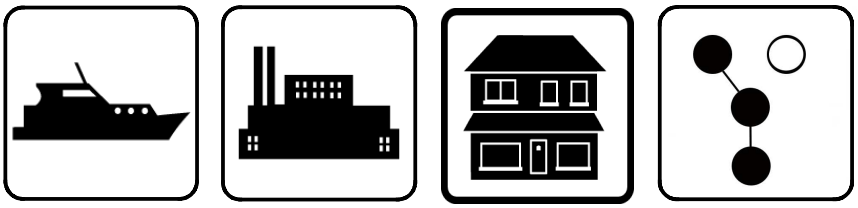
Protocol Operation

Modbus® Communications Protocol



Models:

Generator Set Controllers:

APM402 and APM802
Decision-Maker® 3+, 340, 550, 3000, 3500, 6000, and 8000

Master Control Panel:

MCP 3000

Transfer Switch Controllers:

M340/M340+, MPAC® 1000 and MPAC® 1500
Decision-Maker® MPAC 750, 1200, and 1500

Power Monitor:

PM340

KOHLER®

TP-6113 12/21p

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IMPORTANT SAFETY INSTRUCTIONS. Electromechanical equipment, including generator sets, transfer switches, switchgear, and accessories, can cause bodily harm and pose life-threatening danger when improperly installed, operated, or maintained. To prevent accidents be aware of potential dangers and act safely. Read and follow all safety precautions and instructions. SAVE THESE INSTRUCTIONS.

This manual has several types of safety precautions and instructions: Danger, Warning, Caution, and Notice.

DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

Safety decals affixed to the equipment in prominent places alert the operator or service technician to potential hazards and explain how to act safely. The decals are shown throughout this publication to improve operator recognition. Replace missing or damaged decals.

Accidental Starting

WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Shut down the generator set. (2) Place the controller in Out of Service mode. (3) Press the emergency stop button. (4) Disconnect the power to the battery charger, if equipped. (5) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

(APM802 Controller)

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Move the generator set master switch to the OFF position. (2) Disconnect the power to the battery charger. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent starting of the generator set by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer.

(Decision-Maker® 3+ and 550 Generator Controllers)

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Press the generator set off/reset button to shut down the generator set. (2) Disconnect the power to the battery charger, if equipped. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

(RDC, DC, RDC2, DC2, Decision-Maker® 3000, 3500, 6000 and APM402 Generator Controllers)

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) If the controller is not already in the MAN (manual) mode, press the Controller Mode button and then press the MAN mode button. (2) If the generator set is running, press and hold the Manual- Stop button for at least 2 seconds to stop the generator set. (3) Press the Controller Mode button and then press the controller Off mode button. (4) Disconnect the power to the battery charger, if equipped. (5) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

(Decision-Maker® 8000 Controller)

Hazardous Voltage/ Moving Parts

⚠ DANGER



Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

⚠ DANGER



Hazardous voltage.
Will cause severe injury or death.

Only authorized personnel should open the enclosure.

Grounding electrical equipment. Hazardous voltage will cause severe injury or death. Electrocution is possible whenever electricity is present. Ensure you comply with all applicable codes and standards. Electrically ground the generator set, transfer switch, and related equipment and electrical circuits. Turn off the main circuit breakers of all power sources before servicing the equipment. Never contact electrical leads or appliances when standing in water or on wet ground because these conditions increase the risk of electrocution.

Servicing the transfer switch. Hazardous voltage will cause severe injury or death. Deenergize all power sources before servicing. Turn off the main circuit breakers of all transfer switch power sources and disable all generator sets as follows: (1) Move all generator set master controller switches to the OFF position. (2) Disconnect power to all battery chargers. (3) Disconnect all battery cables, negative (-) leads first. Reconnect negative (-) leads last when reconnecting the battery cables after servicing. Follow these precautions to prevent the starting of generator sets by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer. Before servicing any components inside the enclosure: (1) Remove all jewelry. (2) Stand on a dry, approved electrically insulated mat. (3) Test circuits with a voltmeter to verify that they are deenergized.

(Decision-Maker® 3+ and 550 Generator Controllers)

Servicing the transfer switch. Hazardous voltage will cause severe injury or death. Deenergize all power sources before servicing. Turn off the main circuit breakers of all transfer switch power sources and disable all generator sets as follows: (1) Press the generator set off/reset button to shut down the generator set. (2) Disconnect power to all battery chargers. (3) Disconnect all battery cables, negative (-) leads first. Reconnect negative (-) leads last when reconnecting the battery cables after servicing. Follow these precautions to prevent the starting of generator sets by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer. Before servicing any components inside the enclosure: (1) Remove all jewelry. (2) Stand on a dry, approved electrically insulated mat. (3) Test circuits with a voltmeter to verify that they are deenergized.

(RDC, DC, RDC2, DC2, Decision-Maker® 3000, 3500, 6000 and APM402 Generator Controllers)

Making line or auxiliary connections. Hazardous voltage will cause severe injury or death. To prevent electrical shock deenergize the normal power source before making any line or auxiliary connections.

Short circuits. Hazardous voltage/current will cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage**.** Do not contact electrical connections with tools or jewelry while making adjustments or repairs. Remove all jewelry before servicing the equipment.

Connecting the battery and the battery charger. Hazardous voltage will cause severe injury or death. Reconnect the battery correctly, positive to positive and negative to negative, to avoid electrical shock and damage to the battery charger and battery(ies). Have a qualified electrician install the battery(ies).

⚠ CAUTION



Hot surfaces.

Notice

NOTICE

Electrostatic discharge damage. Electrostatic discharge (ESD) damages electronic circuit boards. Prevent electrostatic discharge damage by wearing an approved grounding wrist strap when handling electronic circuit boards or integrated circuits. An approved grounding wrist strap provides a high resistance (about 1 megohm), *not a direct short*, to ground.

This manual provides instructions for using the Modbus® RTU communication protocol and TCP communication protocol (APM802 and Decision-Maker® 8000) with the following Kohler® controllers:

- APM802 generator set controller
- APM402 generator set controller
- Decision-Maker® 3+ generator set controller with communications
- Decision-Maker® 340 generator set controller *
- Decision-Maker® 550 generator set controller
- Decision-Maker® 3000 generator set controller
- Decision-Maker® 3500 generator set controller
- Decision-Maker® 6000 paralleling generator set controller
- Decision-Maker® 8000 generator set controller
- Decision-Maker® MPAC 750 ATS Controller
- Decision-Maker® MPAC 1200 ATS Controller
- Decision-Maker® MPAC 1500 ATS Controller
- MCP 3000 Master Control Panel for the Decision-Maker® Paralleling System
- M340/M340+ ATS controller *
- MPAC™ 1000 ATS controller
- MPAC™ 1500 ATS controller
- PM340Power Monitor *

* Device must be equipped with Modbus®/KBUS converter kit GM41143-KP3 for Modbus® communication.

Note: For APM603 controller communication protocol information, including Modbus registers, see TP-7151.

Information in this publication represents data available at the time of print. Kohler Co. reserves the right to change this literature and the products represented without notice and without any obligation or liability whatsoever.

Read this manual and carefully follow all procedures and safety precautions to ensure proper equipment operation and to avoid bodily injury. Read and follow the Safety Precautions and Instructions section at the beginning of this manual.

Modbus® is a registered trademark of Schneider Electric.

Modbus Protocol

The Modbus® protocol, initially developed by the Modicon Corporation, is a de facto industry communication standard used by a controller to communicate with other devices. A complete discussion of the protocol is beyond the scope of these instructions. See the applicable Modbus® master application program documentation or other reliable technical information sources for Modbus® protocol details.

This manual contains:

- Modbus® connection information
- Controller setup instructions
- Modbus® register documentation

The system designer assumes responsibility for ensuring that the equipment is used only as intended by the manufacturer. Always conduct a full test and debug of the programming software prior to installing and using it in the system. The manufacturer disclaims any and all responsibility for use of third-party application software that will be used to control the equipment.

List of Related Materials

The protocol covered in this manual is part of a total control system. The controller operation manual provides information about setting up the controller to enable remote communications and programming. It also provides information about equipment operating limits, specifications, and functions. See Figure 1 for document part numbers.

Consult the specification sheets, accessory installation instructions, service bulletins, application notes, drawings, and other applicable literature for additional information on equipment operating limits and specifications. Contact your local distributor/dealer or the equipment manufacturer to obtain applicable literature.

Operation Manual for Model:	Part Number
APM802 Controller	TP-7070
Decision-Maker® 3+ Controller	TP-6161
Decision-Maker® 340 Controller	TP-5829
Decision-Maker® 550 Controller:	
Version 2.10 and higher	TP-6200
Versions prior to 2.10	TP-6083
Controller Setup and Application	TP-6140
APM402/Decision-Maker® 3000 Controller	TP-6694
Decision-Maker® 3500 Controller:	
Marine	TP-6861
Diesel Towable	TP-6895
Prime Power Industrial	TP-6914
Gas Towable	TP-6935
Decision-Maker® 6000 Controller	TP-6750
Decision-Maker® 8000 Controller	TP-6990
Master Control Panel (MCP 3000) for DPS	TP-6747
Decision-Maker® MPAC ATS Controls:	
Decision-Maker® MPAC 750	TP-6865
Decision-Maker® MPAC 1200	TP-6866
Decision-Maker® MPAC 1500	TP-6883
Automatic Transfer Switches with MPAC™ 1500 Controls:	
MPAC™ 1500 Version 2.00 and higher	TP-6714
Model KCS, KCP	TP-6446
Model KSS, KSP	TP-6447
Model KBS, KBP Bypass/Isolation	TP-6448
Model KGS, KGP Bypass/Isolation	TP-6449
Automatic Transfer Switches with MPAC™ 1000 Controls:	
Model KCT, KCP	TP-6126
Model KBT, KBP Bypass/Isolation	TP-6128
Model KDT, KDP	TP-6225
M340+ Transfer Switch Controller	TP-5664
PM340 power monitor	TP-5875
Communication Module for the Decision-Maker™ 3+ Generator Set Controller	TT-1377
Installation Instructions, Connection and Converter Kits	TT-1405

Figure 1 List of Related Materials

Service Assistance

For professional advice on generator set power requirements and conscientious service, please contact your nearest Kohler distributor or dealer.

- Visit the Kohler Co. website at KOHLERPower.com.
- Look at the labels and decals on your Kohler product or review the appropriate literature or documents included with the product.
- Call toll free in the US and Canada 1-800-544-2444.
- Outside the US and Canada, call the nearest regional office.

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Fax: (86) 21 6288 0550

India, Bangladesh, Sri Lanka
India Regional Office
Bangalore, India
Phone: (91) 80 3366208
(91) 80 3366231
Fax: (91) 80 3315972

Japan, Korea
North Asia Regional Office
Tokyo, Japan
Phone: (813) 3440-4515
Fax: (813) 3440-2727

Notes

1.1 Network Configurations

A controller can communicate directly to a Modbus® master or participate in a network of devices. It can also be used to interface a local master to a network of devices.

The Modbus® master polls slave devices for data. Controller devices are slaves. Examples of master devices are a personal computer running Monitor III software (or other Modbus® driver) and the RSA 1000 remote serial annunciator.

In an RS-485 network, there can be only one master device. See Figure 1-1 through Figure 1-4 for an overview of the possible configurations. The configuration chosen determines required connections and the controller setup. All devices in a network must use the same baud rate.

The 550 controller can use either RS-232 or RS-485 connections, and can function as an RS-232 to RS-485 converter. The APM802 and Decision-Maker® 8000 controllers support both RS-485 and Ethernet connections. Other controllers covered in this manual use RS-485 connections.

A Modbus®/Ethernet converter is required for connection of an MCP 3000 to a Modbus® network. See Figure 1-5. Connect the converter to the Ethernet port as described in Section 10.

A Modbus®/Ethernet converter can be used to connect a controller or multiple controllers connected in an RS-485 network to the ethernet. See Figure 1-6. One or more Modbus® masters can then communicate with the devices over the Ethernet. The MPAC™ 1500 and Decision-Maker® MPAC transfer switch controllers do not require a Modbus®/Ethernet converter.

Note: Install communication conductors in raceways, cables, or conduit separate from AC power conductors.

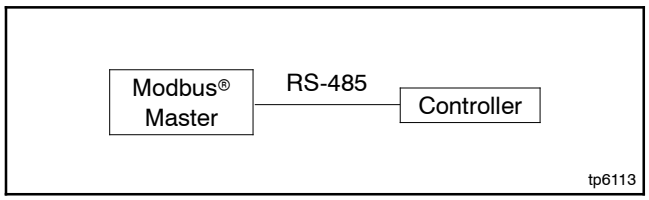


Figure 1-1 Single RS-485 Connection

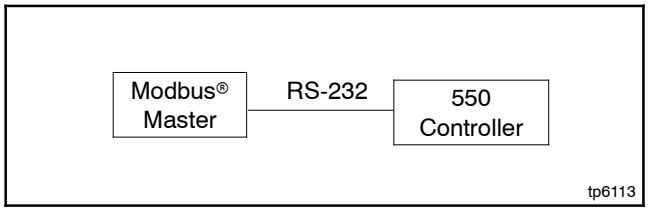


Figure 1-2 Single RS-232 Connection, 550 Controller

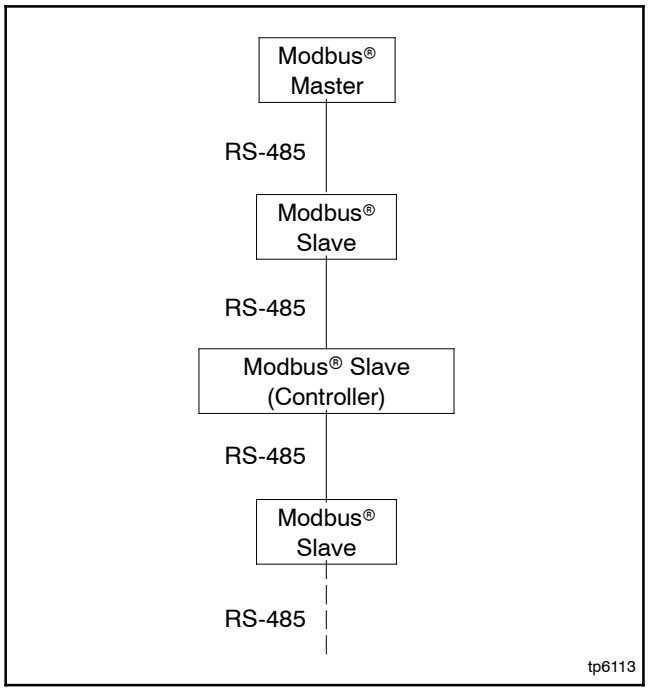


Figure 1-3 RS-485 Network

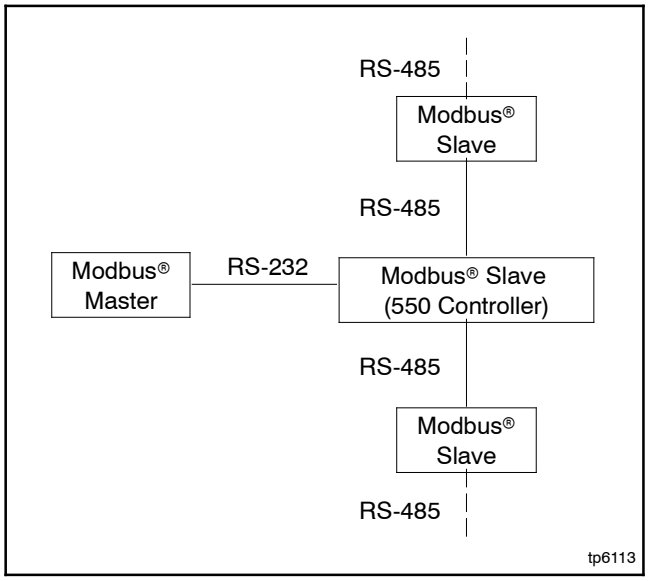


Figure 1-4 RS-485 Network with the 550 Controller used as a Converter

Modbus® is a registered trademark of Schneider Electric.

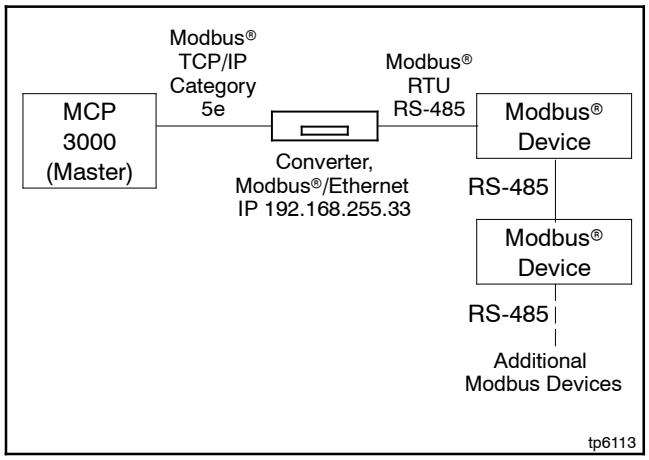


Figure 1-5 MCP 3000 Connection

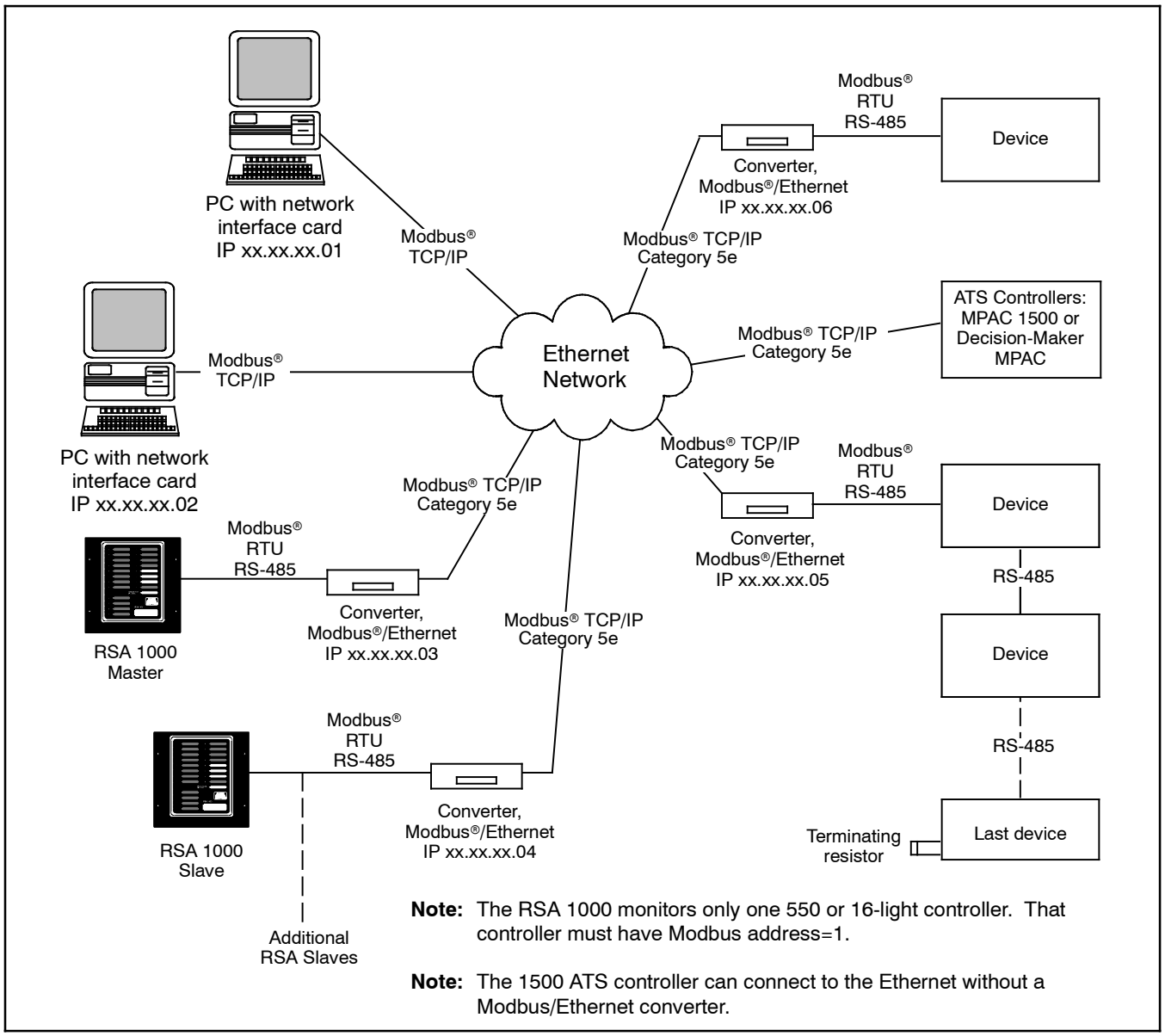


Figure 1-6 Ethernet Connections

1.2 Serial Settings

Kohler® controllers use the settings shown in Figure 1-7.

All devices in a network must use the same baud rate. Refer to TT-1405 or the section in this manual for your device to find the available baud rates.

Property	Setting
Data Bits	8
Parity	None
Stop Bits	1

Figure 1-7 Serial Settings

1.3 Modbus Protocol Definitions

The Kohler® devices covered by this manual use the Modbus codes listed in this document to communicate with Kohler® Monitor III software. For other Modbus applications, the Modbus master must be programmed to read the Modbus registers shown in this manual. A system designer trained in the application of Modbus® protocol must write and thoroughly test the program before implementation.

The tables in Sections 5 through 15 document the generator set controller information available using the Modbus® protocol.

In the tables, all word (16-bit) expressions are integers unless otherwise noted and are shown in decimal notation unless otherwise noted. Hexadecimal expressions begin with 0x. Characters are in the standard 8-bit ASCII character set. Unspecified bytes are undefined, such as the high (most significant) byte of holding registers that contain byte data in the low (least significant) byte.

This section defines terms and symbols used in the Modbus register tables.

Register. Modbus® registers are 16-bit registers and are numbered consecutively. Request of blocks of multiple registers is supported. Requests for no more than 100 registers are supported at one time. Registers are grouped into blocks of related data. Do not read registers past the end of the block where noted in the tables. Do not start a block read of multiple registers at a register that is not defined.

Access. The access column shows the type of access allowed to the register. RO is read only, WO is write only, and RW is read and write.

Data Description. The data description column describes the information located at the address.

Data Type. The data type column indicates whether the parameter is a WORD, SWORD, or LONG. See Figure 1-8. If multiple registers are used, the data type column shows the number of words used (e.g. WORD*10), and the range/units/notes column provides a breakdown of the information available within the parameter.

Data Type	Description
WORD	16-bit unsigned (neither positive nor negative) value
SWORD	16-bit signed (two's complement) value
LONG	32-bit unsigned value. The least significant word (LSW) is first (at the lowest address).

Figure 1-8 Data Types

WORD [0:15]. Represents a 16-bit word that may be divided to contain several items. Bits 0 through 15 are arranged right-to-left, with bit 0 on the right. See Figure 1-9.

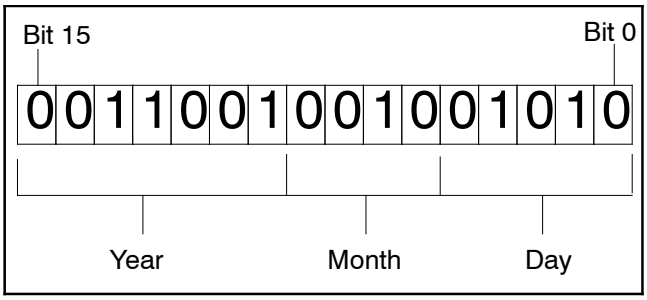


Figure 1-9 16-Bit Word Containing Date
10 February, 2025 (see the example)

Example: From Section 12.4, MPAC® 1000 register number 41320 contains the system start date. Bits 0 through 4 contain the date of the month, 0-31, represented in binary format. Bits 5 through 8 contain the month, 1-12. Bits 9-15 give the year, starting with the year 2000 (number 0) and extending through 2127 (number 127). For example, the 10th of February, 2025, would be represented as shown in Figure 1-9.

Metric or English Units. The controller display setting determines whether the units are returned or interpreted as metric or English. Read or alter this setting in register 40139 (550 controller only).

Pipe (|). A pipe symbol (|) indicates the breakdown of data within a word, with the most significant byte first. For example, min.|sec means that the most significant byte contains minutes and the least significant byte contains seconds. In the 550 controller defined common fault registers, selected|setpoint shows that the first byte indicates whether a given fault has been assigned to the defined common fault, and the last byte indicates the setpoint value for that item.

Pipe Example: Refer to address 40113 for the 550 controller. The table shows that the current date starts at register 40113 and that the date requires two words, or two registers. Register 40113 contains day|month and register 40114 contains year (two-digits)|day of the week.

Using the read holding registers function to read two registers gives the following **hexadecimal** data:

Register 40113: 190C
Register 40114: 0102

The most significant byte of register 40113 is 19 hexadecimal, which equals 25. This is the day. The least significant byte of register 40113 is 0C hexadecimal, which equals 12. This is the month, December.

The most significant byte of register 40114 is 01 hexadecimal, which equals 1. This gives the year, 2001. The least significant byte of register 40114 is 02 hexadecimal, which equals 2. This gives the day of the week, Tuesday(0= Sunday.)

The date is December 25, 2001, a Tuesday.

Setpoints. Setpoints are non-zero values only for analog inputs. The setpoint values for the analog inputs are:

1=Low Warning
2=High Warning
3=Low Shutdown
4=High Shutdown

All other setpoint values are zero (0=none).

Strings. Strings are character data represented in standard ASCII code. Strings are written as they appear on the controller display, with spaces used to pad to the right. The first character in a string is located in the most significant byte in the first register. The last character is located in the least significant byte of the last word.

Range/Units. This column lists additional information about the register type when applicable. For example, if multiple WORDs are used, this column describes the information stored in each WORD. It also lists the units for measurements that have them, the range for valid input or output when applicable, and the scale factor for some parameters. Bit 0 is the least significant bit and bit 15 is the most significant.

Ranges and Bits. Some registers list a range of items with a bit set for each item. Interpret the first number in the range as corresponding to Bit 0 and the last number in the range as corresponding to Bit 15. See Section 5.5.6, System Event Codes, for an example.

ECM only. This notation indicates that the item is available only for generator sets equipped with engine control modules (ECMs).

Device ID. Register 49999 contains the device ID for the devices shown in Figure 1-10. The device ID for 340-series devices is set with DIP switches on the Modbus/KBUS converter. See TT-1405, Installation Instructions, provided with the converter.

Controller	Device ID in Register 49999
APM802	69
APM402	75
Decision-Maker®3+	18
MPAC™ 1000	19
Decision-Maker®550	20
MPAC™ 1500	23
Decision-Maker® 3000	37
Decision-Maker® 3500	49
Decision-Maker® 6000	41
Decision-Maker® 8000	68
Decision-Maker® MPAC:	
MPAC 750	26
MPAC 1200	27
MPAC 1500	23

Figure 1-10 Device ID

1.4 Modbus Functions and Exception Codes

The controllers support the Modbus® functions listed in Figure 1-11. The controller sends exception codes to the Modbus® master to indicate errors. Figure 1-12 lists the exception codes and possible causes.

Modbus® Function	Function Name	Description
03	Read Holding Registers	Reads a single register or a range of registers.
06	Preset Single Register	Sets the value of a single register. Use this function to set all data occupying a single register.
16	Preset Multiple Registers	Sets the value of a sequence of registers. Use this function to set all data occupying multiple registers. The maximum number of registers is 16.

Figure 1-11 Supported Modbus® Functions

Exception Code	Message	Possible Causes
01	Illegal Function	Violates the register access type. Attempts to write registers when the controller programming mode is not set to remote. Attempts to write too many registers using Preset Multiple Registers. The maximum number of registers is 16. Function is not supported.
02	Illegal Data Address	Attempts to read too many registers. The maximum is 50. Attempts to access a nonexistent register.
03	Illegal Data Value	Attempts to set a register to a value outside of the allowable limits. Attempts to set system parameters while the generator set is not in OFF or AUTO. Specifies an incorrect number of registers while attempting to read or write data occupying a sequence of registers. Attempts to modify digital input while the input is high. Attempts to modify analog input while the input is out of range. Attempts to modify preset input that cannot be changed. Attempts to read outside a restricted block. Attempts to define an invalid common fault. Attempts to activate an RDO that is not software-controlled. Attempts to start the engine while the timed run is active.

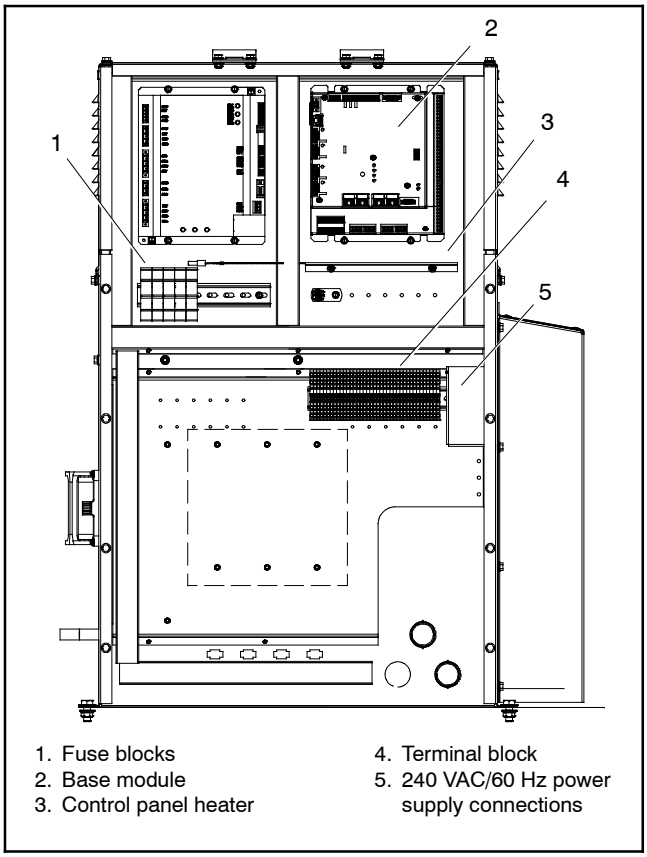
Figure 1-12 Supported Modbus® Exception Codes

Notes

The following section covers controller configurations and connections and provides a list of Modbus® registers. The APM802 supports both Modbus® RTU, Section 2.2, and Modbus® TCP, Section 2.3. Section 2.4 covers the connection procedure for either RTU or TCP.



Figure 2-1 APM802 Controller



1. Fuse blocks
2. Base module
3. Control panel heater
4. Terminal block
5. 240 VAC/60 Hz power supply connections

Figure 2-2 Control Panel Component Identification

2.1 Controller Safety

Carefully read and follow all safety precautions in this section and at the beginning of the manual before performing any work on the generator set. Refer to the controller operation manual as needed.

⚠ WARNING

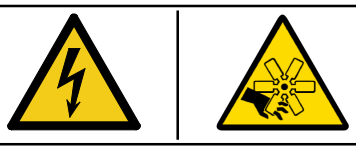


Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Shut down the generator set. (2) Place the controller in Out of Service mode. (3) Press the emergency stop button. (4) Disconnect the power to the battery charger, if equipped. (5) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

DANGER



Hazardous voltage. Moving parts. Will cause severe injury or death.

Operate the generator set only when all guards and electrical enclosures are in place.

Grounding electrical equipment. Hazardous voltage will cause severe injury or death. Electrocution is possible whenever electricity is present. Ensure you comply with all applicable codes and standards. Electrically ground the generator set, transfer switch, and related equipment and electrical circuits. Turn off the main circuit breakers of all power sources before servicing the equipment. Never contact electrical leads or appliances when standing in water or on wet ground because these conditions increase the risk of electrocution.

Connecting the battery and the battery charger. Hazardous voltage will cause severe injury or death. Reconnect the battery correctly, positive to positive and negative to negative, to avoid electrical shock and damage to the battery charger and battery(ies). Have a qualified electrician install the battery(ies).

Short circuits. Hazardous voltage/current will cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage**.** Do not contact electrical connections with tools or jewelry while making adjustments or repairs. Remove all jewelry before servicing the equipment.

DANGER



Hazardous voltage.
Will cause severe injury or death.

Only authorized personnel should open the enclosure.

DANGER



Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

CAUTION



Hot surfaces.

Note: The controller heater, located in the upper compartment, can become extremely hot when activated.

2.2 Controller RS-485 Settings

Use RS-485 cable for Modbus® RTU connections. Belden #9841 or equivalent shielded, twisted-pair cable is recommended. See Figure 2-3. See Figure 2-7 for the Modbus® connection location on TB10.

The controller communicates using Modbus® as a slave connection with the Modbus® master initiating the communication. The controller seeks the system and alternator parameters and diagnostic information then responds back to the Modbus® master.

Note: Only one Modbus® master can be connected to the controller. Examples include the remote serial annunciator and switchgear applications.

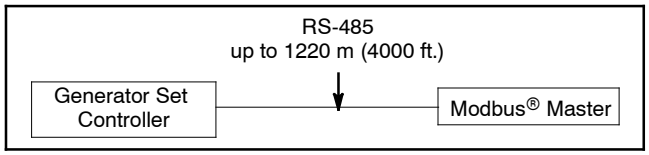


Figure 2-3 Modbus® Connections

The APM802 supports baud rates of 9600, 19200, 38400, or 57600 but is factory configured with a baud rate of 19200 and an address of #1. See Figure 2-4 for the default APM802 controller settings and the controller operation manual for more information about these settings. The controller settings are located on 6.5.2 Serial Link screen under the Communications menu. See Figure 2-5.

Serial Link Settings	Setting Selection
Speed	19200 bauds
Stop bit	1
Parity	Without
Function	Modbus slave
Slave number (address)	1

Figure 2-4 APM802 Configuration

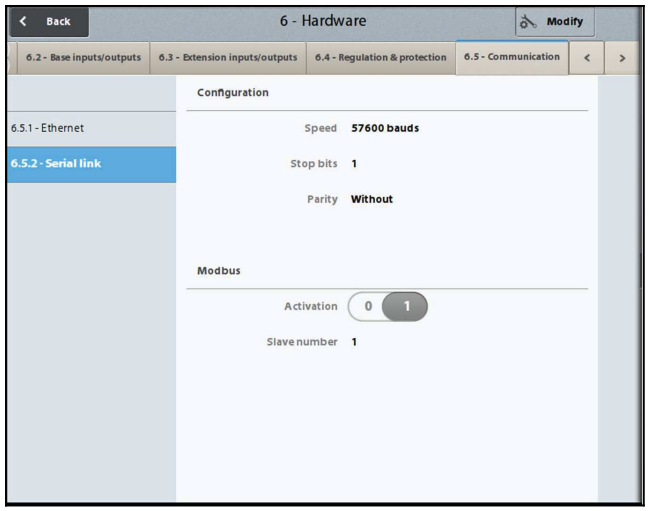


Figure 2-5 Serial Link Screen

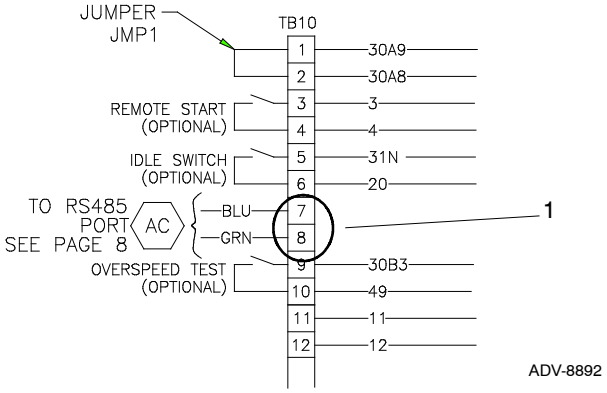
On the APM802 controller, the RS-485 connections are located on customer connection terminal block (TB10) and the 120 Ω resistor is located on the base module. See Figure 2-6. Figure 2-7 and Figure 2-8 show the RS-485 connections on TB10.

Note: If experiencing communication issues, verify that the positive and negative wires are connected to the correct terminals on TB10.



1. 120 Ω resistor, RS-485

Figure 2-6 APM802 Controller Base Module



1. RS-485 communication connections

Figure 2-7 RS-485 Connectors on TB10

TB10 Connector	Circuit Board Designation	Wire Designation
7	(-)	Blue
8	(+)	Green
Do not connect at TB10 or base module; tape to insulate unused end.		Shield

Figure 2-8 APM802, RS-485 Connections on TB10

2.3 Controller Ethernet Settings

The controller also supports Modbus® TCP over Ethernet. Connect to the RJ45 port labeled Ethernet 3 on the controller's base module (see Figure 2-9). For TCP/IP settings, refer to Ethernet screen 6.5.1 (Figure 2-10) under the controller communication menu. The *TCP/IP settings* at the top of the screen are accessible for modification at the operator level.

1. Make the network connections by inserting the RJ45 connector into the Ethernet 3 port on the controller base module. See Section 2.4 for the connection procedure.
2. Login as operator 1966.

   Note: For operator level access, enter 1966 for the login (user). A password is not required.

3. Enter the address type under Addressing Mode and then the IP address under DNS server. See Figure 2-11.



1. Ethernet 3 port

Figure 2-9 APM802 Controller Base Module

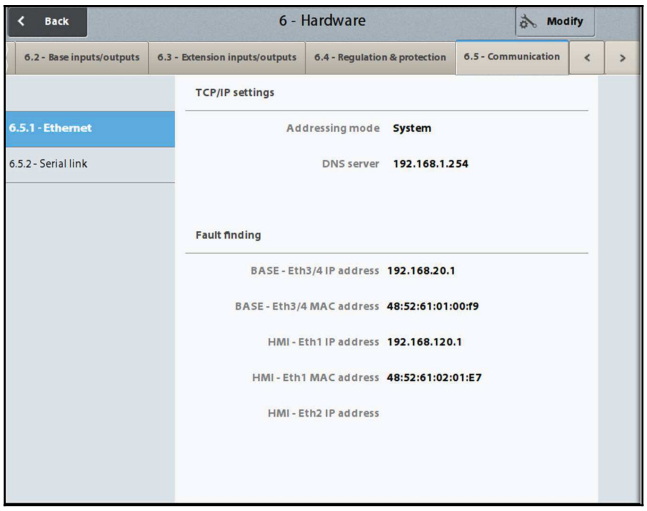


Figure 2-10 Ethernet Screen

TCP/IP Settings	Description and Possible Settings
Addressing mode *	Choice of address type for the TCP/IP connection: System, Customer IP, or DHCP. †
DNS server	IP address of the DNS server. The DNS server is used to make the connection between an APM802 system and an IP address.

* IP = Internet Protocol; MAC = Media Access Control.

