
THOMSON TECHNOLOGY
POWER & CONTROL
A REGAL-BELOIT COMPANY

MEC 20

MICROPROCESSOR
ENGINE/GENERATOR CONTROLLER
(WITH REMOTE COMMUNICATION, EXPANSION OUTPUT MODULE &
EAP 110 REMOTE ANNUNCIATOR OPTIONS)

INSTALLATION, OPERATING &
SERVICE MANUAL

Software Version 1.82

PM047 Rev 13 (05/03/30)

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PRODUCT REVISION HISTORY The following information provides an historical summary of changes made to this product since the original release. 1.1.1. Software Version Revised Idle Control Logic for Digital Inputs #1,2 Increased High Temperature Analog Shutdown High Limit 1.81 03/03/04 Changed Oil Pressure Sender Manufacturer requiring revised pressure/resistance calibration data New Oil Pressure Sender Thomson p/n-003654, ManufacturerDatcon, p/n 102227. Discontinued Oil Pressure Sender Manufacturer- Isspro, p/n R9279C Thomson p/n-000772, 1.82 05/03/30 Note: The oil pressure senders are not interchangeable with the software versions. 1.8 02/09/09 Added Programmable Output Feature "EPS Supplying Load" Added Digital Input Feature "No-Load Test" Added New Digital Fault Names Basin Rupture ATS in Bypass Fuel Leak Vent Damper Fail High Fuel Level Low Fuel Press Bat Charger Fail Fail to Sync HighIntkManfTemp Added Independent Programming features for AMF Outputs Added references for EAP 110 Remote Annunciator Misc.

Display & Menu changes PM047 Rev 13 05/03/30 1 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER 1.7 02/02/15 Key changes implemented as follows: · Auto Mains Failure (AMF) logic with new timers, control outputs and display features · · · · Line to Neutral AC Voltage Display on 3 Phase 4 Wire Systems (neutral connection required) Analog Shutdown Capability from Oil Pressure and Temperature Senders Expanded oil pressure operation up to 150 PSI (was 100 PSI) Single Point Calibration for Oil Pressure/engine temperature sender inputs (simplified calibration, field calibration is now mandatory) · Programmable Output features now expanded to map to every available fault circuit Add new Programmable Output features Engine Ready & Engine Run (Fuel) There were also minor changes that are reflected in the manual. 1.6 01/07/18 Added Ready to load programmable output and new Isspro Oil Pressure sender curves; increased standard digital & analog fault features. 1.5 00/09/20 1.4 99/12/09 1.3 98/02/09 Added kVA metering. Added new digital faults labels and blank selections. New version with communication features, expansion relay module capability, deletion of "horn" programming, deletion of cooldown shutdown programmability, deletion of "common fail" programmability and revised password number.
1.2 97/06/04 Original version. 1.1.2.
Operating & Service Manual Version Rev 13 05/03/30 Rev 12 03/03/04 Added descriptive information for new software version 1.82 Changed Oil pressure/resistance calibration data and new software version 1.81. PM047 Rev 13 05/03/30 2 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER Rev 11 02/09/09 Rev 10 02/02/15 Rev 9 01/10/17 Rev 8 01/07/18 Added descriptive information for new software version 1.8 Added descriptive information for new software version 1.
7 Clarification of faults required for C282 or NFPA 110. Addition of "Static Precaution"; deletion of calibration jumpers to requiring external calibration resistors/potentiometers; standard fault circuits increase from 12 to 28; Ready status changes to "Ready to Load"; changes in temperature and pressure calibrations; extended temperature ratings. Rev 7 00/12/01 Rev 6 00/10/06 Rev 5 00/04/06 Rev 4 99/02/01 Minor text changes. Added KVA metering feature. Changes made to digital fault labels. Remote communication wiring changes; multiple controllers that can be connected changes from 5 to 10. Rev 3 98/05/08 Rev 2 98/02/18 Corrected minor errors. New version with communication features; expansion relay module capability and revised password number. Rev 1 98/01/22 Rev 0 97/06/04 Corrected minor errors. Original release.

Contact Thomson Technology, to obtain applicable instruction manuals. Soft copy of most current version is available at www.thomsontechnology.com. 1.2. GENERAL DESCRIPTION The Thomson Technology MEC 20 Microprocessor-based Engine/Generator Controller utilizes the latest advancements in microprocessor design technology for the control and monitoring of engine-generator sets. The MEC 20 provides a comprehensive array of operational, protection and display features for automatically controlling an engine/generator set. All standard and optional features of the MEC 20 are configurable from the front panel LCD display and are security password protected. The LCD display screen prompts are in plain English, providing a user-friendly operator interface with many display options available.
The microprocessor design provides high accuracy for PM047 Rev 13 05/03/30 3 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER all voltage monitoring, current monitoring and timing functions as well as providing many standard features which were previously only available as expensive add-on optional features. The MEC 20 provides the following advanced features: · · · · · · · · · · · · Up to 28 alarm/shutdown fault circuits utilizing analog and digital inputs. Standard model meets or exceeds CSA C282, NFPA 110 Level 1 generator set control requirements. RS 422 remote communication port. Expansion output module communication port for individual output fault contact capability. Backlit LCD display screen with alpha-numeric readout for display and programming. Digital 3-phase voltage, 3-phase current, KVA and frequency metering

for generator output.

Non-volatile memory retains logic and set points if control power is lost. Direct 3-phase voltage sensing inputs on generator supply from 120Vac up to 600Vac (nominal). Security password-protected programming levels.

Self diagnostic features continuously verify processing, I/O and memory circuits. Superior EMI/RFI noise immunity and surge performance features as per IEEE C62.41 requirements. Dual microprocessor design provides independent speed sensing circuitry for higher performance. CAUTION contents subject to damage by STATIC ELECTRICITY This equipment contains static-sensitive parts. Please observe the following anti-static precautions at all times when handling this equipment. precautions may cause equipment failure and/or damage. Failure to observe these PM047 Rev 13 05/03/30 4 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER · Discharge body static charge before handling the equipment (contact a grounded surface and maintain contact while handling the equipment, a grounded wrist strap can/should also be utilized). · Do not touch any components on the printed circuit board with your hands or any other conductive equipment. · Do not place the equipment on or near materials such as Styrofoam, plastic and vinyl.

Place the equipment on grounded surfaces and only use an anti-static bag for transporting the equipment. 2. INSTALLATION 2.1. GENERAL INFORMATION NOTE: Installations should be done according to all applicable electrical regulation codes as required. The following installation guidelines are provided for general information only pertaining to typical site installations. For specific site installation information, consult Thomson Technology as required. Note: Factory installations of THOMSON TECHNOLOGY supplied control panels that have been tested and proven may deviate from these recommendations. CAUTION!!! All installation and/or service work performed must be done by qualified personnel only. Failure to do so may cause personal injury or death.

2.2. BATTERY SUPPLY INPUT The MEC 20 can operate on any battery supply from 10 to 30 volts DC. The battery DC negative or common conductor must be grounded to the main generator-set frame ground. The MEC 20 is internally protected by a solid state type fuse that protects it from inadvertent shorts on the output terminals.

The solid state fuse will automatically reset when the overcurrent condition is removed. Wiring from the engine cranking PM047 Rev 13 05/03/30 5 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER battery to the control panel should conform to the following guidelines to avoid possible controller malfunction and/or damage. 2.2.1.

