



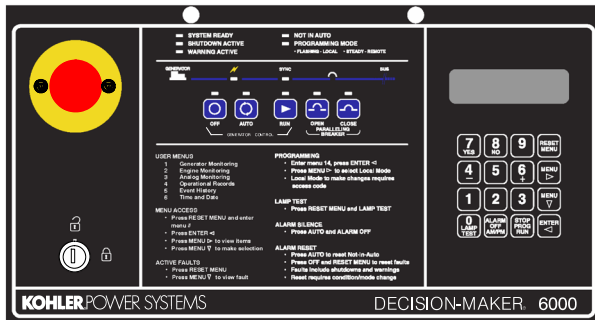
## Kohler® Decision-Maker® 6000 Paralleling Generator Set Controller

### General Description and Function

The Decision-Maker® 6000 generator set controller provides generator set advanced control, system monitoring, and system diagnostics, and control for paralleling multiple generator sets.

The Decision-Maker® 6000 interfaces the generator set to other power system equipment and other network management systems using standard industry network communications.

The controller uses unique software logic to manage sophisticated functions, such as voltage regulation, synchronizing and load sharing controls, and protective relays for paralleling up to eight generator sets on an isolated bus or one generator set to the local utility.



**Decision-Maker® 6000 Paralleling Controller**

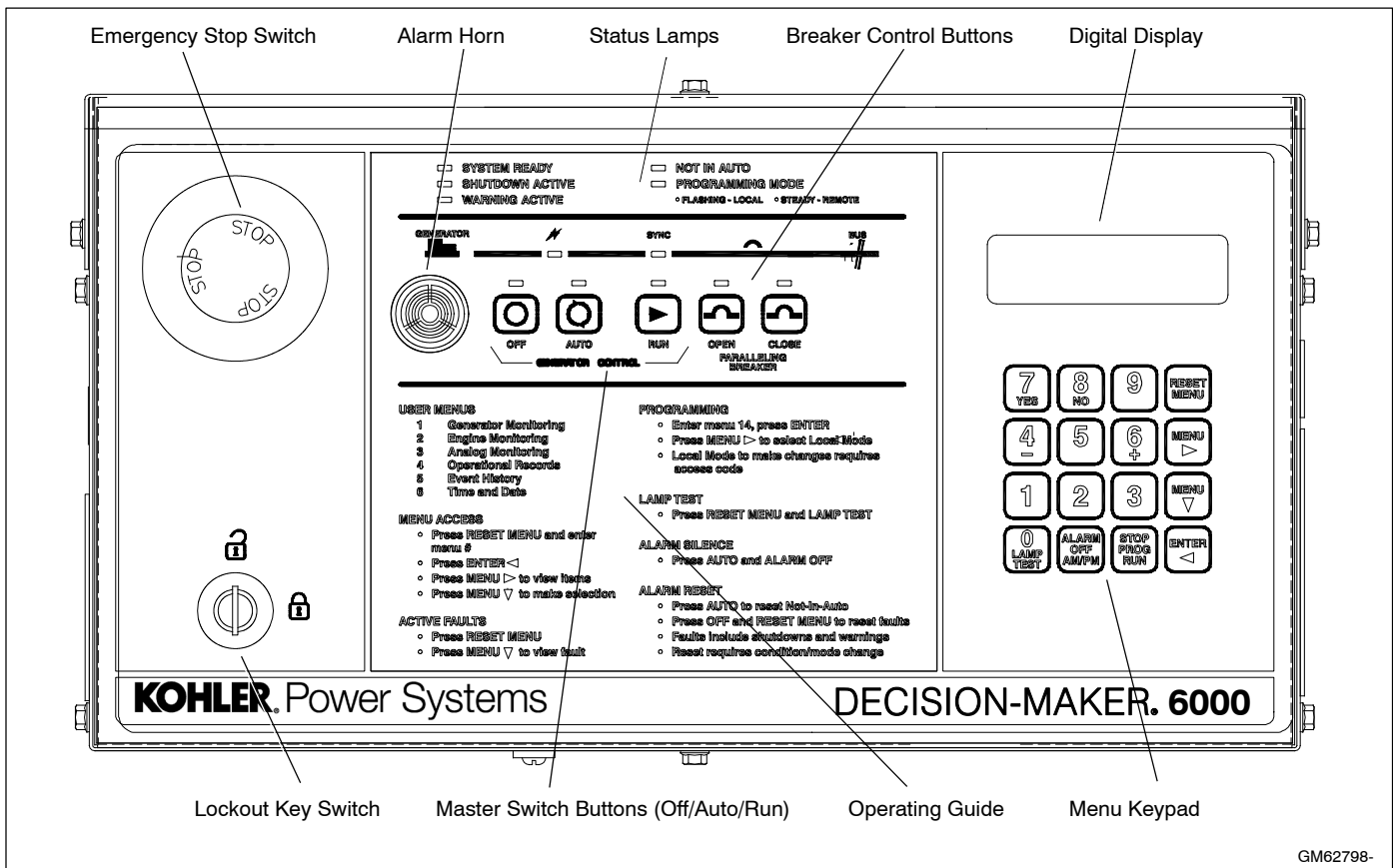
### Paralleling controller features include:

- Isochronous (real and reactive) load sharing with other Decision-Maker® 6000 controller equipped generator sets.
- Random first-on logic to prevent two or more generator sets from closing to a dead bus.
- Automatic synchronizer with dead bus closing.
- Soft loading and unloading.
- Protective relays:
  - Synch check (25C)
  - Loss of field (40)
  - Over current (51)
  - Over frequency (81O)
  - Over power (32O)
  - Over voltage (59)
  - Reverse power (32R)
  - Under frequency (81U)
  - Under voltage (27)

### Additional controller features include:

- A digital display and keypad provide access to data. The display provides complete and understandable information, and the keypad allows easy local access.
- The controller communicates directly with a personal computer via a network or via a modem configuration.
- A lockout key switch meets appropriate local code requirements.
- The controller supports Modbus® RTU protocol.

Modbus® is a registered trademark of Schneider Electric.



GM62798-

## Controller Specifications

Decision-Maker® 6000—Software Version 2.5.23 or higher

- Power supply: 12- or 24-volt DC
- Power drain: 700 milliamps (or 400 milliamps without panel lamps)
- Humidity range: 5% to 95% noncondensing
- Operating temperature range: -40°C to +70°C (-40°F to +158°F)
- Storage temperature range: -40°C to +85°C (-40°F to +185°F)
- Standards:
  - NFPA 99
  - NFPA 110, Level 1 (requires optional RSA for standard NFPA outputs)
  - CSA 282-09
  - UL 508
- Dimensions—W x H x D, 460 x 275 x 291 mm (18.15 x 10.8 x 11.47 in.)

## User Interface Controls and Components

- Emergency stop switch with International Electromechanical Commission (IEC) yellow ring identification
- Lockout key switch
- Vacuum fluorescent display with two lines of 20 characters (*see User Interface Displays for menus*)
- Alarm horn indicates generator set shutdown and warning faults
- Environmentally sealed membrane with five buttons and lamps
  - Off (red)
  - Auto (green)
  - Run (yellow)
  - Open paralleling breaker (green)
  - Close paralleling breaker (red)
- Environmentally sealed 16-button membrane navigation and entry keypad
  - 0-9 numeric entry
  - Yes/no entry
  - Menu reset, menu right, menu down, and enter
  - Stop program run
  - Alarm silence and time AM/PM
  - Lamp test

- Status lamps
  - System ready (green)
  - Shutdown active (red)
  - Warning active (yellow)
  - Not in auto (yellow)
  - Programming mode, flashing-local, steady-remote (yellow)
  - Sync (green), off-not active, flashing-active, steady-in sync
  - ⚡ (Generator set status) (red), off-no voltage detected, on-generator set output voltage is detected \*
- Communication ports
  - Two RS-485 connector for Modbus® RTU communication ports
  - One RS-232 connector for a PC or modem (optional software required)
- Integrated functions include:
  - Base load control (kW and kVAR/PF)
  - Generator set circuit breaker control
  - Load sharing logic (kW and kVAR)
  - Load shed logic
  - Synchronizer
  - Voltage regulator, 3-phase, ±0.25%
- Fuse-protected battery circuits
- Inputs and outputs (*see Controller Monitoring for details*)
- Controller mounts on the generator set and is viewable from one of four positions or remotely up to a distance of 12 m (40 ft.)
- Customer and remote inputs:
  - Analog inputs 0-5 VDC (up to 7 user-defined analog inputs with multiple shutdown and warning levels)
  - Digital contact inputs (up to 21 user-defined digital inputs with shutdown or warning levels)
  - Remote emergency stop
  - Remote reset
  - Remote 2-wire start

\* The lamp is on when generator set output voltage is detected. Voltage may be present on the generator set bus even if the lamp is off, in some circumstances such as blown fuses in the generator voltage sensing circuit.

## User Interface Controls and Components (continued)

- Digital inputs (standard):
  - Battery charger fault
  - Battleswitch
  - Emergency stop
  - Field overvoltage (350 kW and higher)
  - First on enable
  - Frequency trim enable
  - Generator circuit breaker auxiliary
  - Generator circuit breaker, over current trip switch (OTS)
  - Ground fault detector
  - High oil temperature
  - Idle mode active (ECM models only)
  - kVAR raise/lower
  - kVAR/PF raise/lower
  - kW raise/lower
  - Load enable
  - Low coolant level
  - Low coolant temperature
  - Low fuel warning
  - Low fuel shutdown
  - Speed raise/lower
  - Synch enable
  - Utility circuit breaker auxiliary
  - Voltage raise/lower
  - Voltage trim enable
- Thirty-one user-defined relay driver outputs (relays not included).  
See the *Controller Functions* for a breakdown of the available shutdown and warning functions.
  - NFPA 110 faults
  - Defined common faults

### Controller Functions

The following chart shows which functions cause a warning or shutdown.

Most functions are available as relay outputs. The user customizes outputs through a menu of warnings, shutdowns, and status conditions. User defines up to 31 relay driver outputs (RDOs) (relays not included).

**Warning** causes the warning lamp to show yellow, shows a text message on the digital display, and sounds the alarm horn signaling an impending problem.

