delay seconds.	

TABLE 6-2. WARNING AND SHUTDOWN CODES (CONT.)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***		
FAULT CODE	**CORRECTIVE ACTION**	
ENGINE PLATFORM	**FAE Engines**	**HM Engines**
1447 **LOW AC VOLTAGE** Lamp: Shutdown	Indicates that one or more of the line-to-neutral phase voltages has dropped below low the AC voltage threshold for time delay seconds.	
1448 **UNDER FREQUENCY** Lamp: Shutdown	Indicates that the genset frequency has dropped below 90% of nominal for approximately 10 seconds. Check the fuel supply, intake air supply, and load.	
1449 **OVER FREQUENCY** Lamp: Shutdown	Indicates frequency is 10% above base frequency for approximately 10 seconds.	
1469 **SPEED HZ MATCH** Lamp: Shutdown	Not Applicable on FAE engines.	Indicates that the measured speed and the measured AC output frequency do not agree. Check the genset setup for number of flywheel teeth (see Figure 5-19, sheet 1).
1471 **HIGH AC CURRENT** Lamp: Shutdown	Indicates that an individual phase of alternator output current has exceeded the high current threshold of the rated output current continuously for more than the set time delay. Check the load and load lead connections.	
1472 **HIGH AC CURRENT** Lamp: Warning	Indicates that one or more of the phase currents has exceeded the high AC warning threshold for the set time delay seconds. Check the load and load lead connections.	
1853, 1854, 1855 **ANNUNCIATOR FAULT 1, 2, 3** Lamp: Configurable	The nature of the annunciator fault is an optional configurable selection.	
1944 **ANNUNCIATOR OUTPUT CONFIGURATION ERROR** Lamp: Warning	Indicates a mismatch in the configuration of one of the annunciator relay outputs.	
2335 **LOSS OF AC SENSE** Lamp: Shutdown	Indicates a loss of zero cross detection. Check alternator voltage sense and excitation leads for shorts or opens. Check load for shorts.	
2676 **ALTERNATOR FREQUENCY CONFLICT** Lamp: Shutdown	Indicates the alternator line frequency and alternator excitation frequency do not match. 1. Check the Alternator Frequency Gain trim using the Operator Panel (see Figure 5-19, sheet 1) or InPower. 2. Measure the alternator line frequency (J22-1 to J22-4). Measure the alternator excitation frequency (J18-1 to J18-2). The alternator line frequency * Alternator Frequency Gain should equal the excitation frequency. The alternator line frequency and alternator excitation frequency are also viewable with InPower. 3. Check voltage sense leads and excitator power lead for open or shorts.	

TABLE 6-2. WARNING AND SHUTDOWN CODES (CONT.)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***		
FAULT CODE	**CORRECTIVE ACTION**	
ENGINE PLATFORM	**FAE Engines**	**HM Engines**
2677 **FAIL TO STOP** Lamp: Shutdown	Genset continues to run after receiving shutdown command from the controller. The keyswitch relay is the what the PCC1302 uses to tell the engine controller to stop. Check the keyswitch relay operation and make sure it isn't stuck closed. Activating either emergency stop switch should open the keyswitch relay. Consult the engine service manual for other possible causes / solutions.	Genset continues to run after receiving a shutdown command from the controller. Check for a stuck fuel actuator and fuel shutoff valve.
2678 **CHARGER FAILURE** Lamp: Warning	Indicates the battery charging alternator has not reached an acceptable voltage range within the selected period (default = 120 seconds). Refer to the engine service manual if this fault occurs. If not failed, check wiring.	
2972 **FIELD OVERLOAD** Lamp: Shutdown	Indicates that the Field AVR Duty Cycle has been at the maximum for at least 15 seconds.	

TABLE 6-3. CODE 121 – SPEED SIGNAL LOST (SHUTDOWN) – GENSETS WITH MPU

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***	
Reason: This indicates that the control is not sensing the magnetic pickup signal. **Effect:** Engine will shut down.	
POSSIBLE CAUSE	**CORRECTIVE ACTION**
1. There are loose or damaged magnetic pickup (MPU) wires/ connector pins.	Inspect the wires/connector pins and repair or replace as necessary.
2. The magnetic pickup, harness or Base board is defective.	To isolate the problem, reset the control and attempt to start the genset. If **Fault Code 1438** (Fail To Crank) is displayed, or if the engine starts, but then shuts down on **Fault Code 121** (Speed Signal Lost), the MPU sender could be defective. Remove the MPU connectors and check for 3.5 to 15 VAC at the MPU while cranking. • If there is no output, check for damage or debris. Also check for improper adjustment of the MPU. If there is still no output, replace the MPU sender. • If the MPU output is OK, check for MPU voltage at P11-9 (MAG PICK+) to P11 10 (MAG PICK–) while cranking. If OK, replace the Base board. If not OK, use continuity checks to isolate connectors/harness. If the engine starts and idles, and does not display a fault, then there could be a frequency mismatch problem. Measure the generator output frequency with a digital multimeter and compare to the frequency shown on the operator panel or the PC based service tool. • Verify that the number of flywheel teeth has been correctly configured (see Figure 5-19, sheet 1 for information on how to adjust the flywheel tooth setting using the operator panel). • If they do match, multiply the frequency by Speed/Freq Gain Select trim (typically 30) and compare this number to the RPM on the operator panel or PC based service tool. If these are not the same, the MPU sender may be defective. Replace the MPU sender. • If the multimeter and control frequencies do not match, there is a frequency sensing problem within the Base board. Replace the Base board.
3. Restricted fuel supply. The engine may fire once during cranking which could cause the engine to speed up past the starter disconnect speed. Due to the restricted fuel supply, the engine will not turn over anymore and the 1302 control panel will display fault code 121 once the engine stops spinning.	In order to fix the problem, you need to make sure that there is an adequate fuel supply that is free of clogs or leaks.

TABLE 6-4. CODE 135/141 – OIL PRESSURE SENSOR OOR HIGH/LOW (WARNING)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***		
Reason: This indicates that the engine oil pressure sensor signal is out of range – shorted high or low. **Effect:** There is no engine protection for oil pressure during genset operation.		
POSSIBLE CAUSE	**CORRECTIVE ACTION**	
ENGINE PLATFORM	**FAE Engines**	**HM Engines**
The sensor connections could be defective.	Consult the engine service manual.	Inspect the sensor and engine harness connector pins. Repair or replace as necessary.
The sensor could be defective.	Consult the engine service manual.	Disconnect the oil pressure sensor leads and connect an oil pressure sensor simulator to the harness. **An "OIL PRESSURE SENSOR OOR" warning is displayed after the fault condition is sensed for 10 seconds.** If the control responds to the simulator, replace the sensor. If the control does not respond, go to the next step.
The harness could be defective.	Consult the engine service manual.	1. Remove connector P11 from the Base board and the connector from the sensor. 2. Check P11-1, 2 & 3 as follows: • Check for a short circuit from pin to pin (more than 200k ohms is OK). • Check for an open circuit (10 ohms or less is OK). 3. Repair or replace as necessary.
The Base board could be defective.	Consult the engine service manual.	With all connectors attached, check the pressure signal (.5 to 4.5 VDC) at P11-3 (OP OUT) and P11-2 (OP COM). If within range, replace the Base board.

TABLE 6-5. CODE 143 – PRE-LOW OIL PRESSURE (WARNING)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***	
Reason: The engine oil pressure has dropped below the warning/shutdown threshold for pre-low oil pressure. **Effect:** No action is taken by the control.	
POSSIBLE CAUSE	**CORRECTIVE ACTION**
Refer to **Fault Code 415**.	Refer to **Fault Code 415**.

TABLE 6-6. CODE 143/415 – LOW OR PRE-LOW OIL PRESSURE (WARNING/SHUTDOWN)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***		
Reason: Engine oil pressure has dropped below the warning/shutdown threshold for low/high oil pressure. **Effect:** Calibration-dependent. No action is taken by the Control for **Fault Code 143**. Engine will shut down for **Fault Code 415**.		
POSSIBLE CAUSE	**CORRECTIVE ACTION**	
ENGINE PLATFORM	**FAE Engines**	**HM Engines**
Fault simulation was enabled with a PC based service tool.	With a PC based service tool, verify that the fault simulation is not enabled for the oil pressure sensor. If you do not have a PC based service tool, remove battery power from the control to disable the fault simulation overrides.	
Low oil level. Clogged lines or filters.	Check the oil level, lines, and filters. If the oil system is OK but the oil level is low, replenish.	
The sensor or oil pump could be defective. Or the generator set may be shutting down on another fault.	Consult the engine service manual.	Disconnect the oil pressure sensor leads and connect an oil pressure sensor simulator to the harness. 1. If the control responds to the simulator, reconnect the sensor, disconnect the + signal wire at the fuel solenoid, and crank the engine. Check the oil pressure reading on the digital display. • If the display shows an acceptable oil pressure, the problem may not be in the oil or oil sensing system. The genset may be shutting down on another fault (out of fuel, intermittent connector). Restart the genset and monitor the display panel for other faults. • If the display does not show an acceptable oil pressure, replace the sensor. If the Control still doesn't display an oil pressure while cranking, the oil pump may be defective. Refer to the engine service manual. 2. If the control does not respond to the simulator, go to the next step.