Avoid wiring from the engine starter terminals - wiring should go directly from the battery terminals to the engine control panel (to avoid voltage drop in the starter cables and starter motor commutator noise). Note: Unit mounted control panels with short wiring runs may utilize connections from the starter terminals provided that the specific application is tested satisfactorily. CAUTION!!! The battery charger must be turned off before battery cables are removed from the battery (i.e. for servicing). Failure to do so may subject the control panel to an overvoltage condition in which damage may result. 2.2.2. Wiring from battery to engine control panel should be two - #14 AWG (2.

5mm2) wires (i.e. do not use the engine block as one of the common conductors). 2.2.3. Under noisy environments (i.e. gas engines with high voltage ignitions, etc.), wiring from battery should be a twisted pair of #14 AWG (2.

5mm2) wires. 2.3. SPEED SENSING INPUT Field wiring of the speed sensing signal wires should conform to the following guidelines to avoid possible controller malfunction and/or damage: 2.3.

1. Wiring from magnetic pickup must utilize a 2 conductor shielded/twisted cable. The drain (shield) wire must be connected at the control panel end only. 2.3.

2. Magnetic pickup voltage at cranking speed must be greater than 3.0VAC. At nominal speed, magnetic pickup voltage should be between 3.0 and 5VAC. 2.3.3. A single dedicated magnetic pickup is recommended for connection to the speed sensing input terminals. Note: One common magnetic pickup may be utilized for the system provided specific test measurements are done with the equipment installed (i.

e. mag pickup voltage levels meet the required levels). 2.4. DC VOLTAGE INPUTS All DC voltage inputs to the MEC 20 are optically isolated and filtered for protection from noise spic wire sizes for typical circuits (of distances up to 100ft (30m)) are as follows: 2.8.1. Battery Control Power 2.8.2. Engine Alarm/Shutdown Contacts 2.8.3. Remote Start Contact for Transfer Switch 2.8.

4. Crank & Preheat Output Wiring #14 AWG (2.5mm2) #16 AWG (1.5mm2) #14 AWG (2.5mm2) #14 AWG (2.

5mm2) (To pilot relays) PM047 Rev 13 05/03/30 8 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER 2.8.5. Speed Sensing Wiring 2.8.6. Metering Voltage Inputs 2.8.7. Metering Current Inputs (from CT's) #16 AWG (1.

5mm2) 2 Conductor Shielded Cable #16 AWG (1.5mm2) #14 AWG (2.5mm2) For distances exceeding 100 Ft. (30m) consult THOMSON TECHNOLOGY. For unit mounted control panels, wire sizes may be reduced to the next smallest wire size available. 2.9. REMOTE START CONTACT FIELD WIRING Field wiring of a remote start contact from a transfer switch to a control panel should conform to the following guidelines to avoid possible controller malfunction and/or damage. 2.9.

1. Remote start contact wires (2 - #14 AWG (2.5mm2) should be run in a separate conduit. 2.9.

2. Avoid wiring near AC power cables to prevent pick-up of induced voltages. 2.9.3.

An interposing relay may be required if field wiring distance is excessively long (i.e. greater than 100 feet (30m) and/or if a remote contact has a resistance of greater than 5.0 ohms. 2.9.4. The remote start contact must be voltage free (i.e. dry contact).

The use of a "powered" contact will damage the engine controller. 2.10. REMOTE COMMUNICATION WIRING All interconnecting wiring to/from the MEC 20 engine/generator controller communication port shall utilize #22 AWG (min.) 8 conductor, twisted, shielded cable with RJ45 connectors. The drain (shield) wire must be connected at the MEC 20 controller end only. Refer to Section 6 for further information. Communication cable from the controllers' com port must be suitably routed to protect it from sources of electrical interference. electrical interference are as follows: · · Use high quality, 8 conductor shielded cable only with drain wire grounded at the controller end only. Route the communication cable at least 3M (10") away from sources of electrical noise such as variable speed motor drives, high voltage power conductors, UPS systems, transformers, rectifiers etc.

PM047 Rev 13 05/03/30 9 Thomson Technology Guidelines for protection against possible MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER · Use separate, dedicated conduit runs for all communication cables.

Do not tightly bundle communication cables together in the conduit. Conduit should be ferromagnetic type near sources of possible electrical interference. The entire length of conduit should be grounded to building earth ground. · When communication cables must cross over low or high voltage AC power conductors, the communication cables must cross at right angles and not in parallel with the conductors.

For additional information on protection against electrical interference, contact Thomson Technology factory. 2.11. EXPANSION OUTPUT MODULE LOCATION/INSTALLATION The expansion module(s) are to be mounted inside a control panel using four screws with stand-offs provided. The expansion module must be mounted within 300 metres (1000 feet) wiring distance from the MEC 20 using an 8 conductor shielded cable provided with the module. The communication cable must not be bundled together with other control wiring inside the panel. Mounting dimensions for the expansion output module are shown in FIGURE #5. 152.4 mm 0.00 mm 137.16 mm 4 HOLES 4.75 MM DIAMETER (3/16" DRILL) 137.16 mm 7.62 mm 0.00 mm 152.

4 mm FIGURE #5: MEC 20 EXPANSION MODULE MOUNTING DIMENSIONS G:\ENGINEER\PRODUCTS\MEC20\MEC20_14.VSD DRAWING SCALE .75:1 PM047 Rev 13 05/03/30 10 7.62 mm Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER 2.12. MEC MOUNTING LOCATION/INSTALLATION The MEC 20 Engine-generator controller is designed for mounting directly onto a control panel door. Considerations should be given for the following: · · · · The controller should be installed in a dirt free, dry location away from extreme heat The LCD window should be installed at an optimum height for operator viewing. Adequate space should be provided around the rear of the MEC 20 circuit board for Verify that the intended AC voltage input to the controller does not exceed the sources. control wiring. maximum allowable level on the control panel door as per the applicable control panel certification standard.

The MEC 20 controller can be installed onto a door of a control panel using one of the following methods: · The first method requires a special door cutout for the LCD display and LED's as shown in FIGURE #6. This mounting method requires the lexan faceplate to be mounted directly onto the door of the control panel. correct assembly location of all parts. · The second method of controller mounting requires a factory supplied adapter faceplate as shown in FIGURE #8. This method only requires a single large rectangular hole to be cut out of the door as shown in FIGURE #9.

The controller must be disassembled to mount on the door, then re-assembled. Refer to FIGURE #7 for 2.13. FACEPLATE MOUNTING DIMENSIONS PM047 Rev 13 05/03/30 11 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER 268 mm. 126 mm. C TOP 126 mm. 80 mm. 9 HOLES 6 mm. DIAMETER (1/4" DRILL) 32 mm. CUTOUT 166 mm. C 20 mm. 8 mm. 8 mm. OUTLINE OF PRINTED CIRCUIT BOARD UNDER PANEL DOOR G:\ENGINEER\PRODUCTS\MEC20_07.VSD 24 mm.