**Shutdown** causes the fault lamp to show red, shows a text message on the digital display, sounds the alarm horn, and stops the generator set.

| Status Event or Fault   | Warning Function | Shutdown Function | Relay Driver Output |
|---|------------------|-------------------|---------------------|
| <b>General Function</b>   |                  |                   |                     |
| Analog aux. inputs A01-A07  | ○                | ○                 |                     |
| Battery charger fault, digital aux. input D01*                                  | ●                |                   | X                   |
| Defined common faults (each input value is set separately) (default includes †) |                  | ●                 | X                   |
| Defined common warning (each input value is set separately)                     | ●                |                   | X                   |
| Digital aux. input D01-D21  | ○                | ○                 |                     |
| Emergency stop  |                  | ●†                | X                   |
| EPS (emergency power system) supplying load                                     | ●                |                   | X                   |
| Generator set running (status)  |                  |                   | X                   |
| Idle (speed) mode function digital aux. input D21                               | ○                |                   |                     |
| Internal fault  |                  | ●                 | X                   |
| NFPA 110 fault  | ●                | ●                 | X                   |
| Remote shutdown   |                  | ●                 | X                   |
| System ready (status)   |                  |                   | X                   |

| Status Event or Fault  | Warning Function | Shutdown Function | Relay Driver Output |
|--|------------------|-------------------|---------------------|
| <b>Controller/Communication Function</b>                                   |                  |                   |                     |
| Active no dial   |                  |                   | X                   |
| Auto button pressed  |                  |                   | X                   |
| Battle switch (fault shutdown override switch)                             | ●                |                   |                     |
| Connection failed (communication)  |                  |                   | X                   |
| Controller setup error   |                  | ●                 | X                   |
| Dialout message sent   |                  |                   | X                   |
| Date change from (controller)  |                  |                   | X                   |
| Duplicate PGEN ID  |                  |                   | X                   |
| EEPROM initialized   |                  |                   | X                   |
| EEPROM write failure   |                  | ●                 | X                   |
| Extra PGEN node  |                  |                   | X                   |
| Frequency selection error  |                  | ●                 | X                   |
| Key switch locked  |                  |                   | X                   |
| Key switch unlocked  |                  |                   | X                   |
| kW selection error   |                  | ●                 | X                   |
| Loss of ECM communication  |                  | ●                 | X                   |
| Master not In auto (generator set switch) (status)                         | ●                |                   | X                   |
| Master switch error  |                  | ●                 | X                   |
| Master switch open   |                  | ●                 | X                   |
| Master switch to off   |                  | ●                 | X                   |
| Missing PGEN node  |                  |                   | X                   |
| No coolant temperature signal  |                  | ●                 | X                   |
| No modem at power up   |                  |                   | X                   |
| No oil pressure signal   |                  | ●                 | X                   |
| Off button pressed   |                  |                   | X                   |
| Open button pressed (circuit breaker)                                      |                  |                   | X                   |
| Phase selection error  |                  | ●                 | X                   |
| Run button pressed   |                  |                   | X                   |
| SCRDOs 1-4 (software controlled RDOs)                                      |                  |                   | X                   |
| State initialized  |                  |                   | X                   |
| Volt selection error   |                  | ●                 | X                   |
| <b>Generator Function</b>  |                  |                   |                     |
| AC sensing loss  | ●                | ●                 | X                   |
| Alternator protection  |                  | ●                 | X                   |
| Critical over voltage  |                  | ●                 | X                   |
| Field over voltage digital aux. input (M4, M5, M7, or M10 alternator only) |                  | ●                 |                     |
| Ground fault detected *  | ●                |                   | X                   |
| Load shed common   | ●                |                   | X                   |
| Load shed kW over  | ●                |                   | X                   |
| Load shed underfrequency   | ●                |                   | X                   |
| Locked rotor   |                  | ●                 | X                   |
| Loss of field (40)   |                  | ●                 | X                   |
| Over current (51)  | ●                | ●                 | X                   |
| Over current with volts restraint (51VR)                                   |                  | ●                 | X                   |
| Over frequency (81O)   |                  | ●                 | X                   |
| Over power (32O)   |                  | ●                 | X                   |
| Over voltage (each phase) (59)   |                  | ●                 | X                   |
| Under frequency (81U)  |                  | ●                 | X                   |
| Under voltage (each phase) (27)  |                  | ●                 | X                   |

#### ● Standard functions

○ Available user functions are engine and fuel dependant

\* Function requires optional input sensors or kits and is engine dependent, see Controller Displays as Provided by the Engine ECM.