TABLE 6-6. CODE 143/415 – LOW OR PRE-LOW OIL PRESSURE (WARNING/SHUTDOWN) (CONT.)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***		
Reason: Engine oil pressure has dropped below the warning/shutdown threshold for low/high oil pressure. **Effect:** Calibration-dependent. No action is taken by the Control for **Fault Code 143**. Engine will shut down for **Fault Code 415**.		
POSSIBLE CAUSE	**CORRECTIVE ACTION**	
ENGINE PLATFORM	**FAE Engines**	**HM Engines**
Harness or Base board could be defective.	Consult the engine service manual.	If the control does not respond to the simulator, the Base board or the harness is defective. • Check for +5 VDC at the sensor (lead marked S1). If there is no 5 VDC at the sensor: • Check for 5 VDC at P11-1. If present, the harness is defective and must be replaced. If not present, the Base board is defective and must be replaced. If there is 5 VDC at the sensor, use the sensor simulator to generate a signal to P11-3 (Oil Sense) and P11-2 (Oil Comm.). If the pressure signal (0.5 to 4.5 VDC) does not get to P11, isolate to the harness. If the pressure signal does go to P11, the Base board is defective and must be replaced.
Low Oil Pressure fault set points could be incorrect.	Consult the engine service manual.	Verify set points against the normal operating pressures of the engine. Refer to the engine service manual.

TABLE 6-7. CODE 145/144 – COOLANT SENSOR OOR HIGH/LOW (WARNING)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***		
Reason: This indicates that the coolant temperature sensor signal is out of range – shorted high or low. **Effect:** No engine protection for coolant temperature during genset operation. Possible white smoke.		
POSSIBLE CAUSE	**CORRECTIVE ACTION**	
ENGINE PLATFORM	**FAE Engines**	**HM Engines**
The sensor connections could be defective.	Consult the engine service manual.	Inspect the sensor and engine harness connector pins. Repair or replace as necessary.

TABLE 6-7. CODE 145/144 – COOLANT SENSOR OOR HIGH/LOW (WARNING) (CONT.)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: This indicates that the coolant temperature sensor signal is out of range – shorted high or low. **Effect:** No engine protection for coolant temperature during genset operation. Possible white smoke.

POSSIBLE CAUSE	CORRECTIVE ACTION	
ENGINE PLATFORM	**FAE Engines**	**HM Engines**
The sensor could be defective.	Consult the engine service manual.	Disconnect the sensor and plug in a resistive sensor simulator to isolate the fault. If the control responds to the simulator, replace the sensor. If control does not respond, go to the next step.
The harness or Base board could be defective.	Consult the engine service manual.	1. Remove connector P11 from the Base board and disconnect the sensor. Check pins P11-11 (H20) and P11-12 (H20 COM) for a short circuit as follows: • Check for a short circuit to the engine block ground (more than 200k is ohms OK). • Check for a short circuit from pin to pin (more than 200k ohms is OK). • Repair or replace as necessary. 2. Measure the resistance of the coolant sensor and reconnect the harness to the sensor. Remove connector P11 from the Base board and check resistance between pins P11-11 (H20) and P11-12 (H20 COM). • If resistance is not the same, the harness is defective and must be replaced. • If resistance is the same, the Base board is defective and must be replaced.

TABLE 6-8. CODE 146 – PRE-HIGH COOLANT TEMP (WARNING)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: The engine coolant temperature has exceeded the warning threshold for pre-high coolant temperature. **Effect:** No action is taken by the control.

POSSIBLE CAUSE	CORRECTIVE ACTION
Refer to **Fault Code 151**.	Refer to **Fault Code 151**.

TABLE 6-9. CODE 146/151 – HIGH OR PRE-HIGH COOLANT TEMPERATURE (WARNING/SHUTDOWN)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***		
Reason: Engine coolant temperature has exceeded the warning threshold for pre-high/high coolant temperature. **Effect:** Calibration-dependent. No action is taken by the Control for **Fault Code 146**. Engine will shut down for **Fault Code 151**.		
POSSIBLE CAUSE	**CORRECTIVE ACTION**	
ENGINE PLATFORM	**FAE Engines**	**HM Engines**
Fault simulation was enabled with a PC based service tool.	With a PC based service tool, verify that the fault simulation is not enabled for the coolant sensor. If you do not have a PC based service tool, remove battery power from the control to disable fault simulation overrides.	
Engine or sensor circuitry problem.	Refer to the engine service manual.	Check sensor accuracy with a thermocouple or similar temperature probe. • If the coolant temperature reading is accurate, the engine may be overheating. Refer to the engine service manual. • If the coolant temperature reading is not accurate, go to the next step.
The sensor could be defective.	Refer to engine service manual.	Disconnect the sensor and connect a coolant temperature sensor simulator to the harness. If the control responds to the simulator, replace the sensor. If the control does not respond, go to the next step.
The harness or Base board could be defective.	Not applicable.	Measure the resistance of the coolant sensor and reconnect the harness to the sensor. Remove connector J11 from the Base board and check resistance between pins P11-11 (H20) and P11-12 (H20 COM). • If resistance is not the same, the harness is defective and must be replaced. • If resistance is the same, the Base board is defective and must be replaced.

TABLE 6-10. CODE 153, 154, 155, 195, 196, 197, 285, 286, 418, 426, 1845, 1846, 1852, 1992, 2964 – ENGINE FAULTS ANNOUNCED BY THE PCC1302 (EVENT/WARNING/SHUTDOWN)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: The engine controller has sensed a fault condition and is broadcasting the fault message. The PCC1302 is uniquely announcing the fault code. **Effect:** Event, Shutdown, or Warning

POSSIBLE CAUSE	CORRECTIVE ACTION
Consult the engine service manual.	Consult the engine service manual.

TABLE 6-11. CODE 234 – OVERSPEED (SHUTDOWN)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: Engine speed signal indicates an engine speed greater than shutdown threshold. **Effect:** Engine will shut down.

POSSIBLE CAUSE	CORRECTIVE ACTION
The engine is cold (no coolant heaters)	Overspeed can occur when starting a very cold engine. Clear the fault and restart the genset.
There is a single step large block load removal.	Clear the fault and restart the genset.
A fault simulation was enabled with a PC based service tool.	With a PC based service tool, verify that the fault simulation is not enabled for the coolant sensor. If you do not have PC based service tool, remove battery power from the control to disable fault simulation overrides.
The fault threshold is not set correctly with the PC based service tool.	Reset the threshold to the highest allowable setting. Determine the required operating range before adjusting the threshold.
Monitor the engine RPM using a PC based service tool.	If the RPM is not correct, refer to **Fault Code 121** for corrective action.
There is a governor fault.	1. Check the fuel shutoff solenoid adjustment. 2. Replace the defective injection pump unit.
The flywheel tooth count is incorrect.	For gensets with a magnetic pickup installed, verify that the flywheel tooth count is correct for the engine type. Refer to Table 3-25 for a list of flywheel teeth requirements and Figure 5-19, sheet 1 for information on how to adjust the flywheel tooth setting using the operator panel.
The mechanical fuel system setup is incorrect.	Verify that the fuel stop settings are correct for your application.

TABLE 6-12. CODE 359 – FAIL TO START (SHUTDOWN)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***	
Reason: This indicates that the engine failed to start after expiration of the last crank time. **Effect:** Engine will not start.	
POSSIBLE CAUSE	**CORRECTIVE ACTION**
Restricted fuel supply because:	
1. The fuel level is below the pickup tube in the tank.	1. Add fuel if low. Prime the fuel system.
2. There is a closed shutoff valve in the supply line.	2. Open any closed shutoff valve in the fuel line supplying the engine.
3. The fuel injectors are clogged.	3. Refer to the engine service manual.
4. There is air in the fuel system.	4. Bleed air from fuel system. Refer to the engine service manual.
Glow plugs are not heating because:	The Base board determines at what temperature and duration of time that the glow plugs are energized. Using sensed coolant temperature, the glow plugs are energized at 77°F (25°C) and colder. The glow plugs are energized for up to 15 seconds when the coolant temperature is –5°F (–20.5°C) or colder. The time duration (15–0 seconds) is linear between –5°F and 77°F. *With the coolant temperature colder than 77°F (25°C):*
1. The glow plug(s) is defective.	1. Each glow plug should be warm to the touch if the engine has just been cranking. First clean and tighten the terminal of any cold glow plug and then replace it if necessary.
2. The Base board is defective.	2. Install a harness tool between the Base board P11 connector. Attempt to start the engine and check for B+ at P11-6 (RELAY COIL B+) and GND at P11-7 (GLOW PLUG SOL). • If B+ / GND is not present, the Base board is defective and must be replaced. • If B+ / GND is present, go to step 3.
3. The glow plug relay is defective.	3. Check for B+ at the glow plug relay. If not present, check for an open circuit. If there is B+ at the glow plug relay, attempt to start and test for B+ at the other end of the glow plug relay. • If B+ is not present, the glow plug relay is defective and must be replaced. • If B+ is present, check for an open circuit between the glow plug relay contact and the glow plugs.

TABLE 6-12. CODE 359 – FAIL TO START (SHUTDOWN) (CONT.)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: This indicates that the engine failed to start after expiration of the last crank time. **Effect:** Engine will not start.