† DHCP: the DHCP protocol (Dynamic Host Configuration Protocol) allows an APM system to connect to a network, which dynamically assigns it an IP address

Figure 2-11 Ethernet Settings

2.4 Connection Procedure (RS-485 or Ethernet)

1. Before working on the generator set or connected equipment, disable the generator set. Read and follow the safety precautions in Section 2.1.
   a. Remove the load from the generator set.
   b. Shut down the generator set.
   c. Place the generator set controller into **Out-of-Service** mode and press the emergency stop button.
   d. Disconnect the power to the battery charger.
   e. Remove the battery cables negative (-) lead first to disable the generator set.
2. Turn off and disconnect the power to all devices in the system.
3. Connect to RS-485 connections located TB10 (located in the junction box) as shown in Figure 2-12 and Figure 2-7 or to the RJ45 port labeled Ethernet 3 on the controller's base module as shown in Figure 2-9.

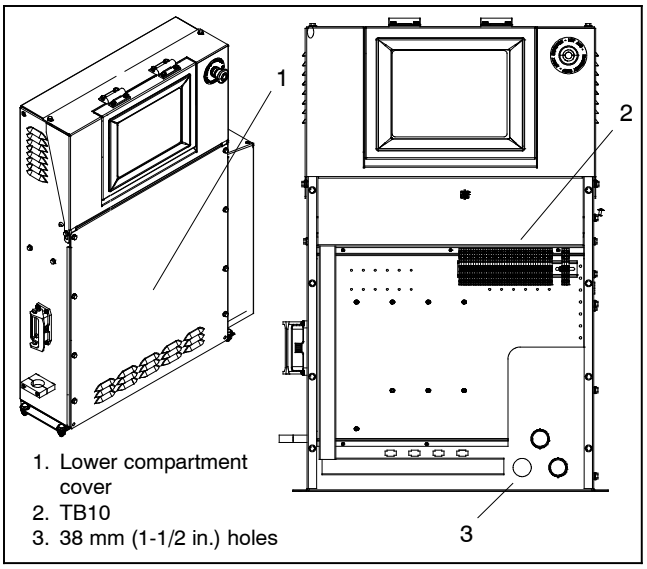


Figure 2-12 TB10 Location

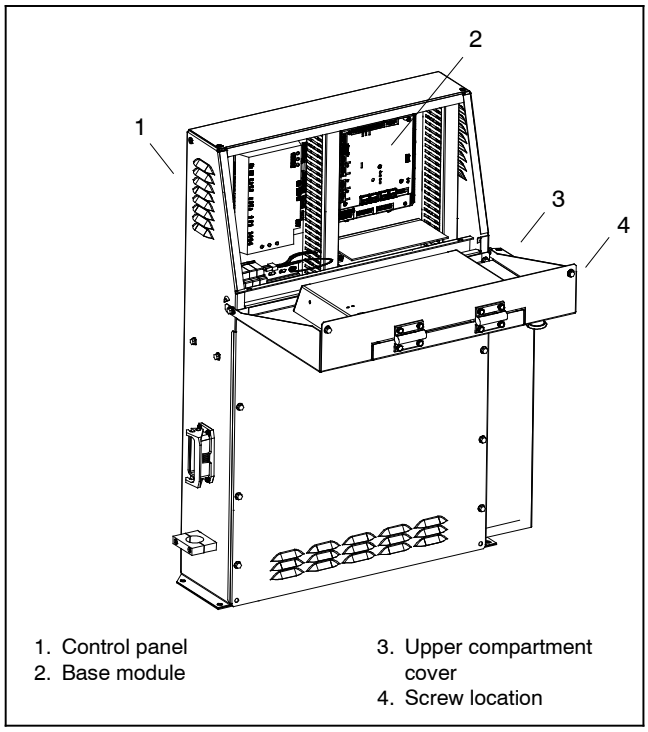


Figure 2-13 Base Module Location

4. Verify that the controller is OFF.
5. Reconnect the generator set engine starting battery, negative (-) lead last.
6. Reconnect power to the battery charger, if equipped.

2.5 Modbus Registers

This section contains Modbus® registers for the APM802 controller. Refer to Section 1.3 for definitions of terms and symbols used in the register tables.

Time delays, setpoints, inputs and outputs, and other user-defined parameters are entered through the controller keypad. Refer to the operation manuals for the controller or software for instructions. See the List of Related Materials for document part numbers.

Note: FFC0 = Unsupported register.

Register	Description	Access	Data Type	Units / Special Format
5893	Base Box Digital Input 0	Read	WORD	Bit 0
5894	Base Box Digital Input 1	Read	WORD	Bit 0
5895	Base Box Digital Input 2	Read	WORD	Bit 0
5896	Base Box Digital Input 3	Read	WORD	Bit 0
5897	Base Box Digital Input 4	Read	WORD	Bit 0
5898	Base Box Digital Input 5	Read	WORD	Bit 0
5899	Base Box Digital Input 6	Read	WORD	Bit 0
5900	Base Box Digital Input 7	Read	WORD	Bit 0
5901	Base Box Digital Input 8	Read	WORD	Bit 0
5902	Base Box Digital Input 9	Read	WORD	Bit 0
5903	Base Box Digital Input 10	Read	WORD	Bit 0
5904	Base Box Digital Input 11	Read	WORD	Bit 0
5905	Base Box Digital Input 12	Read	WORD	Bit 0
5906	Base Box Digital Input 13	Read	WORD	Bit 0
5907	Base Box Digital Input 14	Read	WORD	Bit 0
5908	Base Box Digital Input 15	Read	WORD	Bit 0
5909	Base Box Digital Input 16	Read	WORD	Bit 0
5910	Base Box Digital Input 17	Read	WORD	Bit 0
6149	Programmable I/O Module #0, Input 0	Read	WORD	Bit 0
6150	Programmable I/O Module #0, Input 1	Read	WORD	Bit 0
6151	Programmable I/O Module #0, Input 2	Read	WORD	Bit 0
6152	Programmable I/O Module #0, Input 3	Read	WORD	Bit 0
6153	Programmable I/O Module #0, Input 4	Read	WORD	Bit 0
6154	Programmable I/O Module #0, Input 5	Read	WORD	Bit 0
6155	Programmable I/O Module #0, Input 6	Read	WORD	Bit 0
6156	Programmable I/O Module #0, Input 7	Read	WORD	Bit 0
6213	Programmable I/O Module #1, Input 0	Read	WORD	Bit 0
6214	Programmable I/O Module #1, Input 1	Read	WORD	Bit 0
6215	Programmable I/O Module #1, Input 2	Read	WORD	Bit 0
6216	Programmable I/O Module #1, Input 3	Read	WORD	Bit 0
6217	Programmable I/O Module #1, Input 4	Read	WORD	Bit 0
6218	Programmable I/O Module #1, Input 5	Read	WORD	Bit 0
6219	Programmable I/O Module #1, Input 6	Read	WORD	Bit 0
6220	Programmable I/O Module #1, Input 7	Read	WORD	Bit 0
10631	Frequency	Read	WORD	Hz x 100
10632	L1- L0 Voltage	Read	WORD	
10633	L2- L0 Voltage	Read	WORD	
10634	L3- L0 Voltage	Read	WORD	
10635	L1- L2 Voltage	Read	WORD	
10636	L2- L3 Voltage	Read	WORD	
10637	L3- L1 Voltage	Read	WORD	
10638	L1 Current	Read	WORD	
10639	L2 Current	Read	WORD	
10640	L3 Current	Read	WORD	
10642	L1 kW	Read	SWORD	
10643	L2 kW	Read	SWORD	
10644	L3 kW	Read	SWORD	
10645	Total kW	Read	SWORD	
10646	L1 kVAR	Read	SWORD	
10647	L2 kVAR	Read	SWORD	
10648	L3 kVAR	Read	SWORD	
10649	Total kVAR	Read	SWORD	
10650	L1 Power Factor	Read	SWORD	PF x 100

Register	Description	Access	Data Type	Units / Special Format
10651	L2 Power Factor	Read	SWORD	PF x 100
10652	L3 Power Factor	Read	SWORD	PF x 100
10653	Total Power Factor	Read	SWORD	PF x 100
10655	Total kVA	Read	WORD	
12392	Total Run Time	Read	WORD	Hours
12395	Engine Speed	Read	WORD	RPM
12398	Coolant Temperature	Read	SWORD	Degrees C x 100
12400	Fuel Temperature	Read	SWORD	Degrees C x 100
12401	Oil Temperature	Read	SWORD	Degrees C x 100
12402	Intake Air Temperature	Read	SWORD	Degrees C x 100
12406	Fuel Level	Read	WORD	% x 100
12409	Oil Pressure	Read	WORD	Bar x 100
12410	Fuel Pressure	Read	WORD	Bar x 100
12420	Battery Voltage	Read	WORD	V x 100
33067	Total Fuel Consumption, metric	Read	WORD	Liters x 10
33068	Total Fuel Consumption, metric	Read	WORD	Liters / 1000
33069	Fuel Consumption Rate, metric	Read	WORD	Liters x 10 / hour
33070	Total Fuel Consumption, imperial	Read	WORD	Gallons x 10
33071	Total Fuel Consumption, imperial	Read	WORD	Gallons / 1000
33072	Fuel Consumption Rate, imperial	Read	WORD	Gallons x 10 / hour
43657	Base Box Digital Output 0	Read	WORD	Bit 0
43658	Base Box Digital Output 1	Read	WORD	Bit 0
43659	Base Box Digital Output 2	Read	WORD	Bit 0
43660	Base Box Digital Output 3	Read	WORD	Bit 0
43661	Base Box Digital Output 4	Read	WORD	Bit 0
43662	Base Box Digital Output 5	Read	WORD	Bit 0
43663	Base Box Digital Output 6	Read	WORD	Bit 0
43664	Base Box Digital Output 7	Read	WORD	Bit 0
43665	Base Box Digital Output 8	Read	WORD	Bit 0
43666	Base Box Digital Output 9	Read	WORD	Bit 0
43667	Base Box Digital Output 10	Read	WORD	Bit 0
43668	Base Box Digital Output 11	Read	WORD	Bit 0
43669	Base Box Digital Output 12	Read	WORD	Bit 0
43670	Base Box Digital Output 13	Read	WORD	Bit 0
43671	Base Box Digital Output 14	Read	WORD	Bit 0
43672	Base Box Digital Output 15	Read	WORD	Bit 0
43673	Base Box Digital Output 16	Read	WORD	Bit 0
43674	Base Box Digital Output 17	Read	WORD	Bit 0
43913	Programmable I/O Module #0, Output 0	Read	WORD	Bit 0
43914	Programmable I/O Module #0, Output 1	Read	WORD	Bit 0
43915	Programmable I/O Module #0, Output 2	Read	WORD	Bit 0
43916	Programmable I/O Module #0, Output 3	Read	WORD	Bit 0
43945	Programmable I/O Module #1, Output 0	Read	WORD	Bit 0
43946	Programmable I/O Module #1, Output 1	Read	WORD	Bit 0
43947	Programmable I/O Module #1, Output 2	Read	WORD	Bit 0
43948	Programmable I/O Module #1, Output 3	Read	WORD	Bit 0
49999	Device ID			APM802 = 69

Notes

3.1 Introduction

Decision-Maker® 3+ 16-Light controllers equipped with red main logic boards and a communication board have Modbus® communication capability. The controller:

- Requires the red logic board and a communication board for Modbus communication.
- Supports industry-standard Modbus® RTU protocol.
- Can use Modbus® TCP protocol with the addition of a Modbus/Ethernet converter.
- Uses RS-485 connections to connect to a Modbus® master singly or over an RS-485 network.
- Connects to an Ethernet network using a Modbus/ Ethernet converter.
- Uses 19200 baud rate.

The communication board is required for Modbus® communication with this controller. See Figure 3-2 and Figure 3-3. The communication board accessory kits are:

- GM32644-KA1 or KA2 (factory-installed)
- GM32644-KP1 (field-installed)

The kit includes the communication board, cables, mounting hardware, and installation instructions.

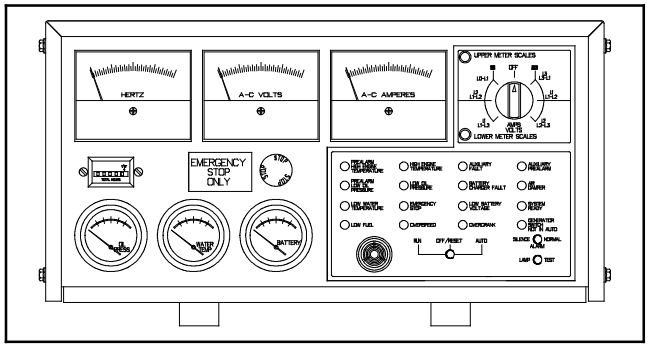


Figure 3-1 Decision-Maker® 3+ Controller

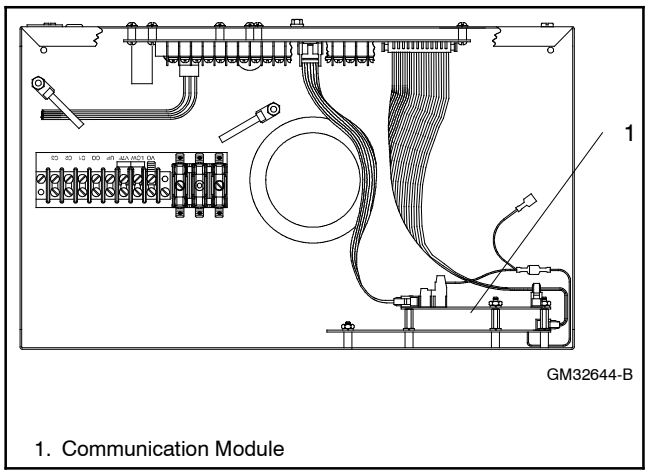


Figure 3-2 Communication Board Location (Controller Top View)

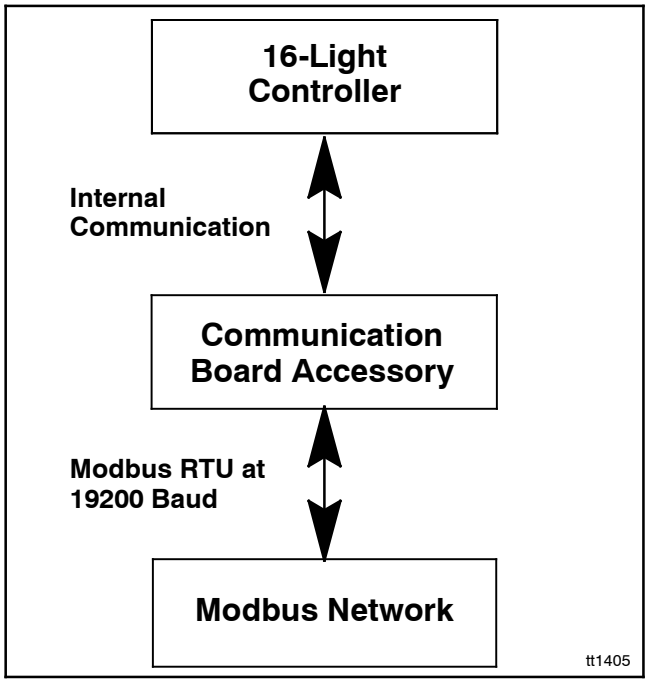


Figure 3-3 Communication Board Function

3.2 Communication Board Identification

Selected generator set models may be equipped with a gauge driver board, which does not provide Modbus® communication. The gauge driver board looks similar to the communication boards shown in Figure 3-4 and is installed in the same location. To identify the board, check the part number on the printed circuit board (PCB) and see Figure 3-5. Part numbers GM47242 and GM49791**-1** are Modbus® communication boards. Gauge driver board part number GM49791**-2** does **not** provide Modbus® communication. Obtain kit GM32644-KP1 to replace the gauge driver board, if necessary.

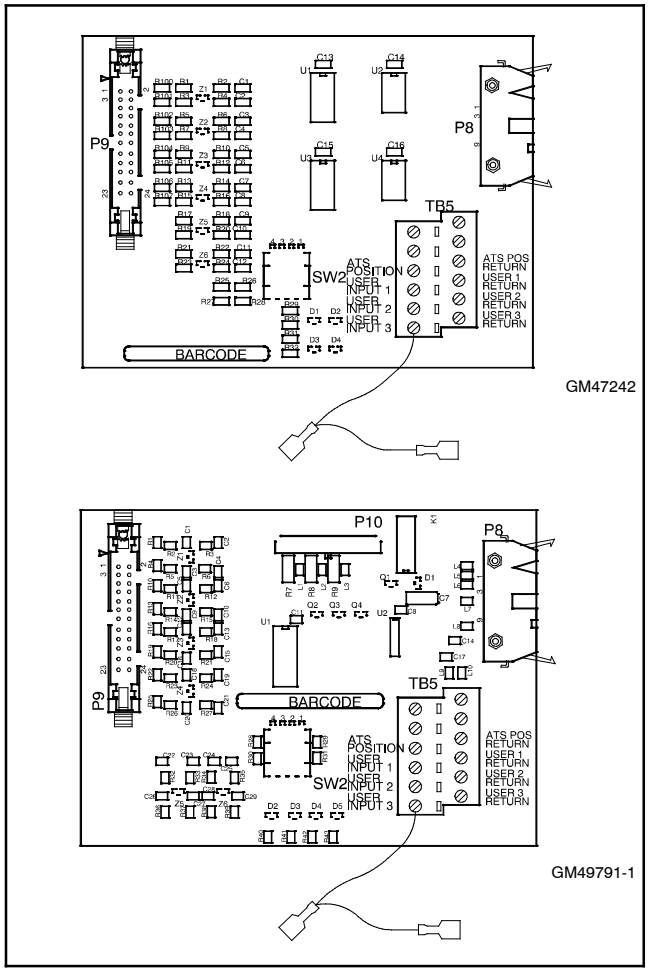


Figure 3-4 Communication Boards

PCB Part No.	Description
GM47242	Communication Board. Superseded by GM49791-1.
GM49791-1	Communication and Gauge Driver Board
GM49791-2	Gauge Driver Board (no Modbus communication)

Figure 3-5 PCB Board Identification

3.3 Controller Connection and Setup

This section describes how to connect the controller to other devices in a Modbus® network and set up the controller for Modbus® communication. Refer to TT-1377, provided with the communication module, for additional information.

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Move the generator set master switch to the OFF position. (2) Disconnect the power to the battery charger. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent starting of the generator set by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer.

⚠ DANGER



Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

Grounding electrical equipment. Hazardous voltage will cause severe injury or death. Electrocution is possible whenever electricity is present. Ensure you comply with all applicable codes and standards. Electrically ground the generator set, transfer switch, and related equipment and electrical circuits. Turn off the main circuit breakers of all power sources before servicing the equipment. Never contact electrical leads or appliances when standing in water or on wet ground because these conditions increase the risk of electrocution.

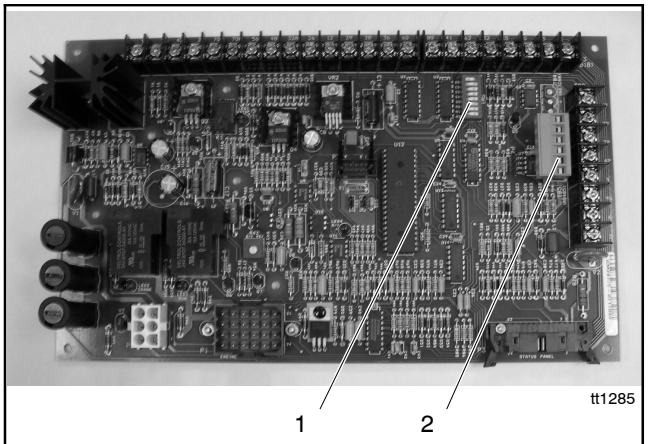
NOTICE

Electrostatic discharge damage. Electrostatic discharge (ESD) damages electronic circuit boards. Prevent electrostatic discharge damage by wearing an approved grounding wrist strap when handling electronic circuit boards or integrated circuits. An approved grounding wrist strap provides a high resistance (about 1 megohm), *not a direct short*, to ground.

3.3.1 Network Connection

Use Belden #9841 or equivalent cable to connect to other devices in an RS-485 network. Connect to the TB5 connector on the controller circuit board shown in Figure 3-6. Attach to the RS-485 connector as shown in Figure 3-7. Use a termination resistor on the last device in the network.

Circuit isolation is recommended for installations that may be exposed to electrical noise. See Appendix B, Noise and Wiring Practices.



1. DIP switches
2. TB5 connector Modbus RS-485 communication connection

Figure 3-6 Decision-Maker® 3+ Controller Circuit Board with DIP Switches

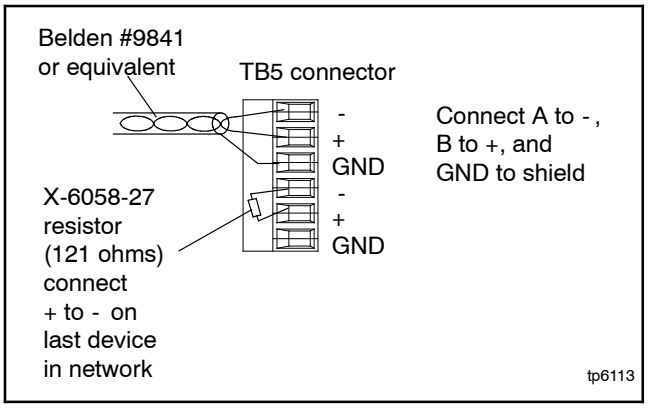


Figure 3-7 RS-485 Connection Details

3.3.2 Controller Setup

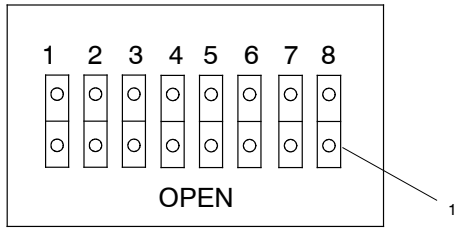
The controller circuit board contains eight DIP switches. Use DIP switches 6, 7, and 8 to set the controller's Modbus® address as described below. See Figure 3-6 for the DIP switch location on the controller circuit board.

Each Modbus® device in the network requires a unique address. Use DIP switches 6, 7, and 8 to assign a unique Modbus® address to each controller in the network. Figure 3-8 shows the DIP switch positions for each address number.

Push down the end of the DIP switch near the OPEN label to open the switch, or push down the other end to close it. See Figure 3-9.

Modbus® Address	DIP Switches		
	6	7	8
	Value = 2	Value = 4	Value = 8
1	Open	Open	Open
3	Closed	Open	Open
5	Open	Closed	Open
7	Closed	Closed	Open
9	Open	Open	Closed
11	Closed	Open	Closed
13	Open	Closed	Closed
15	Closed	Closed	Closed

Figure 3-8 Modbus® Address DIP Switches



1. Push this side down to open the switch.

Figure 3-9 DIP Switch Operation

3.4 Modbus Registers and Codes

This section contains Modbus® registers and codes for the Decision-Maker® 3+ controller with communications.

Refer to Section 1.3 for definitions of terms and symbols used in the register tables.

Note: Kohler often uses extended Modbus registers which exceed 9,999. To illustrate the extended format, Kohler has added an extra digit to its register map to support registers above 9,999. For example: Holding register 9999 may be illustrated as 49999 in the traditional format or as 409999 in the extended format where the most significant digit still represents what type of Modbus register it is. Some software tools may have difficulty reading registers above 9,999.

3.4.1 Modbus Registers

Register	Parameter	Access	Data Type	Range/Units
400001	System status	RO	WORD (0:3)	0: Set if in run mode, otherwise cleared 1: Set if in cooldown mode, otherwise cleared 2: 0 = 50 Hz; 1 = 60 Hz 3: Set if continuous crank enabled, Cleared if cyclic crank enabled 4: Set if generator running 5: Set if system ready
400002	Remote input status	RO	WORD[0:15]	0: Common fault 1: Low fuel 2: Battery charger fault 3: Low battery voltage 4: Air damper switch 5: Low coolant temperature (non-ECM and J1939) 6: Pre-high coolant temperature (non-ECM) 7: Emergency stop 8: ATS Emergency on 9: User Input #1 10: User Input #2 11: User Input #3 (dedicated to high battery voltage) 12: Communications module DIP switch #1 status 13: Communications module DIP switch #2 status 14: Communications module DIP switch #3 status 15: Communications module DIP switch #4 status
400003	Master switch position	RO	WORD	0 = Fault; 1 = Run; 2 = Auto; 4 = Off
400004	Engine RPM	RO	WORD	0- 4000 RPM
400005	Shutdown fault number	RO	WORD	See S/D Fault Code Table, Section 3.4.2, and Section 3.4.3
400006	Flags and warnings	RO	WORD	See Flags/Warnings Code Table, Section 3.4.4. Condition exists if bit is set.
400007	Oil pressure	RO	WORD	kPa
400008	Coolant temperature	RO	WORD	°C + 273
400009	Fuel pressure	RO	WORD	kPa
400010	Fuel temperature	RO	WORD	°C + 273
400011	Charge air pressure	RO	WORD	kPa
400012	Charge air temperature	RO	WORD	°C + 273
400013	ECM supply voltage	RO	WORD	VDC * 10 (0.0 - 99.9 VDC)
400014-400015	ECM hours	RO	WORD * 2	Hrs * 10 (0.0 - 99999.9 hr.) (most significant word first)
400016	ECM temperature	RO	WORD	°C + 273
400017	MDEC/ADEC fault codes	RO	WORD	See MDEC/ADEC engine documentation and Section 3.4.3
400018	Engine communication protocol	RO	WORD	0 = Non ECM; 1 = MTU; 2 = J1939; 3 = MTU w/VSG
400019	Code version	RO	WORD	0- 7: Minor version
				8- 15: Major version

Register	Parameter	Access	Data Type	Range/Units
400020	Manual operations	WO	WORD[0:2]	0: Remote start 1: Remote stop 2: Remote fault reset
409999	Device ID	RO	WORD	Decision-Maker® 3+ = 18

3.4.2 Shutdown Fault Codes

Fault Codes	Description
0	No faults present
1	Master switch not in auto (warning)
2	Master switch error
3	Overcrank
4	Locked rotor
5	Overspeed
6	Low oil pressure prealarm (warning)
7	Low oil pressure shutdown
8	High coolant temperature prealarm (warning)
9	High coolant temperature shutdown
10	Low coolant temperature (warning)
11	Aux. delay
12	Aux. immediate
13	MDEC/ADEC yellow alarm (warning)
14	MDEC/ADEC red alarm
15	Loss of ECM comms

3.4.3 MDEC/ADEC Fault Codes

Fault Condition	Register 400005	Register 400017	Controller Response
Loss of ECM communications	15	—	Auxiliary Fault LED on steady, horn on.
High engine temperature prealarm	—	67	High Engine Temperature Prealarm LED on steady, horn on.
High engine temperature shutdown	9	68	High Engine Temperature Prealarm and Shutdown LED's on steady, horn on.
Low engine temperature prealarm	—	—	Low Water Temperature LED on steady, horn on.
Low engine temperature shutdown	14	—	Low Water Temperature and Auxiliary Fault LED's on steady, horn on.
Overspeed shutdown	5	30	Overspeed LED on steady, horn on.
Low oil pressure prealarm	—	15	Low Oil Pressure Prealarm LED on steady, horn on.
Low oil pressure shutdown	7	16	Low Oil Pressure Prealarm and Shutdown LED's on steady, horn on.
Low fuel pressure prealarm	—	See MDEC/ADEC documentation	Auxiliary Fault LED flashing, horn cycling on/off.
Low fuel pressure shutdown	—	See MDEC/ADEC documentation	Auxiliary Fault LED on steady, horn on.
High charge air temperature prealarm	—	5	Auxiliary Fault LED flashing, horn cycling on/off.
High charge air temperature shutdown	14	6	Auxiliary Fault LED on steady, horn on.
Low coolant level shutdown	14	24	Auxiliary Fault LED on steady, horn on.
High lube oil temperature prealarm	—	51	Auxiliary Fault LED flashing, horn cycling on/off.
Generic MDEC/ADEC yellow alarm (prealarm)	—	See MDEC/ADEC documentation	Auxiliary Fault LED flashing, horn cycling on/off.
Generic MDEC/ADEC red alarm (shutdown)	14	See MDEC/ADEC documentation	Auxiliary Fault LED on steady, horn on.

3.4.4 Flags/Warnings

Warning Bits	Description
Bit 0 (LSB)	No AC voltage
Bit 1	MDEC/ADEC yellow alarm
Bit 2	Speed sensor fault
Bit 3	Intermittent speed sensor
Bit 4	Master switch not in auto
Bit 5	MDEC/ADEC charge air temperature warning
Bit 6	MDEC/ADEC low fuel pressure warning
Bit 7	MDEC/ADEC high oil temperature warning
Bit 8	Low oil pressure warning
Bit 9	High coolant temperature warning (MDEC/ADEC and J1939)
Bit 10	Low coolant temperature warning (MDEC/ADEC)
Bit 11	Unused
Bit 12	Unused
Bit 13	Unused
Bit 14	Unused
Bit 15 (MSB)	Unused

4.1 Introduction

The Decision-Maker® 340 controller uses KBUS protocol for communication. Modbus/KBUS converter kit GM41143-KP3 is required for Modbus communication with this controller. See Figure 4-2.

Installing the Modbus®/KBUS converter kit allows this controller to communicate with a personal computer running Monitor III software. For other Modbus applications, the Modbus master must be programmed to read the Modbus registers shown in this manual. A system designer trained in the application of Modbus® protocol must write and thoroughly test the program before implementation.

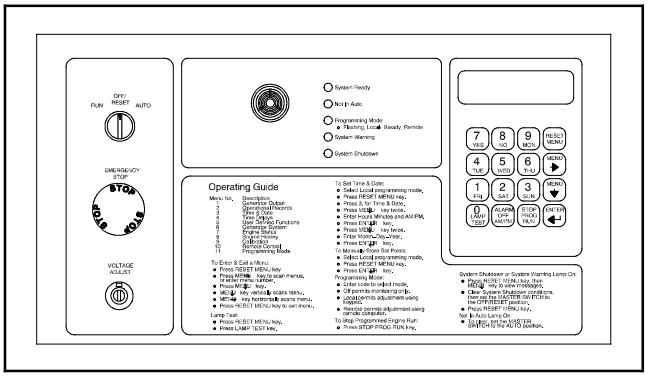


Figure 4-1 Decision-Maker 340 Controller

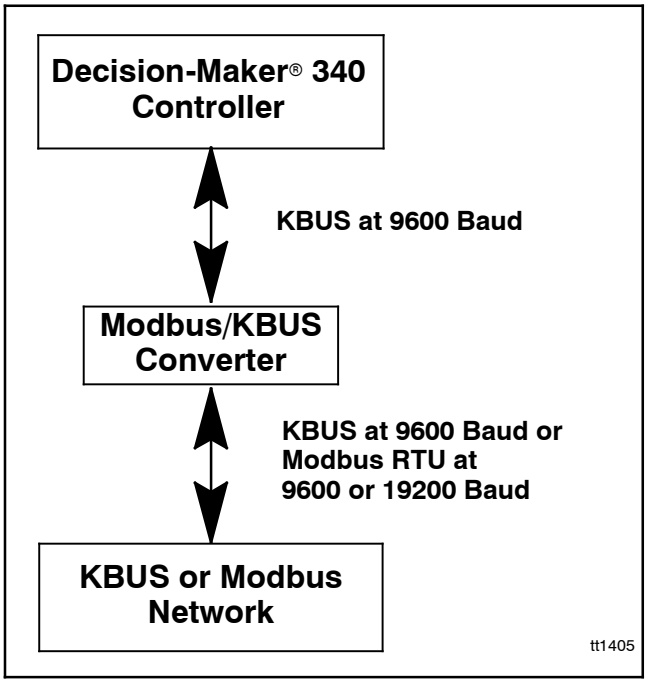


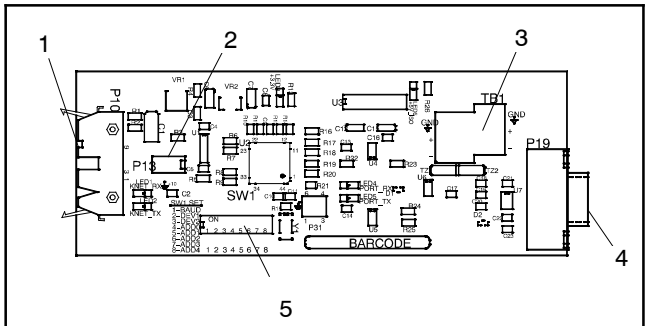
Figure 4-2 Modbus/KBUS Converter Function

4.2 Hardware and Connections

The Modbus/KBUS converter replaces RS-232 and RS-485 communication modules and allows the selection of either KBUS or Modbus communication. Figure 4-3 shows the Modbus/KBUS converter circuit board. See Figure 4-4 for the converter location inside the controller.

If your device is equipped with an RS-232/RS-485 communication module, remove the old communication module and ribbon cable before installing the new Modbus/KBUS converter and ribbon cable.

Refer to Installation Instructions TT-1405, provided with the converter kit, for converter installation and connection instructions. Set the converter DIP switches for baud rate, device type, and network address as described in TT-1405.



1. P10, ribbon cable connection for 340 generator set and power monitor
2. P13, ribbon cable connection for ATS controller
3. RS-485 connection TB1
4. RS-232 connection P19
5. DIP switches 1 - 8

Figure 4-3 Modbus/KBUS Converter Board



1. Converter location inside controller

Figure 4-4 Modbus/KBUS Converter Location

4.3 Controller Setup

Configure the controller for remote communications by setting the parameters shown in Figure 4-5. See TT-1405 and the controller operation manual for more information.

Device	Menu or Index	Parameter	Setting
Decision-Maker® 340 generator set controller	Menu 10, Remote Control	Remote Control: Online?	YES
		Remote Control: Local, LAN, Remote, or Remote Area Network?	Select the appropriate setting for your connection type. Use Local for Ethernet connections. See TT-1405 for more information.
		Address	Any *
		Baud rate	9600 †

* The network address for Series 340 devices is set using DIP switches on the converter module and will override the network address on the controller.

† This baud rate must be set at 9600 to match the KBUS side of the Modbus/KBUS converter. It may be different from the Modbus baud rates of other devices in the system.

Figure 4-5 Controller Settings for Modbus Communication

4.4 Modbus Registers

Refer to Section 1.3 for definitions of terms and symbols used in the register tables.

Note: Kohler often uses extended Modbus registers which exceed 9,999. To illustrate the extended format, Kohler has added an extra digit to its register map to support registers above 9,999.

For example: Holding register 9999 may be illustrated as 49999 in the traditional format or as 409999 in the extended format where the most significant digit still represents what type of Modbus register it is. Some software tools may have difficulty reading registers above 9,999.