49 mm. 24 mm. 49 mm. FIGURE #6 PM047 Rev 13 05/03/30 12 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER 2.14. MEC 20 ASSEMBLY - SIDE VIEW FRONT PANEL DOOR MEC 20 PCB REAR MEC 20 REAR COVER PEM STUD #8-32 × 1" #8-32 × 3/8" MACHINE SCREW # 8-32 INTERNAL TOOTH LOCK WASHER 1/2" NYLON SPACER (#8-32 CLEARANCE UNTHREADED) HIGH VOLTAGE MYLAR BARRIER (mounts on bottom right hand corner, as viewed from rear) 1.25" ALLUMINUM STANDOFF (HEX) #8-32 THREAD #8-32 INTERNAL TOOTH LOCK WASHER G:\ENGINEER\PRODUCTS\MEC20_09.VSD Rev. 0 97/06/02 FIGURE #7 Notes: 1. Ensure that all lockwashers are installed as shown above.

2. The high voltage mylar barrier (P/N TMW;10805;1) must be installed as shown when the MEC 20 is installed onto the door of a control panel. 3. When the MEC 20 is installed on a door without 1" PEM studs, 1" machine screws must be used. PM047 Rev 13 05/03/30 13 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER 11.

5 in C TOP 9 HOLES 1/4" DIAMETER CUTOUT 7.5 in C 4 STUDS #8/32 1/4" 1/4" FIGURE #8: ADAPTER FACEPLATE 5.5 in C 3.5 in 10.875 in C FIGURE #9: DOOR CUTOUT FOR ADAPTER FACEPLATE G:\ENGINEER\PRODUCTS\MEC20_11.

VSD Rev. 1 00/07/13 2.15. DIELECTRIC TESTING Do not perform any high voltage dielectric testing on the control panel with the MEC 20 connected in the circuit as serious damage will occur to the controller. All AC control fuses connected to the MEC 20 must be removed if high voltage dielectric testing is performed on the control panel. 3. DESCRIPTION The MEC 20 controller consists of three parts; a Lexan faceplate, which is mounted externally on the enclosure door, a printed circuit board (PCB) which is mounted inside the enclosure door, and a rear cover for the PCB. 3.1. LEXAN FACEPLATE The Lexan faceplate is shown as in FIGURE #10.

The Lexan push-buttons are PM047 Rev 13 05/03/30 6.875 in 14 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER connected to the main PCB via plug-in ribbon cable. The main features of the Lexan faceplate are described as follows with reference to FIGURE #10. 13 1 4 11 3 14 2 EXIT MICROPROCESSOR ENGINE CONTROLLER MEC 20 ALARM SHUTDOWN SILENCE LAMP TEST RESET ENTER 12 READY SPEED SIGNAL 5 8 9 DECREMENT INCREMENT 7 6 RUN OFF AUTO LOAD TEST EMERGENCY STOP 10 MEC20_03.VSD Rev 2 01/07/09 FIGURE #10 LCD viewing window. The LCD display is mounted on the main PCB that is visible through the lexan faceplate viewing window. EXIT push-button. The EXIT function is used to scroll backwards through the status menus or programming prompts to the previous item. The EXIT function is used to "exit" the programming menu by holding this button down for approximately 2 seconds while in the programming mode. DECREMENT push-button. The DECREMENT function is used to change a programming value while in the programming mode. When this pushbutton is held down, the displayed value will be "decremented" to a lower value as desired. Note: The longer the push-button is held down, the faster the value will be decremented. INCREMENT push-button. The INCREMENT function is used to change a programming value while in the programming mode or to select a desired programming menu loop.

When this push-button is held down, the displayed value will be "incremented" to a higher value as desired. Note: PM047 Rev 13 05/03/30 15 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER The longer the push-button is held down, the faster the value will be incremented. ENTER push-button. The ENTER function is used to scroll forwards through the status menus or programming prompts to the next item. The ENTER function is used to "enter" a programming mode as well as accepting changed programming values.

Note: In the programming mode, the longer the ENTER push-button is held down, the faster the next menu prompts will appear. RUN push-button and LED light viewing window. The RUN function is used to initiate a manual start signal to the engine-generator set. Refer to the operating instructions for detailed information. OFF push-button and LED light viewing window. The OFF function is used to initiate a stop signal to the engine-generator set. Refer to the operating instructions for detailed information. AUTO push-button and LED light viewing window. The AUTO function is used to initiate automatic operation of the engine-generator set. Refer to the operating instructions for detailed information.

LOAD TEST push-button and LED light viewing window. The LOAD TEST function is used to initiate load test of the engine-generator set when connected to an associated transfer switch. Refer to the operating instructions for detailed information. EMERGENCY STOP push-button and LED light viewing window. The EMERGENCY STOP function is used to initiate an emergency stop signal to the engine-generator set. detailed information. 11 Refer to the operating instructions for READY LED light viewing window. The READY LED illuminates when the engine-generator set is set for automatic operation and no shutdown or alarm faults have been activated. 12 SPEED SIGNAL LED light viewing window. The SPEED SIGNAL LED illuminates when the engines speed signal is detected (i.
e. the engine is turning over). 13 ALARM LED light viewing window. The ALARM LED illuminates (flashes) when any pre-programmed alarm fault has been activated. SHUTDOWN LED light viewing window.
The SHUTDOWN LED illuminates (flashes) when any pre-programmed shutdown fault has been activated. 14 PM047 Rev 13 05/03/30 16 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER 3.2. PRINTED CIRCUIT BOARD The printed circuit board (PCB) is shown in FIGURE #11. The PCB contains the following user interface items: MEC 20 CIRCUIT BOARD LAYOUT B+ B- GRD TB4 TB2 MP1 MP2 1 17 J6 EXP R115 TB1 IN IC RJ45 CONTRAST J7 COM RJ45 IB IA VN VC VB VA WATCHDOG REMOTE START CRANK RUN COM FAIL TB3 18 38 G:\ENGINEER\PRODUCTS\MEC20_02.
VSD Rev. 2 01/07/09 DRAWING SCALE (mm) = .6:1 FIGURE #11 PM047 Rev 13 05/03/30 17 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER 3.2.1. TERMINAL BLOCKS Four terminal blocks are located on the PCB as follows: TB1 AC Voltage and Current sensing terminal block (120-600VAC & 5AAC) 0- WARNING!!! Voltage sensing circuits are capable of lethal voltages while energized. Current transformer (CT) secondary circuits are capable of generating lethal voltages when open circuited with their primary circuit energized. Standard safety procedures should be followed and be performed by qualified personnel only. Failure to do so may cause personal injury and/or death. TB2 TB3 TB4 Speed sensing and digital contact input terminal block Output contacts and engine temperature/pressure input signal terminal block DC power input and ground connection terminal block 3.

2.2. DIAGNOSTIC LED'S The MEC 20 controller provides five diagnostics LED lights that are mounted on the rear of the printed circuit board as per FIGURE #11. Their functions are described as follows: 3.2.2.1. WATCHDOG This LED flashes on and off at irregular intervals which indicates that the microprocessor is functioning normally. 3.2.
2.2. REMOTE START This LED is illuminated whenever the MEC 20 has received a remote start signal. 3.2.
2.3. CRANK This LED is illuminated whenever the MEC 20 is initiating an engine cranking signal. PM047 Rev 13 05/03/30 18 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER 3.2.
2.4. run. RUN This LED is illuminated whenever the MEC 20 has called the engine to 3.2.2.5. COMMON FAIL This LED is illuminated whenever the MEC 20 has initiated a common fail signal (i.e. whenever an alarm or shutdown fault has been activated).