POSSIBLE CAUSE	CORRECTIVE ACTION
The fuel solenoid on the injection pump is not energized because:	Isolate to the fuse, fuel relay, fuel solenoid, or the Base board.
1. The fuse is open.	1. Remove the fuse (if installed) and check continuity. If open, replace the fuse with one of the same type and amp rating. If the fuse reopens, check wiring continuity of the fuel solenoid circuit/test fuel solenoid. Binding in the solenoid linkage can prevent activation of the hold coil circuitry in the solenoid. Make sure the solenoid shaft moves completely in and out freely. (Applies to solenoids with both Pull and Hold coils.)
2. The fuel solenoid is defective.	2. Attempt to start the engine and check for B+ at the fuel solenoid coil. • If B+ is present, the fuel solenoid is defective and must be replaced. • If B+ is not present, go to step 3.
3. The Base board/K8 fuel relay is defective.	3. Check wiring continuity/test K8 relay or fuel pilot: Remove the lead from FUEL RELAY−COM (fuel pilot). Attempt to start the engine and check for B+ at lead COM. • If there is no B+, check for an open circuit between K8-COM and fuse. • If B+ is present, reconnect lead COM to the relay. Remove the lead from the N/O connection. Attempt to start the engine and check for B+ at the terminal N/O connection. • If B+ is present, check for an open circuit between the N/O connection and the fuel solenoid (+). • If B+ is not present, check to make sure the E-stop switches are inactive, then check for a ground signal at J11-14. If not, the Base board is defective and must be replaced.

TABLE 6-12. CODE 359 – FAIL TO START (SHUTDOWN) (CONT.)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***	
Reason: This indicates that the engine failed to start after expiration of the last crank time. **Effect:** Engine will not start.	
POSSIBLE CAUSE	**CORRECTIVE ACTION**
The injection pump actuator is not energized due to the harness, governor actuator, governor module, or the Base board is defective.	Isolate to the harness, governor actuator, or the Base board. 1. Display the "Governor Duty Cycle" menu. Attempt to start and check for duty cycle (44% is about average). If the percentage of duty cycle is displayed before a shutdown, the harness, actuator governor, or output circuit of the control is defective Go to step 2. (Duty cycle displayed indicates the processor is functioning, but the output circuitry of the Base board could still be defective.) If the duty cycle is not displayed, the control is defective or is configured incorrectly. Check the configuration. 2. Remove connector P11 from the control and check wiring continuity of the actuator circuit. Check P11-5 (GOV–DR+) and P11-4 (GOV–DR–) to the appropriate +/– terminals of the governor module and between J1-4 on the governor module and the actuator. If continuity is OK, go to step c. 3. Disconnect the two leads attached to the injection pump actuator. Measure the resistance across the two actuator terminals. A reading of 2.3 ohms indicates that the actuator circuit is OK. (This test only shows that the actuator circuit is not opened or shorted, but not if there is binding.) Replace the actuator assembly if an open or short is measured. If the actuator is OK, go to step 4. 4. Remove power from the control for one minute. Put power back on the control and check for B+ at P11-5. If not present, the control is defective and must be replaced. If present, go to step 5. 5. Attempt to start and check for CNTL B+ at terminal lead ACT + of the governor actuator (use the engine block for metering ground). If not present, check the wiring or SW B+ control function and J1-3 of the governor module. 6. If CNTL B+ is present, attempt to start the engine and check for a GOV PWM (pulse wide modulated) signal (measure across the terminals of the actuator and across J1-2 to J1-1 of the governor module). If not present on J1, the control is defective and must be replaced. 7. If not present on the actuator, governor module is defective and must be replaced.
The engine fuel system is worn or malfunctioning or it has lost prime (fuel lift pump, injection pump, injectors, timing).	Service according to the engine service manual.
The engine is worn or is malfunctioning mechanically.	Service according to the engine service manual.

TABLE 6-13. CODE 427/781 – CAN DATALINK LOST (WARNING/SHUTDOWN)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: Indicates that the communication link between the engine controller and genset controller is lost. **Effect:** Warning – The control issues a warning level fault if the CAN datalink is lost and while there is no engine speed or no start command. Shutdown – The control issues a shutdown level fault if the CAN datalink is lost while there is a non-zero engine speed or a start command is active.

POSSIBLE CAUSE	CORRECTIVE ACTION
The networking harness is defective.	1. Check the datalink between the ECM and the GCS. Check for open or shorts between the following: J11-20 (CANH) J11-19 (CANL) J11-17 (CAN Shield) 2. Also check to make sure that there is 60 Ohms resistance between J11-20 and J11-19. If not, the harness is defective; repair the harness.
The ECM is powered down.	1. With the control powered, check for the B+ on the positive side of the keyswitch pilot relay coil. Check for GND on the negative side of the keyswitch relay coil. 2. If B+ doesn't exist, the harness is defective. If GND doesn't exist, check for GND on P11-21 (Keyswitch LS Out). If GND does exist, the harness is defective, repair harness. If GND doesn't exist, the Base board is defective and must be replaced.

TABLE 6-14. CODE 441 – LOW BATTERY (WARNING)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: Low voltage has been detected for the battery. **Effect:** The control's voltage supply approaches a level at which unpredictable operation may occur.

POSSIBLE CAUSE	CORRECTIVE ACTION
Weak or discharged battery.	Recharge or replace the battery. Specific gravity for a fully charged battery is approximately 1.260 at 80°F (27°C).
Low electrolyte level in the battery.	Replenish electrolyte and recharge the battery.
Battery connections are loose or dirty.	Clean and tighten or replace the battery cable connectors and cables at the battery and the genset.
Insufficient battery charging voltage.	Adjust the charge rate of the AC powered battery charging circuit, according to manufactures instructions.
Engine DC alternator could be defective.	Replace the engine DC alternator if the normal battery charging voltage (12 to 14 VDC for 12VDC system, 24 to 27 VDC for 24VDC system) is not obtained.

TABLE 6-14. CODE 441 – LOW BATTERY (WARNING) (CONT.)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: Low voltage has been detected for the battery. **Effect:** The control's voltage supply approaches a level at which unpredictable operation may occur.

POSSIBLE CAUSE	CORRECTIVE ACTION
If the batteries are OK, the problem may be with the harness or the Base board.	Remove connector P11 from the Base board and check battery voltage at P20-9,10,20,21 (B+) to P20-10 2,4,7,12(GND). • If the voltage at P11 is not the same as the battery voltage, the harness is defective and must be replaced. • If the voltage at P11 is OK, the Base board is defective and must be replaced.
Fault threshold could be incorrect.	Check the fault threshold against the requirement of the application.

TABLE 6-15. CODE 442 – HIGH BATTERY VOLTAGE (WARNING)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: High voltage has been detected for the battery. **Effect:** Control damage will occur.

POSSIBLE CAUSE	CORRECTIVE ACTION
Excessive battery charging voltage.	Adjust the charge rate of the AC powered battery charging circuit according to the manufacturer's instructions.
Engine DC alternator could be defective.	Replace the engine DC alternator if the normal battery charging voltage (12 to 14 VDC) is not obtained.
Fault threshold could be incorrect.	Check the fault threshold against the requirement of the application.

TABLE 6-16. CODE 1311, 1312, 1317, 1318 – CONFIGURABLE INPUT (WARNING/SHUTDOWN)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: The nature of the fault is an optional configurable selection. **Effect:** Shutdown.

POSSIBLE CAUSE	CORRECTIVE ACTION
If there is no actual fault, the problem may be an external wiring problem.	If the Fault Input Active State select is set to active close, check to see if GND is at the fault input terminal. If GND is at the fault input terminal, check the external wiring. If the Fault Input Active State select is set to active open, check to see if GND is not at the fault input terminal. If GND is not at the fault input terminal, check the external wiring.

TABLE 6-17. CODE 1426 – GENERIC ENGINE FAULT (WARNING)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: The PCC1302 has received a fault code from the engine control module that it doesn't uniquely recognize. **Effect:** Warning.

POSSIBLE CAUSE	CORRECTIVE ACTION
The engine controller has broadcasted a fault that the PCC1302 control doesn't recognize.	Use an engine service tool (Insite or InPower) to view the active fault messages being sent by the engine controller. Consult the engine service manual for a Fault Code mapping and a procedure to cure the problem.

TABLE 6-18. CODE 1443 – DEAD BATTERY

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: Indicates during cranking battery voltage has dropped below operating voltage of control resetting the control for three consecutive times. **Effect:** Shutdown.

POSSIBLE CAUSE	CORRECTIVE ACTION
Weak or discharged battery.	Measure the voltage of battery with voltmeter. Battery voltage should be 12VDC or greater for 12 VDC system and 24VDC or greater for 24VDC system. If battery voltage is low, check the electrolyte level. Replenish electrolyte level if low and recharge the battery (specific gravity of fully charged lead acid battery is approximately 1.26 at 80 F (27 C). If battery cannot hold adequate voltage, replace battery.
Battery connections are loose or dirty.	Clean and tighten battery terminals and battery cable connector. If battery cable connectors are cracked or worn out then replace.
Insufficient battery charging voltage.	Ensure external battery charger is charging the battery at an acceptable rate. Adjust the rate if the rate is below the recommendation of the manufacturer. If battery is located at a far distance from the battery charger, ensure that adequate wire gauge is used to compensate the voltage drop.
Faulty engine DC alternator.	Replace engine DC alternator if normal battery charging voltage (12 to 14 VDC for 12VDC system , 24 to 27 VDC for 24VDC system) is not obtained.
Faulty Harness.	Measure the battery voltage at battery terminals when genset is cranking. Then measure battery voltage at base board input while genset is cranking (at J20–9, J20–10, J20–20,J20–21 for B+ve and J20–2, J20–4, J20–7, J20–12 for B–ve). If voltage at battery terminals and control is not the same, check harness and replace if necessary.