Register	Data Description	Access	Data Type	Range/Units
400001				
400002	System Time	RO	WORD	
400003	Day of Week	RO	WORD	
400004	Month	RO	WORD	1- 12
400005	Day	RO	WORD	1- 31
400006	Year	RO	WORD	
400007	Week of Month	RO	WORD	
400008	Voltage L1- L2	RO	WORD	Volts
400009	Voltage L2- L3	RO	WORD	Volts
400010	Voltage L3- L1	RO	WORD	Volts
400011	Frequency	RO	WORD	Hz
400012	Voltage L1- L0	RO	WORD	Volts
400013	Voltage L2- L0	RO	WORD	Volts
400014	Voltage L3- L0	RO	WORD	Volts
400015	Alert Code	RO	WORD	Alert Code
400016	Engine Speed	RO	WORD	
400017	Coolant Temp	RO	WORD	
400018	Oil Pressure	RO	WORD	
400019	Battery Voltage	RO	WORD	VDC * 10
400020	L1 Current	RO	WORD	Amps
400021	L2 Current	RO	WORD	Amps
400022	L3 Current	RO	WORD	Amps
400023	Power Factor	RO	WORD	* 100
400024	Total Real Power	RO	WORD	kW
400025	Percent of Max. Power	RO	WORD	% * 100
400034	Status	RO	WORD[0- 7]	0- 1: Sw. Position (00=open; 01=auto; 10=run; 11=off)
				2- 3: Gen. Status (00=stopped; 01=running; 10=crank; 11=undefined)
				4- 5: Program Mode (00=off; 01=remote; 10=local; 11=undefined)
400048	Engine Start Time	RO	WORD	Sec
400049	Crank Time	RO	WORD	Sec
400050	Crank Pause Time	RO	WORD	Sec
400051	Num of Crank Cycles	RO	WORD	
400052	Engine Cooldown Time	RO	WORD	Sec
400053	Over Voltage Time Delay	RO	WORD	Sec
400054	Under Voltage Time Delay	RO	WORD	Sec
400055	Starting Aid Time	RO	WORD	Sec
400056	Aux 1 Inhibit Time	RO	WORD	Sec
400057	Aux 1 Delay Time	RO	WORD	Sec
400058	Aux 2 Inhibit Time	RO	WORD	Sec
400059	Aux 2 Delay Time	RO	WORD	Sec
400060	Aux 3 Inhibit Time	RO	WORD	Sec
400061	Aux 3 Delay Time	RO	WORD	Sec

Register	Data Description	Access	Data Type	Range/Units
400062	Aux 4 Inhibit Time	RO	WORD	Sec
400063	Aux 4 Delay Time	RO	WORD	Sec
400064	Over Voltage Trip Point	RO	WORD	%, 105- 135
400065	Under Voltage Trip Point	RO	WORD	%, 70- 95
400066	Over Freq Trip Point	RO	WORD	%, 102- 140
400067	Under Freq Trip Point	RO	WORD	%, 80- 98
400068	Over Speed Trip Point	RO	WORD	%, 55- 70 <- - - ?
400069	Low Battery Voltage Trip Point	RO	WORD	VDC * 10
400070	High Battery Voltage Trip Point	RO	WORD	VDC * 10
400071	System Voltage	RO	WORD	Volts, 105- 14600
400072	System Frequency	RO	WORD	Hz, 48- 62
400073	Genset Rating	RO	WORD	kW, 0- 3000
400074	Battery Voltage	RO	WORD	VDC, 12 or 24
400076	Run Time Loaded Since Reset	RO	WORD*2	
400078	Run Time Unloaded Since Reset	RO	WORD*2	
400080	Days of Operation Since Reset	RO	WORD	
400081	kW- Hrs Since Reset	RO	WORD*2	
400083	Number Starts Since Reset	RO	WORD	
400084	Month of Reset	RO	WORD	1- 12
400085	Day of Reset	RO	WORD	1- 31
400086	Year of Reset	RO	WORD	
400087	Run Time Loaded Since Startup	RO	WORD*2	
400089	Run Time Unloaded Since Startup	RO	WORD*2	
400091	Days of Operation Since Startup	RO	WORD	
400092	kW- Hrs Since Startup	RO	WORD*2	
400094	Number Starts Since Startup	RO	WORD	
400095	Month of Startup	RO	WORD	1- 12
400096	Day of Startup	RO	WORD	1- 31
400097	Year of Startup	RO	WORD	
400098	Month of Last Start	RO	WORD	1- 12
400099	Day of Last Start	RO	WORD	1- 31
400100	Year of Last Start	RO	WORD	
400101	Time of Last Start	RO	WORD	
400102	Duration of Last Run	RO	WORD	
400112	Shutdown #1 Code	RO	WORD	Code
400113	Shutdown #1 Month	RO	WORD	1- 12
400114	Shutdown #1 Day	RO	WORD	1- 31
400115	Shutdown #1 Year	RO	WORD	
400116	Shutdown #2 Code	RO	WORD	Code
400117	Shutdown #2 Month	RO	WORD	1- 12
400118	Shutdown #2 Day	RO	WORD	1- 31
400119	Shutdown #2 Year	RO	WORD	
400120	Shutdown #3 Code	RO	WORD	Code
400121	Shutdown #3 Month	RO	WORD	1- 12
400122	Shutdown #3 Day	RO	WORD	1- 31
400123	Shutdown #3 Year	RO	WORD	
400124	Shutdown #4 Code	RO	WORD	Code
400125	Shutdown #4 Month	RO	WORD	1- 12
400126	Shutdown #4 Day	RO	WORD	1- 31
400127	Shutdown #4 Year	RO	WORD	
4001400- 400144	Designation	RO	WORD*5	9 chars, 1 per byte, first char = LSB, last byte ignored

Register	Data Description	Access	Data Type	Range/Units
400145-400154	Load Description	RO	WORD*10	20 chars, 1 per byte, first char = LSB
400155-400164	Location	RO	WORD*10	20 chars, 1 per byte, first char = LSB
400165-400177	Model No.	RO	WORD*13	26 chars, 1 per byte, first char = LSB
400178-400185	Spec. No.	RO	WORD*8	16 chars, 1 per byte, first char = LSB
400186-400188	Serial No.	RO	WORD*3	6 chars, 1 per byte, first char = LSB
400189-400191	Controller Serial No.	RO	WORD*3	6 chars, 1 per byte, first char = LSB
400204-400213	Auxiliary 1 Description	RO	WORD*10	20 chars, 1 per byte, first char = LSB
400214-400223	Auxiliary 2 Description	RO	WORD*10	20 chars, 1 per byte, first char = LSB
400224-400233	Auxiliary 3 Description	RO	WORD*10	20 chars, 1 per byte, first char = LSB
400234-400243	Auxiliary 4 Description	RO	WORD*10	20 chars, 1 per byte, first char = LSB
400245	Auxiliary Function Operation	RO	WORD [0-3]	0 = shutdown; 1 = warning (one bit per function)
400264	Relay Driver #1 Code	RO	WORD	Code
400265	Relay Driver #2 Code	RO	WORD	Code
400266	Relay Driver #3 Code	RO	WORD	Code
400267	Relay Driver #4 Code	RO	WORD	Code
400268	Relay Driver #5 Code	RO	WORD	Code
400269	Relay Driver #6 Code	RO	WORD	Code
400270	Relay Driver #7 Code	RO	WORD	Code
400271	Relay Driver #8 Code	RO	WORD	Code
400272	Relay Driver #9 Code	RO	WORD	Code
400273	Relay Driver #10 Code	RO	WORD	Code
400274	Common Fault #1 Code	RO	WORD	Code
400275	Common Fault #2 Code	RO	WORD	Code
400276	Common Fault #3 Code	RO	WORD	Code
400277	Common Fault #4 Code	RO	WORD	Code
400278	Common Fault #5 Code	RO	WORD	Code
400279	Common Fault #6 Code	RO	WORD	Code
400300	Run Time	WO	WORD	Min
400350	Reset Faults	WO	WORD[0]	0: 1=reset faults; 0=ignored

4.5 Alert Codes

Code	Message Summary
0	Defined Common Fault
1	Air Damper
2	Over Voltage
3	Under Voltage
4	Under Frequency Shutdown
5	Low Coolant Level
6	High Oil Temperature
7	Auxiliary 1
8	Auxiliary 2
9	Auxiliary 3
10	Auxiliary 4
11	Locked Rotor
12	Internal Error
13	EPS Supplying Load
14	Speed Sensor Fault
15	Load Shed
16	kW Overload
17	Under Frequency Warning
18	High Battery Voltage
19	Coolant Temperature Signal Loss
20	Oil Pressure Signal Loss
21	Ground Fault Detected
22	Over Current
23	Engine Cooldown
24	Time Delay Engine Start
25	Generator Running
26	NFPA 110 Common Alarm
27	Starting Aid
28	Low Oil Pressure
29	High Coolant Temperature

Code	Message Summary
30	Overcrank
31	Overspeed
32	Emergency Stop
33	Not In Auto
34	System Ready
35	Low Battery Voltage
36	Battery Charger Fault
37	Low Fuel
38	High Coolant Temperature Warning
39	Low Oil Pressure Warning
40	Low Coolant Temperature
41	Weak Battery
42	Load Shed Underfrequency
43	Load Shed Excess kW
44	Low AC Output
45	Overvoltage L1-L2
46	Overvoltage L2-L3
47	Overvoltage L3-L1
48	Overvoltage L1-L0
49	Overvoltage L2-L0
50	Overvoltage L3-L0
51	Undervoltage L1-L2
52	Undervoltage L2-L3
53	Undervoltage L3-L1
54	Undervoltage L1-L0
55	Undervoltage L2-L0
56	Undervoltage L3-L0
57	Master Switch Open (OFF/RESET)
58	Power-Down Error
59	Overfrequency Shutdown

5.1 Specifications

The Decision-Maker® 550 controller's Modbus® communication capability:

- Supports industry-standard Modbus® RTU protocol.
- Can use Modbus® TCP protocol with the addition of a Modbus/Ethernet converter.
- Connects to a Modbus® master singly over an RS-232 line.
- Uses RS-485 connections to connect to a Modbus® master singly or over an RS-485 network.
- Connects to an Ethernet network using a Modbus/ Ethernet converter.
- Can operate as an RS-232 to RS-485 converter.
- Uses standard baud rates of 9600 or 19200.

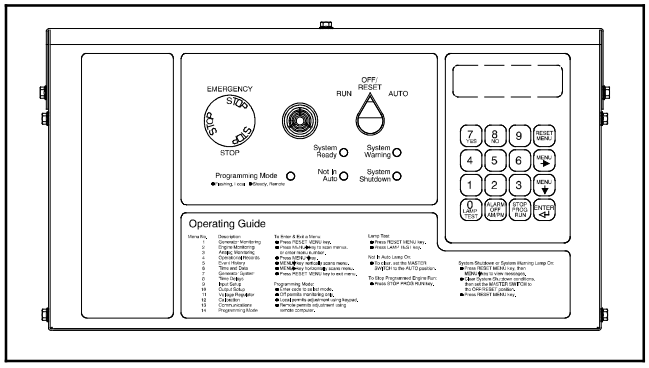


Figure 5-1 Decision-Maker® 550 Controller

5.2 Hardware Connections

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Move the generator set master switch to the OFF position. (2) Disconnect the power to the battery charger. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent starting of the generator set by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer.

Plan the connections and refer to Figure 1-1 through Figure 1-4 to identify the cables needed. Use either an RS-232 cable or the supplied RS-485 connector with Belden #9841 or equivalent cable for a single connection. Use the RS-485 connector and Belden #9841 or equivalent cable to connect devices in a network. Attach the RS-485 connectors as shown in Figure 5-2. Use the termination resistor on the last device in the network.

Circuit isolation is recommended for installations that may be exposed to electrical noise. See Appendix B, Noise and Wiring Practices.

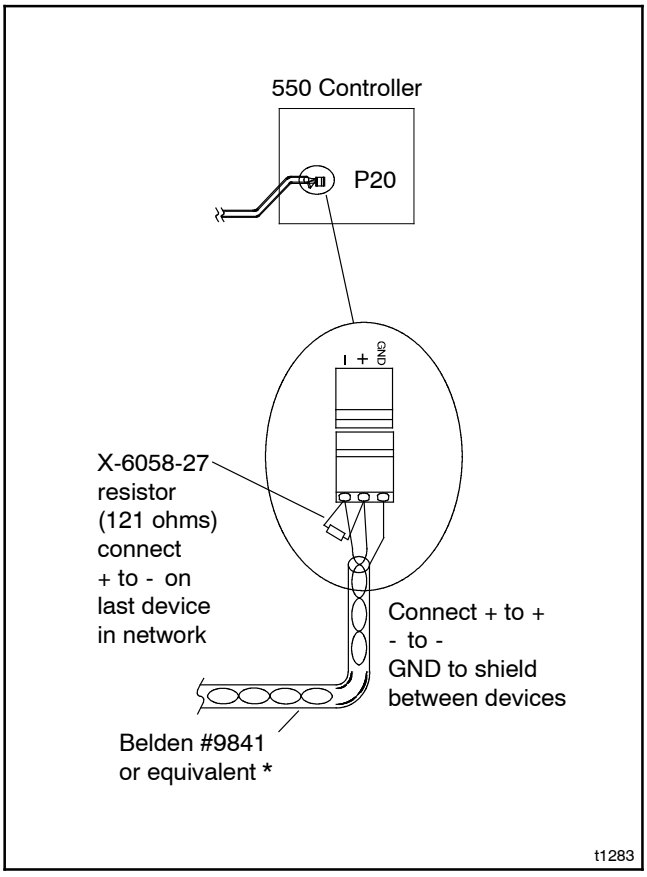


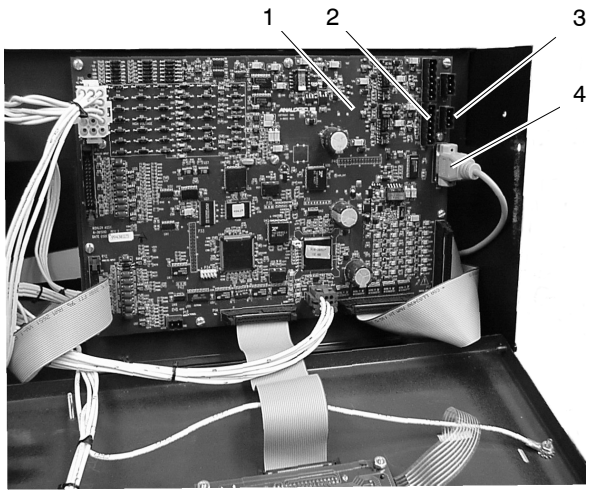
Figure 5-2 RS-485 Connector Details

Use the following procedure to connect the hardware. Observe the safety precautions.

Controller Connection Procedure

1. Place the generator set master switch in the OFF position.
2. Disconnect the power to the battery charger, if equipped.
3. Disconnect the generator set engine starting battery(ies), negative (-) lead first.
4. Turn off and disconnect the power to all devices in the system.
5. Open the enclosure and locate the connection ports as shown in Figure 5-3 and Figure 5-4.
6. Make connections to the desired controller port(s). For RS-232 connections, use connector P18. For RS-485 connections, use the Modbus® RS-485 connectors, P19 or P20 (connector P21 is used for other applications).

   Note: RS-485 on connector P19 is available with controller firmware version 3.01 or higher.
7. Close the controller enclosure.
8. Check that the generator set master switch is in the OFF position.
9. Reconnect the generator set engine starting battery, negative (-) lead last.
10. Reconnect power to the battery charger, if equipped.



1. Main logic board
2. Modbus® RS-485 port (P19), isolated connections
3. Modbus® RS-485 port (P20), non-isolated connections
4. RS-232-C port (P18), connects with standard DB-9 RS-232 cable

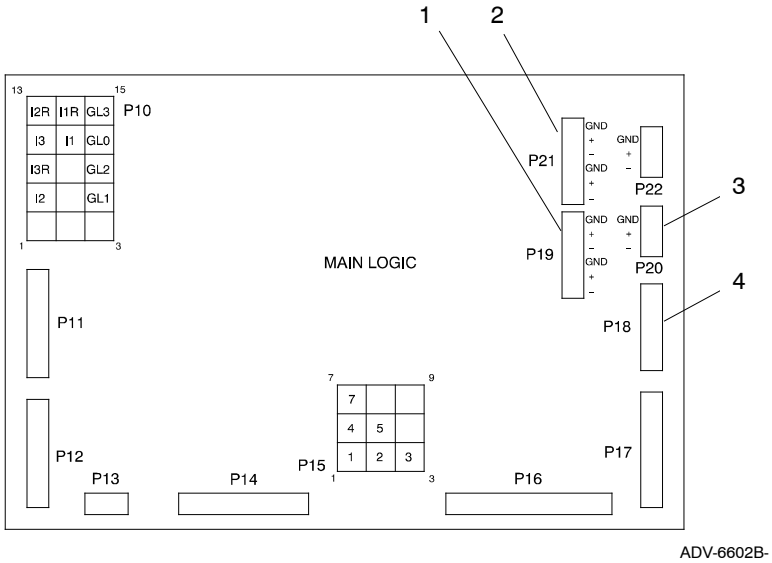
Figure 5-3 Communication Port Locations for Decision-Maker™ 550 Generator Set Controller

MAIN LOGIC BOARD

P18 RS232 CONNECTIONS
P18-1 CD
P18-2 RX
P18-3 TX
P18-4 DTR
P18-5 GROUND
P18-6 DSR
P18-7 RTS
P18-8 CTS
P18-9 RI

P20 RS485 NON-ISOLATED CONNECTIONS
P20-1 GND
P20-2 +
P20-3 -

P21 RS485A ISOLATED CONNECTIONS
P21-1 GND
P21-2 +
P21-3 -
P21-4 GND
P21-5 +
P21-6 -



1. P19 RS-485 Modbus® isolated connections
2. P21 RS-485 KBUS isolated connections
3. P20 RS-485 Modbus® non-isolated connections
4. P18 RS-232 Non-isolated connections

Figure 5-4 Communication Connections Pin Identification

5.3 Controller Setup

After connecting the hardware, set up the controller. Enter the communication settings shown in the procedure below. Refer to the controller operation manual for detailed instructions on how to enter settings through the controller keypad.

Note: Changing the programming mode requires entering the generator set controller access code. Refer to the controller operation manual for more information.

Controller Setup Procedure

1. Go to Menu 14—Programming Mode using the controller keypad. Enter the local programming mode to allow changes to the controller communication settings.
2. Enter the controller access code when prompted by the controller.
3. Go to Menu 13—Communications.
4. Use the MENU arrow buttons to move to the Protocol Modbus0 or Modbus1 heading. Select Modbus 0 for ports P18 (RS-232) or P20 (RS-485). Select Modbus1 for port P19 (RS-485 ISO).
5. Enter Yes at the Modbus® Online Y/N display.
6. Choose the connection type. Choose Converter and proceed to step 8 if the controller is converting RS-232 to RS-485. Otherwise, choose Single and proceed to step 7.

   Note: The controller automatically selects RS-232 for the primary port if Converter is chosen for the connection type.

   Note: The Converter option is not available for Modbus1.
7. Choose RS-232 or RS-485 for the primary port, which is the port connected to the Modbus® master.

   Note: The primary port cannot be changed for Modbus1.
8. Enter the network address of the controller. Enter 1 (one) for a single connection.

   Note: Use a unique network address for each unit. Use numbers between 1 and 246. Do not use 0 (zero).
9. Select the baud rate. Choose the same baud rate for the Modbus® master, modems, and connected devices .
10. Go to Menu 14—Programming Mode again. Choose either remote programming mode, local programming mode, or programming mode off as described below:

    a. To allow the Modbus® master to read and write to the controller, choose Remote; *or*

    b. To allow only monitoring through the Modbus® connections but local programming through the controller keypad, choose Local; *or*

    c. To turn the programming mode off, allowing no controller programming from either the Modbus® master or the local keypad, choose Off.
11. Enter the controller access code when prompted by the controller.

5.4 Controller Application Code Versions

There are two versions of the Modbus® registers for different versions of the controller's application code. Figure 5-5 shows where to find the Modbus register map for your unit based on the application code version number.

550 Controller Application Code Version	Location of Modbus Register Map
Below 2.10	Appendix C
2.10 or higher	Section 5.5

Figure 5-5 Register Map Locations for Different Application Code Versions

Use the following procedure to access Menu 20 to check the version number of the application code loaded on your controller.

Procedure to Identify the Controller Application Code Version

1. Use the controller keypad to access Menu 20. At the controller display Enter Menu No: 1- 15, press 20 and the Enter key.
2. Use the down arrow key on the controller keypad to step through the factory setup items until Code Version is displayed.
3. Record the code version number shown for future reference.
4. Press the Reset Menu key on the controller keypad to exit the menu.

5.5 Modbus Maps for Controllers with Application Code Versions 2.10 or Higher

This section contains Modbus® registers for Decision-Maker® 550 controller with application code versions 2.10 or higher (for example, code version 2.20). See Section 5.4 for instructions to determine the application code version number for your controller.

Refer to Section 1.3 for definitions of terms and symbols used in the register tables.

Time delays, setpoints, inputs and outputs, and other user-defined parameters are entered through the controller keypad or Monitor III software. Refer to the operation manuals for the 550 controller and Monitor III software for instructions. See the List of Related Materials for document part numbers.

The system event stack registers 401500- 401515 contain the status (active or inactive) of fault warnings and shutdowns, inputs, outputs, and MDEC/ADEC alarms. See Section 5.5.6.

The event history registers 400871- 401270 contain the time and date information for the last 100 events. See Section 5.5.6 for event message codes.

Note: Kohler often uses extended Modbus registers which exceed 9,999. To illustrate the extended format, Kohler has added an extra digit to its register map to support registers above 9,999. For example: Holding register 9999 may be illustrated as 49999 in the traditional format or as 409999 in the extended format where the most significant digit still represents what type of Modbus register it is. Some software tools may have difficulty reading registers above 9,999.

5.5.1 Guide to the Register Map

Description	Registers
Monitoring	400001- 400083
Electrical Output	400001- 400032
Engine Status	400033- 400060
Analog Input Status	400061- 400076
Digital Input Status	400077- 400078
Controller Status	400079- 400083
Maintenance	400084- 400112
Time/Date	400113- 400115
Time Delay Settings	400116- 400124
Settings and Setpoints	400125- 400146
Factory Setup	400147- 400226
Digital Input Setup	400227- 400499
Analog Input Setup	400500- 400739
Remapped Registers *	400740- 400837
Relay Driver Output Status (see Section 5.5.4)	400838- 400839
Relay Driver Output Setup	400840- 400870
Event History	400871- 401270
Customer-Defined Character Strings	401271- 401295
Reserved and Write-Only Registers	401296- 401305
Remote Functions	401306- 401413
Reserved for Factory Use	401314- 401499
System Event Stack (status of fault warnings and shutdowns, inputs, outputs, and MDEC alarms; see Section 5.5.6.)	401500- 401515
Reserved for Wireless Monitor	401516- 401536
Reserved	401537- 401549
Defined Common Faults (Define/Inspect)	401550- 401805
Reserved	401806- 409998
Device ID	409999

* Registers 400740- 400837 have been mapped to 401550- 401647 (Defined Common Faults) for compatibility with earlier versions. See Section 5.5.3.

5.5.2 Modbus Registers

Register	Data Description	Access	Data Type	Range/Units/Notes
400001	L1 - L2 Voltage	RO	WORD	Volts AC
400002	L2 - L3 Voltage	RO	WORD	Volts AC
400003	L3 - L1 Voltage	RO	WORD	Volts AC
400004	L1 - L0 Voltage	RO	WORD	Volts AC
400005	L2 - L0 Voltage	RO	WORD	Volts AC
400006	L3 - L0 Voltage	RO	WORD	Volts AC
400007	L1 Current	RO	WORD	Amps AC
400008	L2 Current	RO	WORD	Amps AC
400009	L3 Current	RO	WORD	Amps AC
400010	Frequency	RO	WORD	Hz X 100
400011	Total kW	RO	WORD	kW
400012	Percent of Rated kW	RO	WORD	% Rated kW
400013	Total Power Factor	RO	SWORD	PF X 100 (SIGNED)
400014	L1 kW	RO	WORD	kW
400015	L1 Power Factor	RO	SWORD	PF X 100 (SIGNED)
400016	L2 kW	RO	WORD	kW
400017	L2 Power Factor	RO	SWORD	PF X 100 (SIGNED)
400018	L3 kW	RO	WORD	kW
400019	L3 Power Factor	RO	SWORD	PF X 100 (SIGNED)
400020	Total kVAR	RO	SWORD	kVAR (SIGNED)
400021	L1 kVAR	RO	SWORD	kVAR (SIGNED)
400022	L2 kVAR	RO	SWORD	kVAR (SIGNED)
400023	L3 kVAR	RO	SWORD	kVAR (SIGNED)
400024	Total kVA	RO	WORD	kVA
400025	L1 kVA	RO	WORD	kVA
400026	L2 kVA	RO	WORD	kVA
400027	L3 kVA	RO	WORD	kVA
400028	Current Lead/Lag	RO	WORD	Bits 0-1 Total Current - Leading = 10 Lagging = 01 Bits 2-3 L1 Current - Leading = 10 Lagging = 01 Bits 4-5 L2 Current - Leading = 10 Lagging = 01 Bits 6-7 L3 Current - Leading = 10 Lagging = 01
400029	Reserved For Future Use	RO	WORD	Returns 0 (zero)
400030	Reserved For Future Use	RO	WORD	Returns 0 (zero)
400031	Reserved For Future Use	RO	WORD	Returns 0 (zero)
400032	Reserved For Future Use	RO	WORD	Returns 0 (zero)
400033	Oil Pressure*	RO	WORD	kPa/psi
400034	Coolant Temperature*	RO	SWORD	Degrees C/Degrees F
400035	Engine Speed*	RO	WORD	RPM
400036	Local Battery Voltage*	RO	WORD	Volts DC X 10
400037	Fuel Pressure*	RO	WORD	kPa/psi DDEC/MDEC/ADEC only
400038	Fuel Temperature*	RO	SWORD	Degrees C/Degrees F DDEC/MDEC/ADEC only
400039	Fuel Rate*	RO	WORD	Liters/Hour X 100 or Gallons/Hour X 100 DDEC only
400040	Used Last Run*	RO	WORD	Liters/Gallons DDEC only
400041	Coolant Pressure*	RO	WORD	kPa/psi DDEC only
400042	Coolant Level*	RO	WORD	% X 10 DDEC only
400043	Lube Oil Temperature*	RO	SWORD	Degrees C/Degrees F DDEC/MDEC/ADEC/Waukesha only
400044	Oil Level*	RO	WORD	% X 10 DDEC only
400045	Crankcase Pressure*	RO	WORD	kPa/psi DDEC only
400046	Ambient Temperature *	RO	SWORD	Degrees C/Degrees F DDEC only
400047	ECM Battery Voltage*	RO	WORD	Volts DC X 10 DDEC/MDEC/ADEC only

*0x7FD6 = data unavailable. 0x7FFF = data is out of range.

Register	Data Description	Access	Data Type	Range/Units/Notes
40048	ECM Status	RO	WORD	0 = DDEC-Equipped, 1 = Non-ECM, 2 = MDEC/ADEC-Equipped
400049	Intake Air Temperature	RO	SWORD	Degrees C/Degrees F MDEC/ADEC/Waukesha only
400050	Intake Air Pressure	RO	WORD	Degrees C/Degrees F MDEC/ADEC only
400051	MDEC/ADEC Fault Codes	RO	WORD	Numeric Fault Code MDEC/ADEC only
400052	Reserved For Future Use	RO	WORD	Returns 0 (zero)
400053	Reserved For Future Use	RO	WORD	Returns 0 (zero)
400054	Reserved For Future Use	RO	WORD	Mapped to register 41500 for compatibility with earlier controller application code versions. **Note:** Code versions 2.10 and higher use more registers for the Event Stack than previous versions.
400055	Reserved For Future Use	RO	WORD	Returns 0 (zero)
400056	Reserved For Future Use	RO	WORD	Returns 0 (zero)
400057	Reserved For Future Use	RO	WORD	Returns 0 (zero)
400058	Reserved For Future Use	RO	WORD	Returns 0 (zero)
400059	Reserved For Future Use	RO	WORD	Returns 0 (zero)
400060	Reserved For Future Use	RO	WORD	Returns 0 (zero)
400061	Analog Input 00 (Battery Voltage)*	RO	WORD	Volts DC
400062	Analog Input 01*	RO	WORD	User-defined and calibrated through the 550 controller. See the controller operation manual.
400063	Analog Input 02*	RO	WORD	
400064	Analog Input 03*	RO	WORD	
400065	Analog Input 04*	RO	WORD	
400066	Analog Input 05*	RO	WORD	
400067	Analog Input 06*	RO	WORD	
400068	Analog Input 07*	RO	WORD	
400069	Reserved For Additional Input	RO	WORD	
400070	Reserved For Additional Input	RO	WORD	
400071	Reserved For Additional Input	RO	WORD	
400072	Reserved For Additional Input	RO	WORD	
400073	Reserved For Additional Input	RO	WORD	
400074	Reserved For Additional Input	RO	WORD	
400075	Reserved For Additional Input	RO	WORD	
400076	Reserved For Additional Input	RO	WORD	
400077- 400078	Digital Input Status/Option Flags	RO	2 WORDS	Word #1 Digital Inputs 0- 15: Bit 0 Remote start contacts Bit 1 Emergency stop Bit 2 Low coolant level Bit 3 Digital Input #1 Bit 4 Digital Input #2 Bit 5 Digital Input #3 Bit 6 Digital Input #4 Bit 7 Digital Input #5 Bit 8 Digital Input #6 Bit 9 Digital Input #7 Bit 10 Digital Input #8 Bit 11 Digital Input #9 Bit 12 Digital Input #10 Bit 13 Digital Input #11 Bit 14 Digital Input #12 Bit 15 Digital Input #13
*0x7FD6 = data unavailable. 0x7FFF = data is out of range.				

Register	Data Description	Access	Data Type	Range/Units/Notes
400077-400078, cont.	Digital Input Status/Option Flags	RO	2 WORDS	Word #2: Bit 0 Digital Input #14 Bit 1 Digital Input #15 Bit 2 Digital Input #16 Bit 3 Digital Input #17 Bit 4 Digital Input #18 Bit 5 Digital Input #19 Bit 6 Digital Input #20 Bit 7 Digital Input #21 Bit 8 DDEC Flag Bit 9 MDEC/ADEC Flag Bit 10 Tier1 Flag Bit 11 Waukesha Flag Bits 12- 15 Unused Input Is high/option enabled if bit is set. Digital inputs are user-defined through the controller or Monitor III software. See the related operation manual.
400079	Master Switch Position	RO	WORD	0 = Error, 1 = Auto, 2 = Off, 3 = Run
400080	Programming Mode Status	RO	WORD	1 = Off, 2 = Local, 3 = Remote
400081	Reserved For Future Use	RO	WORD	Returns 0 (zero)
400082	Reserved For Future Use	RO	WORD	Returns 0 (zero)
400083	Reserved For Future Use	RO	WORD	Returns 0 (zero)
400084	Total Number of Starts	RO	WORD	Starts
400085	Total Run Time Hrs	RO	LONG	HRS X 100 (LSW FIRST)
400087	Total Run Time Loaded Hrs	RO	LONG	HRS X 100 (LSW FIRST)
400089	Total Run Time Unloaded Hrs	RO	LONG	HRS X 100 (LSW FIRST)
400091	Total Run Time kW Hrs	RO	LONG	kW Hrs (LSW First)
400093	RTSM Total Hrs	RO	LONG	HRS X 100 (LSW FIRST)
400095	RTSM Loaded Hrs	RO	LONG	HRS X 100 (LSW FIRST)
400097	RTSM Unloaded Hrs	RO	LONG	HRS X 100 (LSW FIRST)
400099	RTSM kW Hrs	RO	LONG	kW Hrs (LSW FIRST)
400101	Last Maintenance Date	RO	2 WORDS	Day | Month - Year
400103	Operating Days Since Maint.	RO	WORD	Days
400104	Number of Starts Since Maint.	RO	WORD	Starts
400105	Last Start Date	RO	2 WORDS	Day | Month - Year
400107	Last Start Time	RO	WORD	Hr|Min
400108	Last Run Length	RO	WORD	Hrs X 100
400109	Last Run Loaded	RO	WORD	0 = Unloaded, 1 = Loaded
400110	Timed Run Time (Hr:Min)	RW	WORD	Hr|Min
400111	Timed Run Remaining (Hr:Min)	RO	WORD	Hr|Min
400112	Is Timed Run Active	RO	WORD	1 = True, 0 = False
400113	Current Date	RW	2 WORDS	Day | Month - 2 Digit Year | Day of Week (0=Sunday)
400115	Current Time (24 Hr Clock)	RW	WORD (Hr|Min)	Hr|Min
400116	Time Delay Engine Start	RW	WORD	Min | Sec
400117	Time Delay Starting Aid	RW	WORD	Min | Sec
400118	Time Delay Crank On	RW	WORD	Min | Sec
400119	Time Delay Crank Pause	RW	WORD	Min | Sec
400120	Time Delay Engine Cooldown	RW	WORD	Min | Sec
400121	Time Delay Crank Cycles	RW	WORD	Cycles
400122	Time Delay Overvoltage	RW	WORD	Min | Sec
400123	Time Delay Undervoltage	RW	WORD	Min | Sec
400124	Time Delay Load Shed kW	RW	WORD	Min | Sec
*0x7FD6 = data unavailable. 0x7FFF = data is out of range.				

Register	Data Description	Access	Data Type	Range/Units/Notes
400125	Operating Mode	RW	WORD	Bits 0- 1: Operating Mode 1=Standby, 2=Prime Power Bit 2: Unused Bit 3: MDEC/ADEC DSC Mode 1 = Enabled, 0 = Disabled Bit 4: MDEC/ADEC VSG Mode 1 =Enabled, 0 = Disabled Bits 5- 7: Temp Sensor Type
400126	System Voltage	RW	WORD	Volts AC
400127	System Frequency	RW	WORD	Hz
400128	System Phase	RW	WORD	1 = 3 Phase Delta, 2 = 3 Phase Wye, 3 = Single Phase
400129	kW Rating	RW	WORD	kW
400130	Load Shed Output	RW	WORD	% of kW RATING
400131	Overvoltage	RW	WORD	% of System Voltage
400132	Undervoltage	RW	WORD	% of System Voltage
400133	Overfrequency	RW	WORD	% of System Frequency
400134	Underfrequency	RW	WORD	% of System Frequency
400135	Overspeed	RW	WORD	Hz
400136	Battery Voltage	RW	WORD	Volts DC X 10
400137	Lo Battery Voltage	RW	WORD	Volts DC X 10
400138	Hi Battery Voltage	RW	WORD	Volts DC X 10
400139	Metric Units	RW	WORD	1 = True, 0 = False
400140	NFPA 110 Defaults Enabled	RW	WORD	1 = True, 0 = False
400141	Rated Current	RO	WORD	Amps AC
400142	Cooldown Temperature Override	RW	WORD	1 = True, 0 = False
400143	Reserved For Future Use	RO	WORD	Returns 0 (zero)
400144	Reserved For Future Use	RO	WORD	Returns 0 (zero)
400145	Reserved For Future Use	RO	WORD	Returns 0 (zero)
400146	Reserved For Future Use	RO	WORD	Returns 0 (zero)
400147	Final Assembly Date	RO	2 WORDS	Day | Month - Year
400149	Final Assembly Clock No.	RO	LONG	99999 Max (LSW FIRST)
400151	Total Operating Days	RO	WORD	Days
400152	Model No.	RO	13 WORDS	26 Character String
400165	Spec. No.	RO	8 WORDS	16 Character String
400173	Genset Serial No.	RO	10 WORDS	20 Character String
400183	Alternator Part No.	RO	10 WORDS	20 Character String
400193	Engine Part No.	RO	10 WORDS	20 Character String
400203	Control No.	RO	LONG	(LSW FIRST)
400205	Code Version	RO	3 WORDS	6 Character String
400208	Setup Lock	RO	WORD	1 = Locked, 0 = Unlocked
400209	Engine Model No.	RO	4 WORDS	8 Character String ECM only
400213	Engine Serial No.	RO	5 WORDS	10 Character String ECM only
400218	Unit No.	RO	5 WORDS	10 Character String ECM only
400223	ECM Serial No.	RO	4 WORDS	8 Character String ECM only
*0x7FD6 = data unavailable. 0x7FFF = data is out of range.				

Register	Data Description	Access	Data Type	Range/Units/Notes
Digital Inputs 1-21 Setup (for status see 400077-400079):				
400227	Digital Input 01	RW	13 WORDS PER INPUT	Word 1: Enabled | Function ID Word 2: Inhibit Time (Min|Sec) Word 3: Delay Time (Min|Sec) Word 4-13: 10 Words for 20 Character Description String Refer to Section 5.5.7, Digital Auxiliary Input Functions, for descriptions and codes. See the controller operation manual, TP-6200, for factory-reserved and user-selectable inputs for various applications.
400240	Digital Input 02			
400253	Digital Input 03			
400266	Digital Input 04			
400279	Digital Input 05			
400292	Digital Input 06			
400305	Digital Input 07			
400318	Digital Input 08			
400331	Digital Input 09			
400344	Digital Input 10			
400357	Digital Input 11			
400370	Digital Input 12			
400383	Digital Input 13			
400396	Digital Input 14			
400409	Digital Input 15			
400422	Digital Input 16			
400435	Digital Input 17			
400448	Digital Input 18			
400461	Digital Input 19			
400474	Digital Input 20			
400487	Digital Input 21			
Note: Cannot read past end of block				
Analog Input Setup (for status see registers 400061-400068)				
400500	Analog Input 01	RW	16 WORDS PER INPUT	Refer to the controller operation manual, TP-6200, for identification of user inputs and factory-reserved inputs for specific applications. Word 1: Warning/Shutdown Enable [Bits 8,9] | Inhibit Time (Sec) Word 2: Warning Time (Sec) | Shutdown Time (Sec) Word 3: Lower Warning Limit Word 4: Upper Warning Limit Word 5: Lower Shutdown Limit Word 6: Upper Shutdown Limit Word 7-16: Analog voltage adjust for switchgear applications only; 10 words for 20 character description string
400516	Analog Input 02			
400532	Analog Input 03			
400548	Analog Input 04			
400564	Analog Input 05			
400580	Analog Input 06			
400596	Analog Input 07			
Note: Cannot read past end of block				
Analog Inputs 8-15 Setup				
400612	Reserved For Non-ECM	RO	16 WORDS PER INPUT	
400628				
400644				
400660				
400676				
400692				
400708				
400724				
Note: Cannot read past end of block				
4007400 - 400837	Mapped to 401550-401647			
*0x7FD6 = data unavailable. 0x7FFF = data is out of range.				

Register	Data Description	Access	Data Type	Range/Units/Notes
Define/Inspect RDO Status (2 WORDS). See Section 5.5.4.				
400838	RDO Status: RDO1 - RDO16	RO*	WORD	Output Is High If Individual Bit Is Set. Bit 0 = RDO 1
400839	RDO Status: RDO17 - RDO31	RO*	WORD	Output Is High If Individual Bit Is Set. Bit 0 = RDO 17
Note: Cannot read past end of block				
* Software-controlled RDOs are RW.				
Define/Inspect RDOs (RW, 1 WORD per RDO). See Section 5.5.6				
400840	Relay Driver Output 01	RW	WORD	Selection | Setpoint Function uses the event codes in Section 5.5.6. Setpoints are for analog inputs only; otherwise setpoint=0.
400841	Relay Driver Output 02	RW	WORD	
400842	Relay Driver Output 03	RW	WORD	
400843	Relay Driver Output 04	RW	WORD	
400844	Relay Driver Output 05	RW	WORD	
400845	Relay Driver Output 06	RW	WORD	
400846	Relay Driver Output 07	RW	WORD	
400847	Relay Driver Output 08	RW	WORD	
400848	Relay Driver Output 09	RW	WORD	
400849	Relay Driver Output 10	RW	WORD	
400850	Relay Driver Output 11	RW	WORD	
400851	Relay Driver Output 12	RW	WORD	
400852	Relay Driver Output 13	RW	WORD	
400853	Relay Driver Output 14	RW	WORD	
400854	Relay Driver Output 15	RW	WORD	
400855	Relay Driver Output 16	RW	WORD	
400856	Relay Driver Output 17	RW	WORD	
400857	Relay Driver Output 18	RW	WORD	
400858	Relay Driver Output 19	RW	WORD	
400859	Relay Driver Output 20	RW	WORD	
400860	Relay Driver Output 21	RW	WORD	
400861	Relay Driver Output 22	RW	WORD	
400862	Relay Driver Output 23	RW	WORD	
400863	Relay Driver Output 24	RW	WORD	
400864	Relay Driver Output 25	RW	WORD	Function | Setpoint Function uses the event codes in Section 5.5.6. Setpoints are for analog inputs only; otherwise setpoint=0.
400865	Relay Driver Output 26	RW	WORD	
400866	Relay Driver Output 27	RW	WORD	
400867	Relay Driver Output 28	RW	WORD	
400868	Relay Driver Output 29	RW	WORD	
400869	Relay Driver Output 30	RW	WORD	
400870	Relay Driver Output 31	RW	WORD	
Note: Cannot read past end of block				
*0x7FD6 = data unavailable. 0x7FFF = data is out of range.				

Register	Data Description	Access	Data Type	Range/Units/Notes
Event History. See Section 5.5.6 for event codes.				
400871-400910	Event History - Page 1 (1-10)	RO	40 WORDS	10 events, 4 words each: Event Code|Setpoint Hr|Min Day|Month Year See Section 5.5.6 for event codes. Setpoints are for analog inputs only; otherwise setpoint=0 **Note:** Message code = 0xFFat end of history
400911-400950	Event History - Page 2 (11-20)	RO	40 WORDS	
400951-400990	Event History - Page 3 (21-30)	RO	40 WORDS	
400991-401030	Event History - Page 4 (31-40)	RO	40 WORDS	
401031-401070	Event History - Page 5 (41-50)	RO	40 WORDS	
401071-401110	Event History - Page 6 (51-60)	RO	40 WORDS	
401111-401150	Event History - Page 7 (61-70)	RO	40 WORDS	
401151-401190	Event History - Page 8 (71-80)	RO	40 WORDS	
401191-401230	Event History - Page 9 (81-90)	RO	40 WORDS	
401231-401270	Event History - Page 10 (91-100)	RO	40 WORDS	
Note: Cannot read past end of block.				
Customer-Defined Character Strings (defined through Monitor software)				
401271	Designation	RW	5 WORDS	9 Character String
401276	Load	RW	10 WORDS	20 Character String
401286	Location	RW	10 WORDS	20 Character String
Note: Cannot read past end of block.				
401296	Reserved for future use	RO	WORD	Returns 0 (zero)
401297	Reserved for future use	RO	WORD	Returns 0 (zero)
401298	Reserved for future use	RO	WORD	Returns 0 (zero)
401299	Reserved for future use	RO	WORD	Returns 0 (zero)
401300	Reserved for future use	RO	WORD	Returns 0 (zero)
401301	Reserved for future use	RO	WORD	Returns 0 (zero)
401302	Reserved for future use	RO	WORD	Returns 0 (zero)
401303	Reserved for future use	RO	WORD	Returns 0 (zero)
401304	Reserved for future use	RO	WORD	Returns 0 (zero)
401305	Reserved for future use	RO	WORD	Returns 0 (zero)
Note: Cannot Read Past End of Block				
Remote Functions				
401306	Start Timed Run	WO	WORD	1 = Start, 0 = No Start
401307	Stop Timed Run	WO	WORD	1 = Stop, 0 = No Stop
401308	Reset Maintenance Records	WO	WORD	1 = Reset, 0 = No Reset
401309	Remote Fault Reset	WO	WORD	1 = Reset, 0 = No Reset
401310	Reserved for future use	RO	WORD	Returns 0 (zero)
401311	Reserved for future use	RO	WORD	Returns 0 (zero)
401312	Reserved for future use	RO	WORD	Returns 0 (zero)
401313	Reserved for future use	RO	WORD	Returns 0 (zero)
401314-401499	Reserved for factory use			
*0x7FD6 = data unavailable. 0x7FFF = data is out of range.				