† Items included with common fault shutdown

## Controller Functions (continued)

| Status Event or Fault                                    | Warning Function | Shutdown Function | Relay Driver Output |
|--|------------------|-------------------|---------------------|
| <b>Engine Function</b>                                   |                  |                   |                     |
| Dual starter application                                 |                  |                   | X                   |
| ECM yellow alarm   | ○                |                   | X                   |
| ECM red alarm  |                  | ○                 | X                   |
| Engine derate active                                     |                  |                   | X                   |
| Dual starter 'B'   |                  |                   | X                   |
| High battery voltage                                     | ●                |                   | X                   |
| High coolant temperature                                 | ●                | ●†                | X                   |
| High oil temperature                                     | ●                | ●                 | X                   |
| Intake air temperature                                   | ○                | ○                 | X                   |
| Low battery voltage                                      | ●                |                   | X                   |
| Low coolant level  |                  | ●                 | X                   |
| Low coolant level, digital aux. input D14                | ○                |                   |                     |
| Low coolant temperature                                  | ●                | ●                 | X                   |
| Low fuel level (diesel models), digital aux. input D02 * | ○                |                   | X                   |
| Low fuel pressure (gas models), digital aux. input D02 * | ○                |                   | X                   |
| (Low) oil pressure                                       | ●                | ●†                | X                   |
| Maintenance due  | ●                |                   | X                   |
| Overcrank  |                  | ●†                | X                   |
| Over speed   |                  | ●†                | X                   |
| Speed sensor fault                                       | ●                |                   | X                   |
| Starter motor 'A' failure                                |                  | ●                 | X                   |
| Starter motor 'B' failure                                |                  | ●                 | X                   |
| Time delay air/fuel mixture engine start                 |                  |                   | X                   |
| Time delay engine cooldown (TDEC)                        |                  |                   | X                   |
| Time delay engine start (TDES)                           |                  |                   | X                   |
| Time delay engine starting aid                           |                  |                   | X                   |
| Weak battery (low cranking voltage)                      | ●                |                   | X                   |

| Status Event or Fault                       | Warning Function | Shutdown Function | Relay Driver Output |
|---|------------------|-------------------|---------------------|
| <b>Paralleling Function</b>                 |                  |                   |                     |
| Auto synch disabled                         | ●                |                   | X                   |
| Circuit breaker close attempts fault        | ●                |                   | X                   |
| Circuit breaker close fault                 | ●                |                   | X                   |
| Circuit breaker common fault                | ●                |                   | X                   |
| Circuit breaker current fault               | ●                |                   | X                   |
| Circuit breaker open fault                  | ●                |                   | X                   |
| Circuit breaker                             |                  |                   | X                   |
| Close breaker                               |                  |                   | X                   |
| Close button pressed (circuit breaker)      |                  |                   |                     |
| Common protective relay                     | ●                |                   | X                   |
| Contactors                                  |                  |                   | X                   |
| Dead bus sensing fault                      | ●                |                   | X                   |
| External breaker trip                       | ●                |                   | X                   |
| First on fault                              | ●                |                   | X                   |
| Generator set circuit breaker closed        |                  |                   | X                   |
| Generator set circuit breaker opened        |                  |                   | X                   |
| Generator set volts/Hz ok                   |                  |                   | X                   |
| In synch (25C) (status)                     |                  |                   | X                   |
| PGEN common not online                      |                  |                   | X                   |
| Reverse kVAR                                |                  | ●                 |                     |
| Reverse power (32R)                         |                  | ●                 | X                   |
| Synch frequency match                       |                  |                   | X                   |
| Synch phase match                           |                  |                   | X                   |
| Synch timeout                               | ●                |                   | X                   |
| Time delay circuit breaker trip to shutdown |                  | ●                 | X                   |
| Utility circuit breaker closed              |                  |                   | X                   |
| Utility circuit breaker opened              |                  |                   | X                   |

● Standard functions

○ Available user functions are engine and fuel dependant

\* Function requires optional input sensors or kits and is engine dependent, see Controller Displays as Provided by the Engine ECM.

† Items included with common fault shutdown

| Controller Displays as Provided by the Engine ECM (availability subject to change by the engine manufacturer) |        |        |                   |                |                 |               |
|---|--------|--------|-------------------|----------------|-----------------|---------------|
| Display   | GM/PSI | Doosan | John Deere (JDEC) | Volvo (EMS II) | Volvo (EDC III) | DD/MTU (ADEC) |
| Ambient temperature   |        | X      |                   |                |                 |               |
| Charge air pressure   | X      | X      |                   | X              | X               | X             |
| Charge air temperature  | X      | X      | X                 | X              | X               |               |
| Coolant level   |        |        |                   | X              | X               | X             |
| Coolant pressure  |        |        |                   | X              | X               |               |
| Coolant temperature   | X      | X      | X                 | X              | X               | X             |
| Crankcase pressure  |        |        |                   | X              | X               |               |
| ECM battery voltage   | X      | X      |                   |                |                 | X             |
| ECM fault codes   | X      | X      | X                 | X              | X               | X             |
| ECM serial number   |        |        |                   |                |                 | X             |
| Engine model number   |        |        | X                 |                |                 | X             |
| Engine serial number  |        |        | X                 |                |                 | X             |
| Engine speed  | X      | X      | X                 | X              | X               | X             |
| Fuel pressure   |        |        |                   | X              | X               |               |
| Fuel rate   | X      | X      | X                 | X              | X               | X             |
| Fuel temperature  |        |        | X                 | X              | X               | X             |
| Oil level   |        |        |                   |                | X               |               |
| Oil pressure  | X      | X      | X                 | X              | X               | X             |
| Oil temperature   |        |        |                   | X              | X               | X             |
| Trip fuel   |        |        |                   | X              | X               | X             |

## User Interface Display Menus

Displays shown in this section relate to three-phase applications.

Single-phase applications are similar where relevant.

Some menus and line items appear only in paralleling applications.

The listing below has ● denoting main menus, ○ denoting first level sub-menus, and - denoting second level sub-menus.