Note: All LED's will be illuminated whenever a lamp test function is performed. 3.2.3. CONTRAST ADJUSTMENT (R115) A contrast adjustment potentiometer is located on the rear of the PCB and is factory set for ambient temperatures of 15° to 30° Celsius. For different ambient temperatures, consult the factory for adjustment procedures. 3.2.4. COMMUNICATION PORTS Two RJ45 communication ports are provided on the circuit board for optional features as follows: 3.
2.4.1 J6 - EXP This port is utilized to interconnect an external expansion module for additional output contacts and/or the EAP 110 remote annunciator. Refer to Section 7.0 & 8.
0 for additional information. 3.2.4.2 J7 - COM This port is utilized to interconnect to a remote communication system for remote monitoring and control. additional information. Refer to Section 6.0 for 4. FAULT CIRCUIT DESCRIPTIONS The MEC 20 engine-generator controller utilizes many analog and digital inputs to perform both monitoring and control functions. Three types of fault circuits are used to monitor and control the engine-generator set. The first type is Internal Fault Circuits that are derived from a combination of digital and analog inputs. The second type is Digital Input Fault circuits that are initiated from external contact inputs. The third type is Analog Input Fault circuits that are initiated from external analog signal inputs. The following functional block diagram (FIGURE #12) shows how all input/output fault circuits are organized. PM047 Rev 13 05/03/30 19 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER 4.

1. MEC 20 FUNCTIONAL BLOCK DIAGRAM FACTORY PROGRAMMED STANDARD FAULTS CUSTOMER CONFIGURED FAULTS FEATURE OUTPUT CONTACTS MAGNETIC PICKUP RPM DISPLAY FAULT LOGIC OVERSPEED SHUTDOWN LOSS OF SPEED ALARM/SHUTDOWN OVERCRANK SHUTDOWN AUTO PUSHBUTTON LOGIC SWITCH NOT IN AUTO ALARM LOW ENGINE TEMP. ALARM HIGH ENGINE TEMP. ALARM HIGH ENGINE TEMP. SHUTDOWN CRANK 10A/240Vac, 8A/24Vdc RESISTIVE RUN 10A/240Vac, 8A/24Vdc RESISTIVE ENGINE TEMPERATURE SENDER TEMP. DISPLAY FAULT LOGIC COMMON FAIL CONTACT 10A/240Vac, 8A/24Vdc RESISTIVE ENGINE OIL PRESSURE SENDER PRESS. DISPLAY FAULT LOGIC LOW OIL PRESSURE ALARM LOW OIL PRESSURE SHUTDOWN LOW BATTERY VOLTAGE ALARM 2 + BATTERY VOLTAGE DC VOLT DISPLAY PROGRAMMABLE CONTACT #1 10A/240Vac, 8A/24Vdc RESISTIVE FAULT LOGIC HIGH BATTERY VOLTAGE ALARM WEAK BATTERY ALARM V 3 PHASE AC VOLTAGE AC VOLT/ FREQ. DISPLAY FAULT LOGIC UNDERVOLTAGE OVERVOLTAGE UNDERFREQUENCY OVERFREQUENCY 2 PROGRAMMABLE CONTACT #2 10A/240Vac, 8A/24Vdc RESISTIVE 3 PHASE AC CURRENT AC CURRENT DISPLAY FAULT LOGIC OVERCURRENT 2 DIGITAL INPUT CONTACTS (N/O or N/C) 1 2 3 4 5 6 7 8 9 10 11 12 E. STOP N/O EMERGENCY STOP FAULT LOGIC 1 LOW OIL PRESSURE SHUTDOWN HIGH ENGINE TEMP. SHUTDOWN LOW COOLANT LEVEL SHUTDOWN LOW FUEL LEVEL ALARM DIGITAL FAULT #5 DIGITAL FAULT #6 DIGITAL FAULT #7 DIGITAL FAULT #8 DIGITAL FAULT #9 DIGITAL FAULT #10 DIGITAL FAULT #11 DIGITAL FAULT #12 PROGRAMMABLE CONTACT #3 10A/240Vac, 8A/24Vdc RESISTIVE 2 PROGRAMMABLE CONTACT #4 10A/240Vac, 8A/24Vdc RESISTIVE NOTES: 1 DIGITAL FAULT LABEL LIST EACH POINT PROGRAMMABLE PROGRAMMABLE FUNCTION LIST 2 G:\ENGINEER\PRODUCTS\ MEC20_10.

VSD Rev. 3 02/02/20 FIGURE #12 PM047 Rev 13 05/03/30 20 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER 4.2. INTERNAL FAULT CIRCUITS The MEC 20 Engine Controller provides four internally activated fault circuits as described below. All internal fault circuits are provided as standard with every MEC 20 controller.

4.2.1. OVERCRANK The overcrank fault circuit is initiated when the engine fails to start after the selected crank time or number of crank cycles. The overcrank fault circuit is internally programmed as a latching shutdown fault and is not user programmable.

Refer to the programming instructions for further information. 4.2.2. OVERSPEED The overspeed fault circuit is initiated when the engine's speed has increased above the overspeed setpoint. The overspeed fault circuit is internally programmed as a latching shutdown fault. The overspeed shutdown fault circuit is programmable for the percentage of nominal engine speed (i.e. overspeed setpoint) and for the transient time delay period. The programming prompts for overspeed are located in the main menu programming loop.

programming instructions for further information. Refer to the 4.2.3. LOSS OF SPEED The loss of speed fault circuit is initiated when the engine's speed sensing circuit does not detect a speed signal for a period more than 2 seconds following a run signal. The loss of speed fault circuit may be user programmed as a latching shutdown fault or alarm only. The programming prompts for loss of speed are located in the main menu programming loop. instructions for further information. Refer to the programming 4.2.

4. SWITCH NOT IN AUTO The "Switch Not In Auto" fault circuit is initiated when the controller's operating mode switch is changed from the auto position to any other position via the front mounted keypad. This fault is internally programmed as a non-latching alarm. In the main programming loop, this alarm may be user programmed to initiate the common fail output relay. PM047 Rev 13 05/03/30 21 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER 4.

*3. DIGITAL FAULT INPUT CIRCUITS The MEC 20 Engine Controller provides up twelve digital fault input circuits that are user programmable. Each digital fault input circuit is activated via a remote sensing contact that is external to the controller. Each digital fault input circuit may be programmed with a unique fault label description as stored in the controller's non-volatile memory. The following digital fault labels are provided in each MEC 20 engine controller: AIR DAMPER TRIPPED BAT CHARGER INPUT FAIL BAT CHRG TROUBLE BREAKER TRIPPED DC FAIL FAILED TO SYNC GEN BREAKER OPEN GROUND FAULT HIGH BEARING TEMP HIGH COOLER VIBRATION HIGH ENGINE TEMP HIGH ENGINE VIBRATION HIGH FUEL LEVEL HIGH OIL LEVEL NO LOAD TEST *HIGHINTKMANFTEMP VENT DAMPER FAIL HIGH FUEL LEVEL FAIL TO SYNC "Blank" (i. e. no text for unused inputs) Note: Up to six custom "user defined" fault label names may be specified for the MEC 20 controller at time of purchase. The six custom fault label names cannot be changed once shipped from the factory. HIGH OIL TEMP HIGH WINDING TEMP IDLE LOW COOLANT LEVEL LOW ENGINE TEMP LOW FUEL PRESS LOW FUEL LEVEL LOW OIL LEVEL LOW OIL PRESSURE REMOTE EMERG. STOP REVERSE POWER BASIN RUPTURE ATS IN BYPASS FUEL LEAK LOW FUEL PRESS BAT CHARGER FAIL 4.3.1. FACTORY PROGRAMMED DIGITAL FAULT CIRCUITS The MEC 20 is supplied from the factory programmed with twelve standard digital fault circuits as follows: PM047 Rev 13 05/03/30 22 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER FAULT NAME Low Oil Pressure High Engine Temperature Battery Charger Input Fail Low Fuel Level Digital Input #5 Digital Input #6 Digital Input #7 Digital Input #8 Digital Input #9 Digital Input #10 Remote Emergency Stop Idle FAULT ACTION Shutdown Shutdown Alarm Alarm Alarm Alarm Alarm Alarm Alarm Shutdown N/A INPUT TERMINAL # 1 2 3 4 5 6 7 8 9 10 11 12 Refer to Section 11.4 Digital Fault Programming Menu for the factory default settings. Note: Fault Input #5 - #10 must be customer configured unless specified at time of order.*