TABLE 6-19. CODE 1435 – LOW COOLANT TEMPERATURE (WARNING)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***		
Reason: The engine coolant temperature has dropped below the warning threshold for low coolant temperature. **Effect:** No action is taken by the control. The engine may not start because of a slow cranking speed.		
POSSIBLE CAUSE	**CORRECTIVE ACTION**	
ENGINE PLATFORM	**FAE Engines**	**HM Engines**
A fault simulation was enabled with a PC based service.	With the PC based service tool, verify that the fault simulation is not enabled for the coolant sensor. If you do not have a based service tool, remove battery power from the control to disable the fault simulation overrides.	
The fault threshold was not set correctly with a PC based service tool.	Reset the threshold to the lowest allowable setting. Determine the required operating range before adjusting the threshold.	
The engine coolant heater could be defective. (Radiant heat should be felt when your hand is held close to the outlet hose.)	The coolant heater is not operating because: • The coolant heater is not connected to power. Check for a blown fuse, or disconnected the heater cord and correct as required. • There is a low coolant level. Look for possible coolant leakage points and repair as required. • There is a defective heater element/thermostat. With the coolant heater removed from the engine and power disconnected, flush with cold tap water for two minutes to close the internal heater thermostat (opens at 100°F and closes at 80°F). Check resistance across the input power leads: a. Open – replace the coolant heater. b. Closed – coolant heater OK (coil resistance of 10 to 60 ohms)	
The sensor connections could be defective.	Inspect the sensor and engine harness connector pins. Repair or replace as necessary.	
The sensor could be defective.	Disconnect the sensor and plug in a resistive sensor simulator to isolate the fault. If the control responds to the simulator, replace the sensor. If control does not respond, the harness or Base board are defective and must be replaced.	

TABLE 6-19. CODE 1435 – LOW COOLANT TEMPERATURE (WARNING) (CONT.)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***		
Reason: The engine coolant temperature has dropped below the warning threshold for low coolant temperature. **Effect:** No action is taken by the control. The engine may not start because of a slow cranking speed.		
POSSIBLE CAUSE	**CORRECTIVE ACTION**	
ENGINE PLATFORM	**FAE Engines**	**HM Engines**
The harness or Base board could be defective.	Measure the resistance of the coolant temperature sensor and reconnect the harness to the sensor. Remove connector P11 from the Base board and check resistance between pins P11-11 (H20) and P11-12 (H20 COM). • If resistance is not the same, the harness is defective and must be replaced. • If resistance is the same, the Base board is defective and must be replaced.	

TABLE 6-20. CODE 1438 – FAIL TO CRANK (SHUTDOWN)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***		
Reason: This indicates that the engine failed to crank after the control received a start signal. **Effect:** Engine will not start.		
POSSIBLE CAUSE	**CORRECTIVE ACTION**	
ENGINE PLATFORM	**FAE Engines**	**HM Engines**
1. The starter is defective.	Refer to the engine service manual. Reset the control. Attempt to start and test for B+ at the starter. If there is B+ at the starter, the starter could be defective. Test the starter (see the engine service manual) and, if necessary, replace the starter. If B+ is not present at the starter, go to the next step.	
2. The starter relay is defective.	Check wiring continuity/test starter relay. Remove the lead from the starter relay–COM and check for B+ at the lead COM (directly connected to battery B+). • If there is no B+, check for an open circuit between starter relay–COM and the battery B+. • If B+ is present, reconnect the lead COM to the starter relay. Remove the lead from the starter relay–N/O. Attempt to start and check for B+ at the terminal starter relay–N/O. • If B+ is present, check for an open circuit between starter relay–N/O and the SW terminal of the starter. • If B+ is not present, the Base board/starter relay is defective.	
3. Either the Emergency Stop switch or the wiring is defective.	With the Emergency Stop push button not activated, remove the configurable leads from TB1-15 and TB1-16 and check for continuity between these two leads. If the circuit is open, isolate to the Emergency Stop switch and wiring. With the Local Emergency Stop push button not activated, remove P25 from the Base board. Check for continuity between J25-2 and J25-6. If there is continuity, go to the next step.	
4. The MPU/circuit or Base board is defective.	Refer to the engine service manual.	Refer to the **Fault Code 121** instructions.

TABLE 6-21. CODE 1442 – WEAK BATTERY (WARNING)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: Low voltage has been detected for the battery. **Effect:** The control's voltage supply is approaching a level at which unpredictable operation may occur.

POSSIBLE CAUSE	CORRECTIVE ACTION
Refer to **Fault Code 441**.	Refer to **Fault Code 441**.

TABLE 6-22. CODE 1446 – HIGH AC VOLTAGE (SHUTDOWN)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: One or more of the phase voltages has exceeded 130% of nominal for 1 seconds, or has exceeded the High AC Voltage Threshold for the High AC Voltage Delay seconds. **Effect:** Engine will shut down.

POSSIBLE CAUSE	CORRECTIVE ACTION
Fault simulation was enabled with a PC based service tool.	With a PC based service tool, verify that the related fault simulation is not enabled. If you do not have a PC based service tool, remove battery power from the control to disable the fault simulation overrides.
Single step large block load removal.	Clear the fault and restart the genset.
Fault threshold is not set correctly with the PC based service tool.	Reset the threshold to the highest allowable setting. Determine the required operating range before adjusting the threshold.
The Base board or generator is defective.	Refer to the Generator/Base Board Isolation Procedure in the Service Manual to determine if the Base board is causing the high AC voltage shutdown fault.
The voltage sense connections/set up could be incorrect.	Refer to the Generator/Base Board Isolation Procedure in the generator Service Manual to determine if the Base board is causing the high AC voltage shutdown fault.

TABLE 6-23. CODE 3539, 3541,3542, 5669 – ENGINE FAULTS ANNOUNCED BY PCC1302

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: The engine controller has sensed a fault condition and is broadcasting the fault message. The PCC1302 is uniquely announcing the fault code. **Effect:** Event,Shutdown,Warning.

POSSIBLE CAUSE	CORRECTIVE ACTION
Consult Engine Service Manual.	Consult Engine Service Manual.

TABLE 6-24. CODE 1447 – LOW AC VOLTAGE (SHUTDOWN)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: One or more of the phase voltages has dropped below the Low AC Voltage Threshold for Low AC Voltage Delay seconds. **Effect:** Engine will shut down.

POSSIBLE CAUSE	CORRECTIVE ACTION
A fault simulation was enabled with a PC based service tool.	With a PC based service tool, verify that the related fault simulation is not enabled. If you do not have a PC based service tool, remove battery power from the control to disable fault simulation overrides.
The fault threshold is not set correctly with a PC based service tool.	Reset the threshold to the lowest allowable setting. Determine the required operating range before adjusting the threshold.
There is an overload.	Check the load and correct any overload. Check operation by disconnecting the load and restarting the generator set.
Improper connections have been made at the generator output terminals.	Reconnect according to the appropriate reconnection diagram.
The voltage sense or set-up wiring connection could be incorrect.	Verify that excitation inputs P18-1 and P18-2 are connected to the correct generator outputs.
The rotating rectifier assembly (diodes CR1 through CR6) is faulty.	Check each diode. See the genset service manual
There is a loose connector or the Base board is defective.	Repair connections (P18) or replace the Base board if necessary.
The voltage sense connections/setup could be incorrect.	See Section 7 for proper connections.

TABLE 6-25. CODE 1448 – UNDER FREQUENCY (SHUTDOWN)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: Generator AC output frequency is low. **Effect:** Generator set will shut down.

POSSIBLE CAUSE	CORRECTIVE ACTION
The fault threshold is not set correctly with PC based service tool.	Reset the threshold to the lowest allowable setting. Determine the required operating range before adjusting the threshold.
There is an overload.	Check the load and correct any overload. Check operation by disconnecting the load and restarting the generator set.
There is a fuel or air delivery problem	Refer to the engine service manual.

TABLE 6-25. CODE 1448 – UNDER FREQUENCY (SHUTDOWN) (CONT.)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: Generator AC output frequency is low. **Effect:** Generator set will shut down.

POSSIBLE CAUSE	CORRECTIVE ACTION
There is a governor fault	Check the fuel shutoff solenoid adjustment.
There is a loose connector or the Base board is defective	Repair connections (P22/P18) or replace the Base board if necessary.

TABLE 6-26. CODE 1449 – OVER FREQUENCY (SHUTDOWN)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: Generator AC output frequency is high. **Effect:** Generator set will shut down.

POSSIBLE CAUSE	CORRECTIVE ACTION
The fault threshold is not set correctly with PC based service tool.	Reset the threshold to the highest allowable setting. Determine the required operating range before adjusting the threshold.
There is a fuel or air delivery problem.	Refer to the engine service manual.
There us a loose connector or the Base board is defective.	Repair connections (P22/P18) or replace the Base board if necessary.

TABLE 6-27. CODE 1471/1472 – HIGH AC CURRENT (SHUTDOWN/WARNING)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: This indicates that the indicated generator output current has exceeded at least110% of rated current. **Effect:** No action is taken by the control for **Fault Code 1472**. Engine will shut down for **Fault Code 147**.

POSSIBLE CAUSE	CORRECTIVE ACTION
1. Short or Overload	Check the load and load cables. Repair if necessary. Check operation by disconnecting the load and restarting the generator set.
2. Incorrect CTs, CT connections, or CT setup.	Check CTs and CT connections. Correct if necessary. Refer to *Current Transformer Setup* on page 3-4.

TABLE 6-27. CODE 1471/1472 – HIGH AC CURRENT (SHUTDOWN/WARNING) (CONT.)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: This indicates that the indicated generator output current has exceeded at least110% of rated current. **Effect:** No action is taken by the control for **Fault Code 1472**. Engine will shut down for **Fault Code 147**.