Register	Data Description	Access	Data Type	Range/Units/Notes
System Event Stack (must be read as 16 register block)**. See Sections 5.5.5 and 5.5.6.**				
401500	System Events 0- 15 Word #1	RO	16 WORDS	System event status. 0=not active 1=active Each bit corresponds to a different event code. See Sections 5.5.5 and 5.5.6.
401501	System Events 16- 31 Word #2			
401502	System Events 32- 47 Word #3			
401503	System Events 48- 63 Word #4			
401504	System Events 64- 79 Word #5			
401505	System Events 80- 95 Word #6			
401506	System Events 96- 111 Word #7			
401507	System Events 112- 127 Word #8			
401508	System Events 128- 143 Word #9			
401509	System Events 144- 159 Word #10			
401510	System Events 160- 175 Word #11			
401511	System Events 176- 191 Word #12			
401512	System Events 192- 207 Word #13			
401513	System Events 208- 223 Word #14			
401514	System Events 224- 239 Word #15			
401515	System Events 240- 255 Word #16			
Note: Cannot Read Past End of Block.				
401516-401536	Reserved	RO	WORD	Reserved for the Wireless Monitor
401537-401549	Not used	RO	WORD	Returns illegal address
Define/Inspect Defined Common Faults:				
401550	Emergency Stop	RW	WORD	Selected | Setpoint The selected byte indicates whether a given fault has been assigned to the defined common fault: 0=not assigned to the defined common fault; 1=assigned to the defined common fault. The setpoint byte indicates the setpoint value for that item.
401551	Overspeed			
401552	Overcrank			
401553	High Coolant Temperature Shutdown			
401554	Oil Pressure Shutdown			
401555	Low Coolant Temperature Warning (ECM only)			
401556	Low Fuel			
401557	High Coolant Temperature Warning			
401558	Oil Pressure Warning			
401559	Master Not In Auto			
401560	NFPA 110 Fault			
401561	Low Battery Voltage			
401562	High Battery Voltage			
401563	Battery Charger Fault			
401564	System Ready			
401565	Loss of ECM Comm (ECM only)			
401566	No Oil Pressure Signal			
401567	High Oil Temperature Shutdown			
401568	No Coolant Temperature Signal			
401569	Low Coolant Level			
401570	Speed Sensor Fault			
401571	Locked Rotor			
*0x7FD6 = data unavailable. 0x7FFF = data is out of range.				

Register	Data Description	Access	Data Type	Range/Units/Notes
Define/Inspect Defined Common Faults, continued:				
401572	Master Switch Error	RW	WORD	Selected | Setpoint The selected byte indicates whether a given fault has been assigned to the defined common fault: 0=not assigned to the defined common fault; 1=assigned to the defined common fault. The setpoint byte indicates the setpoint value for that item.
401573	Master Switch Open			
401574	Master Switch Off			
401575	AC Sensing Loss			
401576	Over Voltage			
401577	Under Voltage			
401578	Weak Battery			
401579	Over Frequency			
401580	Under Frequency			
401581	Load Shed kW Overload	RW	WORD	Selected | Setpoint
401582	Load Shed kW Under Frequency			
401583	Over Current Warning			
401584	EPS Supplying Load			
401585	Internal Fault			
401586	Engine Cooldown Delay			
401587	Engine Start Delay			
401588	Starting Aid			
401589	Generator Running			
401590	Air Damper Control			
401591	Ground Fault			
401592	EEPROM Write Failure	RW	WORD	Selected | Setpoint
401593	Critical Overvoltage			
401594	Alternator Protect Shutdown			
401595	Air Damper Indicator			
401596	Digital Input 01	RW	WORD	**Note:** Analog and digital inputs are user-defined through the controller or Monitor III software. See the related operation manual.
401597	Digital Input 02			
401598	Digital Input 03			
401599	Digital Input 04			
401600	Digital Input 05			
401601	Digital Input 06			
401602	Digital Input 07			
401603	Digital Input 08			
401604	Digital Input 09			
401605	Digital Input 10			
401606	Digital Input 11			
401607	Digital Input 12			
401608	Digital Input 13			
401609	Digital Input 14			
401610	Digital Input 15			
401611	Digital Input 16			
401612	Digital Input 17			
401613	Digital Input 18			
401614	Digital Input 19			
401615	Digital Input 20			
401616	Digital Input 21			
401617	Analog Input 01	RW	WORD	**Note:** Analog and digital inputs are user-defined through the controller or Monitor III software. See the related operation manual.
401618	Analog Input 02			
401619	Analog Input 03			
401620	Analog Input 04			
*0x7FD6 = data unavailable. 0x7FFF = data is out of range.				

Register	Data Description	Access	Data Type	Range/Units/Notes
401621	Analog Input 05	RW	WORD	**Note:** Analog and digital inputs are user-defined through the controller or Monitor III software. See the related operation manual.
401622	Analog Input 06			
401623	Analog Input 07			
401624	Reserved for additional input	RW	WORD	
401625	Reserved for additional input			
401626	Reserved for additional input			
401627	Reserved for additional input			
401628	Reserved for additional input			
401629	Reserved for additional input			
401630	Reserved for additional input			
401631	Reserved for additional input			
401632	Defined Common Fault			
401633	Software Controlled RDO#1	RW	WORD	Selected | Setpoint
401634	Software Controlled RDO#2			
401635	Software Controlled RDO#3			
401636	Software Controlled RDO#4			
401637-401648	*Reserved for factory use*			*Reserved for factory use*
401649	Genset Parameter Warning	RW	WORD	Selected | Setpoint
401650	Genset S/N Mismatch Warning			
401651	Genset S/N Mismatch Shutdown			
401652	*Reserved for factory use*			
401653	Protective Relay Overvoltage	RW	WORD	Switchgear applications only. Cannot be defined as common fault or assigned as RDO, but can referenced in event stack/log.
401654	Protective Relay Under Voltage			
401655	Protective Relay Overfrequency			
401656	Protective Relay Underfrequency			
401657	Protective Relay Reverse Power			
401658	Protective Relay Over Power			
401659	Protective Relay Loss of Field			
401660	Protective Relay Overcurrent Vr			
401661	Reverse Power Shutdown	RW	WORD	Switchgear applications only
401662	Over Power Shutdown			
401663	Loss of Field Shutdown			
401664	Over Current Shutdown			
401665	Common Protective Relay Output	RW	WORD	Switchgear applications only. Cannot be defined as common fault, but can be assigned as RDO and referenced in event stack/log.
401666	In Synch	RW	WORD	Switchgear applications only.
401667	Breaker Trip			
401668	Fuel Valve Relay	RW	WORD	Waukesha only.
401669	Pre Lube Relay			
401670	Air -Fuel Module Start			
401671	Oil Temperature Loss of Signal			
401672	High Oil Temperature Warning			
401673	Intake Air Temperature Loss of Signal			
401674	High Intake Air Temperature Warning	RW	WORD	Waukesha/MDEC/ADEC only.
401675	High Intake Air Temperature Shutdown			
*0x7FD6 = data unavailable. 0x7FFF = data is out of range.				

Register	Data Description	Access	Data Type	Range/Units/Notes
401676	MDEC/ADEC Yellow Alarm	RW	WORD	MDEC/ADEC only.
401677	MDEC/ADEC Red Alarm			
401678	MDEC/ADEC Block Heater Control			
401679	Low Coolant Temperature Shutdown			
401680	MDEC/ADEC Load Shed Over Temperature			
401681	Maintenance Reminder	RW	WORD	
401682	Engine Derate Active (ECM only)	RW	WORD	
401683	Engine Stalled	RW	WORD	
401684	J1939 CAN Engine Shutdown	RW	WORD	Deere, Doosan, GM engines only
401685-401724	Reserved For Future Use	RW	WORD	
401725	Loss of Oil Pressure Signal #1	RO	WORD	Active only with Marine third-party approval option (Lloyd's option)
401726	Loss of Oil Pressure Signal #2	RO	WORD	
401727	Loss of Coolant Temp Signal #1	RO	WORD	
401728	Loss of Coolant Temp Signal #2	RO	WORD	
401729	High Coolant Temp Shutdown #1	RO	WORD	
401730	High Coolant Temp Shutdown #2	RO	WORD	
401731	Low Oil Pressure Shutdown #1	RO	WORD	
401732	Low Oil Pressure Shutdown #2	RO	WORD	
401733	High Coolant Temp Warning #1	RO	WORD	
401734	High Coolant Temp Warning #2	RO	WORD	
401735	Low Coolant Temp Warning #1	RO	WORD	
401736	Low Coolant Temp Warning #2	RO	WORD	
401737	Low Oil Pressure Warning #1	RO	WORD	
401738	Low Oil Pressure Warning #2	RO	WORD	
401739	Low Coolant Pressure Warning	RO	WORD	
401740	Loss of Signal Coolant Pressure	RO	WORD	
401741	Air -Fuel Module Start	RW	WORD	Waukesha only.
401742	No Dial Tone	RW	WORD	With optional dial-out feature only.
401743	Dialout Message Sent	RW	WORD	
401744	No Modem at Powerup	RW	WORD	
401745	Modem Connection Failed	RW	WORD	
401746-401791	Reserved For Future Use	RW	WORD	
401792	Dual Start Application	RW	WORD	
401793	Starter A Failure	RW	WORD	
401794	Starter B Failure	RW	WORD	
401795	Dual Starter B	RW	WORD	
401796	Controller Setup Warning	RW	WORD	
401797	Phase Selection Error	RW	WORD	
401798	Voltage Selection Error	RW	WORD	
401799	Frequency Selection Error	RW	WORD	
401800	kW Selection Error	RW	WORD	
401801	EEPROM Block Initialized	RW	WORD	
401802	Date Changed	RW	WORD	
401803	Controller Initialized	RW	WORD	
401804-409998	Reserved For Future Use	RW	WORD	
Device ID				
409999	Device ID	RO	WORD	Dec 550 Device ID = 20
*0x7FD6 = data unavailable. 0x7FFF = data is out of range.				

5.5.3 Remapped Registers

Registers 40740- 40837 have been mapped to 401550- 401647 (defined common faults) for compatibility with earlier code versions.

Register	Mapped to:	Description
400740	401550	Emergency Stop
400741	401551	Overspeed
400742	401552	Overcrank
400743	401553	High Coolant Temperature Shutdown
400744	401554	Oil Pressure Shutdown
400745	401555	Low Coolant Temperature Warn.
400746	401556	Low Fuel
400747	401557	High Coolant Temperature Warning
400748	401558	Oil Pressure Warning
400749	401559	Master Not In Auto
400750	401560	NFPA 110 Fault
400751	401561	Low Battery Voltage
400752	401562	High Battery Voltage
400753	401563	Battery Charger Fault
400754	401564	System Ready
400755	401565	Loss of ECM Comm
400756	401566	No Oil Pressure Signal
400757	401567	High Oil Temperature Shutdown
400758	401568	No Coolant Temperature Signal
400759	401569	Low Coolant Level
400760	401570	Speed Sensor Fault
400761	401571	Locked Rotor
400762	401572	Master Switch Error
400763	401573	Master Switch Open
400764	401574	Master Switch Off
400765	401575	AC Sensing Loss
400766	401576	Over Voltage
400767	401577	Under Voltage
400768	401578	Weak Battery
400769	401579	Over Frequency
400770	401580	Under Frequency
400771	401581	Load Shed kW Overload
400772	401582	Load Shed kW Under Frequency
400773	401583	Over Current Warning
400774	401584	EPS Supplying Load
400775	401585	Internal Fault
400776	401586	Engine Cooldown Delay
400777	401587	Engine Start Delay
400778	401588	Starting Aid
400779	401589	Generator Running
400780	401590	Air Damper Control
400781	401591	Ground Fault
400782	401592	EEPROM Write Failure
400783	401593	Critical Overvoltage
400784	401594	Alternator Protect Shutdown
400785	401595	Air Damper Indicator
400786	401596	Digital Input 01
400787	401597	Digital Input 02
400788	401598	Digital Input 03
400789	401599	Digital Input 04
400790	401600	Digital Input 05
400791	401601	Digital Input 06
400792	401602	Digital Input 07
400793	401603	Digital Input 08
400794	401604	Digital Input 09
400795	401605	Digital Input 10
400796	401606	Digital Input 11
400797	401607	Digital Input 12
400798	401608	Digital Input 13
400799	401609	Digital Input 14
400800	401610	Digital Input 15
400801	401611	Digital Input 16
400802	401612	Digital Input 17
400803	401613	Digital Input 18
400804	401614	Digital Input 19
400805	401615	Digital Input 20
400806	401616	Digital Input 21
400807	401617	Analog Input 01
400808	401618	Analog Input 02
400809	401619	Analog Input 03
400810	401620	Analog Input 04
400811	401621	Analog Input 05
400812	401622	Analog Input 06
400813	401623	Analog Input 07
400814	401624	*Reserved for additional input*
400815	401625	
400816	401626	
400817	401627	
400818	401628	
400819	401629	
400820	401630	
400821	401631	
400822	401632	Defined Common Fault
400823	401633	Software Controlled RDO#1
400824	401634	Software Controlled RDO#2
400825	401635	Software Controlled RDO#3
400826	401636	Software Controlled RDO#4
400827	401637	*Reserved for factory use*
400828	401638	
400829	401639	
400830	401640	
400831	401641	
400832	401642	
400833	401643	
400834	401644	
400835	401645	
400836	401646	
400837	401647	

5.5.4 Relay Driver Outputs

Status. Registers 400838- 400839 contain the status (active or not active) of the relay driver outputs (RDOs). Each register is a 16-bit word and each individual bit corresponds to one RDO. Figure 5-8 illustrates how the RDO status codes are stored.

The RDO is active if the corresponding bit is set (equal to 1). The example in Figure 5-7 shows that RDOs 7, 8, 12, 18, 23, and 30 are active.

To identify the functions assigned to the RDOs, check registers 400840- 400870.

Setup. Registers 400840- 400870 contain the RDO function and setpoint information. The function assigned to the RDO is indicated by the event codes shown in the first byte of the register. Event codes are listed in the table in Section 5.5.6. Setpoints are for analog inputs only; otherwise setpoint=0.

Register	RDO Number Corresponding to Each Bit															
400838	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
400839	—	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

Figure 5-6 RDO Status Registers

Register	RDO Status: 0 = Not Set (not active), 1 = Set (active)															
400838	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0
400839	—	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0

Figure 5-7 RDO Status Example

5.5.5 System Event Codes

Event codes are contained in registers 401500 through 401515. Each register is a 16-bit word, and each bit corresponds to a system event code. Figure 5-8 illustrates how the event codes are stored in the system event stack registers. The numbers 0- 255 in Figure 5-8 correspond to the event codes shown in the System Event Codes table, Section 5.5.6. For example, number 6 corresponds to low fuel.

The condition indicated by the message code is active if the corresponding bit is set. Figure 5-9 shows register 401500 indicating low battery voltage, a high coolant temperature warning, and a low fuel condition.

Register	Event Code Indicated by Each Bit (See Section 5.5.6 for event code identification.)															
401500	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
401501	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
401502	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
401503	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
401504	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64
401505	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80
401506	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97	96
401507	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112
401508	143	142	141	140	139	138	137	136	135	134	133	132	131	130	129	128
401509	159	158	157	156	155	154	153	152	151	150	149	148	147	146	145	144
401510	175	174	173	172	171	170	169	168	167	166	165	164	163	162	161	160
401511	191	190	189	188	187	186	185	184	183	182	181	180	179	178	177	176
401512	207	206	205	204	203	202	201	200	199	198	197	196	195	194	193	192
401513	223	222	221	220	219	218	217	216	215	214	213	212	211	210	209	208
401514	239	238	237	236	235	234	233	232	231	230	229	228	227	226	225	224
401515	255	254	253	252	251	250	249	248	247	246	245	244	243	242	241	240

Figure 5-8 Event Codes Stored in System Event Stack Registers 401500 through 401515

Register	Event Code Status: 0 = Not Set, 1 = Set															
401500	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0

Figure 5-9 Event Code Status Example, Register 401500

5.5.6 System Event Code Table

The system event codes in the following table are used for relay driver output functions as well as for events in the event history and the event stack.

Code	Description
0	Emergency Stop
1	Overspeed
2	Overcrank
3	High Coolant Temperature Shutdown
4	Oil Pressure Shutdown
5	Low Coolant Temperature
6	Low Fuel Warning
7	High Coolant Temperature Warning
8	Oil Pressure Warning
9	Master Not In Auto
10	NFPA 110 Fault
11	Low Battery Voltage
12	High Battery Voltage
13	Battery Charger Fault
14	System Ready
15	Loss of ECM Comm
16	No Oil Pressure Signal
17	High Oil Temperature Shutdown
18	No Coolant Temperature Signal
19	Low Coolant Level
20	Speed Sensor Fault
21	Locked Rotor
22	Master Switch Error
23	Master Switch Open
24	Master Switch Off
25	AC Sensing Loss
26	Over Voltage
27	Under Voltage
28	Weak Battery
29	Over Frequency
30	Under Frequency
31	Load Shed kW Overload
32	Load Shed kW Under Frequency
33	Over Current
34	EPS Supplying Load
35	Internal Fault
36	Engine Cooldown Delay
37	Engine Start Delay
38	Starting Aid
39	Generator Running
40	Air Damper Control
41	Ground Fault
42	EEPROM Write Failure
43	Critical Overvoltage
44	Alternator Protect Shutdown
45	Air Damper Indicator
46	Digital Input 01
47	Digital Input 02
48	Digital Input 03
49	Digital Input 04
50	Digital Input 05
51	Digital Input 06
52	Digital Input 07
53	Digital Input 08
54	Digital Input 09
55	Digital Input 10
56	Digital Input 11
57	Digital Input 12
58	Digital Input 13
59	Digital Input 14
60	Digital Input 15
61	Digital Input 16
62	Digital Input 17
63	Digital Input 18
64	Digital Input 19
65	Digital Input 20
66	Digital Input 21
67	Analog Input 01
68	Analog Input 02
69	Analog Input 03
70	Analog Input 04
71	Analog Input 05
72	Analog Input 06
73	Analog Input 07
74	*Reserved for additional input*
75	*Reserved for additional input*
76	*Reserved for additional input*
77	*Reserved for additional input*
78	*Reserved for additional input*
79	*Reserved for additional input*
80	*Reserved for additional input*
81	*Reserved for additional input*
82	Defined Common Fault
83	Software Controlled RDO#1
84	Software Controlled RDO#2
85	Software Controlled RDO#3
86	Software Controlled RDO#4
99	Genset Parameter Warning
100	Genset S/N Mismatch Warning
101	Genset S/N Mismatch Shutdown
103	Protective Relay Overvoltage
104	Protective Relay Under Voltage
105	Protective Relay Overfrequency
106	Protective Relay Underfrequency
107	Protective Relay Reverse Power
108	Protective Relay Over Power
109	Protective Relay Loss of Field
110	Protective Relay Overcurrent Vr
111	Reverse Power Shutdown

Code	Description
112	Over Power Shutdown
113	Loss of Field Shutdown
114	Over Current Shutdown
115	Common Protective Relay Output
116	In Synch
117	Breaker Trip
118	Fuel Valve Relay
119	Pre Lube Relay
120	Air -Fuel Module Start
121	Oil Temperature Loss of Signal
122	High Oil Temperature Warning
123	Intake Air Temperature Loss of Signal
124	High Intake Air Temperature Warning
125	High Intake Air Temperature Shutdown
126	MDEC/ADEC Yellow Alarm
127	MDEC/ADEC Red Alarm
128	MDEC/ADEC Block Heater Control
129	Low Coolant Temperature Shutdown
130	MDEC/ADEC Load Shed Over Temperature
131	*Reserved For Future Use*
132	Engine Derate Active
133	Engine Stalled
134	J1939 CAN Engine Shutdown
135-174	Reserved for Future Use
175	No Oil Press1 Signal
176	No Oil Press2 Signal
177	No Cool Temp1 Signal
178	No Cool Temp2 Signal
179	Hi Cool Temp1 Shtdwn
180	Hi Cool Temp2 Shtdwn
181	Oil Press1 Shutdown
182	Oil Press2 Shutdown
183	Hi Cool Temp1 Warn
184	Hi Cool Temp2 Warn
185	Lo Cool Temp1 Warn
186	Lo Cool Temp2 Warn
187	Oil Press1 Warning
188	Oil Press2 Warning
189	Coolant Pressr Warn
190	No Cool Press Signal
191	Air -Fuel Module Start
192	No Dial Tone
193	Dialout Message Sent
194	No Modem at Powerup
195	Modem Connection Failed
196	Close Button Acknowledged
197	Open Button Acknowledged
198	Key Switch Locked
199	Key Switch Unlocked

Code	Description
200	Auto Button Acknowledged
201	Off Button Acknowledged
202	Run Button Acknowledged
203	Generator Circuit Breaker Closed
204	Generator Circuit Breaker Open
205	Utility circuit Breaker Closed
206	Utility Circuit Breaker Open
207	Common Warning
208	Common Load Shed
209	PGEN Common Warning
210	PGEN Common Fault
211	PGEN Comm Not Online
212	PGEN Duplicate ID
213	PGEN Missing Node
214	PGEN Extra Node
215	Auto Synch Disabled
216	Volts and Freq OK
217	Synch Frequency matched
218	Synch Phase matched
219	Synch Volts Matched
220	CB Trip to Shutdown Timeout
221	Dead Bus Sense Error
222	First On Fault
223	Fail to Synch Timeout
224	CB Close Fault
225	CB Close Attempts Fault
226	CB Open Fault
227	CB Current Fault
228	CB Common Fault
229	Contactor Output
230	Close Generator Circuit Breaker
231	External Breaker Trip
232	Remote Shutdown
233-241	Reserved for Future Use
242	Dual Starter App
243	Starter A Failure
244	Starter B Failure
245	Dual Starter B
246	Controller Setup Error
247	Phase Selection Error
248	Voltage Selection Error
249	Frequency Selection Error
250	kW Selection Error
251	EEPROM Block Initialized
252	Date Changed
253	Controller Initialized

5.5.7 Digital Auxiliary Input Functions

The following function ID codes are used in registers 400227- 400499 to identify the function that is assigned to each digital input. The assignment is done through the controller keypad or Monitor III software. See the operation manual for the 550 controller or Monitor III software.

Function ID	Name	Notes
1	Warning	
2	Shutdown Type A	
3	Shutdown Type B	
4	Voltage Raise	
5	Voltage Lower	
6	VAR PF Mode	
7	Remote Shutdown	
8	Remote Reset	
9	Air Damper	
10	Low Fuel Warning	
11	Field Over Volts	
12	Idle Mode	ECM only
13	Battle Switch	
14	Ground Fault	
15	Bat Chgr Fault	
16	High Oil Temperature	
17	Low Coolant Lvl	
18	Low Coolant Temperature	ECM only (not user-assignable)
19	Breaker Closed	(not user-assignable)
20	Enable Synch	(not user-assignable)
21	AFM Shutdown	Waukesha only (not user-assignable)
22	Knock Shutdown	Waukesha only (not user-assignable)
23	Deton Warning	Waukesha only (not user-assignable)
24	Deton Shutdown	Waukesha only (not user-assignable)
25	Low Fuel Shutdown	(not user-assignable)
26	VSG Disable	

6.1 Specifications

The APM402 or Decision-Maker® 3000 controller's Modbus® communication capability:

- Supports industry-standard Modbus® RTU protocol.
- Can use Modbus® TCP protocol with the addition of a Modbus/Ethernet converter.
- Uses RS-485 connections to connect to a Modbus® master singly or over an RS-485 network.
- Connects to an Ethernet network using a Modbus/ Ethernet converter.
- Uses standard baud rates of 9600, 19200, 38400, or 57600.

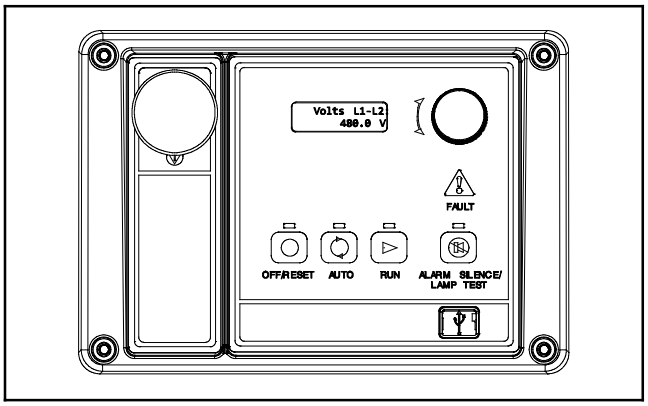


Figure 6-1 APM402 or Decision-Maker® 3000 Controller

6.2 Hardware Connections

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Move the generator set master switch to the OFF position. (2) Disconnect the power to the battery charger. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent starting of the generator set by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer.

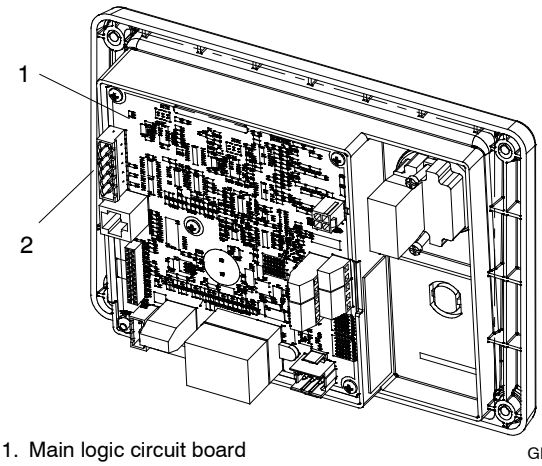
Circuit isolation is recommended for installations that may be exposed to electrical noise. See Appendix B, Noise and Wiring Practices.

Use the following procedure to connect the hardware. Observe the safety precautions. Also see the network connection diagrams in TT-1405.

Ethernet connections require the use of a Modbus/Ethernet converter module. See TT-1405 for Modbus/Ethernet converter connection and setup information.

APM402 or Decision-Maker 3000 Connection Procedure

1. Press the OFF button on the controller.
2. Disconnect the power to the battery charger, if equipped.
3. Disconnect the generator set engine starting battery(ies), negative (-) lead first.
4. Turn off and disconnect the power to all devices in the system.
5. Connect to communication port P21 as shown in Figure 6-2 and Figure 6-3.
6. Verify that the controller is OFF.
7. Reconnect the generator set engine starting battery, negative (-) lead last.
8. Reconnect power to the battery charger, if equipped.



1. Main logic circuit board
2. P21 for RS-485 communication connection

GM65741-

Figure 6-2 Communication Port P21

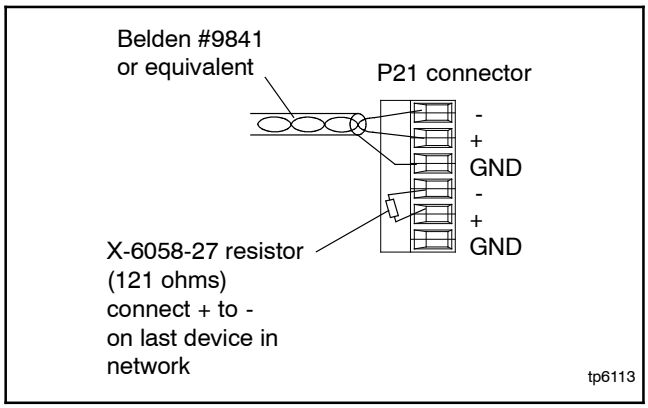


Figure 6-3 Connection Details

6.3 Controller Setup

Use Kohler® SiteTech™ software and a personal computer connected to the controller's USB port to configure the controller's communication parameters shown in Figure 6-4. See TP-6701, SiteTech Software Operation Manual, for instructions.

SiteTech Group	Parameter	Setting
Modbus	Address	Use a unique network address between 1 and 247 for each unit. Use 1 for a single connection. Do not use 0 (zero).
	Baud rate	9600, 19200, 38400, or 57600. Must match the PC and all devices in the system.

Figure 6-4 APM402 or Decision-Maker 3000 Communication Parameters

6.4 Modbus Registers

This section contains Modbus® registers for the APM402 or Decision-Maker® 3000 controller. Refer to Section 1.3 for definitions of terms and symbols used in the register tables.

Time delays, setpoints, inputs and outputs, and other user-defined parameters are entered through the controller keypad or SiteTech™ software. Refer to the operation manuals for the controller or software for instructions. See the List of Related Materials for document part numbers.

Note: Kohler often uses extended Modbus registers which exceed 9,999. To illustrate the extended format, Kohler has added an extra digit to its register map to support registers above 9,999. For example: Holding register 9999 may be illustrated as 49999 in the traditional format or as 409999 in the extended format where the most significant digit still represents what type of Modbus register it is. Some software tools may have difficulty reading registers above 9,999.

Holding Register	Parameter	Write Access	Units	Divider	Type/Notes
400027	ModbusCommand	WO			Int16 1: Start 2: Stop 3: Reset Faults
401000	Vendor	RO			Int16
401001	Product	RO			Int16
401002	FirmwareVersion	RO			Int32
401100	EngineSpeed	RO	RPM	1	Int16
401101	EngineTargetSpeed	RO	RPM	1	Int16
401102	EngineOilPressure	RO	kPa	10	Int16
401103	EngineCoolantTemperature	RO	°C	10	Int16
401107	BatteryVoltage	RO	V	10	Int16
401117	GensetControllerTemperature	RO	°C	1	Int16
401118	BatteryVoltageFromEcm	RO	V	10	Int16
401121	IntakeAirTemperature	RO	°C	1	Int16
401122	IntakeAirPressure	RO	kPa	1	Int16
401132	EnclosureTemperature	RO	°C	1	Int16
401315	GeneratorTotalApparentPower	RO	VA	10	Int32
401331	GeneratorTrueTotalPower	RO	W	10	Int32
401333	GeneratorTruePercentOfRatedPower	RO	%	1	Int16
401334	GeneratorVoltageAB	RO	V	10	Int32
401340	GeneratorVoltageAverageLineToLine	RO	V	10	Int32
401342	GeneratorVoltageAN	RO	V	10	Int32
401344	GeneratorVoltageBN	RO	V	10	Int32
401348	GeneratorVoltageAverageLineToNeutral	RO	V	10	Int32
401350	GeneratorCurrentA	RO	A	10	Int32
401352	GeneratorCurrentB	RO	A	10	Int32
401356	GeneratorCurrentAverage	RO	A	10	Int32
401358	GeneratorFrequency	RO	Hz	10	Int16
401359	GeneratorMeteringFirmwareVersion	RO			Int16
401400	GensetModelNumber	RO*			String
401421	GensetSerialNumber	RO*			String‡
401431	AlternatorPartNumber	RO*			String
401441	GensetControllerSerialNumber	RO			Int32
401443	EnginePartNumber	RO*			String

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Holding Register	Parameter	Write Access	Units	Divider	Type/Notes
401453	EngineModelNumber	RO*			String
401457	EngineSerialNumber	RO*			String
401471	GensetState	RO			Int16 0: Off 1: Cranking 2: Crank Pause 3: Idle 4: Running 5: Cooldown 6: Stopping 7: Shutdown 12: Priming: 13: ECM powered 14: Fault Cldn 15: Standby 16: Preheat
401483	ColdStartIgnitionDelay	RO	Active/ Inactive		Boolean
401504	GensetControllerTotalOperationTime	RO	h	10	Int32
401506	EngineTotalRunTime	RO	h	10	Int32
401508	EngineTotalRunTimeLoaded	RO	h	10	Int32
401510	EngineTotalNumberOfStarts	RO		1	Int32
401512	GensetTotalEnergy	RO	kW-h	10	Int32
401600	EcmModel	RO*			Int16 0: Not Selected 1: No ECM 14: DDC ECM 33: Deere ECM 61: Volvo ECM 68: Scania ECM 85: Kohler Diesel D-Series ECM 114: Kohler Gas E-Series ECM 115: Doosan ECM 128: Moto Tron ECM 153: Kohler Apecs ECM 253: Kohler Gas I-Series ECM 254: Adec ECM 255: V ECM

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Holding Register	Parameter	Write Access	Units	Divider	Type/Notes
401601	MaximumAlternatorCurrent	RO	A		Int16
401602	EngineNumberOfFlywheelTeeth	RO*			Int16
401603	EngineWarmedUpTemperature	RO*	°C		Int16
401604	EngineCooledDownTemperature	RO*	°C		Int16
401605	EngineCrankDisconnectSpeed	RO*	RPM		Int16
401606	EngineIdleSpeed	RO*	RPM		Int16
401607	EngineRunSpeed	RO*	RPM		Int16
401608	EngineCoolantTemperatureProtectives Enabled	RO			Int16 1: Low Warning 2: Critically Low Warning 4: Low Shutdown 8: High Warning 16: Critically High Warning 32: High Shutdown 64: Shorted Low Warning 128: Shorted Low Shutdown 256: Shorted High Warning 512: Shorted High Shutdown

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Holding Register	Parameter	Write Access	Units	Divider	Type/Notes
401609	EngineCoolantTemperatureSensor	RO*			Int16 1: Fuel Level 11: Coolant Temperature GM38523 (M18x1.5) / GM10166 (M14x1.5) / GM39458 (1/2 NPT) / GM39458 (3/8 NPT) 12: Temperature GM39601 14: Temperature 268298 15: Temperature GM88817 16: Temperature GM94527 21: Temperature GM28823 31: Pressure 343473 0-100 PSI 32: Pressure 343474 0-150 PSI 33: Pressure 364388 0-689 kPa 34: Pressure 264390 35: Fuel Level 1 Tank 36: Fuel Level 2 Tanks 37: Fuel Level 4 Tanks 38: Temperature GM93708 39: Pressure GM96251 0-100 PSI 40: Pressure GM96252 0-150 PSI 41: Pressure GM102100 0-100 PSI 42: Temperature GM39458
401611	EngineHighCoolantTemperatureInhibitDelay	RO	s		Int16
401612	EngineLowCoolantTemperatureWarningDelay	RO	s		Int16
401613	EngineHighCoolantTemperatureWarningDelay	RO	s		Int16
401614	EngineLowCoolantTemperatureShutdown Delay	RO	s		Int16
401615	EngineHighCoolantTemperatureShutdown Delay	RO	s		Int16
401616	EngineLowCoolantTemperatureWarningLimit	RO*	°C	10	Int16
401617	EngineHighCoolantTemperatureWarningLimit	RO*	°C	10	Int16
401619	EngineHighCoolantTemperatureShutdown Limit	RO*	°C	10	Int16
401620	EngineCoolantTemperatureDeadband	RO	°C	10	Int16

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Holding Register	Parameter	Write Access	Units	Divider	Type/Notes
401621	PersonalityAlternatorManufacturer	RO*			Int16 0: Marathon 1: Kohler 2: Baylor 3: Kato 4: Kohler Wound Field
401622	PersonalityAlternatorTocTimeConstant	RO*	s		Int16
401623	PersonalityAlternatorNumberOfPoles	RO*			Int16
401624	PersonalityAlternatorType	RO*			Int16 0: Old Reconnectable Or Dual 1: Old Fixed Voltage 2: Reconnectable 3: Wye Only 4: Low Delta 5: Any Three Phase Wye Or Delta 6: Single Phase 2 Or 4 Wire Only 7: HighDelta7 8: Dog Leg Or Delta No Wye 9: Dog Leg Or Wye No Delta 10: Dog Leg Only
401625	PersonalityFixedVoltage50Hz	RO*	V		Int16
401626	PersonalityPowerRatingSinglePhase50Hz10 PF	RO*	kW		Int16
401627	PersonalityPowerRatingSinglePhase50Hz8PF	RO*	kW		Int16
401628	PersonalityPowerRatingFixedVolt50Hz	RO*	kW		Int16
401629	PersonalityPowerRating50Hz_220_440	RO*	kW		Int16
401630	PersonalityPowerRating50Hz_208_415	RO*	kW		Int16
401631	PersonalityPowerRating50Hz_200_400	RO*	kW		Int16
401632	PersonalityPowerRating50Hz_190_380	RO*	kW		Int16
401633	PersonalityPowerRating50Hz_173_346	RO*	kW		Int16
401634	PersonalityPowerRating50HzDelta	RO*	kW		Int16
401635	PersonalityFixedVoltage60Hz	RO*	V		Int16
401636	PersonalityPowerRatingSinglePhase60Hz10 PF	RO*	kW		Int16
401637	PersonalityPowerRatingSinglePhase60Hz8PF	RO*	kW		Int16
401638	PersonalityPowerRatingFixedVolt60Hz	RO*	kW		Int16
401639	PersonalityPowerRating60Hz_240_480	RO*	kW		Int16
401640	PersonalityPowerRating60Hz_230_460	RO*	kW		Int16
401641	PersonalityPowerRating60Hz_220_440	RO*	kW		Int16
401642	PersonalityPowerRating60Hz_208_416	RO*	kW		Int16
401643	PersonalityPowerRating60Hz_190_380	RO*	kW		Int16
401644	PersonalityPowerRating60HzDelta	RO*	kW		Int16

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Holding Register	Parameter	Write Access	Units	Divider	Type/Notes
401646	PersonalityInstalledOptions	RO			Int16 1 Manual Speed Adjust 2 Glow Plug Support 4 FAA Application 8 VSG Telecom 16 Battle Mode 32 Voltage Selector Switch 64 Fuel Select Switch 128 Fuel Level Sender 256 Fuel Leak Switch 512 Lloyds
401700	GensetSystemVoltage	RO†	V	10	Int32
401702	GensetSystemFrequency	RO†	Hz	10	Frequency Configuration 500 or 600
401703	GensetVoltagePhaseConnection	RO†			Int16 0: SinglePhase 1: SinglePhase Dogleg 2: ThreePhaseWye 3: ThreePhaseDelta
401704	GensetPowerRating	RO*	kW	10	Int32
401706	GensetRatedCurrent	RO	A	10	Int32
401708	GensetSystemBatteryVoltage	RO*	V		BatteryConfiguration 12 or 24
401709	PrimePowerApplication	RO*			Int16 0: Standby 1: Prime
401710	CurrentTransformerRatio	RO*			Int16
401712	MeasurementSystem	RO			Int16 0: English 1: Metric
401713	EcmPower	RO†			Boolean
401714	AlarmSilenceAlwaysAllowed	RO			Int16 0: AutoOnly 1: Always
401717	DisplayContrast	RO			Int16
401718	UsingVoltageSelectorSwitch	RO†			Boolean
401731	BattleMode	RO	On/Off		Boolean
401732	EcmPoweredMode	RO	On/Off		Boolean
401800	GensetCalibrationFactorVoltageAB	RO		1000000	Int32
401802	GensetCalibrationFactorVoltageBC	RO		1000000	Int32
401804	GensetCalibrationFactorVoltageCA	RO		1000000	Int32
401806	GensetCalibrationFactorVoltageAN	RO		1000000	Int32
401808	GensetCalibrationFactorVoltageBN	RO		1000000	Int32
401810	GensetCalibrationFactorVoltageCN	RO		1000000	Int32
401812	GensetCalibrationFactorCurrentA	RO		1000000	Int32
401814	GensetCalibrationFactorCurrentB	RO		1000000	Int32
401816	GensetCalibrationFactorCurrentC	RO		1000000	Int32
401900	VoltageRegulatorAverageVoltageAdjustment	RO	V	10	Int32
401902	VoltageRegulatorVoltsPerHertzSlope	RO	%	1	Int16