All faults require a customer connected contact to the MEC 20 input terminal as indicated. All fault circuits may be user field programmed for different control functions or alternate fault names. Note: For CSA C282 applications the controller will be factory supplied with Low coolant level shutdown in place of Battery charger input fail alarm. Refer to the programming instructions for further information on digital fault circuits. Note: Shutdown functions for Low Oil Pressure and High Engine Temperature may alternatively be provided via analog pressure and temperature sender inputs if programmed accordingly in the analog fault programming menu. Section 11.3 for further information. Refer to 4.4. ANALOG FAULT INPUT CIRCUITS The MEC 20 Engine Controller provides up to fifteen analog fault input circuits that are user programmable.

The controller is supplied from the factory with fifteen standard PM047 Rev 13 05/03/30 23 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER analog fault circuits. Each analog fault input circuit is activated via specific analog signal type. Refer to Section 11.3 Analog Fault Programming Menu for the factory default program settings for each analog fault provided. WARNING!!! The analog protection circuits for voltage, frequency, current, engine oil pressure, engine temperature and engine speed will be set at factory default settings only.

Final settings will be required to be set by the commissioning authority. Failure to do so may result in severe equipment failure or damage. 4.4.1. ANALOG FAULT CIRCUITS The MEC 20 is supplied from the factory with fifteen standard analog fault circuits as follows: FAULT NAME Undervoltage Overvoltage Underfrequency Overfrequency Overcurrent Weak battery Low battery voltage High battery voltage Low engine temperature High engine temperature #1 High engine temperature #2 Low oil pressure #1 Low oil pressure #2 Overspeed Loss of speed signal FAULT ACTION Shutdown Shutdown Alarm Alarm Alarm Alarm Alarm Alarm Alarm Alarm Shutdown Alarm Shutdown Shutdown Shutdown INPUT SIGNAL Generator voltage Generator voltage Generator frequency Generator frequency Generator current Battery voltage Battery voltage Battery voltage Engine temperature Engine temperature Engine temperature Oil pressure Oil pressure Engine speed Engine speed Refer to the All fault circuits may be user field programmed for different control functions however their designated fault function is not programmable. programming instructions for further information. PM047 Rev 13 05/03/30 24 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER 4.4.2. GENERATOR AC VOLTAGE/FREQUENCY/CURRENT 4.4.2.1. GENERATOR UNDERVOLTAGE The MEC 20 controller provides a 3-phase undervoltage sensor for the generator supply.

The undervoltage sensor is programmable for type of fault action (i.e. alarm or shutdown), pickup and dropout voltage setpoints (i.e. adjustable hysteresis) and transient time delay settings. Refer to the programming instructions for further information. 4.4.2.2.

GENERATOR OVERVOLTAGE The MEC 20 controller provides a 3-phase overvoltage sensor for the generator supply. The overvoltage sensor is programmable for type of fault action (i.e. alarm or shutdown), pickup and dropout voltage setpoints (i.e. adjustable hysteresis) and transient time delay settings. Refer to the programming instructions for further information. 4.4.2.

3. GENERATOR UNDERFREQUENCY The MEC 20 controller provides an underfrequency sensor for the generator supply. The underfrequency sensor is programmable for type of fault action (i.e. alarm or shutdown), frequency setpoint, and transient time delay settings. Refer to the programming instructions for further information. 4.4.2.4.

GENERATOR OVERFREQUENCY The MEC 20 controller provides an overfrequency sensor for the generator supply. The overfrequency sensor is programmable for type of fault action (i.e. alarm or shutdown), frequency setpoint, and transient time delay settings. Refer to the programming instructions for further information. 4.4.2.5. GENERATOR OVERCURRENT The MEC 20 controller provides a 3-phase current sensor for the generator supply. The current sensor is programmable for type of fault action (i.e. alarm or shutdown), pickup current setpoint, and transient time delay settings. Refer to the programming instructions for further information. PM047 Rev 13 05/03/30 25 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER 4.

4.3. BATTERY VOLTAGE ANALOG INPUT The MEC 20's battery voltage sensor measures DC voltage on terminals B+ and B- that are connected to the engines cranking battery. The battery voltage sensor provides information to perform the following control functions: 4.4.

3.1. WEAK BATTERY ALARM The weak battery alarm fault circuit is activated when the battery voltage drops below a pre-determined setpoint for a specified time delay. The weak battery alarm will detect a low capacity (i.e. "weak") battery condition during the cranking cycle. The weak battery alarm is programmed for a lower battery voltage setpoint and shorter time delay than the low battery alarm function. other functions. information. The weak battery alarm fault is programmable for voltage setpoint level, transient time delay settings and Refer to the programming instructions for further 4.

4.3.2. LOW BATTERY VOLTAGE ALARM The low battery voltage alarm fault circuit is activated when the battery voltage drops below a pre-determined setpoint for a specified time delay. The low battery voltage alarm fault is programmable for the voltage setpoint level, transient time delay settings and other functions. Refer to the programming instructions for further information. 4.4.3.3.

HIGH BATTERY VOLTAGE ALARM The high battery voltage alarm fault circuit is activated when the battery voltage rises above a pre-determined setpoint for a specified time delay. The high battery voltage alarm fault is programmable for voltage setpoint level, transient time delay settings and other functions. programming instructions for further information. Refer to the 4.4.

4. ENGINE TEMPERATURE ANALOG INPUT The MEC 20's engine temperature sensor measures a DC analog signal from an engine mounted sender. The MEC 20 software provides calibration for engine temperature to coordinate with the engine mounted sender and control logic to detect a wiring or sender failure (i.e. open or shorted signal).

In case of a sender or wiring failure, the MEC 20 will display zero or 9999 °C and will initiate an PM047 Rev 13 05/03/30 26 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER alarm signal as programmed by the user. The engine temperature analog input provides the following control functions: 4.4.4.1. LOW ENGINE TEMPERATURE ALARM The low engine temperature alarm fault circuit is activated when the engine temperature drops below a pre-determined setpoint for a specified time delay. The low engine temperature alarm fault is programmable for temperature setpoint level, transient time delay settings and other functions. Refer to the programming instructions for further information. 4.4.