- **Menu 1—Generator Monitoring**  
(shown as three phase or single phase)
    - Volts and Amps
      - Voltage and Current (line-to-line, line-to-neutral for each phase), ±0.25% accuracy
      - Frequency, ±0.5% accuracy
    - Volts and Amps Summary (available as auto-scroll)
      - Voltage (line-to-line, line-to-neutral for all phases), ±0.25% accuracy
      - Current (L1, L2, L3 for all phases), ±0.25% accuracy
    - Power kW
      - Total kW, ±0.5% accuracy
      - kW for each phase, ±0.5% accuracy
      - Total kW and % of rated kW (alternator duty level), ±0.5% accuracy
    - Power kVAR
      - Total kVAR absorbing/generating, ±0.5% accuracy
      - kVAR absorbing/generating for each phase (L1, L2, L3), ±0.5% accuracy
    - Power kVA (power factor)
      - kVA, total, ±0.5% accuracy
      - kVA, for each phase (L1, L2, L3), ±0.5% accuracy
  - **Menu 2—Engine Monitoring**  
Engine Monitoring (Basic) (metric or English units)
    - Oil pressure and coolant temperature
    - Engine RPM and battery voltage
    - High coolant temperature warning and shutdown levels
    - Low oil pressure warning and shutdown levels
    - Engine warmed-up temperature
    - Engine cooled-down temperatureEngine Monitoring (Detailed) (metric or English units)
    - Engine fuel
      - Fuel pressure and temperature \*
      - Charge air pressure and temperature \*
      - Fuel rate, expressed as L/hr. (gal./hr.)
      - Fuel used last run (trip fuel), expressed as L (gal.) \*
    - Engine coolant
      - Coolant pressure and temperature \*
      - Coolant level \*
    - Engine oil
      - Oil pressure and temperature \*
      - Oil level and crankcase pressure \*
    - Engine misc.
      - ECM battery voltage and ambient temperature \*
      - Engine model number \*
      - Engine serial number \*
      - Unit number and ECM serial number \*
      - ECM fault codes
  - **Menu 3—Analog Monitoring**
    - Local battery voltage
    - Analog inputs 0-5 VDC (up to 7 user-defined analog inputs with multiple shutdown and warning levels)
  - **Menu 4—Operational Records**
    - Factory test date
    - Total run time hours
    - Total run time loaded hours
    - Total run time unloaded hours
    - Total run time kW hours
    - Number of starts
    - Engine start? yes/no and countdown time min:sec
      - Run time hours:minutes
    - Records maintenance
      - Maintenance reminder in hours
      - Reset records, yes/no
    - Run time since maintenance, total hours
    - Run time since maintenance, loaded hours
    - Run time since maintenance, unloaded hours
    - Run time since maintenance, total kW hours
    - Number of operating days since last maintenance date
    - Number of starts since last maintenance date
    - Last start time and date
    - Total unloaded/loaded hours of last start
  - **Menu 5—Event History** (up to 100 stored events)
    - Event, time, and date
  - **Menu 6—Time and Date**
    - Day of week
    - Time
    - Date
  - **Menu 7—Generator System**
    - Operating mode, standby or prime
    - System line voltage
    - System frequency
    - Phase, single or three (wye or delta)
    - System kW rating
    - System rated current
    - Load shed output setting, %, kW
      - Time delay, min:sec
    - Over voltage setting, %, VAC
      - Time delay, min:sec
    - Under voltage setting, %, VAC
      - Time delay, min:sec
    - Over frequency setting, %, Hz
    - Under frequency setting, %, Hz
    - Overspeed, Hz, RPM
    - Battery voltage, 12 or 24 volt
    - Low battery voltage setting, VDC
    - High battery voltage setting, VDC
    - Block heater on setting, temp.
    - Block heater off setting, temp.
    - Enable variable speed governor (VSG), yes/no
    - Enable digital speed control (DSC), yes/no
    - English or metric units
    - Set NFPA 110 defaults, yes/no (see NFPA 110 Requirements)
  - **Menu 8—Time Delays**
    - Engine start, min:sec
    - Starting aid, min:sec
    - Crank on, min:sec
    - Crank pause, min:sec
    - Engine cooldown, min:sec
    - Cooldown temperature override, yes/no
    - Overcrank shutdown crank cycles
    - Over voltage, min:sec
    - Under voltage, min:sec
    - Load shed kW, min:sec
  - **Menu 9—Input Setup**  
Input Setup (setup digital auxiliary inputs)
    - Digital input (up to 21 user-defined digital inputs)
      - User-defined description
      - Message text, yes/no
      - Enable, yes/no
      - Inhibit time, 0-60 sec.
      - Delay time, 0-60 sec.Input Setup (setup analog auxiliary inputs)
    - Analog input (up to 7 user-defined analog inputs)
      - User-defined description
      - Warning enabled, yes/no
      - Shutdown enabled, yes/no
      - Inhibit time, 0-60 sec.
      - Warning delay time, 0-60 sec.
      - Shutdown delay time, 0-60 sec.
      - Low shutdown value
      - Low warning value
      - High warning value
      - High shutdown value
  - **Menu 10—Output Setup**  
(up to 31 user-defined relay driver outputs)  
(relays not included)
    - Define common faults
    - System events
      - Common fault, yes/no
    - Digital inputs
      - Common fault, yes/no
    - Analog inputs
      - Common fault, yes/no
  - **Menu 11—Voltage Regulator**
    - Average voltage and voltage adjust
      - Line-to-line voltage of each phase
    - Under frequency unload enabled, yes/no
      - Frequency setup
      - Slope, volts per cycle
    - Reactive droop enabled, yes/no
      - Voltage droop %
    - Regulator gain adjust
    - Analog volt adjust enabled, yes/no
    - Reset regulator defaults, yes/no
- \* Function requires optional input sensors or kits and is engine dependent, see Controller Displays as Provided by the Engine ECM.