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Holding Register	Parameter	Write Access	Units	Divider	Type/Notes
401903	VoltageRegulatorVoltsPerHertzCutIn Frequency	RO	Hz	10	Int16
401904	VoltageRegulatorGain	RO		1	Int16
401905	VoltageRegulatorStabilityAdjust	RO		1	Int16
401906	VoltageRegulatorFirmwareVersion	RO			Int16
402000	EngineIdleDuration	RO	s	10	Int16
402001	EngineRestartDelay	RO	s		Int16
402002	EngineStartDelay	RO	s		Int16
402003	EngineEcmStartDelay	RO	s		Int16
402004	EngineCoolDownDelay	RO	s		Int16
402006	EngineStartAidDelay	RO	s		Int16
402007	EngineCrankOnDelay	RO	s		Int16
402008	EngineCrankPauseDelay	RO	s		Int16
402009	EngineNumberOfCrankCycles	RO†			Int16
402010	EnginePostHeatDelaySeconds	RO	s		Int16
402011	EngineStartAidTemperatureLimit	RO	°C		Int16
402100	AfterCrankDisconnectFaultInhibitDelay	RO	s		Int16
402101	GensetLowBatteryVoltageWarningDelay	RO	s		Int16
402102	GensetHighBatteryVoltageWarningDelay	RO	s		Int16
402103	GensetLowBatteryVoltageWarningLimit	RO	%		Int16
402104	GensetHighBatteryVoltageWarningLimit	RO	%		Int16
402105	GensetBatteryLowCrankingVoltageWarning Delay	RO	s		Int16
402106	GensetBatteryLowCrankingVoltageWarning Limit	RO	%		Int16
402200	EngineLowCoolantLevelShutdownDelay	RO	s		Int16
402203	EngineLowOilPressureWarningDelay	RO	s		Int16
402204	EngineLowOilPressureShutdownDelay	RO	s		Int16
402206	EngineLockedRotorShutdownDelay	RO	s		Int16
402207	EcmCommunicationLossShutdownDelay	RO	s		Int16
402208	GensetLowEngineSpeedShutdownLimit	RO	%		Int16
402209	GensetHighEngineSpeedShutdownLimit	RO	%		Int16
402211	EngineOilPressureProtectivesEnabled	RO			Int16 1: Low Warning 2: Critically Low Warning 4: Low Shutdown 8: High Warning 16: Critically High Warning 32: High Shutdown 64: Shorted Low Warning 128: Shorted Low Shutdown 256: Shorted High Warning 512: Shorted High Shutdown

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Holding Register	Parameter	Write Access	Units	Divider	Type/Notes
402212	EngineOilPressureSensor	RO			Int16 1: Fuel Level 11: Coolant Temperature GM38523 (M18x1.5) / GM10166 (M14x1.5) / GM39458 (1/2 NPT) / GM39458 (3/8 NPT) 12: Temperature GM39601 14: Temperature 268298 15: Temperature GM88817 16: Temperature GM94527 21: Temperature GM28823 31: Pressure 343473 0-100 PSI 32: Pressure 343474 0-150 PSI 33: Pressure 364388 0-689 kPa 34: Pressure 264390 35: Fuel Level 1 Tank 36: Fuel Level 2 Tanks 37: Fuel Level 4 Tanks 38: Temperature GM93708 39: Pressure GM96251 0-100 PSI 40: Pressure GM96252 0-150 PSI 41: Pressure GM102100 0-100 PSI 42: Temperature GM39458
402213	EngineLowOilPressureInhibitDelay	RO	s		Int16
402217	EngineLowOilPressureWarningLimit	RO	kPa	10	Int16
402219	EngineLowOilPressureShutdownLimit	RO	kPa	10	Int16
402221	EngineOilPressureDeadband	RO	kPa	10	Int16
402222	GensetLowEngineSpeedDelay	RO	s		Int16
402300	LossOfACSensingShutdownDelay	RO	s		Int16
402301	GensetLowVoltageShutdownDelay	RO	s		Int16
402302	GensetHighVoltageShutdownDelay	RO	s		Int16
402303	GensetLowVoltageShutdownLimit	RO	%		Int16
402304	GensetHighVoltageShutdownLimit	RO	%		Int16
402305	GensetShortTermLowFrequencyShutdown Delay	RO	s		Int16
402306	GensetLongTermLowFrequencyShutdown Delay	RO	s		Int16

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Holding Register	Parameter	Write Access	Units	Divider	Type/Notes
402307	GensetHighFrequencyShutdownDelay	RO	s		Int16
402308	GensetLowFrequencyShutdownLimit	RO	%		Int16
402309	GensetHighFrequencyShutdownLimit	RO	%		Int16
403303	ModbusBaudRate	RO	b/s		Int16 1: 9600 b/s 2: 19200 b/s 3: 38400 b/s 4: 57600 b/s 5: 115200 b/s
403305	ModbusSlaveAddress	RO			Int16
407041	Charger1State	RO			Int16 0: IDLING 1: CHARGING 2: STANDBY 13: BATT FAIL 14: CHRGR FAIL 15: NA
407042	Charger1PowerLineState	RO			Int16 0: Power Disconnected 1: Power Connected 2: Power Error 3: Power Not Available
407043	Charger1OutputVoltage	RO	V	100	UInt16
407044	Charger1OutputCurrent	RO	A	100	Int16
407045	Charger1Temperature	RO	°C	1	Int16
407047	Charger1DeviceNumber	RO			Int16 0: Device 1 1: Device 2 2: Device 3 3: Device 4
407048	Charger1TemperatureCompensationActive	RO	Active/ Inactive		Boolean
407049	Charger1PresentChargeCurve	RO			Int16 0: IDLE 1: BULK 2: ABSORB 3: FLOAT 4: EQUAL 5: REFRESH 6: RECOVER 7: NA
407050	Charger1SoftStartChargingActive	RO	Active/ Inactive		Boolean
407051	Charger1ReducedOutputActive	RO	Active/ Inactive		Boolean
407052	Charger1TempCompensationSensor	RO			Int16 0: Not In Range 1: In Range 2: Error 3: Not Available
407053	Charger1LowVoltageForTopology	RO	Active/ Inactive		Boolean
407054	Charger1HighVoltageForTopology	RO	Active/ Inactive		Boolean
407055	Charger1InternalTemperatureHigh	RO	Active/ Inactive		Boolean

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Holding Register	Parameter	Write Access	Units	Divider	Type/Notes
407056	Charger1AbsorptionCycleTimedOut	RO	Active/ Inactive		Boolean
407057	Charger1OutputConnectionReversed	RO	Active/ Inactive		Boolean
407058	Charger1CustomProfileEnable	RO	Active/ Inactive		Boolean
407059	Charger1StarterBatteryTopology	RO			Int16 0: Default 1: VRLA 2: AGM 3: Gel 4: NiCd
407060	Charger1SystemBatteryVoltage	RO			Int16 0: 12V DC 1: 24V DC
407061	Charger1AutomaticEqualizeEnable	RO	Active/ Inactive		Boolean
407062	Charger1ManualEqualizeCycleActivation	RO	Active/ Inactive		Boolean
407063	Charger1TemperatureCompensationEnable	RO	Active/ Inactive		Boolean
407064	Charger1TemperatureCompensationSlope	RO	mV/C	1	Int16
407066	Charger1VoltageBulk	RO	V	1000	UInt16
407067	Charger1VoltageAbsorption	RO	V	1000	UInt16
407068	Charger1VoltageFloat	RO	V	1000	UInt16
407069	Charger1VoltageEqualize	RO	V	1000	UInt16
407071	Charger1AbsorptionCurrentTerminationTarget	RO	A	1000	UInt16
407072	Charger1DepletedBatteryCurrentLimit	RO	A	1000	UInt16
407073	Charger1DepletedBatteryVoltageTarget	RO	V	1000	UInt16
407074	Charger1ReturnToBulkStateVoltageThreshold	RO	V	1000	UInt16
407075	Charger1MaximumAbsorptionTimeThreshold	RO	min	1	UInt16
407076	Charger1MaximumBulkTimeThreshold	RO	min	1	UInt16
407077	Charger1RefreshChargeCycleTime	RO	hours	1	UInt16
407078	Charger1EqualizeStageDuration	RO	min	1	UInt16
407096	Charger1ForcedChargeCycleReset	RO			Boolean
407097	Charger1PendingEqualize	RO			Boolean
407098	Charger1TotalEqualizeCycleCount	RO		1	UInt16
407099	Charger1OutputEnable	RO			Boolean
407101	Charger1OutputConnectionShort	RO			Boolean
407102	Charger1EstimatedBatteryVoltage WhileCharging	RO	V	1000	UInt16
407103	Charger1EqualizeCurrentLimit	RO	A	1000	UInt16
407104	Charger1Installed	RO			Int16 0: Not Connected 1: Connected 2: Configured
407106	Charger1SerialNumber	RO			String
407122	Charger1ChargeCyclesBetweenAuto EqualizeCycles	RO			UInt16
407181	Charger2State	RO			Int16 0: IDLING 1: CHARGING 2: STANDBY 13: BATT FAIL 14: CHRGR FAIL 15: NA

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Holding Register	Parameter	Write Access	Units	Divider	Type/Notes
407182	Charger2PowerLineState	RO			Int16 0: Power Disconnected 1: Power Connected 2: Power Error 3: Power Not Available
407183	Charger2OutputVoltage	RO	V	100	UInt16
407184	Charger2OutputCurrent	RO	A	100	Int16
407185	Charger2Temperature	RO	°C	1	Int16
407187	Charger2DeviceNumber	RO			Int16 0 Device 1 1 Device 2 2 Device 3 3 Device 4
407188	Charger2TemperatureCompensationActive	RO	Active/ Inactive		Boolean
407189	Charger2PresentChargeCurve	RO			Int16 0: IDLE 1: BULK 2: ABSORB 3: FLOAT 4: EQUAL 5: REFRESH 6: RECOVER 7: NA
407190	Charger2SoftStartChargingActive	RO	Active/ Inactive		Boolean
407191	Charger2ReducedOutputActive	RO	Active/ Inactive		Boolean
407192	Charger2TempCompensationSensor	RO			Int16 0: Not In Range 1: In Range 2: Error 3: Not Available
407193	Charger2LowVoltageForTopology	RO	Active/ Inactive		Boolean
407194	Charger2HighVoltageForTopology	RO	Active/ Inactive		Boolean
407195	Charger2InternalTemperatureHigh	RO	Active/ Inactive		Boolean
407196	Charger2AbsorptionCycleTimedOut	RO	Active/ Inactive		Boolean
407197	Charger2OutputConnectionReversed	RO	Active/ Inactive		Boolean
407198	Charger2CustomProfileEnable	RO	Active/ Inactive		Boolean
407199	Charger2StarterBatteryTopology	RO			Int16 0: Default 1: VRLA 2: AGM 3: Gel 4: NiCd
407200	Charger2SystemBatteryVoltage	RO			Int16 0: 12V DC 1: 24V DC
407201	Charger2AutomaticEqualizeEnable	RO	Active/ Inactive		Boolean

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Holding Register	Parameter	Write Access	Units	Divider	Type/Notes
407202	Charger2ManualEqualizeCycleActivation	RO	Active/ Inactive		Boolean
407203	Charger2TemperatureCompensationEnable	RO	Active/ Inactive		Boolean
407204	Charger2TemperatureCompensationSlope	RO	mV/C	1	Int16
407206	Charger2VoltageBulk	RO	V	1000	UInt16
407207	Charger2VoltageAbsorption	RO	V	1000	UInt16
407208	Charger2VoltageFloat	RO	V	1000	UInt16
407209	Charger2VoltageEqualize	RO	V	1000	UInt16
407211	Charger2AbsorptionCurrentTerminationTarget	RO	A	1000	UInt16
407212	Charger2DepletedBatteryCurrentLimit	RO	A	1000	UInt16
407213	Charger2DepletedBatteryVoltageTarget	RO	V	1000	UInt16
407214	Charger2ReturnToBulkStateVoltageThreshold	RO	V	1000	UInt16
407215	Charger2MaximumAbsorptionTimeThreshold	RO	min	1	UInt16
407216	Charger2MaximumBulkTimeThreshold	RO	min	1	UInt16
407217	Charger2RefreshChargeCycleTime	RO	hours	1	UInt16
407218	Charger2EqualizeStageDuration	RO	min	1	UInt16
407236	Charger2ForcedChargeCycleReset	RO			Boolean
407237	Charger2PendingEqualize	RO			Boolean
407238	Charger2TotalEqualizeCycleCount	RO		1	UInt16
407239	Charger2OutputEnable	RO			Boolean
407241	Charger2OutputConnectionShort	RO			Boolean
407242	Charger2EstimatedBatteryVoltageWhile Charging	RO	V	1000	UInt16
407243	Charger2EqualizeCurrentLimit	RO	A	1000	UInt16
407244	Charger2Installed	RO			Int16 0: Not Connected 1: Connected 2: Configured
407246	Charger2SerialNumber	RO			String
407262	Charger2ChargeCyclesBetweenAuto EqualizeCycles	RO			UInt16
408000	DigitalInputPresentSummary	RO			Int16[16]
408016	DigitalOutputPresentSummary	RO			Int16[16]
408032	AnalogInputPresentSummary	RO			Int16[16]
408064	DigitalInputValueSummary	RO			Int16[16]
408080	DigitalOutputValueSummary	RO			Int16[16]
408096	AnalogInputValueSummary	RO			Int32[256]
409999	ModbusProduct	RO			Int16 37 = Decision-Maker 3000 75 = APM402
411000- 418000 Inputs and Outputs. See Section 6.5.					
431000	ModbusActiveAlertsVersion	RO			Int16§
431001	ModbusActiveAlertCount	RO			Int16
431002	ModbusActiveAlerts	RO			DeviceEvent[50] See Section 6.6.
432000	ModbusEventsVersion	RO			Int16**
432001	ModbusEventCount	RO			Int16
432002	ModbusEvents	RO			ModbusEvent[100] See Section 6.6.

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6.5 Inputs and Outputs

Register	Parameter	Write Access	Units	Divider	Type/Notes
411000	**DigitalInput[16][16]**				Boolean
+0	Digital Input #1 Value	RO			Boolean
+1	Digital Input #1 Enabled	RO			Boolean
+2	Digital Input #1 Event	RO			DigitalInputEvent See Figure 6-6
+4	Digital Input #1 InhibitDelay	RO	s		Int16
+5	Digital Input #1 Delay	RO	s		Int16
+6	Digital Input #1 SwitchType	RO			Int16 0: Normally open 1: Normally closed
411010	**DigitalInput[16][16]** Additional digital inputs use the next registers in sequence, with the structure shown above.				
414000	**DigitalOutput[16][16]**				
+0	Value	RO			Boolean
+1	Event	RO			OutputEvent See Figure 6-6
+2					
+3	Reserved for factory use.	RO			
+4					
+5					
+6					
+7					
+8					
+9					
414160 thru 414200	**DigitalOutput[16][16]** These additional digital outputs, available with the two-input, five-output board, use the structure shown above.				
417000	**AnalogInput[16][16]**				
+0	Value	RO		10	Int16
+1	RelativeValue	RO		100	Int16
+2	ProtectivesEnabled	RO			AnalogInputProtectives 1: LowWarning 2: CriticallyLow Warning 4: LowShutdown 8: HighWarning 16: CriticallyHigh Warning 32: HighShutdown
+3	Event	RO			AnalogInputEvent See Figure 6-6
+5	Sensor	RO			Sensor
+6	LowProtectiveInhibitDelay	RO	s		Int16
+7	HighProtectiveInhibitDelay	RO	s		Int16
+8	NormalDelay	RO	s		Int16
+9	LowWarningDelay	RO	s		Int16
+10	CriticallyLowWarningDelay	RO	s		Int16
+11	HighWarningDelay	RO	s		Int16
+12	CriticallyHighWarningDelay	RO	s		Int16
+13	LowShutdownDelay	RO	s		Int16
+14	HighShutdownDelay	RO	s		Int16
+15	LowWarningLimit	RO		10	Int16
+16	CriticallyLowWarningLimit	RO		10	Int16
+17	LowShutdownLimit	RO		10	Int16

Register	Parameter	Write Access	Units	Divider	Type/Notes
+18	HighWarningLimit	RO		10	Int16
+19	CriticallyHighWarningLimit	RO		10	Int16
+20	HighShutdownLimit	RO		10	Int16
+21	Deadband	RO		10	Int16
417022	**AnalogInput[16][16]** Additional analog inputs use the next registers in sequence, with the structure shown above.				

Figure 6-5 Inputs and Outputs

Input/Output Events

Event ID	Level	FMI	Parameter	Prog Input	Prog Output
ParameterValueAbnormal	Shutdown	Low	EngineSpeed		D
ParameterValueAbnormal	Shutdown	High	EngineSpeed		D
ParameterValueAbnormal	Warning	Low	EngineOilPressure		D
ParameterValueAbnormal	Shutdown	Low	EngineOilPressure		D
ParameterValueAbnormal	Shutdown	NoSignal	EngineOilPressure		D
ParameterValueAbnormal	Warning	Low	EngineCoolantTemperature		D
ParameterValueAbnormal	Warning	High	EngineCoolantTemperature		D
ParameterValueAbnormal	Shutdown	High	EngineCoolantTemperature		D
ParameterValueAbnormal	Shutdown	NoSignal	EngineCoolantTemperature		D
ParameterValueAbnormal	Shutdown	Low	EngineCoolantLevel		D
ParameterValueAbnormal	Warning	Low	EngineCoolantLevel		D
ParameterValueAbnormal	Warning	Low	EngineFuelLevel	AD	D
ParameterValueAbnormal	Shutdown	Low	EngineFuelLevel	D	D
ParameterValueAbnormal	Warning	High	EngineFuelLevel	D	D
ParameterValueAbnormal	Warning	CriticallyHigh	EngineFuelLevel	D	D
ParameterValueAbnormal	Warning	Low	FuelPressure	AD	D
ParameterValueAbnormal	Warning	Low	BatteryVoltage		D
ParameterValueAbnormal	Warning	High	BatteryVoltage		D
LowCrankingVoltage	Warning	Low	BatteryVoltage		D
ParameterValueAbnormal	Warning	Low	BatteryCurrent		D
ParameterValueAbnormal	Warning	High	BatteryCurrent		D
ParameterValueAbnormal	Warning	Low	EngineOilLevel	AD	D
ParameterValueAbnormal	Shutdown	Low	EngineOilLevel	D	D
ParameterValueAbnormal	Shutdown	Low	GeneratorVoltageAB		D
ParameterValueAbnormal	Shutdown	High	GeneratorVoltageAB		D
ParameterValueAbnormal	Shutdown	Low	GeneratorVoltageBC		D
ParameterValueAbnormal	Shutdown	High	GeneratorVoltageBC		D
ParameterValueAbnormal	Shutdown	Low	GeneratorVoltageCA		D
ParameterValueAbnormal	Shutdown	High	GeneratorVoltageCA		D
ParameterValueAbnormal	Shutdown	Low	GeneratorFrequency		D
ParameterValueAbnormal	Shutdown	High	GeneratorFrequency		D
ParameterValueAbnormal	Shutdown	High	GeneratorTrueTotalPower		D
ParameterValueAbnormal	Shutdown	Low	MaximumAlternatorCurrent		D
ACSensingLost	Warning				D
ACSensingLost	Shutdown				D
AirDamper	Shutdown				D
AlternatorProtection	Shutdown				D
AuxiliaryInput	Warning			AD	D
AuxiliaryInput	Shutdown			D	D

Event ID	Level	FMI	Parameter	Prog Input	Prog Output
BatteryChargerFault	Warning			AD	D
BatteryFault	Warning				D
CommonFault	Notice				D
CommonWarning	Notice				D
EcmCommunicationLoss	Shutdown				D
EmergencyStop	Shutdown				D
FuelTankLeak	Warning			AD	D
FuelTankLeak	Shutdown			D	D
GeneratorCommunicationLoss	Warning				D
GroundFaultInput	Warning			AD	D
LockedRotor	Shutdown				D
Nfpa110AlarmActive	Notice				D
NoACPower	Warning				D
OverCrank	Shutdown				D
PublicCanCommunicationLoss	Shutdown				D
RemoteReset	Status			D	
SpeedSensorFault	Warning				D
Annunciator1CommunicationLoss	Warning				D
Annunciator2CommunicationLoss	Warning				D
Annunciator3CommunicationLoss	Warning				D
Annunciator4CommunicationLoss	Warning				D
Annunciator5CommunicationLoss	Warning				D
AtsCommunicationError	Warning				D
AtsCommunicationError	Shutdown				D
BlockHeaterControl	Notice				D
ChicagoCodeActive	Notice			AD	D
EngineCoolDownActive	Notice				D
EngineStartAidActive	Notice				D
EngineStartDelayActive	Notice				D
EpsSupplyingLoad	Notice				D
GeneratorRunning	Notice				D
NotInAuto	Warning				D
SystemReady	Notice				D
LowFuel	Notice				D
FuelSpill	Notice				D
MinorFault	Notice				D

Figure 6-6 Input and Output Events

6.6 Event Codes

Active Alerts Structure

The DeviceEvent structure is a 2-register structure, packed with unsigned integer fields as follows:

Bit offset	Value	Description
0- 7	DeviceEventId	Identifies the type of event. Refer to Figure 6-6.
8 – 10	Level	Indicates the general degree to which the event affects product operation. 1 Device Event Level Status, indicates an event that is not brought to the operator's attention but is added to the history of events. 2 Device Event Level Warning, indicates an immediate problem but allows the engine to continue running. 4 Device Event Level Shutdown, indicates an event that results in the controller automatically stopping the engine. 5 Device Event Level Notice, does not necessarily indicate a problem and the event is excluded from the history of events.
11 – 15	Fmi	Indicates how the parameter associated with this event is out of range; or NotApplicable. 0 Critically High 1 Critcally Low 5 No Signal 16 High 18 Low 19 Erroneous Data Received 30 OK 31 Not Applicable
16 – 31	ParameterId	Parameter related to the event, or None. See parameter ID's in Figure 6-5. Note that the parameter ID is equal to (the same as) the register number.

Figure 6-7 Device Event Structure

ModbusEvent Structure

Register offset	Value	Type	Description
0 – 1	DeviceEvent	DeviceEvent	Identifies the nature of the event.
2 – 5	DateTime	DateTime	When the event occurred in UTC, or 0 if unknown.
6 – 7	ControllerOnTime	UInt32	Duration that the controller has been powered since manufacture, or *Unknown*. Value is 10 x hours.
8 – 9	EngineRuntime	UInt32	Engine runtime since manufacture, or *Unknown.* Value is 10 x hours.
10 – 11	Value0	Int32	Value of a parameter related to the event, or *Unknown.* If DeviceEventId is ParameterChanged, this is the old parameter value.
12 – 13	Value1	Int32	If DeviceEventId is ParameterChanged, the new parameter value; otherwise, *Unknown*.

Figure 6-8 Modbus Event Structure

APM402 or Decision-Maker® 3000 Controller		
EventID	**Fault Condition**	**Text to display**
1	Parameter Value Abnormal	See Figure 6-10
2	BlockHeaterControl	Non Critical Event
3	NotInAuto	Master Not in Auto
4	OverCrank	Overcrank
5	BatteryChargerFault	Battery Charger Fault
6	LowCrankingVoltage	Low Battery Voltage
7	AirDamper	Air Damper Control
8	EpsSupplyingLoad	EPS Supplying Load
9	GeneratorRunning	Generator Running
10	Nfpa110AlarmActive	NFPA 110 Fault
12	EngineCoolDownActive	Engine Cooldown Delay
13	EngineStartDelayActive	Engine Start Delay
14	EngineStartAidActive	Starting Aid
15	SystemReady	System Ready
16	RemoteStart	Remote Start
17	PublicCanStart	Remote Start
19	EmergencyStop	Emergency Stop
20	AlternatorProtection	Alternator Protect Shutdown
21	GroundFaultInput	Ground Fault
22	ChicagoCodeActive	Chicago Code Active
23	AuxiliaryInput	Auxiliary Input
24	CommonWarning	Common Warning
25	CommonFault	Common Fault
26	RunRelayCoilOverload	Internal Fault
27	StarterRelayCoilOverload	Internal Fault
28	LockedRotor	Locked Rotor
29	SpeedSensorFault	Speed Sensor Fault
30	ACSensingLost	AC Sensing Loss
32	EngineDerateActive	Engine Derate Active
33	InjectorWiringFault	ECM Fault
34	WaterInFuel	ECM Fault
35	FuelTankLeak	Fuel Leak
36	LossOfFuel	Low Fuel
37	ElectricalMeteringCommunicationLoss	Internal Fault
38	VoltageRegulatorCommunicationLoss	Internal Fault
39	Tps1HigherThanTps2	ECM Fault
40	Tps1LowerThanTps2	ECM Fault
41	Tps1HighVoltage	ECM Fault
42	Tps1LowVoltage	ECM Fault
43	CannotReachHiLoTps	ECM Fault
44	Tps1Tps2SimulVoltageOutOfRange	ECM Fault
49	TipActive	ECM Fault
50	TipHighVoltage	ECM Fault
51	TipLowVoltage	ECM Fault
52	IatHigherThanExpected2	ECM Fault
53	IatHighVoltage	ECM Fault
54	IatLowVoltage	ECM Fault
55	IatHigherThanExpected1	ECM Fault
56	MapLowVoltage	ECM Fault

APM402 or Decision-Maker® 3000 Controller		
EventID	**Fault Condition**	**Text to display**
57	MapHighPressure	ECM Fault
58	BpHighPressure	ECM Fault
59	BpLowPressure	ECM Fault
60	EctHigherThanExpected2	ECM Fault
61	EctChtHighVoltage	ECM Fault
62	EctChtLowVoltage	ECM Fault
63	EctHigherThanExpected1	ECM Fault
66	SparkRevLimitExceeded	ECM Fault
67	MaxGovernSpeedOverride	ECM Fault
68	FuelRevLimitExceeded	ECM Fault
69	FlashCsumInvalid	ECM Fault
70	InternalEcuFailure	ECM Fault
71	RamFailure	ECM Fault
72	CrankSyncNoise	ECM Fault
73	CrankSignalLost	ECM Fault
74	NoCrankSyncAtStart	ECM Fault
75	ECMCommunicationLoss	ECM Fault
76	ECMAddressConflict	ECM Fault
77	CamSyncNoise	ECM Fault
78	CamSignalLost	ECM Fault
79	Knock1ExcessiveSignal	ECM Fault
80	Knock1SensorOpen	ECM Fault
81	External5V1High	ECM Fault
82	External5V1Low	ECM Fault
83	External5V2High	ECM Fault
84	External5V2Low	ECM Fault
85	MilRelayCoilShortToPower	ECM Fault
86	MilRelayGroundShort	ECM Fault
87	MilRelayCoilOpen	ECM Fault
88	FuelRunOutLongerThanExpected	ECM Fault
89	PrimaryLoopOpen	ECM Fault
90	PrimaryLoopShorted	ECM Fault
91	StartRelayCoilShortToPower	ECM Fault
92	StartRelayGroundShort	ECM Fault
93	PowerRelayCoilShortToPower	ECM Fault
94	PowerRelayGroundShort	ECM Fault
95	PowerRelayCoilOpen	ECM Fault
96	Ego1Open	ECM Fault
97	Tps2HighVoltage	ECM Fault
98	Tps2LowVoltage	ECM Fault
99	ClosedLoopHighNg	ECM Fault
100	ClosedLoopLowNg	ECM Fault
101	AdaptiveLearnHighLpgNG	ECM Fault
102	AdaptiveLearnLowLpgNG	ECM Fault
103	ClosedLoopHighLpg	ECM Fault
104	ClosedLoopLowLpg	ECM Fault
105	Ego2Open	ECM Fault
106	Knock2ExcessiveSignal	ECM Fault
107	Knock2SensorOpen	ECM Fault

APM402 or Decision-Maker® 3000 Controller		
EventID	**Fault Condition**	**Text to display**
108	MjDeliveryPressureHigh	ECM Fault
109	MjDeliveryPressureLow	ECM Fault
110	MjVoltageSupplyHigh	ECM Fault
111	MjVoltageSupplyLow	ECM Fault
112	MjInternalFault	ECM Fault
113	MjCommLost	ECM Fault
125	EngineStarted	Status Event
126	EngineStopped	Status Event
127	FuelPrimingStarted	Fuel Priming Started
128	FuelPrimingStopped	Fuel Priming Stopped
133	DefaultParametersLoaded	Controller Initialized
139	FirmwareUpgradeFault	Internal Fault
140	FirmwareUpgradeIntegrityTestFailed	Internal Fault
141	FirmwareStartupIntegrityTestFailed	Internal Fault
142	SystemTimerFailed	Status Event
143	WatchdogTimerExpired	Internal Fault
144	InternalFailure	Internal Fault
145	FileSystemError	Internal Fault
146	USBError	Internal Fault
156	OptionBoard1CommunicationLoss	Option Board1 Communication Loss
157	OptionBoard2CommunicationLoss	Option Board2 Communication Loss
158	OptionBoard3CommunicationLoss	Option Board3 Communication Loss
159	OptionBoard4CommunicationLoss	Option Board4 Communication Loss
163	TestEvent	Test Event
176	ECMModelMismatch	ECM Model Mismatch
177	BackupParametersLoaded	Backup Parameters Loaded
178	AutoRecovery	Auto Recovery
179	RemoteReset	Remote Reset
181	ECMUnknownFault	ECM Unknown Fault
222	LowFuel	Low Fuel
223	FuelSpill	Fuel Spill
224	MinorFault	Minor Fault
225	J1939CANShutdown	J1939 CANShutdown
226	EcmYellowAlarm	ECM Yellow Alarm
227	EcmRedAlarm	ECM Red Alarm
228	RemoteStartCommandIssued	Remote Start Command Issued
229	IdleStartCommandIssued	Idle Start Command Issued
231	RunButtonAcknowledged	Run Button Acknowledged

Figure 6-9 Event Codes, APM402 or Decision-Maker® 3000 Controller

APM402 or Decision-Maker® 3000 Controller				
EventID	**Level**	**FMI**	**ParamID**	**Text to display**
1	4	16	1100	Overspeed
1	4	18	1100	Underspeed
1	2	18	1102	Low Oil Pressure Warning
1	4	18	1102	Low Oil Pressure Shutdown
1	2	18	1103	Low Coolant Temperature
1	2	16	1103	High Coolant Temp Warning
1	4	16	1103	High Coolant Temp Shutdown
1	4	5	1103	No Coolant Temp Signal
1	4	18	1105	Low Coolant Level Shutdown
1	2	18	1106	Low Fuel Warning
1	4	18	1106	Low Fuel Shutdown
1	2	16	1106	High Fuel Warning
1	2	0	1106	Critically High Fuel Warning
1	2	18	1110	Low Fuel Pressure Warning
1	2	18	1107	Low Battery Voltage
1	2	16	1107	High Battery Voltage
1	2	18	1104	Low Oil Level Warning
1	4	18	1104	Low Oil Level Shutdown
1	4	18	1334	Under Voltage
1	4	16	1334	Over Voltage
1	4	18	1336	Under Voltage
1	4	16	1336	Over Voltage
1	4	18	1338	Under Voltage
1	4	16	1338	Over Voltage
1	4	18	1358	Under Freqeuncy
1	4	16	1358	Over Frequency
1	4	16	1331	Over Power Shutdown
1	4	16	1601	Low Maximum Alternator Current

Figure 6-10 Event ID 1, Parameter Value Abnormal, APM402 or Decision-Maker® 3000 Controller

7.1 Specifications

The Decision-Maker® 3500 controller's Modbus® communication capability:

- Supports industry-standard Modbus® RTU protocol.
- Can use Modbus® TCP protocol with the addition of a Modbus/Ethernet converter.
- Uses RS-485 connections to connect to a Modbus® master singly or over an RS-485 network.
- Connects to an Ethernet network using a Modbus/ Ethernet converter.
- Uses standard baud rates of 9600, 19200, 38400, or 57600.



Figure 7-1 Decision-Maker® 3500 Controller

7.2 Hardware Connections

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Press the generator set off/reset button to shut down the generator set. (2) Disconnect the power to the battery charger, if equipped. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

Circuit isolation is recommended for installations that may be exposed to electrical noise. See Appendix B, Noise and Wiring Practices.

Use the following procedure to connect the hardware. Observe the safety precautions. Also see the network connection diagrams in TT-1405.

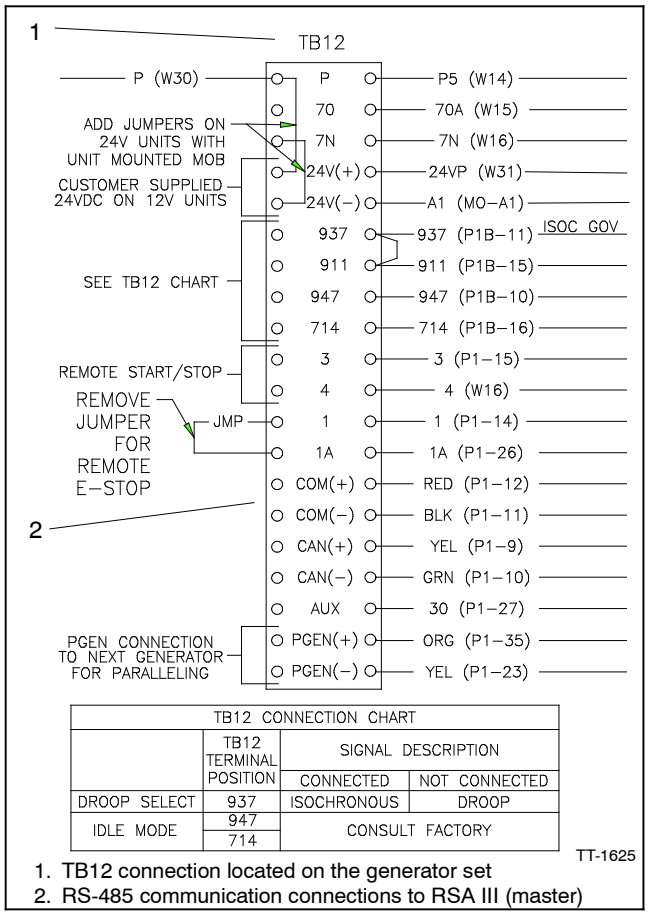
Ethernet connections require the use of a Modbus/Ethernet converter module. See TT-1405 for Modbus/Ethernet converter connection and setup information.

Decision-Maker 3500 Connection Procedure

1. Press the OFF button on the controller.
2. Disconnect the power to the battery charger, if equipped.
3. Disconnect the generator set engine starting battery(ies), negative (-) lead first.
4. Turn off and disconnect the power to all devices in the system.
5. Connect to communication port on TB12 (located in the junction box) as shown in Figure 7-2.
6. Verify that the controller is OFF.
7. Reconnect the generator set engine starting battery, negative (-) lead last.
8. Reconnect power to the battery charger, if equipped.

7.3 Controller Setup

Use Kohler® SiteTech™ software and a personal computer connected to the controller's USB port to configure the controller's communication parameters shown in Figure 7-3. See TP-6701, SiteTech Software Operation Manual, for instructions.



TB12 CONNECTION CHART

	TB12 TERMINAL POSITION	SIGNAL DESCRIPTION	
		CONNECTED	NOT CONNECTED
DROOP SELECT	937	ISOCHRONOUS	DROOP
IDLE MODE	947	CONSULT FACTORY	
	714		

1. TB12 connection located on the generator set
2. RS-485 communication connections to RSA III (master)

Note: Use Belden #9844 or equivalent

TB12 Connector	Circuit Board Designation	Wire Designation
COM (+)	(+)	White
COM (-)	(-)	Black
Do not connect at TB12 or DEC 3500, tape to insulate unused end.		Shield
Note: When using RS-485 communication cable, connect the "shield" wire at the RSA III P27 connection but not at the DEC 3500 controller/TB12 connection.		

Figure 7-2 Connection Details

SiteTech Group	Parameter	Setting
Modbus	Address	Use a unique network address between 1 and 247 for each unit. Use 1 for a single connection. Do not use 0 (zero).
	Baud rate	9600, 19200, 38400, or 57600. Must match the PC and all devices in the system.

Figure 7-3 Decision-Maker 3500 Communication Parameters

7.4 Modbus Registers

This section contains Modbus® registers for the Decision-Maker® 3500 controller. Refer to Section 1.3 for definitions of terms and symbols used in the register tables.

Note: FFC0 = Unsupported register.

Time delays, setpoints, inputs and outputs, and other user-defined parameters are entered through the controller keypad or SiteTech™ software. Refer to the operation manuals for the controller or software for instructions. See the List of Related Materials for document part numbers.

Note: Kohler often uses extended Modbus registers which exceed 9,999. To illustrate the extended format, Kohler has added an extra digit to its register map to support registers above 9,999. For example: Holding register 9999 may be illustrated as 49999 in the traditional format or as 409999 in the extended format where the most significant digit still represents what type of Modbus register it is. Some software tools may have difficulty reading registers above 9,999.