4.2. HIGH ENGINE TEMPERATURE #1 ALARM The high engine temperature alarm fault circuit is activated when the engine temperature rises above a pre-determined setpoint for a specified time delay. The high engine temperature alarm fault is programmable for the level of temperature setpoint, transient time delay settings and other functions. Refer to the programming instructions for further information. 4.4.4.3. HIGH ENGINE TEMPERATURE #2 SHUTDOWN The high engine temperature shutdown fault circuit is activated when the engine temperature rises above a pre-determined setpoint for a specified time delay. The high engine temperature shutdown fault is programmable for the level of temperature setpoint, transient time delay settings and other functions. Note: If the engine temperature exceeds 170 degrees Celsius as monitored by the analog input, the engine will shutdown regardless of setpoint. Refer to the programming instructions for further information. Note: High Engine Temperature shutdown may alternately be programmed and wired as a digital fault input contact. Refer to Section 4.

3 for further details. 4.4.5. ENGINE OIL PRESSURE ANALOG INPUT The MEC 20's engine oil pressure sensor measures a DC analog signal from an engine mounted sender.

The MEC 20 software provides calibration for oil pressure to coordinate with the engine mounted sender and control logic to detect a wiring or sender failure (i.e. open or shorted signal). In case of a sender or wiring failure, the MEC 20 will display zero or 9999 PSI and will initiate an PM047 Rev 13 05/03/30 27 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER alarm and/or shutdown signal as programmed by the user. pressure analog input provides the following control function: The engine oil 4.4.5.1. LOW OIL PRESSURE #1 ALARM The low oil pressure alarm fault circuit is activated when the oil pressure drops below a pre-determined setpoint for a specified time delay. The low oil pressure alarm fault is programmable for pressure setpoint level, transient time delay settings and other functions.

programming instructions for further information. Refer to the 4.4.5.2. LOW OIL PRESSURE #2 SHUTDOWN The low oil pressure shutdown fault circuit is activated when the oil pressure drops below a pre-determined setpoint for a specified time delay. The low oil pressure shutdown fault is programmable for pressure setpoint level, transient time delay settings and other functions. Refer to the programming instructions for further information. Note: Low Oil Pressure shutdown may alternately be programmed and wired as a digital fault input contact.

details.
Refer to Section 4.3 for further 4.4.6. ENGINE SPEED ANALOG INPUT The MEC 20's engine speed sensor measures AC voltage and frequency from an engine mounted magnetic pick-up.
The engine speed sensor provides information to perform the following control functions: Overspeed shutdown Crank Disconnect control Loss of speed signal detection Starter Re-engage control RPM display Refer to the programming instructions for further information. 5. CONTROL OUTPUT CONTACT DESCRIPTIONS All output contacts from the MEC 20 Engine Controller are non-powered (i.e. dry contacts) and are rated 10A/240Vac, 8A/24Vdc resistive (3A inductive, 0.
4pf). Output contacts are not fused therefore external overcurrent protection (maximum 10A) is required for all control circuits using these contacts. Contacts indicated on schematic drawings and connection diagrams are shown in a de-energized state and will change state upon activation of the specific control function. PM047 Rev 13 05/03/30 28 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER 5.1. RUN, CRANK, COMMON FAIL OUTPUT CONTACTS The MEC 20 Controller provides three dedicated output contacts for basic control and alarm circuits as described below: 5.1.1. RUN OUTPUT The Run output contact is a Form "A" dry contact and is used to control the engines "run" circuit. This typically includes external control devices such as "fuel rack solenoids" or electronic governors'.

Note: An additional pilot relay will be required to energize high current devices that exceed the 10A resistive rating. The run output control logic provides an "energize to run signal" (i.e. the run contact closes when a run condition is activated). Note: For energize to stop control logic, refer to the programmable output control function. 5.1.2. CRANK OUTPUT The Crank output contact is a Form "A" dry contact and is used to control an external crank pilot relay that directly controls the engine starter motor. Note: An external crank pilot relay is required to energize the high current starter motor pinion solenoid that exceeds the 10A resistive crank output contact rating.
The crank output contact closes when a crank condition is activated and the contact will automatically open when crank disconnect speed is obtained and/or the generators output AC voltage exceeds 10% of nominal level. The generators output AC voltage is utilized for back-up crank disconnect protection should the speed sensor fail. 5.1.3.
COMMON FAIL OUTPUT The Common Fail output contact is a Form "C" dry contact and is typically used to provide a remote alarm signal should the generator set fail. The common fail output contact closes when any programmed alarm or shutdown fault condition is activated. Note: The MEC 20 may be programmed to activate the common fail output for any desired fault input circuits or for abnormal switch position (i.e. switch not in auto).
Refer to the programming instructions for further information. 5.2. PROGRAMMABLE OUTPUT CONTACTS The MEC 20 Controller provides four standard programmable output contacts. Each programmable output is a Form "C" dry contact that is programmable for many different PM047 Rev 13 05/03/30 29 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER control functions. All programmable outputs may be user field programmed for the desired control function. The following programmable features are provided: ENERGIZE TO STOP AIR FLAP OIL BYPASS TIMER COMPLETE COMMON FAIL SWITCH NOT IN AUTO ENGINE READY ENGINE RUN (FUEL) PREHEAT ENGINE RUNNING ATS TEST COMMON ALARM COMMON SHUTDOWN EPS SUPPLYING LOAD GEN READY TO LOAD UTILITY READY TO LOAD DIGITAL FAULTS #1 #12 OVERSPEED LOSS OF SPEED SIGNAL LOW BAT VOLTAGE HIGH BAT VOLTAGE WEAK BAT VOLTAGE LOW OIL PRESS #1 ALARM LOW OIL PRESS #2 SHUTDOWN HIGH ENG TEMP #1 ALARM HIGH ENG TEMP #2 SHUTDOWN 5.2.1. ENERGIZE TO STOP The designated programmable output relay will energize when a stop signal has been activated.

The output will remain energized for 10 seconds once the engine has come to a complete stop, then de-energizes. 5.2.2. IDLE CONTROL The designated programmable output relay will energize when an idle signal has been issued to the engine controller. The output contact would typically be connected to the "idle/run" input control of an electronic governor. Note: The controller receives an idle signal from a digital input contact that must additionally be programmed for an idle function. During an idle condition, the engine controller automatically bypasses all alarm or shutdown circuits except oil pressure, digital fault input #1, digital fault input #2 and overspeed) which are programmed for "bypass on start". 5.2.
3. PRE/POST/CYCLIC LUBE CONTROL The designated programmable output relay will energize when a "lube" signal has been initiated. Note: The Lube function will be automatically terminated PM047 Rev 13 05/03/30 30 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER once an engine start signal is issued. Refer to the programming instructions for further information. 5.
2.4. SWITCH NOT IN AUTO The designated programmable output relay will energize when the controller's operation mode switch is not in the auto position. 5.2.
5. OVERCURRENT The designated programmable output relay will energize when the overcurrent fault circuit is activated. The output will remain energized until the fault condition has been manually reset (if programmed as a latching type fault) or until the overcurrent level drops below the setpoint. 5.2.6. ENGINE READY The designated programmable output relay will energize when the engine controller's mode switch is in the auto mode and no shutdown or alarm conditions are present. 5.2.7.

PREHEAT The designated programmable output relay will energize during the start delay timer period and cranking period until the engine starts and reaches crank disconnect speed. The preheat output is typically used for an engine starting aid such as glow plugs. Note: An external pilot relay is required to switch the high current glow plug load. 5.2.8. GEN READY TO LOAD The designated programmable output relay will energize when the generators voltage and frequency exceeds predetermined setpoints (e.g. voltage 90% nominal, frequency 95% nominal as user programmed) and a warm-up time delay period expires. Once the output has energized, it will remain latched on irrespective of voltage/frequency levels until the controller either has a stop/shutdown signal, or the engine's speed drops below crank disconnect level.
The voltage, frequency and time delay levels programmable. Refer to Section 10.3 for Programming. PM047 Rev 13 05/03/30 31 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER The Generator Ready To Load output is typically used in an Auto Mains Failure (AMF) application. operation.