POSSIBLE CAUSE	CORRECTIVE ACTION
1. The problem may be the Base board or harness connections.	Remove connector P12 from the Base board. Check continuity from P12 to the CTs. P12-1 (CT1) to P12-4 (CT1-COM) P12-2 (CT2) to P12-5 (CT2-COM) P12-3 (CT3) to P12-6 (CT3-COM) Repair connections.
2. There may be an incorrect rating setup.	Check the rating setup in the control. Correct if necessary.

TABLE 6-28. CODE 1689 – CLOCK NOT SET

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: 'Exercise Scheduler' function is enabled and real time clock (RTC) is not set. **Effect:** Warning. Exercise function will not work.

POSSIBLE CAUSE	CORRECTIVE ACTION
Battery power recycled with 'Exercise Scheduler' function enabled.	If exercise scheduler function is not required, disable the function via HMI211 or service tool. If exercise scheduler function is required, set and save the real time clock.
RTC not set after enabling exercise function.	Set and save the real time clock.

TABLE 6-29. CODE 1944 – ANNUNCIATOR OUTPUT CONFIGURATION ERROR (WARNING)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: Indicates that more then one network device is configured to activate one of the Annunciator output relays. **Effect:** Warning

POSSIBLE CAUSE	CORRECTIVE ACTION
Network configuration is incorrect.	Check setup of the devices on the network against duplicate use of the same Annunciator relay output.
There is a defective device on the network.	Troubleshoot the network for malfunctioning devices.

TABLE 6-30. CODE 2118 – LOW FUEL PRESSURE

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***	
Reason: Low pressure sensed for gaseous fuel application. **Effect:** Warning (configurable to shutdown)	
POSSIBLE CAUSE	**CORRECTIVE ACTION**
Fuel source level is low or exhausted.	Check primary fuel source level. If refill is required, stop the genset, and refill.
Fuel Pressure switch is faulty.	Refer engine manual for pressure switch check. Replace if faulty.

TABLE 6-31. CODE 2335 – LOSS OF AC SENSE (SHUTDOWN)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***	
Reason: This indicates that the control has loss voltage sensing or it has lost zero cross sensing. **Effect:** Generator set will shutdown.	
POSSIBLE CAUSE	**CORRECTIVE ACTION**
1. There may be problems with the load.	Verify that the load contains no shorts. Using a DMM check for shorts between each of the J22 pins. It also may be helpful to disconnect all load lines and start the genset. If the genset runs with no load, that could be load lines are shorted. Refer to the reconnection drawings in Section 7 as a reference.
2. The wire harness is defective.	Remove the AC Sense harness (J22) and check continuity of all wires. Repair the harness as needed, reset the control, and restart the genset. Check continuity between the following leads. If resistance is greater than 200 Ohms, repair the harness. J22 Pin 4 and VN terminal J22 Pin 3 and V3 terminal J22 Pin 2 and V2 terminal J22 Pin 1 and V1 terminal Check continuity between the following leads. If resistance is greater than 200 Ohms, repair the harness. J17 Pin 1 and Field Coil +. J17 Pin 2 and Field Coil –. Check continuity between the following leads, if resistance is greater than 200 Ohms, repair the harness: J18 Pin 1 and V1 terminal (shunt) or PMG 1 terminal (PMG) J18 Pin 2 and V2 terminal (shunt) or PMG 2 terminal (PMG)

TABLE 6-31. CODE 2335 – LOSS OF AC SENSE (SHUTDOWN) (CONT.)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: This indicates that the control has loss voltage sensing or it has lost zero cross sensing. **Effect:** Generator set will shutdown.

POSSIBLE CAUSE	CORRECTIVE ACTION
3. The excitation coil isn't charged.	The excitation coil may need to be flashed: 1.. Remove the Field Coil + and Field Coil – leads from the alternator. 2.. Using a 12 VDC power supply, touch the positive supply terminal to the Field Coil + and the negative supply terminal to the Field Coil –. Remove after brief contact. Repeat this procedure three times. 3.. Reconnect the Field Coil + and the Field Coil – leads to the alternator. 4.. Reset the control, and restart the genset. 5.. If the genset fails to operate correctly, repeat steps 1–4 with a 24 VDC power supply.
4. The excitation coil is defective.	Remove the Field Coil + and the Field Coil – leads from the alternator. Check continuity between Field Coil + and Field Coil –. Verify that the reading is within alternator specifications. If so, continue to step 4.
5. Verify the genset set-up.	Verify that the genset is capable of reaching rated speed by manually running the genset. Some potential problems could be: clogged fuel filter, incorrect fuel stop position, malfunctioning fuel actuators, etc. If the genset is not capable of reaching rated speed: correct the problem, reset the control, and restart the genset.
6. The control board is defective.	Replace the control board module.

TABLE 6-32. CODE 2545 – KEYSWITCH RESET REQUIRED (SHUTDOWN)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***	
Reason: After sensing a CAN datalink failed condition (**Fault Code 781**), the PCC1302 has tried unsuccessfully to restore communications by toggling power to the ECM. **Effect:** Shutdown.	
POSSIBLE CAUSE	**CORRECTIVE ACTION**
The networking harness is defective.	1. Check the datalink between the ECM and the GCS. Check for open or shorts between the following: J11-20 (CANH) J11-19 (CANL) J11-17 (CAN Shield) 2. Also check to make sure that there is 60 ohms resistance between J11-20 and J11-19. If not, the harness is defective; repair the harness.
The ECM is powered down.	With the control powered, check for B+ on the positive side of the keyswitch pilot relay coil. Check for GND on the negative side of the keyswitch relay coil. If B+ doesn't exist, the harness is defective. If GND doesn't exist, check for GND on P11-21 (Keyswitch LS Out). If GND does exist, the harness is defective; repair the harness. If GND doesn't exist, the Base board is defective and must be replaced.
The keyswitch minimum on-time is set too short.	This time delay sets how long the control waits for the ECM to come online during a power cycle before it determines that the datalink is down and does another power cycle. Using InPower, increase the keyswitch minimum on-time trim to the highest possible value. Reset the fault.
the keyswitch reset time is set too short.	This time delay sets how long it takes for the keyswitch circuits to turn off. Using InPower, increase the keyswitch reset time delay to the highest possible value. Reset the fault.
The number of CAN datalink retries is set too low.	This sets how many times the control power cycles the ECM before it declares **Fault Code 2545**. Use InPower to increase this number to the highest possible setting.

TABLE 6-33. CODE 2972 – OVER EXCITATION (SHUTDOWN)

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***	
Reason: The control has sensed an over-excitation caused by an AVR duty cycle greater then 46% (60 Hz) for 8 seconds, or 55% (50 Hz) for 8 seconds. **Effect:** Shutdown.	
POSSIBLE CAUSE	**CORRECTIVE ACTION**
The load is too large	Check to make sure load is with genset capabilities.
The load is faulty.	Check for shorts in the load.
The field winding / harness may be faulty	1. Check for shorts or opens between the two field coils (J18-1 and J18-2) leads. If resistance is less then 20 Ohm or greater then 200 Ohms, the field winding or field winding harness may be defective. 2. Check both 10 amp fuses on J17-1 and J17-2.

TABLE 6-34. CODE 5134 – UNKNOWN SHUTDOWN AT IDLE

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***	
Reason: Genset has shutdown with unknown fault before reaching rated conditions (for engines with ECM only). **Effect:** Shutdown.	
POSSIBLE CAUSE	**CORRECTIVE ACTION**
Genset failed to reach rated conditions and shutdown because of unknown reasons.	Check engine service manual.

TABLE 6-35. CODE 5186 – GENERATOR SET FAILED TO CLOSE

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***	
Reason: Transfer switch has failed to close on generator side. **Effect:** Shutdown.	
POSSIBLE CAUSE	**CORRECTIVE ACTION**
Mechanical failure of transfer switch.	Check the transfer switch manual.
Transfer switch transitioned to genset side, but feedback is lost.	Check for loose connection of the feedback wire connected to TB1–14 from auxiliary contact of transfer switch. Tighten the same. Faulty auxiliary contact. Check and replace the auxiliary contact of transfer switch.

TABLE 6-36. CODE 5187 – UTILITY FAILED TO CLOSE

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***	
Reason: Transfer switch has failed to close on utility side. **Effect:** Warning.	
POSSIBLE CAUSE	**CORRECTIVE ACTION**
Mechanical failure of transfer switch.	Check the transfer switch manual.
Transfer switch transitioned to utility side, but feedback is lost.	Check for loose connection of the feedback wires connected to TB1–12 and TB1–14 from auxiliary contact of transfer switch. Tighten the same. Faulty auxiliary contacts. Check and replace the auxiliary contact of transfer switch.

TABLE 6-37. CODE 5365 – ON SECONDARY SOURCE

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: Genset is running on secondary fuel source in dual fuel application. **Effect:** Warning.

POSSIBLE CAUSE	CORRECTIVE ACTION
Primary fuel source level is low or exhausted and genset is transitioned to run on secondary fuel source.	Check primary fuel source level. If refill is required, stop the genset, and refill.
Fuel Pressure switch is faulty.	Refer engine manual for pressure switch check. Replace if faulty.

TABLE 6-38. CODE 5188 – TRANSFER SWITCH UNKNOWN POSITION

⚠ WARNING ***Hazards present in troubleshooting can cause equipment damage, severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Read Important Safety Instructions pages and observe all instructions and precautions in this manual.***
Reason: Transfer switch position is not known. **Effect:** Warning.