Register	Parameter	Write Access	Units	Data Type	Type/Notes
400001	RMS Generator Voltage L1 - L2	RO	% X 100	UINT	% of Rated VAC
400002	RMS Generator Voltage L2 - L3	RO	% X 100	UINT	% of Rated VAC
400003	RMS Generator Voltage L3 - L1	RO	% X 100	UINT	% of Rated VAC
400004	RMS Generator Voltage Line to Line Average	RO	% X 100	UINT	% of Rated VAC
400005	RMS Generator Voltage L1 - N	RO	% X 100	UINT	% of Rated VAC
400006	RMS Generator Voltage L2 - N	RO	% X 100	UINT	% of Rated VAC
400007	RMS Generator Voltage L3 - N	RO	% X 100	UINT	% of Rated VAC
400008	RMS Generator Voltage Line to Neutral Average	RO	% X 100	UINT	% of Rated VAC
400009	RMS Generator Current L1	RO	% X 100	UINT	% of Rated Current (RMS)
400010	RMS Generator Current L2	RO	% X 100	UINT	% of Rated Current (RMS)
400011	RMS Generator Current L3	RO	% X 100	UINT	% of Rated Current (RMS)
400012	RMS Generator Current Average	RO	% X 100	UINT	% of Rated Current (RMS)
400013	Generator Frequency	RO	X 100	UINT	Hz
400014	Generator Real Power L1	RO	% X 100	INT	% of Rated kW (Full Real Load = 33.3%)
400015	Generator Real Power L2	RO	% X 100	INT	% of Rated kW (Full Real Load = 33.3%)
400016	Generator Real Power L3	RO	% X 100	INT	% of Rated kW (Full Real Load = 33.3%)
400017	Generator Total Real Power	RO	% X 100	INT	% of Rated kW
400018	Generator Reactive Power L1	RO	% X 100	INT	% of Rated kW (Full Reactive Load = 25%)
400019	Generator Reactive Power L2	RO	% X 100	INT	% of Rated kW (Full Reactive Load = 25%)
400020	Generator Reactive Power L3	RO	% X 100	INT	% of Rated kW (Full Reactive Load = 25%)
400021	Generator Reactive Power	RO	% X 100	INT	% of Rated kW (Full Reactive Load = 75%)
400022	Generator Apparent Power L1	RO	% X 100	UINT	% of Rated kW (Full Alternator Load = 41.7%)

* Firmware versions before 1.4 do not support reading these reserved registers.

† Firmware versions before 1.4 do not support this parameter.

‡ Parameter is not writable in firmware versions before 1.4.

Register	Parameter	Write Access	Units	Data Type	Type/Notes
400023	Generator Apparent Power L2	RO	% X 100	UINT	% of Rated kW (Full Alternator Load = 41.7%)
400024	Generator Apparent Power L3	RO	% X 100	UINT	% of Rated kW (Full Alternator Load = 41.7%)
400025	Generator Apparent Power	RO	% X 100	UINT	% of Rated kW (Full Alternator Load = 125%)
400026	Generator Power Factor L1	RO	pF X 100	INT	Generator Output Power Factor (- = reverse Power)
400027	Generator Power Factor L2	RO	pF X 100	INT	Generator Output Power Factor (- = reverse Power)
400028	Generator Power Factor L3	RO	pF X 100	INT	Generator Output Power Factor (- = reverse Power)
400029	Generator Power Factor	RO	pF X 100	INT	Generator Output Power Factor (- = reverse Power)
400030	Generator Phase Angle Voltage L1 - Voltage L2	RO	° X 10	INT	Phase difference in Degrees
400031	Generator Phase Angle Voltage L1 - Voltage L3	RO	° X 10	INT	Phase difference in Degrees
400032	Generator Phase Angle Voltage L1 - Current L1	RO	° X 10	INT	Phase difference in Degrees
400033	Generator Phase Angle Voltage L2 - Current L2	RO	° X 10	INT	Phase difference in Degrees
400034	Generator Phase Angle Voltage L3 - Current L3	RO	° X 10	INT	Phase difference in Degrees
400035	Phase Rotation	RO	UNIQUE	PHASE_ ROT	0 = Unknown, 1 = ABC, 2 = CBA, 3 = Single-Phase
400036	Generator L1 Current Lead/Lag	RO	UNIQUE	LEAD/ LAG	0 = Invalid, 1 = Leading, 2 = Lagging
400037	Generator L2 Current Lead/Lag	RO	UNIQUE	LEAD/ LAG	0 = Invalid, 1 = Leading, 2 = Lagging
400038	Generator L3 Current Lead/Lag	RO	UNIQUE	LEAD/ LAG	0 = Invalid, 1 = Leading, 2 = Lagging
400039	Generator Avg Current Lead/Lag	RO	UNIQUE	LEAD/ LAG	0 = Invalid, 1 = Leading, 2 = Lagging
400040 thru 400043	RESERVED for factory use				
400044	RMS Bus Voltage L1 - L2	RO	% X 100	UINT	% of Rated VAC
400045	RMS Bus Voltage L2 - L3	RO	% X 100	UINT	% of Rated VAC
400046	RMS Bus Voltage L3 - L1	RO	% X 100	UINT	% of Rated VAC
400047	RMS Bus Voltage Average Line to Line	RO	% X 100	UINT	% of Rated VAC
400048	Total Bus Real Power	RO	% X 100	INT	% of Rated kW
400049	Total Bus Reactive Power	RO	% X 100	INT	% of Rated kW (Full Reactive Load = 75%)
400050	Bus Frequency	RO	X 100	UINT	Hz

***** Firmware versions before 1.4 do not support reading these reserved registers.

† Firmware versions before 1.4 do not support this parameter.

‡ Parameter is not writable in firmware versions before 1.4.

Register	Parameter	Write Access	Units	Data Type	Type/Notes
400051	Bus Phase Rotation	RO	UNIQUE	PHASE_ ROT	0 = Unknown, 1 = ABC, 2 = CBA, 3 = Single-Phase
400052	Phase Angle Generator Voltage L1 - Bus Voltage L1	RO	° X 10	INT	Phase difference in Degrees
400053	Speed Bias	RO	% X 100	INT	Adjustment provided to Speed (100% = 10% change in speed)
400054	Voltage Bias	RO	% X 100	INT	Adjustment provided to Voltage (100% = 10% change in voltage)
400055	Bus Phase Angle Voltage L1 - Voltage L2	RO	° X 10	INT	Phase difference in Degrees
400056	Bus Phase Angle Voltage L1 - Voltage L3	RO	° X 10	INT	Phase difference in Degrees
400057	RESERVED for factory use				
400058	RESERVED for factory use				
400059	Engine Oil Pressure	RO	kPA X 10	UINT	kPA
400060	Engine Coolant Temperature	RO	°C X 10	INT	°C
400061	Engine Speed	RO	RPM	UINT	RPM
400062	Battery Voltage	RO	V X 10	UINT	V
400063	Controller Temperature	RO	°C	INT	°C
400064	Engine Fuel Pressure	RO	kPA	UINT	kPA
400065	Engine Fuel Temperature	RO	°C	INT	°C
400066	Engine Fuel Rate	RO	liters / hour	UINT	l/hr
400067	Fuel Used During Last Run	RO	liters	UINT	l
400068	Engine Coolant Pressure	RO	kPA X 10	UINT	kPA
400069	Engine Coolant Level	RO	% X 100	UINT	%
400070	Engine Oil Temperature	RO	°C	INT	°C
400071	Engine Oil Level	RO	% X 1	UINT	%
400072	Engine Crankcase Pressure	RO	kPA	UINT	kPA
400073	Intake Air Temperature	RO	°C	INT	°C
400074	Intake Air Pressure	RO	kPA	UINT	kPA
400075	RESERVED				
400076	ECM Battery Voltage	RO	V X 10	UINT	V
400077	ECM Model	RO	UNIQUE	UINT	
400078	RESERVED				
400079	RESERVED				
400080	RESERVED				
400081	RESERVED				
400082	RESERVED				
400083	Total Runtime Hours LW	RO	h X 10	UDINT	h
400084	Total Runtime Hours HW	RO			
400085	Total Runtime Loaded Hours LW	RO	h X 10	UDINT	h
400086	Total Runtime Loaded Hours HW	RO			
400087	Genset Controller Total Operation Time	RO	h X 10	UDINT	h
400088	Total Runtime Unloaded Hours HW	RO			
400089	Total Runtime kW Hours LW	RO	kWh	UDINT	kWh
400090	Total Runtime kW Hours HW	RO			
400091	Code Version MSB = Minor, LSB = Major	RO	UNIQUE		
400092	Code Version Build Number	RO	UNIQUE		
400093	RESERVED for factory use				
400094	RESERVED for factory use				
400095	RESERVED for factory use				
400096	RESERVED for factory use				

* Firmware versions before 1.4 do not support reading these reserved registers.

† Firmware versions before 1.4 do not support this parameter.

‡ Parameter is not writable in firmware versions before 1.4.

Register	Parameter	Write Access	Units	Data Type	Type/Notes
400097	LSB = Day, MSB = Month	RW	Day of Month, Month of Year	UINT	
400098	Year	RW	16 bit year (A.D.)	UINT	
400099	mSecond	RW	seconds X 1000	UINT	
400100	LSB = Minute, MSB = Hour	RW	Minutes past Hour, Hours past Midnight	UINT	
400101	RESERVED for factory use				
400102	RESERVED for factory use				
400103	RESERVED for factory use				
400104	RESERVED for factory use				
400105	System Voltage	RW	V	UINT	V
400106	System Frequency	RW	Hz	UINT	Hz
400107	System Phase Connection	RW	UNIQUE	Voltage Phase Connection	0 = Single-Phase, 1 = DogLeg, 2 = Wye, 3 = Delta
400108	Rated Current	RO	A	UINT	A
400109	Genset kW Rating	RO	kW X 10	UINT	kW
400110	System Battery Voltage	RW	V	UINT	V
400111	Engine Run Speed	RW	RPM X 1	UINT	RPM
400112	RESERVED for factory use				
400113	RESERVED for factory use				
400513	Total Number of Starts	RO		UINT	
400514	Total Runtime Hours Since Maintenance LW	RO	hr X 10	UDINT	hr
400515	Total Runtime Hours Since Maintenance HW	RO			
400516	Total Loaded Hours Since Maintenance LW	RO	hr X 10	UDINT	hr
400517	Total Loaded Hours Since Maintenance HW	RO			
400518	Total kW Hours Since Maintenance LW	RO	kWh X 10	UDINT	kWh
400519	Total kW Hours Since Maintenance LW	RO			
400520	Last Mantenance Day, Month	RO	Day of Month, Month of Year	UINT	
400521	Last Maintenance Year	RO	16 bit year (A.D.)	UINT	
400522	Last Maintenance mSecond	RO	seconds X 1000	UINT	
400523	Last Maintenance Minute, Hour	RO	Minutes past Hour, Hours past Midnight	UINT	
400524	Operating Days Since Last Maintenance	RO	days	UINT	days
400525	Number of Starts Since Last Maintenance	RO		UINT	
400526	Last Start Day, Month	RO	Day of Month, Month of Year	UINT	
400527	Last Start Year	RO	16 bit year (A.D.)	UINT	
400528	Last Start mSecond	RO	seconds X 1000	UINT	

* Firmware versions before 1.4 do not support reading these reserved registers.

† Firmware versions before 1.4 do not support this parameter.

‡ Parameter is not writable in firmware versions before 1.4.

Register	Parameter	Write Access	Units	Data Type	Type/Notes
400529	Last Start Minute, Hour	RO	Minutes past Hour, Hours past Midnight	UINT	
400530	RESERVED for factory use				
400531	RESERVED for factory use				
400532	RESERVED for factory use				
400533	RESERVED for factory use				
400534	RESERVED for factory use				
400535	Voltage Measurement Channel Select	RW		UINT	1-7 are local, 8-10 are isolated.
400536	High Shutdown Configuration for Active Voltage Channel	RW	Event, Invert, Enable	UINT	bits 0-12 = Event, bit 14 = Invert, bit 15 = Enable
400537	High Shutdown Level for Active Voltage Channel	RW	Volts X 100	UINT	
400538	High Shutdown Pickup Time Delay for Active Voltage Channel	RW	sec X 10	UINT	
400539	High Shutdown Dropout Time Delay for Active Voltage Channel	RW	sec X 10	UINT	
400540	High Warning Configuration for Active Voltage Channel	RW	Event, Invert, Enable	UINT	bits 0-12 = Event, bit 14 = Invert, bit 15 = Enable
400541	High Warning Level for Active Voltage Channel	RW	Volts X 100	UINT	
400542	High Warning Pickup Time Delay for Active Voltage Channel	RW	sec X 10	UINT	
400543	High Warning Dropout Time Delay for Active Voltage Channel	RW	sec X 10	UINT	
400544	Low Warning Configuration for Active Voltage Channel	RW	Event, Invert, Enable	UINT	bits 0-12 = Event, bit 14 = Invert, bit 15 = Enable
400545	Low Warning Level for Active Voltage Channel	RW	Volts X 100	UINT	
400546	Low Warning Pickup Time Delay for Active Voltage Channel	RW	sec X 10	UINT	
400547	Low Warning Dropout Time Delay for Active Voltage Channel	RW	sec X 10	UINT	
400548	Low Shutdown Configuration for Active Voltage Channel	RW	Event, Invert, Enable	UINT	bits 0-12 = Event, bit 14 = Invert, bit 15 = Enable
400549	Low Shutdown Level for Active Voltage Channel	RW	Volts X 100	UINT	
400550	Low Shutdown Pickup Time Delay for Active Voltage Channel	RW	sec X 10	UINT	
400551	Low Shutdown Dropout Time Delay for Active Voltage Channel	RW	sec X 10	UINT	
400552	RESERVED for factory use	RO			
400553	RESERVED for factory use	RO			
400554	RESERVED for factory use	RO			
400555	RESERVED for factory use	RO			
400556	RESERVED for factory use	RO			
400557	Active Voltage Measurement Channel Value	RO	Volts DC X 100	UINT	VDC
400558	RESERVED for factory use	RO			
400559	RESERVED for factory use	RO			
400560	Resistance Measurement Channel Select	RW		UINT	1-6 are isolated

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‡ Parameter is not writable in firmware versions before 1.4.

Register	Parameter	Write Access	Units	Data Type	Type/Notes
400561	High Shutdown Configuration for Active Resistance Channel	RW	Event, Invert, Enable	UINT	bits 0-12 = Event, bit 14 = Invert, bit 15 = Enable
400562	High Shutdown Level for Active Resistance Channel	RW	Ohms	UINT	
400563	High Shutdown Pickup Time Delay for Active Resistance Channel	RW	sec X 10	UINT	
400564	High Shutdown Dropout Time Delay for Active Resistance Channel	RW	sec X 10	UINT	
400565	High Warning Configuration for Active Resistance Channel	RW	Event, Invert, Enable	UINT	bits 0-12 = Event, bit 14 = Invert, bit 15 = Enable
400566	High Warning Level for Active Resistance Channel	RW	Ohms	UINT	
400567	High Warning Pickup Time Delay for Active Resistance Channel	RW	sec X 10	UINT	
400568	High Warning Dropout Time Delay for Active Resistance Channel	RW	sec X 10	UINT	
400569	Low Warning Configuration for Active Resistance Channel	RW	Event, Invert, Enable	UINT	bits 0-12 = Event, bit 14 = Invert, bit 15 = Enable
400570	Low Warning Level for Active Resistance Channel	RW	Ohms	UINT	
400571	Low Warning Pickup Time Delay for Active Resistance Channel	RW	sec X 10	UINT	
400572	Low Warning Dropout Time Delay for Active Resistance Channel	RW	sec X 10	UINT	
400573	Low Shutdown Configuration for Active Resistance Channel	RW	Event, Invert, Enable	UINT	bits 0-12 = Event, bit 14 = Invert, bit 15 = Enable
400574	Low Shutdown Level for Active Resistance Channel	RW	Ohms	UINT	
400575	Low Shutdown Pickup Time Delay for Active Resistance Channel	RW	sec X 10	UINT	
400576	Low Shutdown Dropout Time Delay for Active Resistance Channel	RW	sec X 10	UINT	
400577	RESERVED for factory use	RO			
400578	RESERVED for factory use	RO			
400579	RESERVED for factory use	RO			
400580	RESERVED for factory use	RO			
400581	RESERVED for factory use	RO			
400582	Active Resistance Measurement Channel Value	RO	Ohms	UINT	
400583	RESERVED for factory use	RO			
400584	RESERVED for factory use	RO			
400585	Digital Input Select	RW		UINT	
400586	RESERVED for factory use	RW	Event, Force, Invert, Enable	UINT	
400587	RESERVED for factory use	RO			
400588	Dropout Time Delay for Active Digital Input	RW	sec X 10	UINT	
400589	Status / Force for Active Digital Input	RW	1 = on, 0 = off	UINT	
400590	Digital Input Status (Bit field)	RO	bit0 = input1, bit1 = input 2, etc.	UINT	

* Firmware versions before 1.4 do not support reading these reserved registers.

† Firmware versions before 1.4 do not support this parameter.

‡ Parameter is not writable in firmware versions before 1.4.

Register	Parameter	Write Access	Units	Data Type	Type/Notes
400591	RESERVED for factory use				
400592	RESERVED for factory use				
400593	RESERVED for factory use				
400594	RESERVED for factory use				
400595	Digital Output Select	RW		UINT	
400596	Configuration of Active Digital Output	RW	Event, Force, Enable	UINT	
400597	RESERVED for factory use	RO			
400598	RESERVED for factory use	RO			
400599	Status / Force for Active Digital Output	RW	1 = on, 0 = off	UINT	
400600	RESERVED for factory use				
400601	RESERVED for factory use				
400602	RESERVED for factory use				
400603	RESERVED for factory use				
400604	RESERVED for factory use				
400605	Ecm Start Delay	RW	sec	UINT	
400606	Engine Start Delay	RW	sec	UINT	
400607	Starting Aid Delay	RW	sec	UINT	
400608	Crank On Time Delay	RW	sec	UINT	
400609	Crank Pause Time Delay	RW	sec	UINT	
400610	Engine Cooldown Time Delay	RW	sec	UINT	
400611	OverVoltage Time Delay	RW	sec	UINT	
400612	UnderVoltage Time Delay	RW	sec	UINT	
400613	RESERVED for factory use	RO			
400614	Low Battery Voltage Delay	RW	sec	UINT	
400615	High Battery Voltage Delay	RW	sec	UINT	
400616	Speed Adjust	RW		UINT	
400617	Voltage Adjust	RW	% X 100	UINT	% of Rated VAC
400618	Warmed Up Temperature	RO	°C	INT	°C
400619	Cooled Down Temperature	RO	°C	INT	°C
400620	Engine Low Coolant Temperature Warning Limit	RO	°C X 10	INT	°C
400621	Engine High Coolant Temperature Warning Limit	RO	°C X 10	INT	°C
400622	RESERVED for factory use	RO			
400623	Engine High Coolant Temperature Shutdown Limit	RO	°C X 10	INT	°C
400624	Engine Low Oil Pressure Warning Limit	RO	kPA X 10	UINT	kPA
400625	Engine Low Oil Pressure Shutdown Limit	RO	kPA X 10	UINT	kPA
400626	RESERVED for factory use	RO			
400627	OverVoltage Level	RW	%	UINT	% of Rated VAC
400628	UnderVoltage Level	RW	%	UINT	% of Rated VAC
400629	OverFrequency Level	RW	%	UINT	% of Rated Hz
400630	UnderFrequency Level	RW	%	UINT	% of Rated Hz
400631	UnderSpeed Level	RW	%	UINT	% of Engine Run Speed
400632	OverSpeed Level	RW	%	UINT	% of Engine Run Speed
400633	Low Battery Voltage Warning Level	RW	%	UINT	% of System Battery Voltage
400634	High Battery Voltage Warning Level	RW	%	UINT	% of System Battery Voltage
400635	Number of Crank Cycles	RW		UINT	
400636	Prime Power	RO		UINT	
400637	RESERVED for factory use	RO		UINT	
400638	Number of Alternator Poles	RO		UINT	
400639	Volts/Hz Cut In Frequency	RW	Hz X 10	UINT	Hz

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† Firmware versions before 1.4 do not support this parameter.

‡ Parameter is not writable in firmware versions before 1.4.

Register	Parameter	Write Access	Units	Data Type	Type/Notes
400640	Volts/Hz Slope	RW	%	UINT	Volts/Hz
400641	Voltage Regulator Gain	RW		UINT	
400642	Voltage Normal Ramp Rate	RW		UINT	
400643	NFPA Faults Enabled	RW		UINT	
400644	Cooldown Temperature Override	RW		UINT	
400645	Genset Controller Date Format	RW		UNIQUE	DateFormat
400646	Genset Controller Time Format	RW		UNIQUE	TimeFormat
400647	Post Heat Delay Seconds	RW	sec	UINT	Post Heat Time Delay
400648	Starting Aid Temp Limit	RW	°C	INT	Coolant temp threshold
400649	Engine Idle Duration	RW	sec X 10	UINT	Seconds for idle
400650	RESERVED for factory use	RO		UINT	
400651	RESERVED for factory use	RO		UINT	
400652	Status	RO		UINT	See Figure 7-4 for more information
400653	Master Switch Position	RO		UINT	See Figure 7-4 for more information
400654	RESERVED for factory use	RO		UINT	
400655	RESERVED for factory use				
400656	RESERVED for factory use				
400657	RESERVED for factory use				
400658	RESERVED for factory use				
400659	RESERVED for factory use				
400660	Overpower Protective Relay Level	RW		UINT	% of Rated Power
400661	Overpower Protective Relay Time Delay	RW		UINT	sec X 10
400662	Reverse Power Protective Relay Level	RW		UINT	% of Rated Power
400663	Reverse Power Protective Relay Time Delay	RW		UINT	sec X 10
400664	OverVoltage Protective Relay Level	RW		UINT	% of Rated Voltage
400665	OverVoltage Protective Relay Time Delay	RW		UINT	sec X 10
400666	UnderVoltage Protective Relay Level	RW		UINT	% of Rated Voltage
400667	UnderVoltage Protective Relay Time Delay	RW		UINT	sec X 10
400668	OverFrequency Protective Relay Level	RW		UINT	% of Rated Frequency
400669	OverFrequency Protective Relay Time Delay	RW		UINT	sec X 10
400670	UnderFrequency Protective Relay Level	RW		UINT	% of Rated Frequency
400671	UnderFrequency Protective Relay Time Delay	RW		UINT	sec X 10
400672	Loss of Field Protective Relay Level	RW		UINT	% of Rated kVAR (Typically 75% of Rated kW)
400673	Loss of Field Protective Relay Time Delay	RW		UINT	sec X 10
400674	OverCurrent Protective Relay Level	RW		UINT	% of Rated Current
400675	OverCurrent Protective Relay Time Delay	RW		UINT	sec X 10
400676	OverPower Shutdown Level	RO		UINT	% of Rated Power (102/112% kW Overload)
400677	OverPower Shutdown Time Delay	RO		UINT	sec X 1 (102/112% kW Overload)
400678 thru 400681	RESERVED for factory use	RO			
400682	BreakerTripToShutdownTime	RW		UINT	sec X 10
400683 thru 400702	RESERVED				
400703	Voltage Match Window	RW		UINT	% Rated Volts x 10 (20 = 2.0% Rated Volts)
400704	Voltage Match Proportional Gain	RW		UINT	GAIN X 100 (100 = 1.00)
400705	Voltage Match Integral Gain	RW		UINT	GAIN X 100 (100 = 1.00)

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† Firmware versions before 1.4 do not support this parameter.

‡ Parameter is not writable in firmware versions before 1.4.

Register	Parameter	Write Access	Units	Data Type	Type/Notes
400706	Voltage Match Derivative Gain	RW		UINT	GAIN X 100 (100 = 1.00)
400707	Frequency Window	RW		UINT	Freq x 10 (5 = 0.5 Hz)
400708	Frequency Match Proportional Gain	RW		UINT	GAIN X 100 (100 = 1.00)
400709	Frequency Match Integral Gain	RW		UINT	GAIN X 100 (100 = 1.00)
400710	Frequency Match Derivative Gain	RW		UINT	GAIN X 100 (100 = 1.00)
400711	Phase Match Window	RW		UINT	+/- Deg x 10 (50 = +/- 5.0 Deg)
400712	Phase Match Proportional Gain	RW		UINT	GAIN X 100 (100 = 1.00)
400713	Phase Match Integral Gain	RW		UINT	GAIN X 100 (100 = 1.00)
400714	Phase Match Derivative Gain	RW		UINT	GAIN X 100 (100 = 1.00)
400715	Dwell Time	RW		UINT	Sec x 10 (10 = 1.0 Sec)
400716	Fail to Synch Time	RW		UINT	Sec x 1 (300 = 300 Sec)
400717	Breaker Reclose Time	RW		UINT	Sec x 10 (10 = 1.0 Sec)
400718	Breaker Close Attempts	RW		UINT	Atts x 1 (10 = 10 Attempts)
400719	First On Close Delay	RW		UINT	Sec x 10 (10 = 1.0 Sec)
400720	Breaker Current Fault Threshold	RW		UINT	% Rated I x 10 (10 = 1.0%)
400721	Breaker Current Fault Delay	RW		UINT	Sec x 10 (10 = 1.0 Sec)
400722	Voltage and Frequency Ok Delay	RW		UINT	Sec x 10
400723	Sync Mode in Auto	RW		UNIQUE	1 = Off, 2 = Passive, 3 = Check, 4 = Active, 5 = Dead Field
400724	Sync Mode in Run	RW		UNIQUE	1 = Off, 2 = Passive, 3 = Check, 4 = Active, 5 = Dead Field
400725	Breaker Phase Angle Fault	RW		UINT	° X 10
400726	Breaker Phase Angle Fault Delay	RW		UINT	Sec x 10
400727	Dead Bus Threshold	RW		UINT	% x 100
400728	Acceptable Voltage Pickup	RW		UINT	% x 100
400729	Acceptable Voltage Dropout	RW		UINT	% x 100
400730	Acceptable Frequency Pickup	RW		UINT	Hz x 100
400731	Acceptable Frequency Dropout	RW		UINT	Hz x 100
400732	Stand-Alone Operation	RW		UINT	0 = Requires PGen Signal to control paralleling breaker, 1 = Control paralleling breaker regardless of paralleling connection
400733	PGen Baud Rate	RW		UNIQUE	1 = 9600, 2 = 19200, 3 = 38400, 4 = 57600, 5 = 115200
400734	PGen Node Id	RO		UINT	1-15 = Valid, 255 = Invalid

* Firmware versions before 1.4 do not support reading these reserved registers.

† Firmware versions before 1.4 do not support this parameter.

‡ Parameter is not writable in firmware versions before 1.4.

Register	Parameter	Write Access	Units	Data Type	Type/Notes
400735	PGen Nodes Connected	RO		UINT	1 to 15
400736	PGen Nodes Disconnected	RO		UINT	1 to 14
400737	Bus Connection Status	RO		BOOL	0 = disconnected, 1 = connected
400738	Fail To Open Delay	RW		UINT	Sec x 10
400739	Fail to Close Delay	RW		UINT	Sec x 10
400740	Synchronization Time Remaining	RO		UINT	Sec x 10
400741	Dwell Time Remaining	RO		UINT	Sec x 10
400742	Voltage Matched During Sync	RO		BOOL	
400743	Frequency Matched During Sync	RO		BOOL	
400744	Phase Matched During Sync	RO		BOOL	
400745	Synchronized to Bus	RO		BOOL	
400746	Voltage and Frequency Ok	RO		BOOL	
400747	Real Power Sharing Proportional Gain	RW		UINT	GAIN x 100, 100 = 1.00
400748	Real Power Sharing Integral Gain	RW		UINT	GAIN x 100, 100 = 1.00
400749	Real Power Sharing Derivative Gain	RW		UINT	GAIN x 100, 100 = 1.00
400750	Torque Sharing Proportional Gain	RW		UINT	GAIN x 100, 100 = 1.00
400751	Torque Sharing Integral Gain	RW		UINT	GAIN x 100, 100 = 1.00
400752	Torque Sharing Derivative Gain	RW		UINT	GAIN x 100, 100 = 1.00
400753	Frequency Trim Proportional Gain	RW		UINT	GAIN x 100, 100 = 1.00
400754	Frequency Trim Integral Gain	RW		UINT	GAIN x 100, 100 = 1.00
400755	Frequency Trim Derivative Gain	RW		UINT	GAIN x 100, 100 = 1.00
400756	Real Power Baseload Setpoint	RW		UINT	% Rated KW x 10
400757	Real Power Baseload Proportional Gain	RW		UINT	GAIN x 100, 100 = 1.00
400758	Real Power Baseload Integral Gain	RW		UINT	GAIN x 100, 100 = 1.00
400759	Real Power Baseload Derivative Gain	RW		UINT	GAIN x 100, 100 = 1.00
400760	System Load Control Proportional Gain	RW		UINT	GAIN x 100, 100 = 1.00
400761	System Load Control Integral Gain	RW		UINT	GAIN x 100, 100 = 1.00
400762	System Load Control Derivative Gain	RW		UINT	GAIN x 100, 100 = 1.00
400763	Real Power Disconnect Level	RW		UINT	% of Rated KW x 10
400764	Real Power Ramp Rate	RW		UINT	% of Rated KW / Sec x 10
400765	Real Power Droop Slope	RW		UINT	% of Rated Speed @ Rated KW x 10
400766	Speed Bias	RO		INT	Speed Bias x 100
400767	Load Enable	RW		BOOL	
400768	Base Load Mode	RW		BOOL	
400769	System Load Control	RW		BOOL	
400770	System Sync Control	RW		BOOL	
400771	Trims Enabled	RW		BOOL	
400772	RESERVED for factory use				
400773	RESERVED for factory use				
400774	RESERVED for factory use				
400775	Reactive Power Sharing Proportional Gain	RW		UINT	GAIN x 100, 100 = 1.00
400776	Reactive Power Sharing Integral Gain	RW		UINT	GAIN x 100, 100 = 1.00
400777	Reactive Power Sharing Derviative Gain	RW		UINT	GAIN x 100, 100 = 1.00
400778	Voltage Trim Proportional Gain	RW		UINT	GAIN x 100, 100 = 1.00
400779	Voltage Trim Integral Gain	RW		UINT	GAIN x 100, 100 = 1.00
400780	Voltage Trim Derivative Gain	RW		UINT	GAIN x 100, 100 = 1.00
400781	Reactive Power Baseload Setpoint	RW		INT	% Rated KVAR x 10
400782	Reactive Power Baseload Proportional Gain	RW		UINT	GAIN x 100, 100 = 1.00
400783	Reactive Power Baseload Integral Gain	RW		UINT	GAIN x 100, 100 = 1.00
400784	Reactive Power Baseload Derivative Gain	RW		UINT	GAIN x 100, 100 = 1.00
400785	Power Factor Control Setting	RW		INT	PF x 100
400786	Power Factor Control Proportional Gain	RW		UINT	GAIN x 100, 100 = 1.00
400787	Power Factor Control Integral Gain	RW		UINT	GAIN x 100, 100 = 1.00
400788	Power Factor Control Derivative Gain	RW		UINT	GAIN x 100, 100 = 1.00

* Firmware versions before 1.4 do not support reading these reserved registers.

† Firmware versions before 1.4 do not support this parameter.

‡ Parameter is not writable in firmware versions before 1.4.

Register	Parameter	Write Access	Units	Data Type	Type/Notes
400789	System Reactive Load Control Proportional Gain	RW		UINT	GAIN x 100, 100 = 1.00
400790	System Reactive Load Control Integral Gain	RW		UINT	GAIN x 100, 100 = 1.00
400791	System Reactive Load Control Derivative Gain	RW		UINT	GAIN x 100, 100 = 1.00
400792	System Power Factor Control Proportional Gain	RW		UINT	GAIN x 100, 100 = 1.00
400793	System Power Factor Control Integral Gain	RW		UINT	GAIN x 100, 100 = 1.00
400794	System Power Factor Control Derivative Gain	RW		UINT	GAIN x 100, 100 = 1.00
400795	Reactive Droop Slope	RW		UINT	% Rated Volts @ Rated KVAR x 10
400796	Voltage Bias	RO		INT	Voltage Bias x 100
400797	Reactive Power Control Mode	RW		UNIQUE	0 = Power Factor Control, 1 = Reactive Power Control
400798	RESERVED for factory use				
400799	RESERVED for factory use				
400800	Gen Management Control Mode	RW		UNIQUE	1 = Manual, 2 = Runtime, 3 = Fuel Level
400801	Gen Management Enabled	RW		BOOL	
400802	Gen Management Order	RW		UINT	
400803	Gen Management Start Percent	RW		UINT	% x 10
400804	Gen Management Stop Percent	RW		UINT	% x 10
400805	Gen Management Start Delay	RW		UINT	s
400806	Gen Management Stop Delay	RW		UINT	s
400807	Gen Management Start Accumulator LW	RO		UDINT	% X 10000
400808	Gen Management Start Accumulator HW	RO			
400809	Gen Management Stop Accumulator LW	RO		UDINT	% X 10000
400810	Gen Management Stop Accumulator HW	RO			
400811	Gen Management Start KW	RO	kW X 10	UINT	kW
400812	Gen Management Stop KW	RO	kW X 10	UINT	kW
400813	Gen Management Stable Delay	RW		UINT	s
400814	Gen Management Run Time Threshold	RW		UINT	h X 10
400815	Gen Management Fuel Difference Threshold	RW	% X 10	UINT	%
400816	Gen Management Min Gens Online	RW		UINT	
400817	Gen Management Min Load Shed Priority	RW		UINT	
400818	Gen Management Stopped By Gen Mgmt	RO		BOOL	
400819	Gen Management Total Bus Capacity	RO	kW X 10	UINT	kW
400820	RESERVED for factory use				
400821	RESERVED for factory use				
400822	RESERVED for factory use				
400823	RESERVED for factory use				
400824	RESERVED for factory use				
400825	Number of Events	RO		UINT	
400826	Event1 Time Stamp Register1: 0 = Time stamped based in controller hours. > 0 = Time stamped based in Calendar Date and Time, with this register being Year	RO		UINT	
400827	Event1 Time Stamp Register2: If Event1 Time Stamp Register 1 = 0 then Not Used Else if Event1 Time Stamp Register 1 > 0 then Calendar Day, Month	RO		UINT	

* Firmware versions before 1.4 do not support reading these reserved registers.

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‡ Parameter is not writable in firmware versions before 1.4.

Register	Parameter	Write Access	Units	Data Type	Type/Notes
400828	Event1 Time Stamp Register3: If Event1 Time Stamp Register 1 = 0 then Controller Hours Most Significant Word scaled by 10. Else if Event1 Time Stamp Register 1 > 0 then Calendar Seconds	RO		UINT	
400829	Event1 Time Stamp Register4: If Event1 Time Stamp Register 1 = 0 then Controller Hours Least Significant Word scaled by 10. Else if Event1 Time Stamp Register 1 > 0 then Calendar Minute, Hour	RO		UINT	
400830	Event1 Event Id	RO		UINT	
400831	Event1 ParameterId	RO		UINT	
400832	Event1 FMI, Severity	RO		UINT	
400833	Event2 Time Stamp Register1: 0 = Time stamped based in controller hours. > 0 = Time stamped based in Calendar Date and Time, with this register being Year	RO		UINT	
400834	Event2 Time Stamp Register2: If Event2 Time Stamp Register 1 = 0 then Not Used Else if Event2 Time Stamp Register 1 > 0 then Calendar Day, Month	RO		UINT	
400835	Event2 Time Stamp Register3: If Event2 Time Stamp Register 1 = 0 then Controller Hours Most Significan Word scaled by 10. Else if Event2 Time Stamp Register 1 > 0 then Calendar Seconds	RO		UINT	
400836	Event2 Time Stamp Register4: If Event2 Time Stamp Register 1 = 0 then Controller Hours Least Significant Word scaled by 10. Else if Event2 Time Stamp Register 1 > 0 then Calendar Minute, Hour	RO		UINT	
400837	Event2 Event Id	RO		UINT	
400838	Event2 ParameterId	RO		UINT	
400839	Event2 FMI, Severity	RO		UINT	
400840	Event3 Time Stamp Register1: 0 = Time stamped based in controller hours. > 0 = Time stamped based in Calendar Date and Time, with this register being Year	RO		UINT	
400841	Event3 Time Stamp Register2: If Event3 Time Stamp Register 1 = 0 then Not Used Else if Event3 Time Stamp Register 1 > 0 then Calendar Day, Month	RO		UINT	
400842	Event3 Time Stamp Register3: If Event3 Time Stamp Register 1 = 0 then Controller Hours Most Significan Word scaled by 10. Else if Event3 Time Stamp Register 1 > 0 then Calendar Seconds	RO		UINT	

* Firmware versions before 1.4 do not support reading these reserved registers.

† Firmware versions before 1.4 do not support this parameter.

‡ Parameter is not writable in firmware versions before 1.4.

Register	Parameter	Write Access	Units	Data Type	Type/Notes
400843	Event3 Time Stamp Register4: If Event3 Time Stamp Register 1 = 0 then Controller Hours Least Significant Word scaled by 10. Else if Event3 Time Stamp Register 1 > 0 then Calendar Minute, Hour	RO		UINT	
400844	Event3 Event Id	RO		UINT	
400845	Event3 ParameterId	RO		UINT	
400846	Event3 FMI, Severity	RO		UINT	
400847	Event4 Time Stamp Register1: 0 = Time stamped based in controller hours. > 0 = Time stamped based in Calendar Date and Time, with this register being Year	RO		UINT	
400848	Event4 Time Stamp Register2: If Event4 Time Stamp Register 1 = 0 then Not Used Else if Event4 Time Stamp Register 1 > 0 then Calendar Day, Month	RO		UINT	
400849	Event4 Time Stamp Register3: If Event4 Time Stamp Register 1 = 0 then Controller Hours Most Significan Word scaled by 10. Else if Event4 Time Stamp Register 1 > 0 then Calendar Seconds	RO		UINT	
400850	Event4 Time Stamp Register4: If Event4 Time Stamp Register 1 = 0 then Controller Hours Least Significant Word scaled by 10. Else if Event4 Time Stamp Register 1 > 0 then Calendar Minute, Hour	RO		UINT	
400851	Event4 Event Id	RO		UINT	
400852	Event4 ParameterId	RO		UINT	
400853	Event4 FMI, Severity	RO		UINT	
400854	Event5 Time Stamp Register1: 0 = Time stamped based in controller hours. > 0 = Time stamped based in Calendar Date and Time, with this register being Year	RO		UINT	
400855	Event5 Time Stamp Register2: If Event5 Time Stamp Register 1 = 0 then Not Used Else if Event5 Time Stamp Register 1 > 0 then Calendar Day, Month	RO		UINT	
400856	Event5 Time Stamp Register3: If Event5 Time Stamp Register 1 = 0 then Controller Hours Most Significan Word scaled by 10. Else if Event5 Time Stamp Register 1 > 0 then Calendar Seconds	RO		UINT	
400857	Event5 Time Stamp Register4: If Event5 Time Stamp Register 1 = 0 then Controller Hours Least Significant Word scaled by 10. Else if Event5 Time Stamp Register 1 > 0 then Calendar Minute, Hour	RO		UINT	
400858	Event5 Event Id	RO		UINT	
400859	Event5 ParameterId	RO		UINT	
400860	Event5 FMI, Severity	RO		UINT	

* Firmware versions before 1.4 do not support reading these reserved registers.

† Firmware versions before 1.4 do not support this parameter.

‡ Parameter is not writable in firmware versions before 1.4.