Refer to Section 9.3.5 for further details on sequence of 5.2.9.
UTILITY READY TO LOAD The designated programmable output relay will energize when the remote start input has not been activated (i.e. contact on terminals 16 & 17 is not closed) and the Return Delay & Neutral Delays have expired (if programmed). The output will de-energize when the remote start input has been activated and the Engine Start Delay & warm-up Delays have expired (if programmed). This output is typically used for Auto Mains Failure (AMF) applications. Refer to Section 9.3.5 for further details on the sequence of operation. 5.2.

10. ENGINE RUNNING The designated programmable output relay will energize when the engine has started and has reached crank disconnect speed. 5.2.11. ENGINE RUN (FUEL) The designated programmable output relay will energize when the engine "RUN" (i.e. FUEL) energizes prior to the engine starting. The output will remain on until the engine has reached a "stop" or "shutdown" command. 5.
2.12. AIRFLAP The designated programmable output relay will energize when the engine's speed exceeds the overspeed setpoint level. The output will remain energized until the engine's speed drops below the low speed setpoint (typically 5% of rated speed). Note: An external pilot relay will be required if the main air flap solenoid current rating exceeds the MEC 20 contact rating.
5.2.13. ATS TEST NOTE: This control feature is only operative if a remote transfer switch is interconnected with remote testing capability. PM047 Rev 13 05/03/30 32 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER The designated programmable output relay will energize when a load test operating mode is selected via the front keypad push-button.
Once initiated, the engine will receive a start signal from the transfer switch and upon the generator reaching nominal voltage and frequency levels, a load transfer will be initiated. The generator set will remain running on load until a different operating mode is selected or the generator set develops an alarm or shutdown condition. Notes: 1) The MEC 20's standard programmable output contact is factory supplied with the ATS LOADTEST function programmed. When the "Utility Ready to Load" and "Generator Ready to Load" outputs are programmed, the "Load Test" programmable output is not required as the engine starting logic is internally initiated. 2) When both "Utility Ready to Load" and "Generator Ready to Load" programmable outputs are programmed and utilized in a AMF control configuration, the ATS Output is not utilized (i.e. engine start signal is internally generated). 5.2.14.

OIL BYPASS TIMER COMPLETE The designated programmable output relay will energize upon the expiry of the controller's oil bypass delay timer function, following a normal start sequence. 5.2.15. COMMON ALARM The designated programmable output relay will energize when any alarm fault circuit has been activated. 5.2.16. COMMON FAIL The designated programmable output relay will energize when any alarm or shutdown fault circuit has been activated. 5. 2.17. COMMON SHUTDOWN The designated programmable output relay will energize when any shutdown fault circuit has been activated. PM047 Rev 13 05/03/30 33 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER 5.2.
18. EPS SUPPLYING LOAD The designated programmable output relay will energize when the engine is running and the generator is supplying current to the load more than or equal to 10% of nominal CT ratio. 6. REMOTE COMMUNICATION OPTION The MEC 20 engine generator controller is available with an optional remote communication feature. The remote communication feature allows a MEC 20 controller to be monitored and controlled from a remote location via serial communication link to a personal computer (PC).
*PC's may be connected locally via serial communication cable to the MEC 20 or remotely via modem and telephone systems. Remote communication can be via customer supplied equipment or an external communication interface module (CIM) as manufactured by Thomson Technology. The CIM module utilizes an internal modem and contains ModbusTM protocol to interface with different remote monitoring software programs. Refer to separate literature for detailed information on the CIM module. The MEC 20 remote communication option must be ordered and be factory enabled prior to shipment. The communication feature cannot be user enabled once shipped from the factory. The MEC 20 communication port utilizes a RS422 data transmission signal which is directly interconnected to the CIM module via 8 conductor, shielded cable with plug-in RJ45 connectors. Refer to FIGURE #14 & 15 for detailed information on direct connected or remote connected PC applications with CIM module. TMTrademarks belong to their respective parties. PM047 Rev 13 05/03/30 34 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER CIM Communication Interface Module Phone no connection GRD +- G To expansion output module (optional) J6 GRD Port 2A Port 3B J7 GRD MEC 20 Engine Controller RS 232 Signal 15M (50')** maximum cable length THS 2000 DC Power 8-35Vdc 8 conductor Shielded Cable c/w RJ45 connectors 305M (1000')** maximum cable length null modem connector Personal Computer **Communication cable wiring must be suitably routed to protect it from sources of electrical interference.*

*Refer to installation section for further information. G:\ENGINEER\PRODUCTS\MEC20\MEC20_20.VSD FIGURE #14 MEC 20 WITH CIM MODULE & DIRECT CONNECTED PC CIM Communication Interface Module Phone +G GRD To expansion output module (optional) J6 GRD Port 2A no connection Port 3B J7 GRD MEC 20 Engine Controller DC Power 8-35Vdc 8 conductor Shielded Cable c/w RJ45 connectors 305M (1000')** maximum cable length **Communication cable wiring must be suitably routed to protect it from sources of electrical interference. Refer to installation section for further information. G:\ENGINEER\PRODUCTS\MEC20\MEC20_21.VSD Modem Personal Computer FIGURE #15 MEC 20 WITH CIM MODULE & REMOTE CONNECTED PC PM047 Rev 13 05/03/30 35 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER The MEC 20 RS422 communication port allows multiple MEC 20 controllers to be directly interconnected together to form a single network system. Up to 10 MEC 20 controllers may be interconnected to a single CIM module. Each MEC 20 controller is programmed with an unique communication address number for the remote communication system to reference. CIM module. Refer to FIGURE #15 for a typical MEC 20 network system with CIM module.*
*The network system may be connected to a local PC or to a remote PC via telephone system and CIM Communication Interface Module Phone +G 8 conductor Shielded Cable c/w RJ45 connectors J6 GRD Port 2A no connection Port 3B GRD J7 MEC 20 Engine Controller #1 MEC 20 Engine Controller #2 MEC 20 Engine Controller #3 DC Power 8-35Vdc THS 305M (1000')** maximum cable length J6 GRD J7 Modem Personal Computer J6 GRD J7 **Communication cable wiring must be suitably routed to protect it from sources of electrical interference.*

Refer to installation section for further information. To additional MEC 20 controllers (maximum 10 total per network) G:\ENGINEER\PRODUCTS\MEC20\MEC20_22.VSD FIGURE #16 NETWORKED MEC 20 INTERCONNECTION DIAGRAM PM047 Rev 13 05/03/30 36 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER 7. EXPANSION OUTPUT MODULE OPTION An optional expansion output module is available for the MEC 20 engine generator controller.