POSSIBLE CAUSE	CORRECTIVE ACTION
Mechanical failure of transfer switch. Feedback indicating as, it is neither at utility side nor at genset side OR feedback is indicating it is at genset as well as at utility side at the same time.	Check the transfer switch manual.
Transfer switch is either at genset side or utility side, but respective feedback is lost or both side feedbacks are available.	Check for loose connection of the feedback wire connected to TB1–12 from auxiliary contact of transfer switch. Tighten the same. Faulty auxiliary contact. Check and replace the auxiliary contact of transfer switch.

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7. 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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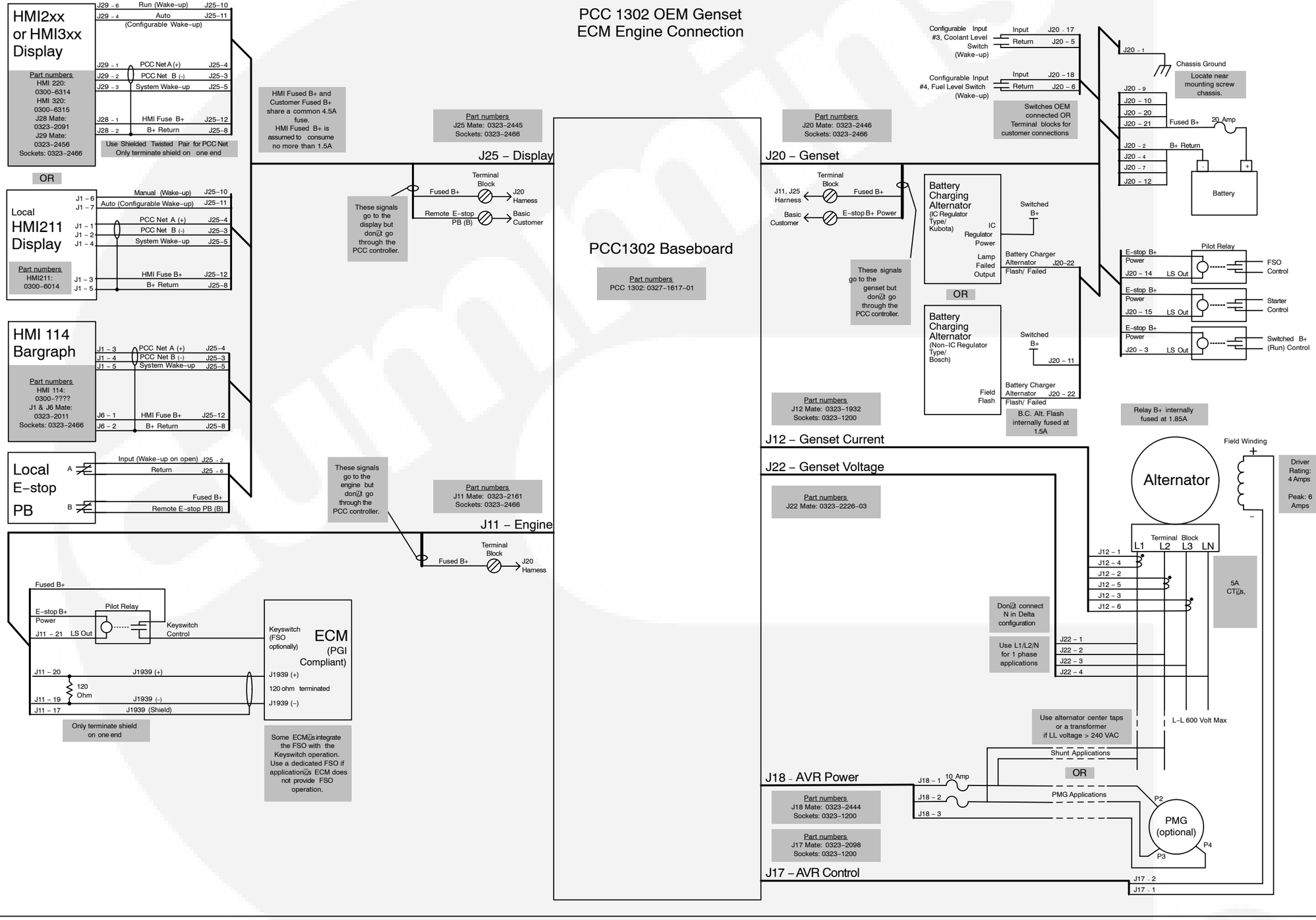
PCC 1302 OEM Genset ECM Engine Connection



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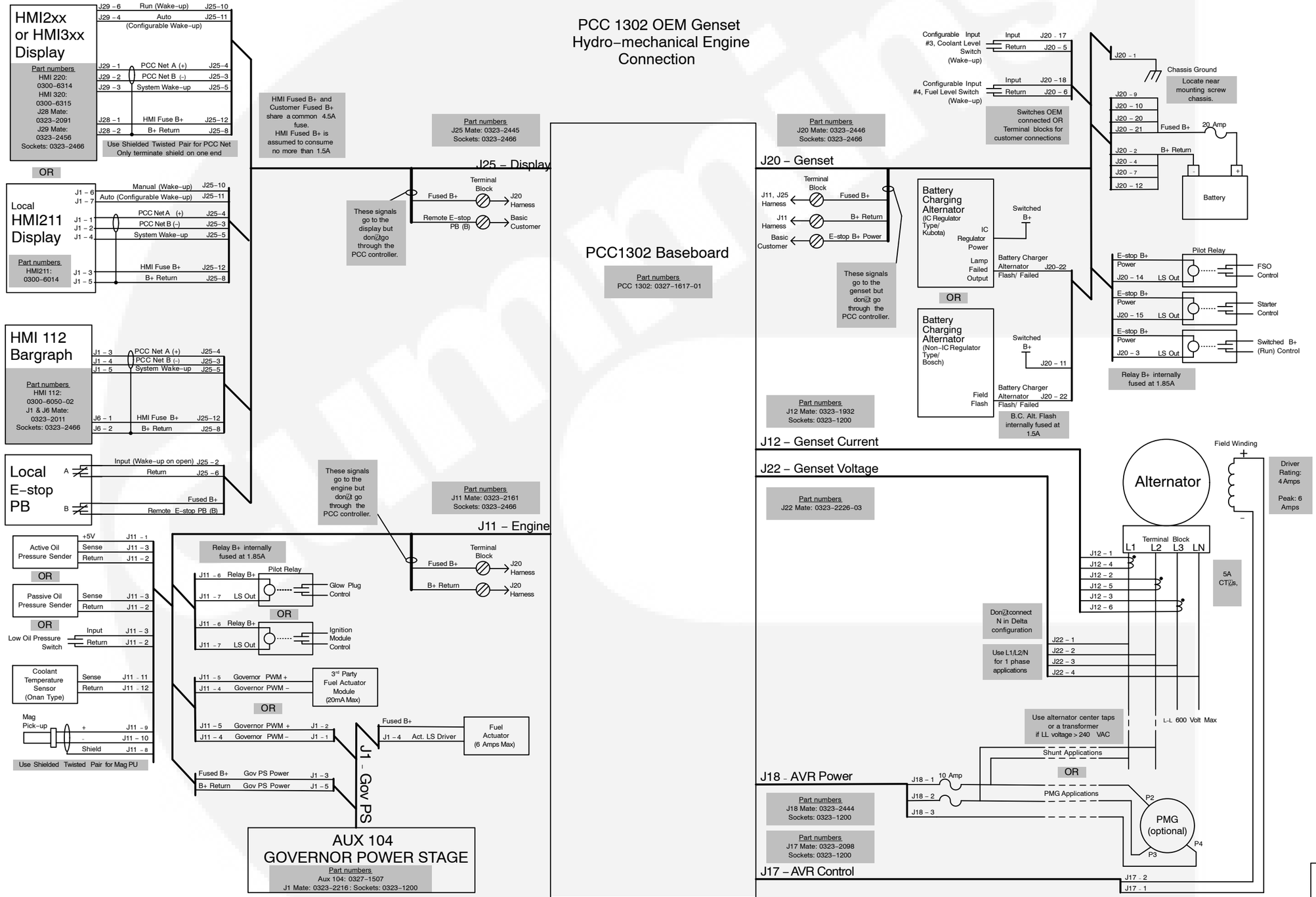
Rev. – Sys: ProE
Modified

FIGURE 7-1. 1302 CONTROL WIRING DIAGRAM (SHEET 1 OF 4)

PCC 1302 OEM Genset Hydro–mechanical Engine Connection



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Rev. – Sys: ProE
Modified

FIGURE 7-1. 1302 CONTROL WIRING DIAGRAM (SHEET 2 OF 4)