Register	Parameter	Write Access	Units	Data Type	Type/Notes
400861	Event6 Time Stamp Register1: 0 = Time stamped based in controller hours. > 0 = Time stamped based in Calendar Date and Time, with this register being Year	RO		UINT	
400862	Event6 Time Stamp Register2: If Event6 Time Stamp Register 1 = 0 then Not Used Else if Event6 Time Stamp Register 1 > 0 then Calendar Day, Month	RO		UINT	
400863	Event6 Time Stamp Register3: If Event5 Time Stamp Register 1 = 0 then Controller Hours Most Significan Word scaled by 10. Else if Event5 Time Stamp Register 1 > 0 then Calendar Seconds	RO		UINT	
400864	Event6 Time Stamp Register4: If Event5 Time Stamp Register 1 = 0 then Controller Hours Least Significant Word scaled by 10. Else if Event5 Time Stamp Register 1 > 0 then Calendar Minute, Hour	RO		UINT	
400865	Event6 Event Id	RO		UINT	
400866	Event6 ParameterId	RO		UINT	
400867	Event6 FMI, Severity	RO		UINT	
400868	Event7 Time Stamp Register1: 0 = Time stamped based in controller hours. > 0 = Time stamped based in Calendar Date and Time, with this register being Year	RO		UINT	
400869	Event7 Time Stamp Register2: If Event7 Time Stamp Register 1 = 0 then Not Used Else if Event7 Time Stamp Register 1 > 0 then Calendar Day, Month	RO		UINT	
400870	Event7 Time Stamp Register3: If Event7 Time Stamp Register 1 = 0 then Controller Hours Most Significan Word scaled by 10. Else if Event7 Time Stamp Register 1 > 0 then Calendar Seconds	RO		UINT	
400871	Event7 Time Stamp Register4: If Event7 Time Stamp Register 1 = 0 then Controller Hours Least Significant Word scaled by 10. Else if Event7 Time Stamp Register 1 > 0 then Calendar Minute, Hour	RO		UINT	
400872	Event7 Event Id	RO		UINT	
400873	Event7 ParameterId	RO		UINT	
400874	Event7 FMI, Severity	RO		UINT	
400875	Event8 Time Stamp Register1: 0 = Time stamped based in controller hours. > 0 = Time stamped based in Calendar Date and Time, with this register being Year	RO		UINT	
400876	Event8 Time Stamp Register2: If Event8 Time Stamp Register 1 = 0 then Not Used Else if Event8 Time Stamp Register 1 > 0 then Calendar Day, Month	RO		UINT	

* Firmware versions before 1.4 do not support reading these reserved registers.

† Firmware versions before 1.4 do not support this parameter.

‡ Parameter is not writable in firmware versions before 1.4.

Register	Parameter	Write Access	Units	Data Type	Type/Notes
400877	Event8 Time Stamp Register3: If Event8 Time Stamp Register 1 = 0 |then Controller Hours Most Significan Word scaled by 10. Else if Event8 Time Stamp Register 1 > 0 then Calendar Seconds	RO		UINT	
400878	Event8 Time Stamp Register4: If Event8 Time Stamp Register 1 = 0 then Controller Hours Least Significant Word scaled by 10. Else if Event8 Time Stamp Register 1 > 0 then Calendar Minute, Hour	RO		UINT	
400879	Event8 Event Id	RO		UINT	
400880	Event8 ParameterId	RO		UINT	
400881	Event8 FMI, Severity	RO		UINT	
400882	Event Select	RW		UINT	
400883	Selected Event Time Stamp Register1: 0 = Time stamped based in controller hours. > 0 = Time stamped based in Calendar Date and Time, with this register being Year	RO		UINT	
400884	Selected Event Time Stamp Register2: If Selected Event Time Stamp Register 1 = 0 then Not Used Else if Selected Event Time Stamp Register 1 > 0 then Calendar Day, Month	RO		UINT	
400885	Selected Event Time Stamp Register3: If Event8 Time Stamp Register 1 = 0 then Controller Hours Most Significan Word scaled by 10. Else if Event8 Time Stamp Register 1 > 0 then Calendar Seconds	RO		UINT	
400886	Selected Event Time Stamp Register4: If Selected Event Time Stamp Register 1 = 0 then Controller Hours Least Significant Word scaled by 10. Else if Selected Event Time Stamp Register 1 > 0 then Calendar Minute, Hour	RO		UINT	
400887	Selected Event Event Id	RO		UINT	
400888	Selected Event ParameterId	RO		UINT	
400889	Selected Event FMI, Severity	RO		UINT	
400890	RESERVED (reserved for object ID)				
400891	RESERVED for factory use				
400892	RESERVED for factory use				
400893	RESERVED for factory use				
400894	RESERVED for factory use				
400895	Number of Active Events	RO		UINT	
400896	Active Event1 Level and FMI	RO		UINT	
400897	Active Event1 Object ID	RO		UINT	
400898	Active Event1 Event Id	RO		UINT	
400899	Active Event1 ParameterId	RO		UINT	
400900	Active Event2 Level and FMI	RO		UINT	
400901	Active Event2 Object ID	RO		UINT	
400902	Active Event2 Event Id	RO		UINT	
400903	Active Event2 ParameterId	RO		UINT	
400904	Active Event3 Level and FMI	RO		UINT	
400905	Active Event3 Object ID	RO		UINT	
400906	Active Event3 Event Id	RO		UINT	
400907	Active Event3 ParameterId	RO		UINT	

* Firmware versions before 1.4 do not support reading these reserved registers.

† Firmware versions before 1.4 do not support this parameter.

‡ Parameter is not writable in firmware versions before 1.4.

Register	Parameter	Write Access	Units	Data Type	Type/Notes
400908	Active Event4 Level and FMI	RO		UINT	
400909	Active Event4 Object ID	RO		UINT	
400910	Active Event4 Event Id	RO		UINT	
400911	Active Event4 ParameterId	RO		UINT	
400912	Active Event5 Level and FMI	RO		UINT	
400913	Active Event5 Object ID	RO		UINT	
400914	Active Event5 Event Id	RO		UINT	
400915	Active Event5 ParameterId	RO		UINT	
400916	Active Event6 Level and FMI	RO		UINT	
400917	Active Event6 Object ID	RO		UINT	
400918	Active Event6 Event Id	RO		UINT	
400919	Active Event6 ParameterId	RO		UINT	
400920	Active Event7 Level and FMI	RO		UINT	
400921	Active Event7 Object ID	RO		UINT	
400922	Active Event7 Event Id	RO		UINT	
400923	Active Event7 ParameterId	RO		UINT	
400924	Active Event8 Level and FMI	RO		UINT	
400925	Active Event8 Object ID	RO		UINT	
400926	Active Event8 Event Id	RO		UINT	
400927	Active Event8 ParameterId	RO		UINT	
400928	Active Event9 Level and FMI	RO		UINT	
400929	Active Event9 Object ID	RO		UINT	
400930	Active Event9 Event Id	RO		UINT	
400931	Active Event9 ParameterId	RO		UINT	
400932	Active Event10 Level and FMI	RO		UINT	
400933	Active Event10 Object ID	RO		UINT	
400934	Active Event10 Event Id	RO		UINT	
400935	Active Event10 ParameterId	RO		UINT	
400936	Active Event11 Level and FMI	RO		UINT	
400937	Active Event11 Object ID	RO		UINT	
400938	Active Event11 Event Id	RO		UINT	
400939	Active Event11 ParameterId	RO		UINT	
400940	Active Event12 Level and FMI	RO		UINT	
400941	Active Event12 Object ID	RO		UINT	
400942	Active Event12 Event Id	RO		UINT	
400943	Active Event12 ParameterId	RO		UINT	
400944	Active Event13 Level and FMI	RO		UINT	
400945	Active Event13 Object ID	RO		UINT	
400946	Active Event13 Event Id	RO		UINT	
400947	Active Event13 ParameterId	RO		UINT	
400948	Active Event14 Level and FMI	RO		UINT	
400949	Active Event14 Object ID	RO		UINT	
400950	Active Event14 Event Id	RO		UINT	
400951	Active Event14 ParameterId	RO		UINT	
400952	Active Event15 Level and FMI	RO		UINT	
400953	Active Event15 Object ID	RO		UINT	
400954	Active Event15 Event Id	RO		UINT	
400955	Active Event15 ParameterId	RO		UINT	
400956	Active Event16 Level and FMI	RO		UINT	
400957	Active Event16 Object ID	RO		UINT	
400958	Active Event16 Event Id	RO		UINT	
400959	Active Event16 ParameterId	RO		UINT	
400960	Active Event17 Level and FMI	RO		UINT	
400961	Active Event17 Object ID	RO		UINT	
400962	Active Event17 Event Id	RO		UINT	
400963	Active Event17 ParameterId	RO		UINT	
400964	Active Event18 Level and FMI	RO		UINT	

* Firmware versions before 1.4 do not support reading these reserved registers.

† Firmware versions before 1.4 do not support this parameter.

‡ Parameter is not writable in firmware versions before 1.4.

Register	Parameter	Write Access	Units	Data Type	Type/Notes
400965	Active Event18 Object ID	RO		UINT	
400966	Active Event18 Event Id	RO		UINT	
400967	Active Event18 ParameterId	RO		UINT	
400968	Active Event19 Level and FMI	RO		UINT	
400969	Active Event19 Object ID	RO		UINT	
400970	Active Event19 Event Id	RO		UINT	
400971	Active Event19 ParameterId	RO		UINT	
400972	Active Event20 Level and FMI	RO		UINT	
400973	Active Event20 Object ID	RO		UINT	
400974	Active Event20 Event Id	RO		UINT	
400975	Active Event20 ParameterId	RO		UINT	
400976	Active Event21 Level and FMI	RO		UINT	
400977	Active Event21 Object ID	RO		UINT	
400978	Active Event21 Event Id	RO		UINT	
400979	Active Event21 ParameterId	RO		UINT	
400980	Active Event22 Level and FMI	RO		UINT	
400981	Active Event22 Object ID	RO		UINT	
400982	Active Event22 Event Id	RO		UINT	
400983	Active Event22 ParameterId	RO		UINT	
400984	Active Event23 Level and FMI	RO		UINT	
400985	Active Event23 Object ID	RO		UINT	
400986	Active Event23 Event Id	RO		UINT	
400987	Active Event23 ParameterId	RO		UINT	
400988	Active Event24 Level and FMI	RO		UINT	
400989	Active Event24 Object ID	RO		UINT	
400990	Active Event24 Event Id	RO		UINT	
400991	Active Event24 ParameterId	RO		UINT	
400992	Active Event25 Level and FMI	RO		UINT	
400993	Active Event25 Object ID	RO		UINT	
400994	Active Event25 Event Id	RO		UINT	
400995	Active Event25 ParameterId	RO		UINT	
400996	Active Event26 Level and FMI	RO		UINT	
400997	Active Event26 Object ID	RO		UINT	
400998	Active Event26 Event Id	RO		UINT	
400999	Active Event26 ParameterId	RO		UINT	
401000	Active Event27 Level and FMI	RO		UINT	
401001	Active Event27 Object ID	RO		UINT	
401002	Active Event27 Event Id	RO		UINT	
401003	Active Event27 ParameterId	RO		UINT	
401004	Active Event28 Level and FMI	RO		UINT	
401005	Active Event28 Object ID	RO		UINT	
401006	Active Event28 Event Id	RO		UINT	
401007	Active Event28 ParameterId	RO		UINT	
401008	Active Event29 Level and FMI	RO		UINT	
401009	Active Event29 Object ID	RO		UINT	
401010	Active Event29 Event Id	RO		UINT	
401011	Active Event29 ParameterId	RO		UINT	
401012	Active Event30 Level and FMI	RO		UINT	
401013	Active Event30 Object ID	RO		UINT	
401014	Active Event30 Event Id	RO		UINT	
401015	Active Event30 ParameterId	RO		UINT	
401016	Active Event Select	RW		UINT	
401017	Selected Active Event Level and FMI	RO		UINT	
401018	Selected Active Event Object ID	RO		UINT	
401019	Selected Active Event Event Id	RO		UINT	
401020	Selected Active Event ParameterId	RO		UINT	

* Firmware versions before 1.4 do not support reading these reserved registers.

† Firmware versions before 1.4 do not support this parameter.

‡ Parameter is not writable in firmware versions before 1.4.

Register	Parameter	Write Access	Units	Data Type	Type/Notes
401021 thru 401033	RESERVED for factory use				
401034	Characters 1 and 2 of String for Genset Model Number	RO		STRING	
401035	Characters 3 and 4 of String for Genset Model Number				
401036	Characters 5 and 6 of String for Genset Model Number				
401037	Characters 7 and 8 of String for Genset Model Number				
401038	Characters 9 and 10 of String for Genset Model Number				
401039	Characters 11 and 12 of String for Genset Model Number				
401040	Characters 13 and 14 of String for Genset Model Number				
401041	Characters 15 and 16 of String for Genset Model Number				
401042	Characters 17 and 18 of String for Genset Model Number				
401043	Characters 19 and 20 of String for Genset Model Number				
401044	Characters 21 and 22 of String for Genset Model Number				
401045	Characters 23 and 24 of String for Genset Model Number				
401046	Characters 25 and 26 of String for Genset Model Number				
401047	Characters 1 and 2 of String for Controller Serial Number	RO		STRING	
401048	Characters 3 and 4 of String for Controller Serial Number				
401049	Characters 5 and 6 of String for Controller Serial Number				
401050	Characters 7 and 8 of String for Controller Serial Number				
401051	Characters 9 and 10 of String for Controller Serial Number				
401052	Characters 11 and 12 of String for Controller Serial Number				
401053	Characters 13 and 14 of String for Controller Serial Number				
401054	Characters 15 and 16 of String for Controller Serial Number				
401055	Characters 17 and 18 of String for Controller Serial Number				
401056	Characters 19 and 20 of String for Controller Serial Number				

* Firmware versions before 1.4 do not support reading these reserved registers.

† Firmware versions before 1.4 do not support this parameter.

‡ Parameter is not writable in firmware versions before 1.4.

Register	Parameter	Write Access	Units	Data Type	Type/Notes
401057	Characters 1 and 2 of String for Genset Spec Number	RO		STRING	
401058	Characters 3 and 4 of String for Genset Spec Number				
401059	Characters 5 and 6 of String for Genset Spec Number				
401060	Characters 7 and 8 of String for Genset Spec Number				
401061	Characters 9 and 10 of String for Genset Spec Number				
401062	Characters 11 and 12 of String for Genset Spec Number				
401063	Characters 13 and 14 of String for Genset Spec Number				
401064	Characters 15 and 16 of String for Genset Spec Number				
401065	Characters 17 and 18 of String for Genset Spec Number				
401066	Characters 19 and 20 of String for Genset Spec Number				
401067	Characters 1 and 2 of String for Genset Serial Number	RO		STRING	
401068	Characters 3 and 4 of String for Genset Serial Number				
401069	Characters 5 and 6 of String for Genset Serial Number				
401070	Characters 7 and 8 of String for Genset Serial Number				
401071	Characters 9 and 10 of String for Genset Serial Number				
401072	Characters 11 and 12 of String for Genset Serial Number				
401073	Characters 13 and 14 of String for Genset Serial Number				
401074	Characters 15 and 16 of String for Genset Serial Number				
401075	Characters 17 and 18 of String for Genset Serial Number				
401076	Characters 19 and 20 of String for Genset Serial Number				

* Firmware versions before 1.4 do not support reading these reserved registers.

† Firmware versions before 1.4 do not support this parameter.

‡ Parameter is not writable in firmware versions before 1.4.

Register	Parameter	Write Access	Units	Data Type	Type/Notes
401077	Characters 1 and 2 of String for Alternator Part Number	RO		STRING	
401078	Characters 3 and 4 of String for Alternator Part Number				
401079	Characters 5 and 6 of String for Alternator Part Number				
401080	Characters 7 and 8 of String for Alternator Part Number				
401081	Characters 9 and 10 of String for Alternator Part Number				
401082	Characters 11 and 12 of String for Alternator Part Number				
401083	Characters 13 and 14 of String for Alternator Part Number				
401084	Characters 15 and 16 of String for Alternator Part Number				
401085	Characters 17 and 18 of String for Alternator Part Number				
401086	Characters 19 and 20 of String for Alternator Part Number				
401087	Characters 1 and 2 of String for Engine Part Number	RO		STRING	
401088	Characters 3 and 4 of String for Engine Part Number				
401089	Characters 5 and 6 of String for Engine Part Number				
401090	Characters 7 and 8 of String for Engine Part Number				
401091	Characters 9 and 10 of String for Engine Part Number				
401092	Characters 11 and 12 of String for Engine Part Number				
401093	Characters 13 and 14 of String for Engine Part Number				
401094	Characters 15 and 16 of String for Engine Part Number				
401095	Characters 17 and 18 of String for Engine Part Number				
401096	Characters 19 and 20 of String for Engine Part Number				

* Firmware versions before 1.4 do not support reading these reserved registers.

† Firmware versions before 1.4 do not support this parameter.

‡ Parameter is not writable in firmware versions before 1.4.

Register	Parameter	Write Access	Units	Data Type	Type/Notes
401097	Characters 1 and 2 of String for Engine Model Number	RO		STRING	
401098	Characters 3 and 4 of String for Engine Model Number				
401099	Characters 5 and 6 of String for Engine Model Number				
401100	Characters 7 and 8 of String for Engine Model Number				
401101	Characters 9 and 10 of String for Engine Model Number				
401102	Characters 11 and 12 of String for Engine Model Number				
401103	Characters 13 and 14 of String for Engine Model Number				
401104	Characters 15 and 16 of String for Engine Model Number				
401105	Characters 17 and 18 of String for Engine Model Number				
401106	Characters 19 and 20 of String for Engine Model Number				
401107	Characters 1 and 2 of String for Engine Serial Number	RO		STRING	
401108	Characters 3 and 4 of String for Engine Serial Number				
401109	Characters 5 and 6 of String for Engine Serial Number				
401110	Characters 7 and 8 of String for Engine Serial Number				
401111	Characters 9 and 10 of String for Engine Serial Number				
401112	Characters 11 and 12 of String for Engine Serial Number				
401113	Characters 13 and 14 of String for Engine Serial Number				
401114	Characters 15 and 16 of String for Engine Serial Number				
401115	Characters 17 and 18 of String for Engine Serial Number				
401116	Characters 19 and 20 of String for Engine Serial Number				
401117	Characters 1 and 2 of String for ECM Serial Number				
401118	Characters 3 and 4 of String for ECM Serial Number				

* Firmware versions before 1.4 do not support reading these reserved registers.

† Firmware versions before 1.4 do not support this parameter.

‡ Parameter is not writable in firmware versions before 1.4.

Register	Parameter	Write Access	Units	Data Type	Type/Notes
401119	Characters 5 and 6 of String for ECM Serial Number	RO		STRING	
401120	Characters 7 and 8 of String for ECM Serial Number				
401121	Characters 9 and 10 of String for ECM Serial Number				
401122	Characters 11 and 12 of String for ECM Serial Number				
401123	Characters 13 and 14 of String for ECM Serial Number				
401124	Characters 15 and 16 of String for ECM Serial Number				
401125	Characters 17 and 18 of String for ECM Serial Number				
401126	Characters 19 and 20 of String for ECM Serial Number				
401127 thru 409996	RESERVED				
409997	Vendor	RO		UINT	* 7728 for Kohler Co.
409998	Modbus Map Version	RO		UINT	* 2 for this map, 1 is initial release
409999	Controller Type	RO		UINT	* 49 for DEC3500

* Firmware versions before 1.4 do not support reading these reserved registers.

† Firmware versions before 1.4 do not support this parameter.

‡ Parameter is not writable in firmware versions before 1.4.

See the following table for additional information of Modbus registers 400652 and 400653.

Register	Parameter	Type/Notes
400652	Status	0 =GensetState_Off 1 =GensetState_CrankOn 2 =GensetState_CrankPause 3 =GensetState_Idle 4 =GensetState_Running 5 =GensetState_CoolDown 6 =GensetState_Stopping 7 =GensetState_Shutdown 8 =GensetState_PerformingLoadedTest 9 =GensetState_PerformingUnloadedTest 10 =GensetState_PerformingVariableSpeedExcercise 11 =GensetState_PerformingLoadedExcercise 12 =GensetState_FuelPriming 13 =GensetState_EcmPowered 14 =GensetState_FaultCoolDown 15 =GensetState_Standby 16 =GensetState_Preheat 17 =GensetState_PerformingUnloadedFullSpeedExcercise 18 =GensetState_PerformingFullSpeedDiagnostics 19 =GensetState_StoppedByGeneratorManagement 20 =GensetState_Synchronizing 21 =GensetState_ProtectiveRelayTrippedContactor 22 =GensetState_StartDelay 23 =GensetState_StationaryRegen 24 =GensetState_Choke
400653	Master Switch Position	0 =MasterSwitch_Error 1 =MasterSwitch_Auto 2 =MasterSwitch_Off 3 =MasterSwitch_Run

Figure 7-4 Modbus Registers 400652 and 400653

The Decision-Maker® 3500 controller reports the following abnormal values to express invalid, incorrect, or unsupported data in a given register.

Value (Hex)	Data Type	Unsigned Value (Decimal)	Signed Value (Decimal)	Description
0xFFC0	ANY	65472	- 64	A Modbus register is not supported in the given application. **Note:** Not all unsupported registers will return the invalid register flag, some unsupported registers will return an exception response.
0x7FE0 — 0x7FFF	INT	32736 — 32767 **Note:** This return value is used when the value reported is a signed number. Any number larger than this will appear to be a very large negative number.	32736 — 32767	The register is supported, but the data in the register is unknown. This could indicate that the operating conditions render the data unreadable (such as sensors on an ECM engine when the ECM is not powered up), or indicate that the physical hardware to measure the quantity is either not present or replying with an out-of-range signal.
0xFFE0 — 0xFFFF	UINT	65504 — 65535	- 32 — - 1 **Note:** This return value is used when the value reported is an unsigned number. The number should not be interpreted as negative.	The register is supported, but the data in the register is unknown. This could indicate that the operating conditions render the data unreadable (such as sensors on an ECM engine when the ECM is not powered up), or indicate that the physical hardware to measure the quantity is either not present or replying with an out-of-range signal.
0x7FFFFFE0 — 0x7FFFFFFF	DINT	2147483616 — 2147483647	2147483616 — 2147483647	The register is supported, but the data in the register is unknown. This could indicate that the operating conditions render the data unreadable (such as sensors on an ECM engine when the ECM is not powered up), or indicate that the physical hardware to measure the quantity is either not present or replying with an out-of-range signal.
0xFFFFFFE0 — 0xFFFFFFFF	UDINT	4294967264 — 4294967295	4294967264 — 4294967295	The register is supported, but the data in the register is unknown. This could indicate that the operating conditions render the data unreadable (such as sensors on an ECM engine when the ECM is not powered up), or indicate that the physical hardware to measure the quantity is either not present or replying with an out-of-range signal.

7.5 Inputs and Outputs Events

Note: See Figure 7-6 for more information on Event IDs that are identified as 1 in the table below.

Event ID	Parameter ID	FMI (Failure Mode Indicator)	Event ID/Parameter at Local Display	Level	Programmed Input	Programmed Output
			Protectives			
1	1100	Low	Engine Speed	Shutdown		D
		High	Engine Speed	Shutdown		D
1	1102	Shorted High	Engine Oil Pressure *	Warning	AD	D
		Shorted High	Engine Oil Pressure *	Shutdown	AD	D
		Shorted Low	Engine Oil Pressure *	Shutdown		D
		Low	Engine Oil Pressure	Warning	AD	D
		Low	Engine Oil Pressure	Shutdown	D	D
		Open Circuit	Engine Oil Pressure *	Shutdown		D
1	1103	Low	Engine Coolant Temperature *	Warning	AD	D
		Low	Engine Coolant Temperature *	Shutdown		D
		High	Engine Coolant Temperature *	Warning	AD	D
		High	Engine Coolant Temperature *	Shutdown	AD	D
		Open Circuit	Engine Coolant Temperature *	Shutdown		D
		Shorted High (3)	Engine Coolant Temperature *	Shutdown		D
		Shorted Low (4)	Engine Coolant Temperature *	Shutdown		D
1	1115	High	Lube Oil Temperature *	Warning	AD	
		High	Lube Oil Temperature *	Shutdown	D	
1	1105	Low	Engine Coolant Level	Shutdown	D	D
1	1106	Low	Engine Fuel Level	Warning	AD	D
		Low	Engine Fuel Level	Shutdown	D	D
		High	Engine Fuel Level	Warning	D	D
		Critically High	Engine Fuel Level	Warning	D	D
1	1110	Low	Fuel Pressure	Warning	AD	D
		Low	Fuel Pressure	Shutdown	AD	D
1	1107	Low	Gen Battery Voltage	Warning		D
		High	Gen Battery Voltage	Warning		D
6		Low	Cranking Voltage	Warning		D
1	1104	Low	Engine Oil Level	Warning	AD	D
		Low	Engine Oil Level	Shutdown	D	D
1	1334	Low	Generator Voltage L1-L2	Shutdown		D
		High	Generator Voltage L1-L2	Shutdown		D
1	1336	Low	Generator Voltage L2-L3	Shutdown		D
		High	Generator Voltage L2-L3	Shutdown		D
1	1338	Low	Generator Voltage L3-L1	Shutdown		D
		High	Generator Voltage L3-L1	Shutdown		D
1	134	Low	Avg Gen Voltage L-L	Warning		D
		High	Avg Gen Voltage L-L	Warning		D
1	1358	Low	Generator Frequency	Warning		D
		High	Generator Frequency	Warning		D
		Low	Generator Frequency	Shutdown		D
		High	Generator Frequency	Shutdown		D
1	1374	Low	Total Power (Generator Total Real Power)	Warning		D
		High	Total Power (Generator Total Real Power)	Warning		D
		High	Total Power (Generator Total Real Power)	Shutdown		D
1	1323	Low	Total Reactive Power	Warning		D
1	1356	High	Avg Current	Warning		D
1	1601	Low	Maximum Alternator Current	Shutdown		D
1	1121	High	Intake Air Temperature	Warning		D
		High	Intake Air Temperature	Shutdown		D
1	1109	High	Fuel Temperature	Warning		D
		High	Fuel Temperature	Shutdown		D
1	1114	Low	Coolant Pressure	Warning	AD	D

Event ID	Parameter ID	FMI (Failure Mode Indicator)	Event ID/Parameter at Local Display	Level	Programmed Input	Programmed Output
30			AC Sensing Lost	Warning		D
30			AC Sensing Lost	Shutdown		D
20			Alternator Protection	Shutdown		D
23			Auxiliary Input	Warning	AD	D
23			Auxiliary Input	Shutdown	D	D
5			Battery Charger Fault	Warning	AD	D
75			Ecm Communication Loss	Shutdown		D
176			Ecm Model Mismatch	Shutdown		
19			Emergency Stop	Shutdown		D
35			Fuel Tank Leak	Warning	AD	D
35			Fuel Tank Leak	Shutdown	D	D
21			Ground Fault Input	Warning	AD	D
28			Locked Rotor	Shutdown		D
37			Electrical Metering Communication Loss	Shutdown		
4			Over Crank	Shutdown		D
29			Speed Sensor Fault	Warning		D
			Other Alerts			
11			Alarm Horn Silenced	Status		
12			Engine Cool Down Active	Notice		D
14			Engine Start Aid Active	Notice		D
125			Engine Started	Status		
126			Engine Stopped	Status		
8			Emergency Power System Supplying Load	Notice		D
9			Generator Running	Notice		D
3			Not In Auto	Warning		D
248			Option Board 2A Communication Loss	Notice		
249			Option Board 2B Communication Loss	Notice		
250			Option Board 2C Communication Loss	Notice		
16			Remote Start	Status		
235			Load Priority 1 Shed	Notice		D
236			Load Priority 2 Shed	Notice		D
237			Load Priority 3 Shed	Notice		D
238			Load Priority 4 Shed	Notice		D
239			Load Priority 5 Shed	Notice		D
24			Load Priority 6 Shed	Notice		D
255			Cabinet Intrusion Alarm	Warning	D	D
253			Reserve Oil Empty	Warning	D	D
410			Stopped By Generator Management	Status		D
379			Failure To Synchronize	Warning		D
1	474	High	Fail To Open Delay	Warning		
1	4741	High	Fail To Close Delay	Warning		
1	4716	High	Max Close Attempts	Warning		
1	3851	Erroneous Data Received	Generator Management (Invalid Generator Management Enabled)	Warning		
1	4328	High	Trip To Shutdown Delay	Shutdown		
26			Run Relay Coil Overload	Shutdown		
27			Starter Relay Coil Overload	Shutdown		
1	1702	High	System Frequency	Warning		
		Low	System Frequency	Warning		
1	1700	High	System Voltage	Warning		
		Low	System Voltage	Warning		
1	1703	Erroneous Data Received	System Phase	Warning		

Event ID	Parameter ID	FMI (Failure Mode Indicator)	Event ID/Parameter at Local Display	Level	Programmed Input	Programmed Output
			ECM Diagnostics			
32			Engine Derate Active	Warning		
33			Injector Wiring Fault	Warning		
26			Run Relay Coil Overload	Warning		
31			Sensor Supply Voltage	Warning		
29			Speed Sensor Fault	Warning		
27			Starter Relay Coil Overload	Warning		
34			Water In Fuel	Warning		
			Notices Excluded From Display			
25			Common Fault	Notice		D
24			Common Warning	Notice		D
15			System Ready	Notice		D
228			Remote Start Command Issued	Notice		
231			Run Button Acknowledged	Notice		
312			Contactor	Notice		D
313			Close Breaker	Notice		D
43			Remove Breaker Trip	Notice		D
44			Standalone Operation	Status	D	
45			Load Enable	Status	D	
46			Baseload Mode	Status	D	
47			System Control Mode	Status	D	
48			System Sync Mode	Status	D	
49			Enable Trims	Status	D	

* Sensor dependent **Note:** A = Analog, D = Digital

Figure 7-5 Input and Output Events

7.6 Failure Mode Indicator (FMI)

CriticallyHigh	0
CriticallyLow	1
Erratic	2
ShortedHigh	3
ShortedLow	4
OpenCircuit	5
GroundedCircuit	6
MechanicalSystemNotResponding	7
AbnormalFrequency	8
AbnormalUpdateRate	9
AbnormalRateOfChange	10
RootCauseUnknown	11
DeviceOutOfOrder	12
OutOfCalibration	13
SpecialInstructions	14
SlightlyHigh	15
High	16
SlightlyLow	17
Low	18
ErroneousDataReceived	19
Unavailable	28
Available	29
OK	30
NotApplicable	31

7.7 Severity Level

Status	1
Warning	2
Fault	3
Shutdown	4
Notice	5

7.8 Object ID

DEC3500 = 0
14 Relay Board = 1

7.9 Event ID 1

Decision-Maker® 3500 Controller				
Event ID	**Level**	**FMI**	**Param ID**	**Text to display**
1	4	16	1100	Overspeed Shutdown
1	4	18	1100	Underspeed Shutdown
1	2	18	1102	Low Oil Pressure Warning
1	4	18	1102	Low Oil Pressure Shutdown
1	2	3	1102	Shorted High Oil Pressure Warning
1	4	3	1102	Shorted High Oil Pressure Shutdown
1	4	4	1102	Shorted Low Oil Pressure Shutdown
1	4	5	1102	Open Circuit Oil Pressure Shutdown
1	2	18	1103	Low Coolant Temperature Warning
1	2	16	1103	High Coolant Temp Warning
1	4	16	1103	High Coolant Temp Shutdown
1	4	5	1103	No Coolant Temp Signal Shutdown
1	4	18	1103	Low Coolant Temperature Shutdown
1	4	3	1103	Shorted High Coolant Temperature Shutdown
1	4	4	1103	Shorted Low Coolant Temperature Shutdown
1	2	18	1104	Low Oil Level Warning
1	4	18	1104	Low Oil Level Shutdown
1	4	18	1105	Low Coolant Level Shutdown
1	2	18	1106	Low Fuel Warning
1	4	18	1106	Low Fuel Shutdown
1	2	16	1106	High Fuel Warning
1	2	0	1106	Critically High Fuel Warning
1	2	18	1107	Low Battery Voltage
1	2	16	1107	High Battery Voltage
1	2	16	1109	High Fuel Temperature Warning
1	4	16	1109	High Fuel Temperature Shutdown
1	2	18	1110	Low Fuel Pressure Warning
1	4	18	1110	Low Fuel Pressure Shutdown
1	2	18	1114	Low Coolant Pressure Warning
1	2	6	1115	High Oil Temperature Warning
1	4	16	1115	High Oil Temperature Shutdown
1	2	16	1121	High Intake Air Temperature Warning
1	4	16	1121	High Intake Air Temperature Shutdown
1	2	18	1323	Low Total Reactive Power Warning
1	4	18	1334	Under Voltage Shutdown (L1- L2)
1	4	16	1334	Over Voltage Shutdown (L1- L2)
1	4	18	1336	Under Voltage Shutdown (L2- L3)
1	4	16	1336	Over Voltage Shutdown (L2- L3)
1	4	18	1338	Under Voltage Shutdown (L3- L1)
1	4	16	1338	Over Voltage Shutdown (L3- L1)
1	2	18	134	Under Avg. Voltage Warning (L- L)
1	2	16	134	Over Avg. Voltage Warning (L- L)
1	2	16	1356	Over Avg. Current Warning
1	4	18	1358	Under Frequency Shutdown
1	4	16	1358	Over Frequency Shutdown
1	2	18	1358	Under Frequency Warning
1	2	16	1358	Over Frequency Warning
1	2	18	1374	Low Total Power Warning
1	2	16	1374	High Total Power Warning
1	4	16	1374	High Total Power Shutdown
1	4	18	1601	Low Maximum Alternator Current

Decision-Maker® 3500 Controller				
Event ID	**Level**	**FMI**	**Param ID**	**Text to display**
1	2	16	1700	High System Voltage Warning
1	2	18	1700	Low System Voltage Warning
1	2	16	1702	High System Frequency Warning
1	2	18	1702	Low System Frequency Warning
1	2	19	1703	Erroneous Data Received System Phase Warning
1	2	19	3851	Erroneous Data Received Generator Management Warning
1	4	16	4328	High Trip To Shutdown Delay Shutdown
1	2	16	4716	High Max Close Attempts Warning
1	2	16	474	High Fail To Open Delay Warning
1	2	16	4741	High Fail To Close Delay Warning

Figure 7-6 Event ID 1, Parameter Value Abnormal, Decision-Maker® 3500 Controller

8.1 Specifications

The Decision-Maker® 6000 controller's Modbus® communication capability:

- Supports industry-standard Modbus® RTU protocol.
- Can use Modbus® TCP protocol with the addition of a Modbus/Ethernet converter.
- Connects to a Modbus® master singly over an RS-232 line.
- Uses RS-485 connections to connect to a Modbus® master singly or over an RS-485 network.
- Connects to an Ethernet network using a Modbus/ Ethernet converter.
- Can operate as an RS-232 to RS-485 converter.
- Uses standard baud rates of 9600 or 19200.

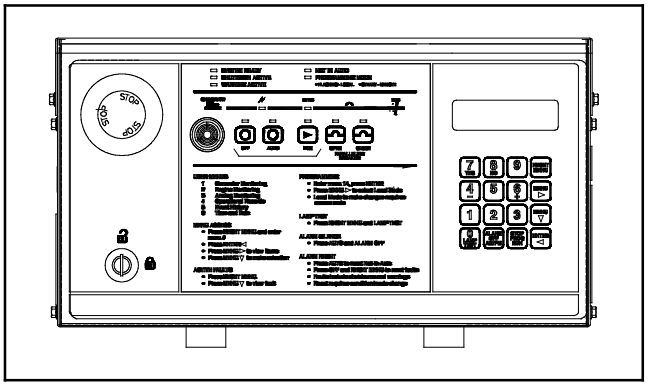


Figure 8-1 Decision-Maker® 6000 Controller

8.2 Hardware Connections

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Move the generator set master switch to the OFF position. (2) Disconnect the power to the battery charger. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent starting of the generator set by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer.

Plan the connections and refer to Figure 1-1 through Figure 1-4 to identify the cables needed. Use either an RS-232 cable or the supplied RS-485 connector with Belden #9841 or equivalent cable for a single connection. Use the RS-485 connector and Belden #9841 or equivalent cable to connect devices in a network. Attach the RS-485 connectors as shown in Figure 8-2. Use the termination resistor on the last device in the network.

Circuit isolation is recommended for installations that may be exposed to electrical noise. See Appendix B, Noise and Wiring Practices.

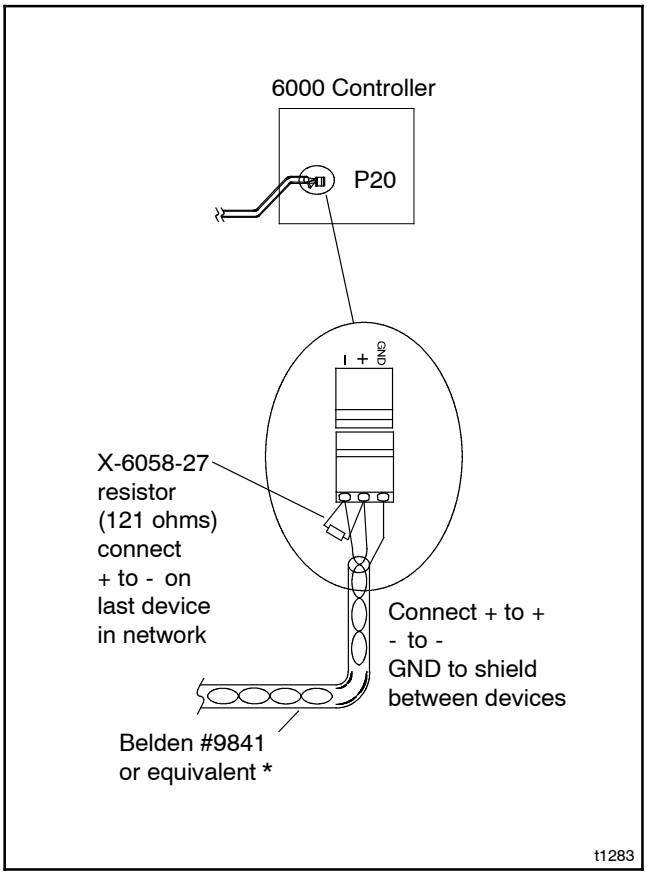
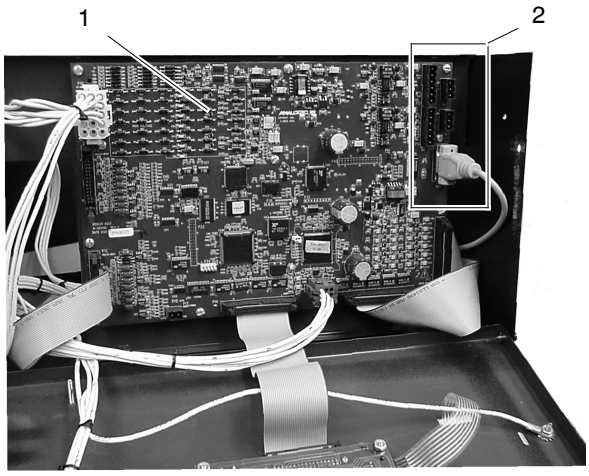


Figure 8-2 RS-485 Connector Details

Use the following procedure to connect the hardware. Observe the safety precautions.