This module provides 16 individual fault output contacts for remote alarming or control purposes. The expansion module is interconnected to the MEC 20 controller via RS 422 communication link utilizing 8 conductor shielded cable with plug-in RJ45 connectors. Refer to FIGURE #17 for the expansion output module connection diagram. TO MEC 20 J6 1A 12-24VDC POW ER INPUT B+ B+ J1 RJ45 IN TO ADDITIONAL EXPANSION UNIT J2 RJ45 OUT RE LAY ID C282/NFP A S TAN DARD FAULTS (J17 O FF) 1 2 3 EMERGENCY STOP OVERCRANK OVERSPEED LOSS OF SPEED SIGNAL W EAK BATTERY LOW BATTERY VOLTAGE HIGH BATTERY VOLTAGE LOW ENGINE TEMPERATURE HIGH ENGINE TEMPERATURE ALARM LOW OIL PRESSURE ALARM DIGITAL FAULT #1 DIGITAL FAULT #2 DIGITAL FAULT #3 DIGITAL FAULT #4 SW ITCH NOT IN AUTO PROGRAMMABLE OUTPUT #5 ADD ITIO NAL FAUL TS (J17 O N) B- B- GRD 5 4 5 GRD 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 K8 4 3 3 17 K1 3 3 6 7 K9 18 19 8 9 10 K2 3 3 K10 20 21 11 12 13 K3 3 3 K11 22 23 14 15 16 K4 3 3 K12 24 25 1 2 3 27 4 5 6 7 8 30 31 9 10 11 32 12 13 K5 3 3 UNDER VOLTAGE OVER VOLTAGE UNDER FREQUENCY OVER FREQUENCY OVER CURRENT HIGH ENGINE TEMPT 2 SHUTDOW N LOW OIL PRESSURE 2 SHUTDOW N DIGITAL FAULT #5 DIGITAL FAULT #6 DIGITAL FAULT #7 DIGITAL FAULT #8 DIGITAL FAULT #9 DIGITAL FAULT #10 DIGITAL FAULT #11 DIGITAL FAULT #12 PROGRAMMABLE OUTPUT #6 K13 26 K6 3 3 K14 28 29 K7 3 3 K15 K16 4 2 J17 14 15 16 NO TE S : 1 2 3 ALL CONTACTS RATED MAXIMUM 0.5A, 120Vac/1.

0A, 30Vdc RESISTIVE PROGRAMMABLE MODULE ADDRESS (REMOVE JUMPER FOR STANDARD C282/NFPA FAULTS,ADD JUMPER FOR ADDITIONAL FAULTS) CONTACT LOGIC IS INDIVIDUALLY PROGRAMMABLE VIA PIN JUMPERS (CONTACT TO OPEN OR CLOSE W HEN FAULT ACTIVATED) PROGRAMMABLE CONTACT - USER CONFIGURED FUNCTION VIA MEC 20 SOFTW ARE (REFER TO MEC 20 LITERATURE) "GRD" CONNECTION TO BE MADE TO COMMON CHASSIS/ENCLOSURE GROUND BOND SYSTEM C282 OR NFPA 110 STANDARD FAULTS EXCLUDE ANALOG FAULTS OVER/UNDER VOLTAGE, OVER/UNDER FREQUENCY, OVERCURRENT, SPARE DIGITAL FAULT INPUTS #5-#12 AND PROGRAMMABLE OUTPUT #6 (I.E. MUST SPECIFY SECOND EXPANSION MODULE TO OBTAIN CONTACTS FOR THESE FAULTS). G:\ENG INEER\PRODUCTS\MEC 20\MEC20_15.VSD 4 5 6 FIGURE #17 : EXPANSION OUTPUT MODULE CONNECTION DIAGRAM PM047 Rev 13 05/03/30 37 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER The expansion module outputs are relay contacts which may be individually configured for normally open or normally closed contact position. Contact configuration is via circuit board mounted jumper pins and clips. Refer to FIGURE #18 for jumper pin location and configuration settings. Each output contact is rated maximum 0.5A 120Vac, 1.0A 30Vdc resistive.

Each expansion module also provides one programmable contact for desired control function. The programmable contact on the first expansion module (in the system) is referenced as "Programmable Output #5". On the second expansion module, the programmable contact is referenced as "Programmable Output #6". Refer to Section 9.0 of this manual for programming functions and procedures for the programmable contact feature. Note: The communication cable between the MEC 20 and the expansion module must be ordered separately. JMP 1-10, 16 JMP FOR NORMALLY OPEN CONTACT JMP FOR NORMALLY CLOSED CONTACT TB1 B+ B- GRD 1 K2 K3 K4 K5 K6 K7 K8 K9 K10 20 K1 JMP1 JMP2 JMP3 JMP4 JMP5 JMP6 JMP7 JMP8 JMP9 JMP10 JMP11 K11 K12 K13 K14 K15 K16 21 JMP12 JMP13 JMP14 JMP15 JMP16 32 J1 RJ45 (IN) J2 RJ45 (OUT) DIAGNOSTIC LED'S JMP 17 OFF - STANDARD C282/NFPA FAULTS ON - ADDITIONAL FAULTS G:\ENGINEER\PRODUCTS\MEC20\MEC20_16.VSD FIGURE #18: MEC 20 EXPANSION OUTPUT MODULE PRINTED CIRCUIT BOARD LAYOUT PM047 Rev 13 05/03/30 38 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER Diagnostic LED's are provided on each expansion module as shown in FIGURE #17. Their functions are described as follows: WATCHDOG - This LED flashes on and off at a very high rate which indicates that the expansion module microprocessor is functioning normally. MESSAGE - This LED flashes on and off at irregular intervals which indicates that the expansion module is correctly receiving all data messages from the MEC 20.

Two expansion modules may be connected to a single MEC 20 controller to provide a maximum of 32 output contacts. Two modules are interconnected together using a single communication cable to the MEC 20 controller. Refer to FIGURE #19 for interconnection details. The first expansion module addresses standard C282/NFPA110 MEC 20 fault circuits1 and the second expansion module addresses all additional fault circuits. To select which faults are addressed by each expansion module, jumper pins and clips are provided on the circuit boards.

Refer to FIGURE #18 for jumper pin location and configuration settings. Expansion M odule #2 (Additional Fault C irc uits) Expansion M odule #1 (C 282/N F PA Stand ard F ault C ircuits) 8 conductor Shielded Cable c/w RJ45 connectors J6 GRD GRD J7 J17 on J17 off GRD M EC 20 Engine C ontroller 300M (~1000') m axim um cable length 1 To rem ote com m unication system (optional) C282 or NFPA 110 standard faults exclude analog faults Over/Under voltage, Over/Under Frequency, Overcurrent, spare digital inputs #5-#12 and programmable output #6 (i.e. must specify second expansion module to obtain contacts for these faults). G:\ENGINEER\PRODUCTS\MEC20\MEC20_17.

VSD FIGURE #19 MEC 20 EXPANSION MODULE INTERCONNECTION DIAGRAM PM047 Rev 13 05/03/30 39 Thomson Technology MEC 20 MICROPROCESSOR ENGINE/GENERATOR CONTROLLER 8. EAP 110 REMOTE ANNUNCIATOR OPTION An optional EAP 110 remote annunciator is available for the MEC 20 engine generator controller. The standard features of the EAP 110 meet and exceed all requirements of NFPA 110, NFPA 99 & CSA 282-00 building code standards for Emergency Standby Generator systems. The design uses a 8 conductor RS 422 communication data link to provide the control & monitoring signals between the engine controller and remote annunciator. Up to 20 individual fault conditions are remotely monitored utilizing both visual LED lights & audible alarm annunciation. The EAP 110 is DC powered from the same 12 or 24V engine starting battery as the engine controller is connected to.