## User Interface Display Menus (continued)

### ● Menu 12—Calibration

Calibration (Scale AC Analog Inputs)

- Generator voltage line-to-neutral
  - Generator line-to-neutral calibration reference for each phase
- Generator voltage line-to-line
  - Generator line-to-line calibration reference for each phase
  - Calibrate regulator, yes/no
- Generator amps
  - Generator line amps calibration reference
- Bus voltage line-to-neutral
  - Bus line-to-neutral calibration reference
- Restore defaults
  - Restore generator voltage defaults, yes/no
  - Restore generator amperage defaults, yes/no
  - Restore bus voltage defaults, yes/no
  - Restore all calibration defaults, yes/no

Calibration (Scale Aux. Analog Inputs)

(up to 7 user-defined analog inputs)

- Zero aux. analog inputs, yes/no
- Analog input scale value 1
  - Scale 1 and scale 2
- Analog input scale value 2
  - Scale 1 and scale 2

### ● Menu 13—Communications

- Protocol Modbus 0
  - Modbus online, yes/no
  - Connection type, single or converter
  - Primary port, RS-485 or RS-232
  - Address
  - Baud rate, 19200 or 9600
- Protocol Modbus 1
  - Modbus online, yes/no
  - Connection type, single or converter
  - Primary port, RS-485 or RS-232
  - Address
  - Baud rate, 19200 or 9600
- Protocol Dial Out (available option)
  - Enabled, yes/no
  - Target, pager or modem
  - Phone number
  - Phone delay (pager only)
  - Pin number (pager only)
  - Pin delay (pager only)

### ● Menu 14—Programming Mode

- Programming mode
  - Local
  - Remote
  - Off
- Programming mode change access code
  - Change access code
  - Enter old code
  - Enter new code

### ● Menu 15—Protective Relays (PR—protective relay, SD—shutdown)

- PR over voltage, %, VAC
  - Time delay, sec
- PR under voltage, %, VAC
  - Time delay, sec
- PR over frequency, %, Hz
  - Time delay, sec
- PR under frequency, %, Hz
  - Time delay, sec
- PR reverse power, %, kW
  - Time delay, sec
- SD reverse power, %, kW
  - Time delay, sec
- PR over power, %, kW
  - Time delay, sec
- SD over power, %, kW
  - Time delay, sec
- PR loss of field, %, kVAR
  - Time delay, sec
- SD loss of field, %, kVAR
  - Time delay, sec
- PR over current, %, amps
  - Time delay, sec
- SD over current, %, amps
  - Time delay, sec
- Time delay, breaker trip to SD, min:sec

### ● Menu 16—Paralleling Menu

- PGEN (paralleling generator set) settings
  - Generator ID
  - Number of nodes on bus?

- Synch parameters adjust
  - Volts match: window, gain, and reset
  - Synchronize frequency window and frequency match gain
  - Phase match: window, gain, and reset
  - Dwell time: first on close time delay, fail to synch time delay, and voltage/frequency ok timer
- Manual synchronize controls and monitoring
  - Phase rotation
  - Voltage, frequency, and phase (generator set vs. bus)
  - Speed and voltage bias
- Control input settings
  - First on enable
  - Load enable
  - Sync mode in auto enable
  - Sync mode in run enable
  - kW base load control enable
  - kW ramp hold
  - Frequency trim enable
  - Volts trim enable
  - Reactive droop enable
  - kW system control enable
  - VAR power factor system control enable
  - External kW adjust enable
  - External VAR/power factor adjust enable
  - VAR power factor mode control enable
  - kVAR control enable
  - Power factor control enable

### ● Menu 17—Load Share Control

- kW load control parameters
  - kW sharing control parameters: kW sharing gain, kW sharing reset, kW sharing dead band, frequency trim gain, and frequency trim deadband
  - kW base load control parameters: kW adjust, gain, reset, and kW dead band
  - kW droop control parameters: % of droop at rated kW
  - kW ramp rates: % kW ramp rate, and % kW up/down rate
  - Disconnect load level: % of kW
- kVAR load control parameters
  - kVAR share control parameters: gain, reset, kVAR dead band, voltage trim gain, and volts trim dead band
  - kVAR base load control parameters: kVAR adjust, gain, reset, kVAR dead band, and up/down rate
  - Power factor control parameters: PF adjust, gain, reset, PF dead band, and up/down rate
  - Reactive droop control parameters: % voltage droop
- Circuit breaker and misc. control parameters
  - Breaker energize time delay
  - Breaker reclose time delay
  - Breaker close attempts
  - Circuit breaker current fault limit
  - Circuit breaker current fault time delay
  - Transformer phase shift