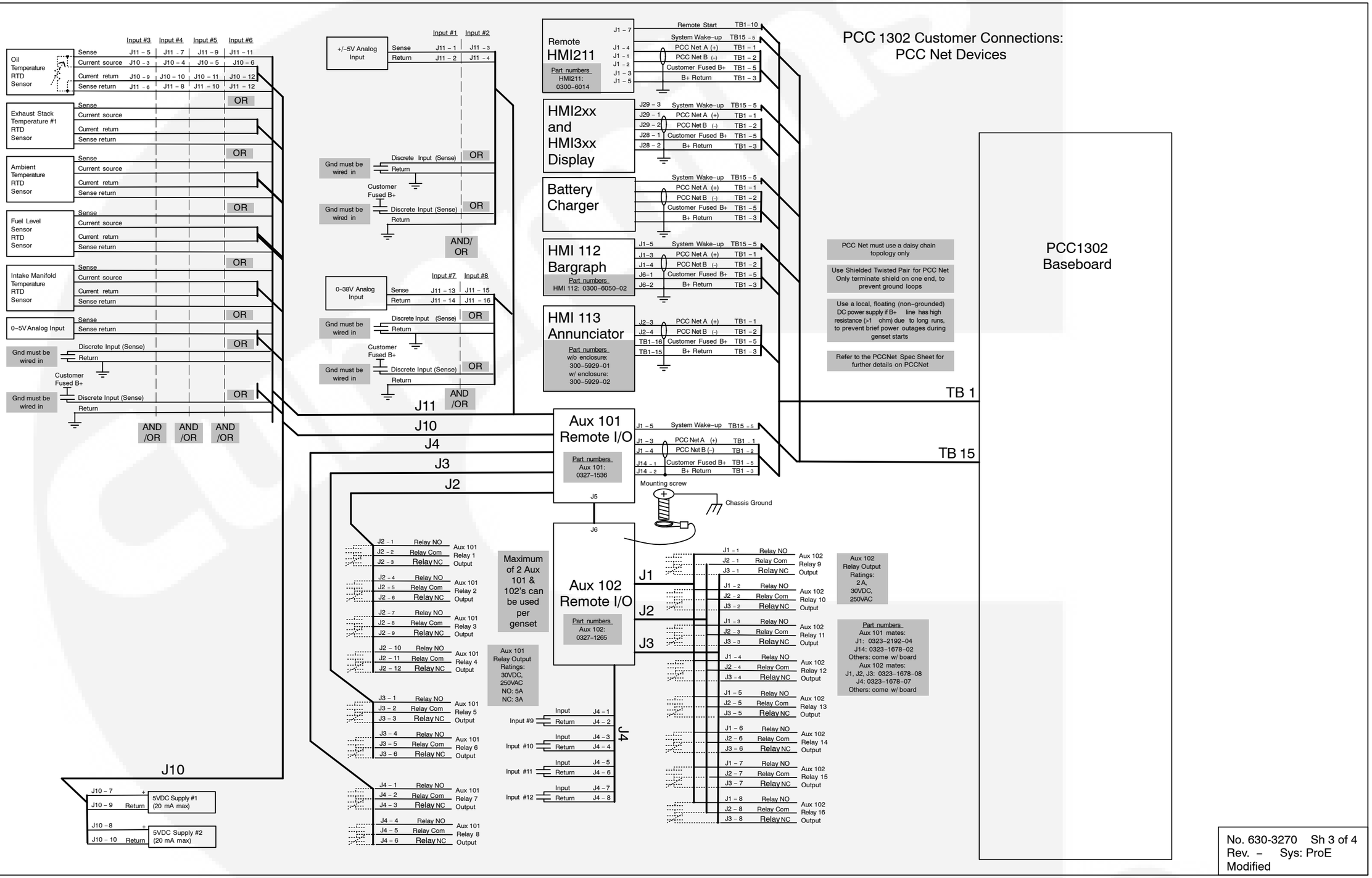
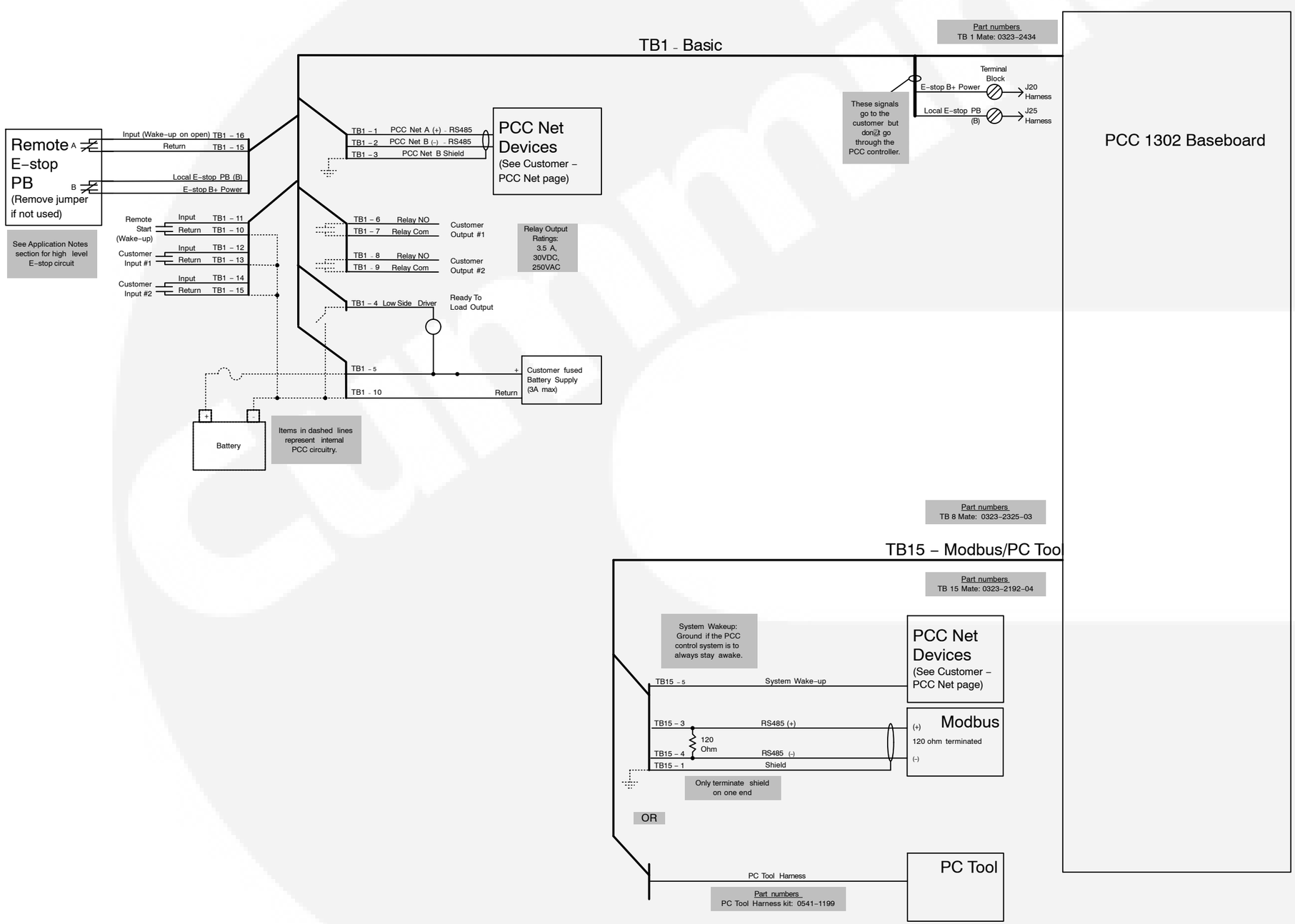


FIGURE 7-1. 1302 CONTROL WIRING DIAGRAM (SHEET 3 OF 4)

PCC 1302 Customer Connections:

CCS WD
0630–3270 WD–CONTROL
(WD–CONTROL 1302)
FRD24967



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Modified

FIGURE 7-1. 1302 CONTROL WIRING DIAGRAM (SHEET 4 OF 4)