## NFPA 110 Requirements

In order to meet NFPA 110, Level 1 requirements, the generator set controller monitors the engine/generator functions and faults shown below. †

- Engine functions:
  - Overcrank
  - Low coolant temperature warning
  - High coolant temperature warning
  - High coolant temperature shutdown
  - Low oil pressure shutdown
  - Low oil pressure warning
  - High engine speed
  - Low fuel (level or pressure) \*
  - Low coolant level
  - EPS supplying load
  - High battery voltage \*
  - Low battery voltage \*
- General functions:
  - Master switch not in auto
  - Battery charger fault \*
  - Lamp test
  - Contacts for local and remote common alarm
  - Audible alarm silence switch
  - Remote emergency stop

\* Function requires optional input sensors or kits and is engine dependent, see Controller Displays as Provided by the Engine ECM.

† Requires optional RSA for standard NFPA 110 outputs.

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## Controller Features

The control functions apply to both the ECM and non-ECM equipped models unless noted otherwise.

- **AC Output Voltage Adjustment.** The voltage adjustment provides keypad adjustment in 0.1 volt increments of the average line-to-line AC output voltage with a maximum adjustment of  $\pm 10\%$  of the system voltage.
- **Alternator Protection.** The controller firmware provides generator set overload and short circuit protection matched to each alternator for the particular voltage/phase configuration.
- **Automatic Restart.** The controller automatic restart feature initiates the start routine and re crank when the generator set slows to less than 390 RPM after a failed start attempt.
- **Battleswitch (Fault Shutdown Override Switch).** The battle switch input provides the ability to override the fault shutdowns except emergency stop and overspeed shutdown in emergency situations and during generator set troubleshooting.
- **Clock and Calendar.** Real-time clock and calendar functions time stamp shutdowns for local display and remote monitor. Also use these functions to determine the generator set start date and days of operation.
- **Cooldown Temperature Override.** This feature provides the ability to bypass (override) the cooldown temperature shutdown and force the generator set to run for the full engine cooldown time delay. Also see Time Delay Engine Cooldown (TDEC).
- **Communication Access.** The controller can connect to a PC for updates using SiteTech™ software and can provide remote annunciation using Monitor software. Two of the three available ports may be used.
- **Cyclic Cranking.** The controller has programmable cyclic cranking. The customer selects the number of crank cycles (1-6) and the crank time from 10 to 30 seconds. The crank disconnect depends upon the speed sensor input information or the generator frequency information. The default cyclic crank setting is 15 seconds on, 15 seconds off for three cycles.
- **Display Power Shutdown.** To conserve battery power, the display turns off after 5 minutes of inactivity. Pressing any keypad button activates the display.
- **ECM Communication.** The controller monitors ECM communication links and provides fault detection for oil pressure signal loss, coolant temperature signal loss, and ECM communication loss. Each of these faults provides local display, alarm horn ON, and relay driver output (RDO) on ECM models only. See *Controller Functions* following for additional information.
- **ECM Diagnostics.** The controller displays engine ECM fault code descriptions to help in engine troubleshooting. See *Controller Functions* following for additional information.
- **Engine Starting Aid.** The starting aid feature provides control for an ether injection system. This setup has adjustable on time before engine crank from 0 to 10 seconds. This feature is also part of the remote communication option.
- **Event Logging.** The controller keeps a record (up to 100 entries) for warning and shutdown faults. This fault information becomes a stored record of system events and can be reset.
- **Idle Speed Function.** Idle speed function provides the ability to start and run the engine at idle speed for a selectable time period. The engine will go to normal speed should the temperature reach warm-up before the time delay is complete.
- **Integrated Voltage Regulator.** The voltage regulator provides  $\pm 0.25\%$  no-load to full-load regulation with three-phase sensing.
- **Lamp Test.** Keypad switch verifies functionality of the indicator lamps, alarm horn, and digital display.
- **Load Shed.** The load shed function provides a load control output (RDO) with user-selectable load shed level.
- **Master Switch Fault .** The generator set master switch has fault detection at four levels: 1) master switch to off, 2) master switch open, 3) master switch error, and 4) master switch not in auto. Each of these faults/ warnings provides local display, alarm horn on, and activates a relay driver output (RDO). By placing the master switch to the off/reset position, all generator set faults can be reset.
- **Measurement Units.** The controller provides selection of English or metric displays.
- **Modbus® Interface.** The Modbus® interface provides industry standard open protocol for communication between the generator set controller and other devices or for network communications.
- **Number of Starts.** Total number of generator set successful starts is recorded and displayed on the local display and remote PC monitor. This information is a resettable and total record.
- **Programmed Run.** The programmed run function provides user-selectable time for a one-time exercising of the generator set. The controller does not provide weekly scheduled exercise periods.
- **Programming Access.** The setup access and programming information is password protected. When locally accessing programming information, the PM (programming mode) lamp flashes. When remotely accessing programming information, the PM lamp is steady.
- **Remote Reset.** The remote reset function resets faults and allows restarting of the generator set without going to the master switch off/reset position. The remote reset function is initiated via the remote reset digital input.
- **RSA II Remote Monitoring Panel.** The controller is compatible with the Kohler® Remote Serial Annunciator (RSA II).
- **Run Time Hourmeter.** The run time hourmeter function is available on the local display and remote monitor. The information displayed uses real time loaded and unloaded run time as an actual and resettable record.
- **Self-Test.** The controller has memory protection and a microprocessor self-test.
- **Time Delay Engine Cooldown (TDEC).** The TDEC provides a user-selectable time delay before the generator set shuts down. If the engine is *above* the preset temperature and unit is signalled to shut down, unit will continue to run for the duration of the TDEC. If the engine is *at or below* the preset temperature and unit is signalled to shut down or the TDEC is running, unit will shut down without waiting for the time delay to expire. Also see Cooldown Temperature Override.
- **Time Delay Engine Start (TDES).** The TDES provides a user-selectable time delay before the generator set starts.

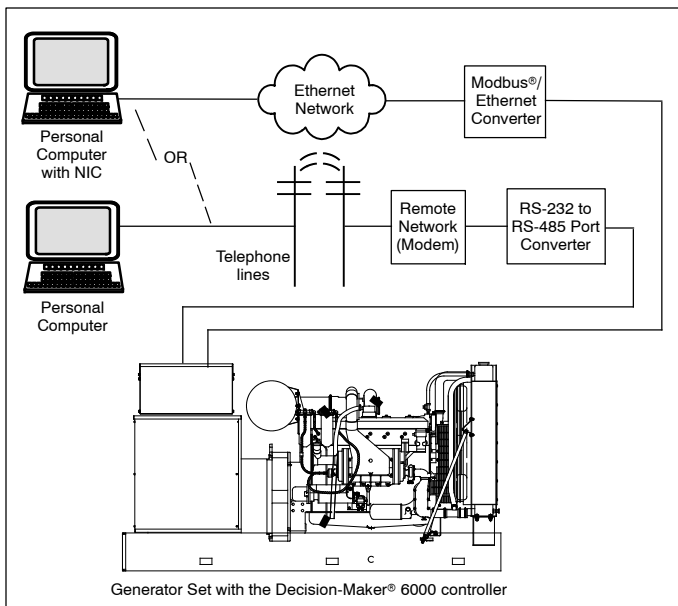
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## Decision-Maker® 6000 Available Options

### Communication and PC Software Available Options

Refer to G6-76 Monitor III Software and the communication literature for additional communication and PC software information including Modbus® communication.

- Local Single Connection.** A PC is connected directly to the device communication module with an RS-232 cable for applications where the PC is within 15 m (50 ft.) of the device or RS-485 cable for applications where the PC is up to 1220 m (4000 ft.) from the device.
- Local Area Network (LAN).** A PC is connected directly to the device's local area network. A LAN is a system of connecting more than one device to a single PC.
- Remote Network (Ethernet):** A PC with a NIC card uses an Ethernet connection to access a remotely located converter (Modbus®/Ethernet) serving a controller. Refer to G6-79 for system details.
- Remote Network (Modem):** A PC uses a modem to connect to a remotely located device modem serving a controller. Monitoring software (Monitor III) runs on the PC to view system operation.
- Monitor III Software for Monitoring and Control (Windows®-based user interface)**
- Converter, Modbus®/Ethernet.** Supports a power system using controllers accessed via the Ethernet. Converter is supplied with an IP address by the site administrator. Refer to G6-79 for converter details.
- RS-232 to RS-485 Port Converters**



### Other Available Options

- Common Failure Relay** remotely signals auxiliary fault, emergency stop, high engine temperature, low oil pressure, overcrank, and overspeed via one single-pole, double-throw relay with 10-amp contacts at 120 VAC or 28 VDC maximum.
- Controller Cable** enables remote mounting of the controller with distances of up to 12 m (40 ft.) from the generator set.
- Decision-Maker® Paralleling System (DPS)** provides the components including a master control panel (MCP), switchboards, and circuit breakers to parallel several generator sets. (Refer to the respective DPS literature for details.)
- Dry Contact Kit** interfaces between the controller signals and customer-supplied accessories providing contact closure to activate warning devices such as lamps or horns. Kits are available with either one or ten single-pole, double-throw relays with 10-amp contacts at 120 VAC or 28 VDC maximum.
- Float/Equalize Battery Charger with Alarm Feature** signals controller of battery charger fault.
- Prealarm Kit for NFPA 110 (gas fuel models only)** warns the operator of low fuel pressure. Select the kit based on LP vapor or natural gas, combination dual fuel, or LP liquid withdrawal.
- Prime Power Switch** prevents battery drain during generator set non-operation periods and when the generator set battery cannot be maintained by an AC battery charger.
- Remote Audiovisual Alarm Panel** warns the operator of fault shutdowns and warning conditions. Kit includes common fault lamp and horn with silence switch.
- Remote Emergency Stop Panel** immediately shuts the generator set down from a remote station.
- Remote Serial Annunciator (RSA) Panel** enables the operator to monitor the status of the generator set from a remote location, which may be required for NFPA 99 and NFPA 110 installations. Uses Modbus® protocol, an industry standard.
- Run Relay** provides a three-pole, double-throw relay with 10-amp contacts at 120 VAC or 28 VDC maximum for indicating that the generator set is running.

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