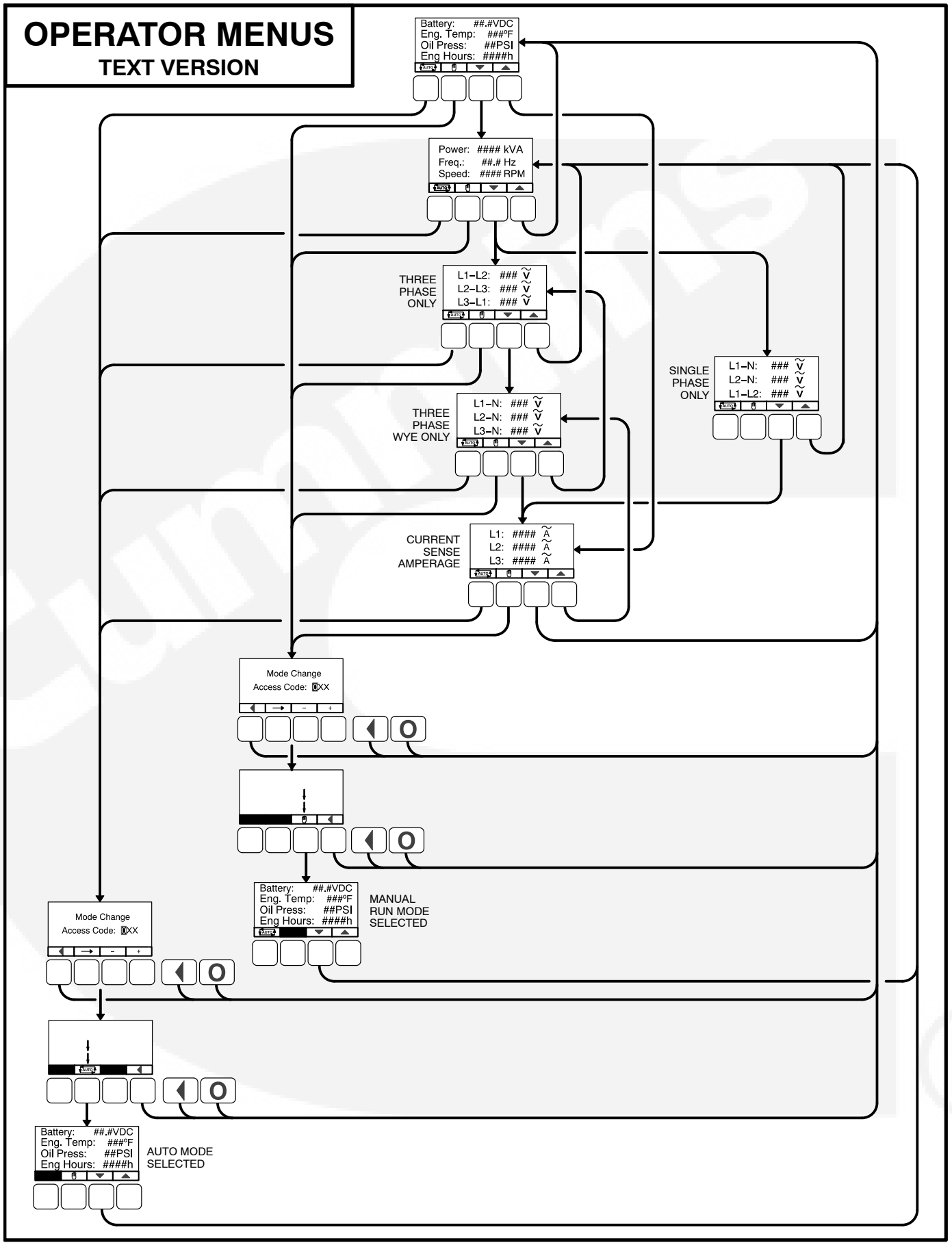
Appendix A. 1302 Menu System Maps

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.

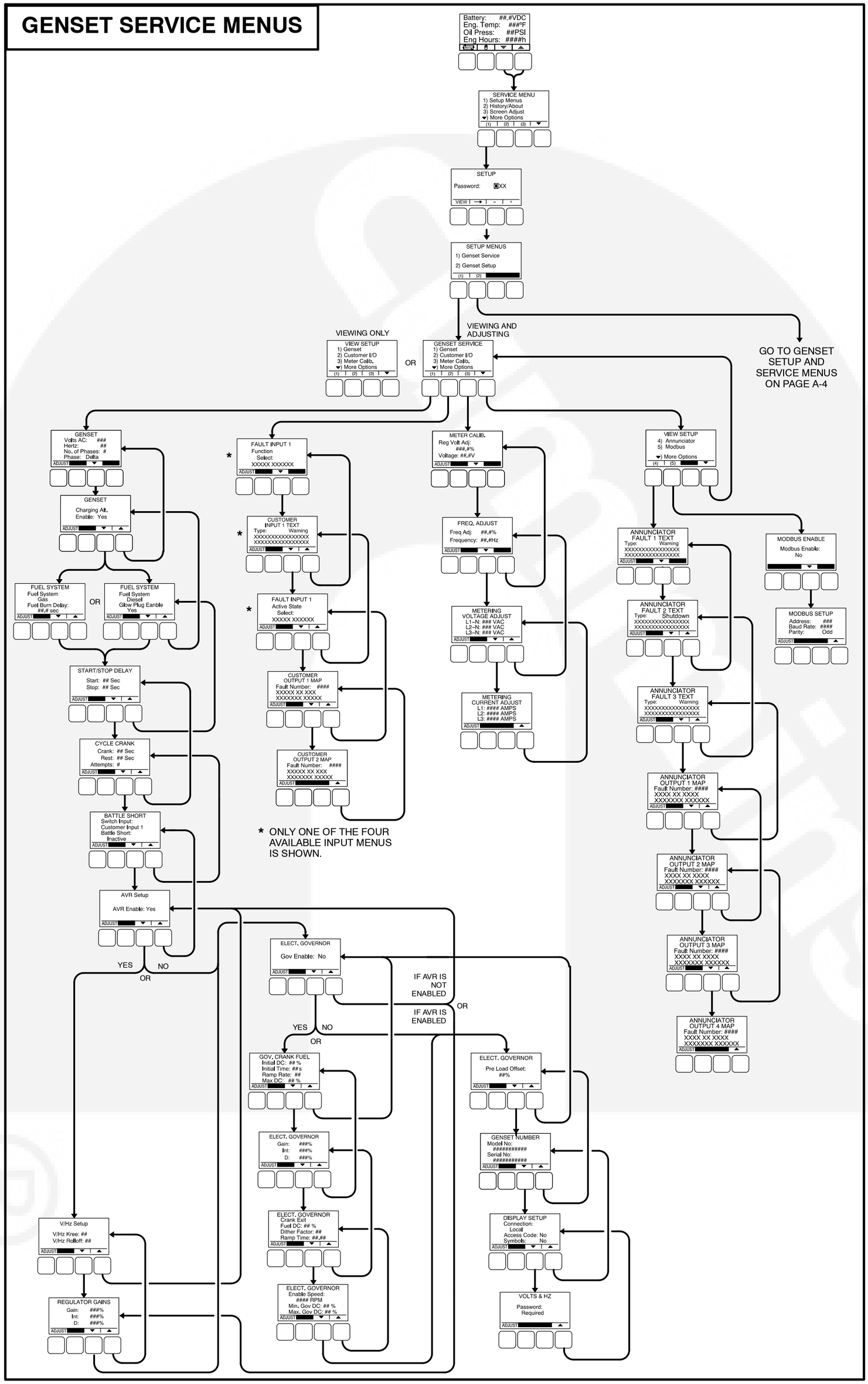
The first illustration shows the basic Operator Menus. The remaining two illustrations show the Service, Genset Setup, and Genset Service menus.

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.

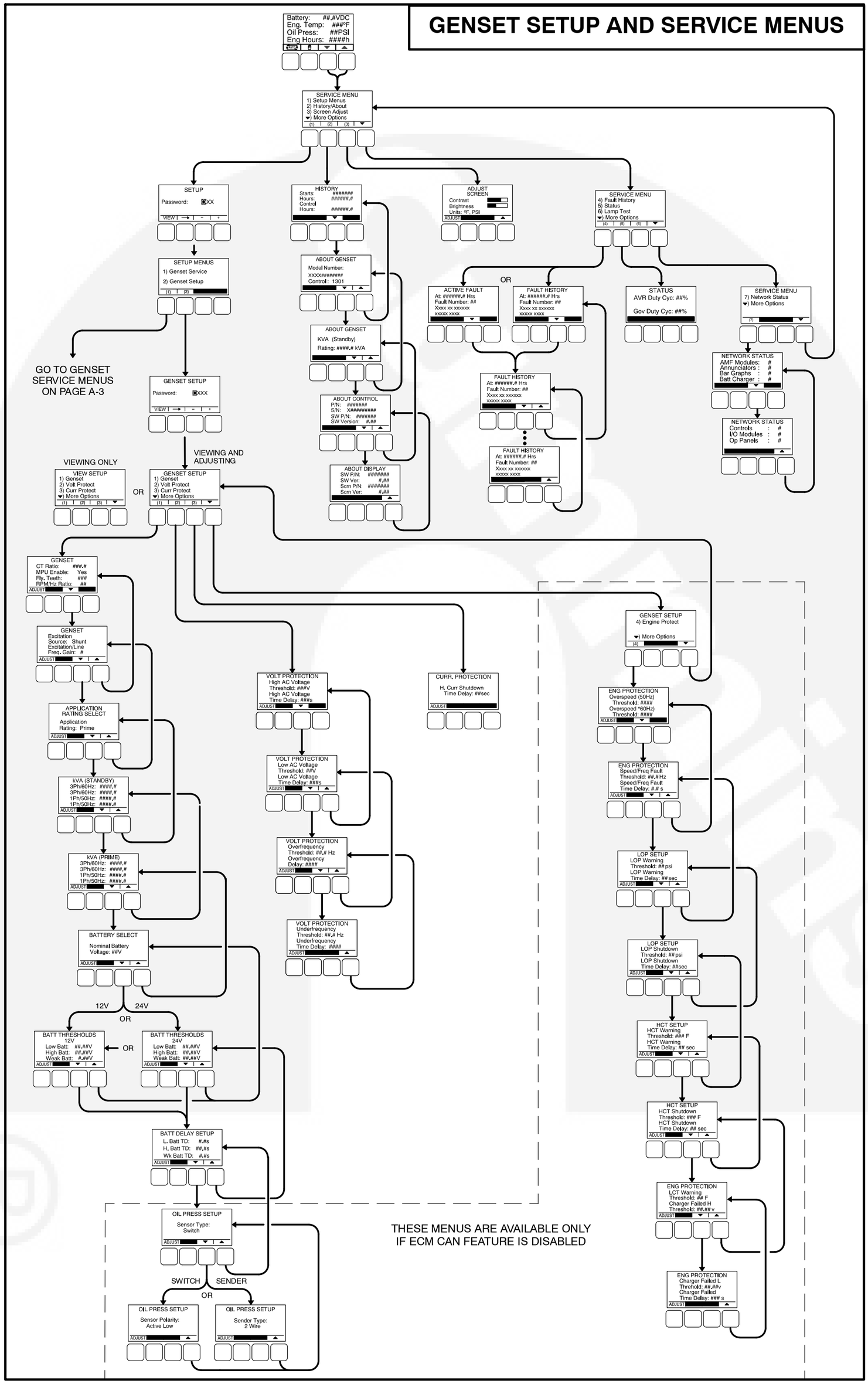
OPERATOR MENUS
TEXT VERSION



GENSET SERVICE MENUS



GENSET SETUP AND SERVICE MENUS



Appendix B. Index

GENERAL INFORMATION

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