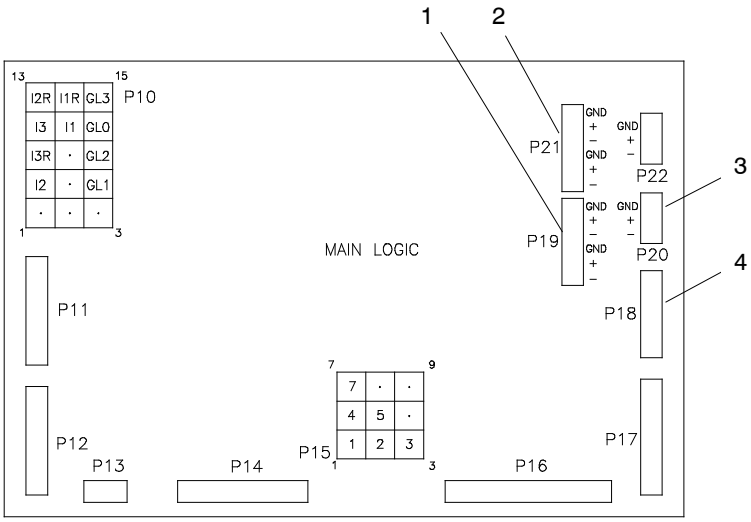
Controller Connection Procedure

1. Press the OFF button on the Decision-Maker 6000.
2. Disconnect the power to the battery charger, if equipped.
3. Disconnect the generator set engine starting battery(ies), negative (-) lead first.
4. Turn off and disconnect the power to all devices in the system.
5. Open the enclosure and locate the connection ports as shown in Figure 8-3 and Figure 8-4.
6. Make connections to the desired controller port(s). For RS-232 connections, use connector P18. For RS-485 connections, use the Modbus® RS-485 connector, P20 (connectors P19 and P21 are used for other applications).
7. Close the controller enclosure.
8. Verify that the Decision-Maker 6000 is off.
9. Reconnect the generator set engine starting battery, negative (-) lead last.
10. Reconnect power to the battery charger, if equipped.



1. Main logic board
2. Communication connections. See Figure 8-4.

Figure 8-3 Communication Port Locations for Decision-Maker 6000 Generator Set Controller



1. P19 RS-485 port (Modbus for DPS, SiteTech software, Ethernet converter)
2. P21 PGEN paralleling connection
3. P20 RS-485 Modbus® non-isolated connection for RSA or Ethernet converter
4. P18 RS-232 non-isolated connections (Monitor III connection)

Figure 8-4 Communication Connections Pin Identification

8.3 Controller Setup

After connecting the hardware, set up the controller. Enter the communication settings shown in the procedure below. Refer to the controller operation manual for detailed instructions on how to enter settings through the controller keypad.

Note: Changing the programming mode requires entering the generator set controller access code. Refer to the controller operation manual for more information.

Controller Setup Procedure

1. Go to Menu 14—Programming Mode using the controller keypad. Enter the local programming mode to allow changes to the controller communication settings.
2. Enter the controller access code when prompted by the controller.
3. Go to Menu 13—Communications.
4. Use the MENU arrow buttons to move to the Protocol Modbus 0 heading.
5. Enter Yes at the Modbus Online Y/N display.
6. Choose the connection type. Choose Converter and proceed to step 8 if the controller is converting RS-232 to RS-485. Otherwise, choose Single and proceed to step 7.

   Note: The controller automatically selects RS-232 for the primary port if Converter is chosen for the connection type.

7. Choose RS-232 or RS-485 for the primary port, which is the port connected to the Modbus® master.
8. Enter the network address of the controller. Enter 1 (one) for a single connection.

   Note: Use a unique network address for each unit. Use numbers between 1 and 246. Do not use 0 (zero).

9. Select the baud rate. Choose the same baud rate for the Modbus® master, modems, and connected devices.
10. Go to Menu 14—Programming Mode again. Choose either remote programming mode, local programming mode, or programming mode off as described below:

    a. To allow the Modbus® master to read and write to the controller, choose Remote; *or*

    b. To allow only monitoring through the Modbus® connections but local programming through the controller keypad, choose Local; *or*

    c. To turn the programming mode off, allowing no controller programming from either the Modbus® master or the local keypad, choose Off.

11. Enter the controller access code when prompted by the controller.

8.4 Modbus Registers

This section contains Modbus® registers for the Decision- Maker 6000 controller. Refer to Section 1.3 for definitions of terms and symbols used in the register tables.

Time delays, setpoints, inputs and outputs, and other user-defined parameters are entered through the controller keypad or SiteTech software. Refer to the operation manuals for the controller or software for instructions. See the List of Related Materials for document part numbers.

The system event stack registers 401500- 401515 contain the status (active or inactive) of fault warnings and shutdowns, inputs, outputs, and MDEC/ADEC alarms. See Section 8.4.6.

The event history registers 400871- 401270 contain the time and date information for the last 100 events. See Section 8.4.6 for event message codes.

Note: Kohler often uses extended Modbus registers which exceed 9,999. To illustrate the extended format, Kohler has added an extra digit to its register map to support registers above 9,999. For example: Holding register 9999 may be illustrated as 49999 in the traditional format or as 409999 in the extended format where the most significant digit still represents what type of Modbus register it is. Some software tools may have difficulty reading registers above 9,999.

8.4.1 Guide to the Register Map

Description	Registers
Monitoring	400001- 400083
Electrical Output	400001- 400032
Engine Status	400033- 400060
Analog Input Status	400061- 400076
Digital Input Status	400077- 400078
Controller Status	400079- 400083
Maintenance	400084- 400112
Time/Date	400113- 400115
Time Delay Settings	400116- 400124
Settings and Setpoints	400125- 400146
Factory Setup	400147- 400226
Digital Input Setup	400227- 400499
Analog Input Setup	400500- 400739
Remapped Registers *	400740- 400837
Relay Driver Output Status (see Section 8.4.4)	400838- 400839
Relay Driver Output Setup	400840- 400870
Event History	400871- 401270
Customer-Defined Character Strings	401271- 401295
Reserved and Write-Only Registers	401296- 401305
Remote Functions	401306- 401413
Reserved for Factory Use	401314- 401499
System Event Stack (status of fault warnings and shutdowns, inputs, outputs, and MDEC alarms; see Section 8.4.6.)	401500- 401515
Reserved for Wireless Monitor	401516- 401536
Reserved	401537- 401549
Defined Common Faults (Define/Inspect)	401550- 401805
Reserved	401806- 409998
Device ID	409999

* Registers 400740- 400837 have been mapped to 401550- 41647 (Defined Common Faults). See Section 8.4.3.

8.4.2 Modbus Registers

Register	Data Description	Access	Data Type	Range/Units/Notes
400001	L1 - L2 Voltage	RO	WORD	Volts AC
400002	L2 - L3 Voltage	RO	WORD	Volts AC
400003	L3 - L1 Voltage	RO	WORD	Volts AC
400004	L1 - L0 Voltage	RO	WORD	Volts AC
400005	L2 - L0 Voltage	RO	WORD	Volts AC
400006	L3 - L0 Voltage	RO	WORD	Volts AC
400007	L1 Current	RO	WORD	Amps AC
400008	L2 Current	RO	WORD	Amps AC
400009	L3 Current	RO	WORD	Amps AC
400010	Frequency	RO	WORD	Hz X 100
400011	Total kW	RO	WORD	kW
400012	Percent of Rated kW	RO	WORD	% Rated kW
400013	Total Power Factor	RO	SWORD	PF X 100 (SIGNED)
400014	L1 kW	RO	WORD	kW
400015	L1 Power Factor	RO	SWORD	PF X 100 (SIGNED)
400016	L2 kW	RO	WORD	kW
400017	L2 Power Factor	RO	SWORD	PF X 100 (SIGNED)
400018	L3 kW	RO	WORD	kW
400019	L3 Power Factor	RO	SWORD	PF X 100 (SIGNED)
400020	Total kVAR	RO	SWORD	kVAR (SIGNED)
400021	L1 kVAR	RO	SWORD	kVAR (SIGNED)
400022	L2 kVAR	RO	SWORD	kVAR (SIGNED)
400023	L3 kVAR	RO	SWORD	kVAR (SIGNED)
400024	Total kVA	RO	WORD	kVA
400025	L1 kVA	RO	WORD	kVA
400026	L2 kVA	RO	WORD	kVA
400027	L3 kVA	RO	WORD	kVA
400028	Current Lead/Lag	RO	WORD	Bits 0-1 Total Current - Leading = 10 Lagging = 01 Bits 2-3 L1 Current - Leading = 10 Lagging = 01 Bits 4-5 L2 Current - Leading = 10 Lagging = 01 Bits 6-7 L3 Current - Leading = 10 Lagging = 01
400029	Reserved For Future Use	RO	WORD	Returns 0 (zero).
400030	Reserved For Future Use	RO	WORD	Returns 0 (zero).
400031	Reserved For Future Use	RO	WORD	Returns 0 (zero).
400032	Reserved For Future Use	RO	WORD	Returns 0 (zero).
400033	Oil Pressure*	RO	WORD	kPa/psi
400034	Coolant Temperature*	RO	SWORD	Degrees C/Degrees F
400035	Engine Speed*	RO	WORD	RPM
400036	Local Battery Voltage*	RO	WORD	Volts DC X 10
400037	Fuel Pressure*	RO	WORD	kPa/psi DDEC/MDEC/ADEC only
400038	Fuel Temperature*	RO	SWORD	Degrees C/Degrees F DDEC/MDEC/ADEC only
400039	Fuel Rate*	RO	WORD	Liters/Hour X 100 or Gallons/Hour X 100 DDEC only
400040	Used Last Run*	RO	WORD	Liters/Gallons DDEC only
400041	Coolant Pressure*	RO	WORD	kPa/psi DDEC only
400042	Coolant Level*	RO	WORD	% X 10 DDEC only

*0x7FD6 = data unavailable. 0x7FFF = data is out of range.

Register	Data Description	Access	Data Type	Range/Units/Notes
400043	Lube Oil Temperature*	RO	SWORD	Degrees C/Degrees F DDEC/MDEC/ADEC only
400044	Oil Level*	RO	WORD	% X 10 DDEC only
400045	Crankcase Pressure*	RO	WORD	kPa/psi DDEC only
400046	Ambient Temperature*	RO	SWORD	Degrees C/Degrees F DDEC only
400047	ECM Battery Voltage*	RO	WORD	Volts DC X 10 DDEC/MDEC/ADEC only
400048	ECM Status	RO	WORD	0 = DDEC-Equipped, 1 = Non-ECM, 2 = MDEC/ADEC-Equipped
400049	Intake Air Temperature*	RO	SWORD	Degrees C/Degrees F MDEC/ADEC only
400050	Intake Air Pressure*	RO	WORD	Degrees C/Degrees F MDEC/ADEC only
400051	MDEC/ADEC Fault Codes*	RO	WORD	Numeric Fault Code MDEC/ADEC only
400052	Reserved For Future Use	RO	WORD	Returns 0 (zero).
400053	Reserved For Future Use	RO	WORD	Returns 0 (zero).
400054	Reserved For Future Use	RO	WORD	Mapped to register 401500 for compatibility with earlier controller application code versions. **Note:** Code versions 2.10 and higher use more registers for the Event Stack than previous versions.
400055	Reserved For Future Use	RO	WORD	Returns 0 (zero).
400056	Reserved For Future Use	RO	WORD	Returns 0 (zero).
400057	Reserved For Future Use	RO	WORD	Returns 0 (zero).
400058	Reserved For Future Use	RO	WORD	Returns 0 (zero).
400059	Reserved For Future Use	RO	WORD	Returns 0 (zero).
400060	Reserved For Future Use	RO	WORD	Returns 0 (zero).
400061	Analog Input 00 (Battery Voltage)*	RO	WORD	Volts DC
400062	Analog Input 01*	RO	WORD	User-defined and calibrated through the 6000 controller. See the controller operation manual.
400063	Analog Input 02*	RO	WORD	
400064	Analog Input 03*	RO	WORD	
400065	Analog Input 04*	RO	WORD	
400066	Analog Input 05*	RO	WORD	
400067	Analog Input 06*	RO	WORD	
400068	Analog Input 07*	RO	WORD	
400069	Reserved For Additional Input	RO	WORD	
400070	Reserved For Additional Input	RO	WORD	
400071	Reserved For Additional Input	RO	WORD	
400072	Reserved For Additional Input	RO	WORD	
400073	Reserved For Additional Input	RO	WORD	
400074	Reserved For Additional Input	RO	WORD	
400075	Reserved For Additional Input	RO	WORD	
400076	Reserved For Additional Input	RO	WORD	

*0x7FD6 = data unavailable. 0x7FFF = data is out of range.

Register	Data Description	Access	Data Type	Range/Units/Notes
400077-400078	Digital Input Status/Option Flags	RO	2 WORDS	Word #1 Digital Inputs 0- 15: Bit 0 Remote start contacts Bit 1 Emergency stop Bit 2 Low coolant level Bit 3 Digital Input #1 Bit 4 Digital Input #2 Bit 5 Digital Input #3 Bit 6 Digital Input #4 Bit 7 Digital Input #5 Bit 8 Digital Input #6 Bit 9 Digital Input #7 Bit 10 Digital Input #8 Bit 11 Digital Input #9 Bit 12 Digital Input #10 Bit 13 Digital Input #11 Bit 14 Digital Input #12 Bit 15 Digital Input #13
400077-400078, cont.	Digital Input Status/Option Flags	RO	2 WORDS	Word #2: Bit 0 Digital Input #14 Bit 1 Digital Input #15 Bit 2 Digital Input #16 Bit 3 Digital Input #17 Bit 4 Digital Input #18 Bit 5 Digital Input #19 Bit 6 Digital Input #20 Bit 7 Digital Input #21 Bit 8 DDEC Flag Bit 9 MDEC/ADEC Flag Bit 10 Tier1 Flag Bit 11 Waukesha Flag Bits 12- 15 Unused Input Is high/option enabled if bit is set. Digital inputs are user-defined through the controller or Monitor III software. See the related operation manual.
400079	Master Switch Position	RO	WORD	0 = Error, 1 = Auto, 2 = Off, 3 = Run
400080	Programming Mode Status	RO	WORD	1 = Off, 2 = Local, 3 = Remote
400081	Reserved For Future Use	RO	WORD	Returns 0 (zero).
400082	Reserved For Future Use	RO	WORD	Returns 0 (zero).
400083	Reserved For Future Use	RO	WORD	Returns 0 (zero).
400084	Total Number of Starts	RO	WORD	Starts
400085	Total Run Time Hrs	RO	LONG	HRS X 100 (LSW FIRST)
400087	Total Run Time Loaded Hrs	RO	LONG	HRS X 100 (LSW FIRST)
400089	Total Run Time Unloaded Hrs	RO	LONG	HRS X 100 (LSW FIRST)
400091	Total Run Time kW Hrs	RO	LONG	kW Hrs (LSW First)
400093	RTSM Total Hrs	RO	LONG	HRS X 100 (LSW FIRST)
400095	RTSM Loaded Hrs	RO	LONG	HRS X 100 (LSW FIRST)
400097	RTSM Unloaded Hrs	RO	LONG	HRS X 100 (LSW FIRST)
400099	RTSM kW Hrs	RO	LONG	kW Hrs (LSW FIRST)
400101	Last Maintenance Date	RO	2 WORDS	Day | Month - Year
400103	Operating Days Since Maint.	RO	WORD	Days
400104	Number of Starts Since Maint.	RO	WORD	Starts
400105	Last Start Date	RO	2 WORDS	Day | Month - Year
400107	Last Start Time	RO	WORD	Hr|Min
400108	Last Run Length	RO	WORD	Hrs X 100
400109	Last Run Loaded	RO	WORD	0 = Unloaded, 1 = Loaded

*0x7FD6 = data unavailable. 0x7FFF = data is out of range.

Register	Data Description	Access	Data Type	Range/Units/Notes
400110	Timed Run Time (Hr:Min)	RW	WORD	Hr|Min
400111	Timed Run Remaining (Hr:Min)	RO	WORD	Hr|Min
400112	Is Timed Run Active	RO	WORD	1 = True, 0 = False
400113	Current Date	RW	2 WORDS	Day | Month - 2 Digit Year | Day of Week (0=Sunday)
400115	Current Time (24 Hr Clock)	RW	WORD (Hr|Min)	Hr|Min
400116	Time Delay Engine Start	RW	WORD	Min | Sec
400117	Time Delay Starting Aid	RW	WORD	Min | Sec
400118	Time Delay Crank On	RW	WORD	Min | Sec
400119	Time Delay Crank Pause	RW	WORD	Min | Sec
400120	Time Delay Engine Cooldown	RW	WORD	Min | Sec
400121	Time Delay Crank Cycles	RW	WORD	Cycles
400122	Time Delay Overvoltage	RW	WORD	Min | Sec
400123	Time Delay Undervoltage	RW	WORD	Min | Sec
400124	Time Delay Load Shed kW	RW	WORD	Min | Sec
400125	Operating Mode	RW	WORD	Bits 0- 1: Operating Mode 1=Standby, 2=Prime Power Bit 2: Unused Bit 3: MDEC/ADEC DSC Mode 1 = Enabled, 0 = Disabled Bit 4: MDEC/ADEC VSG Mode 1 =Enabled, 0 = Disabled Bits 5- 7: Temp Sensor Type
400126	System Voltage	RW	WORD	Volts AC
400127	System Frequency	RW	WORD	Hz
400128	System Phase	RW	WORD	1 = 3 Phase Delta, 2 = 3 Phase Wye, 3 = Single Phase
400129	kW Rating	RW	WORD	kW
400130	Load Shed Output	RW	WORD	% of kW RATING
400131	Overvoltage	RW	WORD	% of System Voltage
400132	Undervoltage	RW	WORD	% of System Voltage
400133	Overfrequency	RW	WORD	% of System Frequency
400134	Underfrequency	RW	WORD	% of System Frequency
400135	Overspeed	RW	WORD	Hz
400136	Battery Voltage	RW	WORD	Volts DC X 10
400137	Lo Battery Voltage	RW	WORD	Volts DC X 10
400138	Hi Battery Voltage	RW	WORD	Volts DC X 10
400139	Metric Units	RW	WORD	1 = True, 0 = False
400140	NFPA 110 Defaults Enabled	RW	WORD	1 = True, 0 = False
400141	Rated Current	RO	WORD	Amps AC
400142	Cooldown Temperature Override	RW	WORD	1 = True, 0 = False
400143	Reserved For Future Use	RO	WORD	Returns 0 (zero).
400144	Reserved For Future Use	RO	WORD	Returns 0 (zero).
400145	Reserved For Future Use	RO	WORD	Returns 0 (zero).
400146	Reserved For Future Use	RO	WORD	Returns 0 (zero).
400147	Final Assembly Date	RO	2 WORDS	Day | Month - Year
400149	Final Assembly Clock No.	RO	LONG	99999 Max (LSW FIRST)
400151	Total Operating Days	RO	WORD	Days
400152	Model No.	RO	13 WORDS	26 Character String

*0x7FD6 = data unavailable. 0x7FFF = data is out of range.

Register	Data Description	Access	Data Type	Range/Units/Notes	
400165	Spec. No.	RO	8 WORDS	16 Character String	
400173	Genset Serial No.	RO	10 WORDS	20 Character String	
400183	Alternator Part No.	RO	10 WORDS	20 Character String	
400193	Engine Part No.	RO	10 WORDS	20 Character String	
400203	Control No.	RO	LONG	(LSW FIRST)	
400205	Code Version	RO	3 WORDS	6 Character String	
400208	Setup Lock	RO	WORD	1 = Locked, 0 = Unlocked	
400209	Engine Model No.	RO	4 WORDS	8 Character String	ECM only
400213	Engine Serial No.	RO	5 WORDS	10 Character String	ECM only
400218	Unit No.	RO	5 WORDS	10 Character String	ECM only
400223	ECM Serial No.	RO	4 WORDS	8 Character String	ECM only
Digital Inputs 1-21 Setup (for status see 400077-400079):					
400227	Digital Input 01	RW	13 WORDS PER INPUT	Word 1: Enabled | Function ID Word 2: Inhibit Time (Min|Sec) Word 3: Delay Time (Min|Sec) Word 4-13: 10 Words for 20 Character Description String Refer to Section 8.4.7, Digital Auxiliary Input Functions, for descriptions and codes. See the controller operation manual for factory-reserved and user-selectable inputs for various applications.	
400240	Digital Input 02				
400253	Digital Input 03				
400266	Digital Input 04				
400279	Digital Input 05				
400292	Digital Input 06				
400305	Digital Input 07				
400318	Digital Input 08				
400331	Digital Input 09				
400344	Digital Input 10				
400357	Digital Input 11				
400370	Digital Input 12				
400383	Digital Input 13				
400396	Digital Input 14				
400409	Digital Input 15				
400422	Digital Input 16				
400435	Digital Input 17				
400448	Digital Input 18				
400461	Digital Input 19				
400474	Digital Input 20				
400487	Digital Input 21				
Note: Cannot read past end of block					
Analog Input Setup (for status see registers 400061-400068)					
400500	Analog Input 01	RW	16 WORDS PER INPUT	Refer to the controller operation manual for identification of user inputs and factory-reserved inputs for specific applications.	
400516	Analog Input 02				
400532	Analog Input 03				
400548	Analog Input 04				
400564	Analog Input 05				
400580	Analog Input 06				
400596	Analog Input 07				
Note: Cannot read past end of block					
*0x7FD6 = data unavailable. 0x7FFF = data is out of range.					

Register	Data Description	Access	Data Type	Range/Units/Notes
Analog Inputs 8-15 Setup				
400612	Reserved For Non-ECM	RO	16 WORDS PER INPUT	
400628				
400644				
400660				
400676				
400692				
400708				
400724				
Note: Cannot read past end of block				
Registers 400740-400837 have been mapped to 401550-41647.				
Define/Inspect RDO Status (2 WORDS). See Section 8.4.4.				
400838	RDO Status: RDO1 - RDO16	RO†	WORD	Output Is High If Individual Bit Is Set. Bit 0 = RDO 1
400839	RDO Status: RDO17 - RDO31	RO†	WORD	Output Is High If Individual Bit Is Set. Bit 0 = RDO 17
† Software-controlled RDOs are RW.				
Note: Cannot read past end of block				
Define/Inspect RDOs (RW, 1 WORD per RDO). See Section 8.4.6				
400840	Relay Driver Output 01	RW	WORD	Selection | Setpoint
400841	Relay Driver Output 02	RW	WORD	
400842	Relay Driver Output 03	RW	WORD	
400843	Relay Driver Output 04	RW	WORD	
400844	Relay Driver Output 05	RW	WORD	
400845	Relay Driver Output 06	RW	WORD	
400846	Relay Driver Output 07	RW	WORD	
400847	Relay Driver Output 08	RW	WORD	
400848	Relay Driver Output 09	RW	WORD	
400849	Relay Driver Output 10	RW	WORD	
400850	Relay Driver Output 11	RW	WORD	
400851	Relay Driver Output 12	RW	WORD	
400852	Relay Driver Output 13	RW	WORD	
400853	Relay Driver Output 14	RW	WORD	
400854	Relay Driver Output 15	RW	WORD	
400855	Relay Driver Output 16	RW	WORD	
400856	Relay Driver Output 17	RW	WORD	
400857	Relay Driver Output 18	RW	WORD	
400858	Relay Driver Output 19	RW	WORD	
400859	Relay Driver Output 20	RW	WORD	
400860	Relay Driver Output 21	RW	WORD	
400861	Relay Driver Output 22	RW	WORD	
400862	Relay Driver Output 23	RW	WORD	
400863	Relay Driver Output 24	RW	WORD	
*0x7FD6 = data unavailable. 0x7FFF = data is out of range.				

Register	Data Description	Access	Data Type	Range/Units/Notes
400864	Relay Driver Output 25	RW	WORD	Function | Setpoint Function uses the event codes in Section 8.4.6. Setpoints are for analog inputs only; otherwise setpoint=0.
400865	Relay Driver Output 26	RW	WORD	
400866	Relay Driver Output 27	RW	WORD	
400867	Relay Driver Output 28	RW	WORD	
400868	Relay Driver Output 29	RW	WORD	
400869	Relay Driver Output 30	RW	WORD	
400870	Relay Driver Output 31	RW	WORD	
Note: Cannot read past end of block				
Event History. See Section 8.4.6 for event codes.				
400871-400910	Event History - Page 1 (1-10)	RO	40 WORDS	10 events, 4 words each: Event Code|Setpoint Hr|Min Day|Month Year See Section 8.4.6 for event codes. Setpoints are for analog inputs only; otherwise setpoint=0 **Note:** Message code = 0xFFat end of history
400911-400950	Event History - Page 2 (11-20)	RO	40 WORDS	
400951-400990	Event History - Page 3 (21-30)	RO	40 WORDS	
400991-401030	Event History - Page 4 (31-40)	RO	40 WORDS	
401031-401070	Event History - Page 5 (41-50)	RO	40 WORDS	
401071-401110	Event History - Page 6 (51-60)	RO	40 WORDS	
401111-401150	Event History - Page 7 (61-70)	RO	40 WORDS	
401151-401190	Event History - Page 8 (71-80)	RO	40 WORDS	
401191-401230	Event History - Page 9 (81-90)	RO	40 WORDS	
401231-401270	Event History - Page 10 (91-100)	RO	40 WORDS	
Note: Cannot read past end of block.				
Customer-Defined Character Strings (defined through Monitor software)				
401271	Designation	RW	5 WORDS	9 Character String
401276	Load	RW	10 WORDS	20 Character String
401286	Location	RW	10 WORDS	20 Character String
Note: Cannot read past end of block.				
401296	Reserved for future use	RO	WORD	Returns 0 (zero).
401297	Reserved for future use	RO	WORD	Returns 0 (zero).
401298	Reserved for future use	RO	WORD	Returns 0 (zero).
401299	Reserved for future use	RO	WORD	Returns 0 (zero).
401300	Reserved for future use	RO	WORD	Returns 0 (zero).
401301	Reserved for future use	RO	WORD	Returns 0 (zero).
401302	Reserved for future use	RO	WORD	Returns 0 (zero).
401303	Reserved for future use	RO	WORD	Returns 0 (zero).
401304	Reserved for future use	RO	WORD	Returns 0 (zero).
401305	Reserved for future use	RO	WORD	Returns 0 (zero).
Note: Cannot Read Past End of Block				
*0x7FD6 = data unavailable. 0x7FFF = data is out of range.				

Register	Data Description	Access	Data Type	Range/Units/Notes
Remote Functions				
401306	Start Timed Run	WO	WORD	1 = Start, 0 = No Start
401307	Stop Timed Run	WO	WORD	1 = Stop, 0 = No Stop
401308	Reset Maintenance Records	WO	WORD	1 = Reset, 0 = No Reset
401309	Remote Fault Reset	WO	WORD	1 = Reset, 0 = No Reset
401310	Reserved for future use	RO	WORD	Returns 0 (zero).
401311	Reserved for future use	RO	WORD	Returns 0 (zero).
401312	Reserved for future use	RO	WORD	Returns 0 (zero).
401313	Reserved for future use	RO	WORD	Returns 0 (zero).
401314-401499	Reserved for factory use			
System Event Stack (must be read as 16 register block)**. See Sections 8.4.5 and 8.4.6.**				
401500	System Events 0- 15 Word #1	RO	16 WORDS	System event status. 0=not active 1=active Each bit corresponds to a different event code. See Sections 8.4.5 and 8.4.6.
401501	System Events 16- 31 Word #2			
401502	System Events 32- 47 Word #3			
401503	System Events 48- 63 Word #4			
401504	System Events 64- 79 Word #5			
401505	System Events 80- 95 Word #6			
401506	System Events 96- 111 Word #7			
401507	System Events 112- 127 Word #8			
401508	System Events 128- 143 Word #9			
401509	System Events 144- 159 Word #10			
401510	System Events 160- 175 Word #11			
401511	System Events 176- 191 Word #12			
401512	System Events 192- 207 Word #13			
401513	System Events 208- 223 Word #14			
401514	System Events 224- 239 Word #15			
401515	System Events 240- 255 Word #16			
Note: Cannot Read Past End of Block.				
401516-401536	Reserved	RO	WORD	Reserved for the Wireless Monitor
401537-401549	Not used	RO	WORD	Returns illegal address
*0x7FD6 = data unavailable. 0x7FFF = data is out of range.				

Register	Data Description	Access	Data Type	Range/Units/Notes
Define/Inspect Defined Common Faults:				
401550	Emergency Stop	RW	WORD	Selected | Setpoint The selected byte indicates whether a given fault has been assigned to the defined common fault: 0=not assigned to the defined common fault; 1=assigned to the defined common fault. The setpoint byte indicates the setpoint value for that item.
401551	Overspeed			
401552	Overcrank			
401553	High Coolant Temperature Shutdown			
401554	Oil Pressure Shutdown			
401555	Low Coolant Temperature Warning (ECM only)			
401556	Low Fuel			
401557	High Coolant Temperature Warning			
401558	Oil Pressure Warning			
401559	Master Not In Auto			
401560	NFPA 110 Fault			
401561	Low Battery Voltage			
401562	High Battery Voltage			
401563	Battery Charger Fault			
401564	System Ready			
401565	Loss of ECM Comm (ECM only)			
401566	No Oil Pressure Signal			
401567	High Oil Temperature Shutdown			
401568	No Coolant Temperature Signal			
401569	Low Coolant Level			
401570	Speed Sensor Fault			
401571	Locked Rotor			
401572	Master Switch Error			
401573	Master Switch Open			
401574	Master Switch Off			
401575	AC Sensing Loss	RW	WORD	Selected | Setpoint The selected byte indicates whether a given fault has been assigned to the defined common fault: 0=not assigned to the defined common fault; 1=assigned to the defined common fault. The setpoint byte indicates the setpoint value for that item.
401576	Over Voltage			
401577	Under Voltage			
401578	Weak Battery			
401579	Over Frequency			
401580	Under Frequency			
401581	Load Shed kW Overload	RW	WORD	Selected | Setpoint
401582	Load Shed kW Under Frequency			
401583	Over Current Warning			
401584	EPS Supplying Load			
401585	Internal Fault			

*0x7FD6 = data unavailable. 0x7FFF = data is out of range.

Register	Data Description	Access	Data Type	Range/Units/Notes
401586	Engine Cooldown Delay	RW	WORD	Selected | Setpoint
401587	Engine Start Delay			
401588	Starting Aid			
401589	Generator Running			
401590	Air Damper Control			
401591	Ground Fault			
401592	EEPROM Write Failure			
401593	Critical Overvoltage			
401594	Alternator Protect Shutdown			
401595	Air Damper Indicator			
401596	Digital Input 01	RW	WORD	**Note:** Analog and digital inputs are user-defined through the controller or using Monitor III or SiteTech software. See the related operation manual.
401597	Digital Input 02			
401598	Digital Input 03			
401599	Digital Input 04			
401600	Digital Input 05			
401601	Digital Input 06			
401602	Digital Input 07			
401603	Digital Input 08			
401604	Digital Input 09			
401605	Digital Input 10			
401606	Digital Input 11			
401607	Digital Input 12			
401608	Digital Input 13			
401609	Digital Input 14			
401610	Digital Input 15			
401611	Digital Input 16			
401612	Digital Input 17			
401613	Digital Input 18			
401614	Digital Input 19			
401615	Digital Input 20			
401616	Digital Input 21			
401617	Analog Input 01			
401618	Analog Input 02			
401619	Analog Input 03			
401620	Analog Input 04			
401621	Analog Input 05			
401622	Analog Input 06			
401623	Analog Input 07			
401624	Reserved for additional input	RW	WORD	
401625	Reserved for additional input			
401626	Reserved for additional input			
401627	Reserved for additional input			

*0x7FD6 = data unavailable. 0x7FFF = data is out of range.

Register	Data Description	Access	Data Type	Range/Units/Notes
Define/Inspect Defined Common Faults, continued:				
401628	Reserved for additional input	RW	WORD	
401629	Reserved for additional input			
401630	Reserved for additional input			
401631	Reserved for additional input			
401632	Defined Common Fault			
401633	Software Controlled RDO#1	RW	WORD	Selected | Setpoint
401634	Software Controlled RDO#2			
401635	Software Controlled RDO#3			
401636	Software Controlled RDO#4			
401637-401648	*Reserved for factory use*			
401649	Genset Parameter Warning			
401650	Genset S/N Mismatch Warning	RW	WORD	Selected | Setpoint
401651	Genset S/N Mismatch Shutdown			
401652	*Reserved for factory use*			
401653	Protective Relay Overvoltage	RW	WORD	Switchgear applications only. Cannot be defined as common fault or assigned as RDO, but can referenced in event stack/log.
401654	Protective Relay Under Voltage			
401655	Protective Relay Overfrequency			
401656	Protective Relay Underfrequency			
401657	Protective Relay Reverse Power			
401658	Protective Relay Over Power			
401659	Protective Relay Loss of Field			
401660	Protective Relay Overcurrent Vr			
401661	Reverse Power Shutdown	RW	WORD	Switchgear applications only
401662	Over Power Shutdown			
401663	Loss of Field Shutdown			
401664	Over Current Shutdown			
401665	Common Protective Relay Output	RW	WORD	Switchgear applications only. Cannot be defined as common fault, but can be assigned as RDO and referenced in event stack/log.
401666	In Synch	RW	WORD	Switchgear applications only.
401667	Breaker Trip			
401668	Fuel Valve Relay	RW	WORD	Waukesha only.
401669	Pre Lube Relay			
401670	Air -Fuel Module Start			
401671	Oil Temperature Loss of Signal			
401672	High Oil Temperature Warning			
401673	Intake Air Temperature Loss of Signal			
401674	High Intake Air Temperature Warning	RW	WORD	MDEC/ADEC only.
401675	High Intake Air Temperature Shutdown			

*0x7FD6 = data unavailable. 0x7FFF = data is out of range.

Register	Data Description	Access	Data Type	Range/Units/Notes
401676	MDEC/ADEC Yellow Alarm	RW	WORD	MDEC/ADEC only.
401677	MDEC/ADEC Red Alarm			
401678	MDEC/ADEC Block Heater Control			
401679	Low Coolant Temperature Shutdown			
401680	MDEC/ADEC Load Shed Over Temperature			
401681	Maintenance Reminder	RW	WORD	
401682	Engine Derate Active (ECM only)	RW	WORD	
401683	Engine Stalled	RW	WORD	
401684	J1939 CAN Engine Shutdown	RW	WORD	Deere, Doosan, GM engines only
401685-401740	Reserved For Future Use	RW	WORD	
401741	Air-Fuel Module Start	RW	WORD	Waukesha only.
401742	No Dial Tone	RW	WORD	With optional dial-out feature only.
401743	Dialout Message Sent			
401744	No Modem at Powerup			
401745	Modem Connection Failed			
401746	Close Button Pressed	RW	WORD	
401747	Open Button Pressed			
401748	Key Switch Locked			
401749	Key Switch Unlocked			
401750	Auto Button Pressed			
401751	Off Button Pressed			
401752	Run Button Pressed			
401753	Gen Circuit Breaker Closed			
401754	Gen Circuit Breaker Opened			
401755	Util Circuit Breaker Closed			
401756	Util Circuit Breaker Opened			
401757	Common Warning			
401758	Common Load Shed			
401759	PGEN General Warning			
401760	PGEN General Fault			
401761	PGEN Comm Not Online			
401762	PGEN Duplicate ID			
401763	PGEN Missing Node			
401764	PGEN Extra Node			
401765	Auto Synch Disabled			
401766	Gen Volts and Hz Ok			
401767	Synch Frequency Match			
401768	Synch Phase Match			
401769	Synch Volts Match			
401770	Breaker Trip to Shutdown Time Delay Expired			
401771	Dead Bus Sense Fault			
401772	First On Fault			

*0x7FD6 = data unavailable. 0x7FFF = data is out of range.

Register	Data Description	Access	Data Type	Range/Units/Notes
401773	Fail to Synch Timeout	RW	WORD	
401774	Circuit Breaker Close Fault			
401775	Circuit Breaker Close Atts Fault			
401776	Circuit Breaker Open Fault			
401777	Circuit Breaker Current Fault			
401778	Circuit Breaker Common Fault			
401779	Contactor Output			
401780	Close Generator Circuit Breaker Output			
401781	Trip Generator Circuit Breaker Output			
401782	Remote Shutdown			
401783-401791	Reserved For Future Use	RW	WORD	
401792	Dual Start Application	RW	WORD	
401793	Starter A Failure			
401794	Starter B Failure			
401795	Dual Starter B			
401796	Controller Setup Warning			
401797	Phase Selection Error			
401798	Voltage Selection Error			
401799	Frequency Selection Error			
401800	kW Selection Error			
401801	EEPROM Block Initialized			
401802	Date Changed			
401803	Controller Initialized			
401804-401999	Reserved For Future Use			
402000-402512	Reserved For Factory Use			
402513-409998	Reserved For Future Use			
Device ID				
409999	Device ID	RO	WORD	Decision-Maker 6000 Device ID = 41
*0x7FD6 = data unavailable. 0x7FFF = data is out of range.				

8.4.3 Remapped Registers

Registers 400740- 400837 have been mapped to 401550- 401647 (defined common faults).

Register	Mapped to:	Description
400740	401550	Emergency Stop
400741	401551	Overspeed
400742	401552	Overcrank
400743	401553	High Coolant Temperature Shutdown
400744	401554	Oil Pressure Shutdown
400745	401555	Low Coolant Temperature Warn.
400746	401556	Low Fuel
400747	401557	High Coolant Temperature Warning
400748	401558	Oil Pressure Warning
400749	401559	Master Not In Auto
400750	401560	NFPA 110 Fault
400751	401561	Low Battery Voltage
400752	401562	High Battery Voltage
400753	401563	Battery Charger Fault
400754	401564	System Ready
400755	401565	Loss of ECM Comm
400756	401566	No Oil Pressure Signal
400757	401567	High Oil Temperature Shutdown
400758	401568	No Coolant Temperature Signal
400759	401569	Low Coolant Level
400760	401570	Speed Sensor Fault
400761	401571	Locked Rotor
400762	401572	Master Switch Error
400763	401573	Master Switch Open
400764	401574	Master Switch Off
400765	401575	AC Sensing Loss
400766	401576	Over Voltage
400767	401577	Under Voltage
400768	401578	Weak Battery
400769	401579	Over Frequency
400770	401580	Under Frequency
400771	401581	Load Shed kW Overload
400772	401582	Load Shed kW Under Frequency
400773	401583	Over Current Warning
400774	401584	EPS Supplying Load
400775	401585	Internal Fault
400776	401586	Engine Cooldown Delay
400777	401587	Engine Start Delay
400778	401588	Starting Aid
400779	401589	Generator Running
400780	401590	Air Damper Control
400781	401591	Ground Fault
400782	401592	EEPROM Write Failure
400783	401593	Critical Overvoltage
400784	401594	Alternator Protect Shutdown
400785	401595	Air Damper Indicator
400786	401596	Digital Input 01
400787	401597	Digital Input 02
400788	401598	Digital Input 03
400789	401599	Digital Input 04
400790	401600	Digital Input 05
400791	401601	Digital Input 06
400792	401602	Digital Input 07
400793	401603	Digital Input 08
400794	401604	Digital Input 09
400795	401605	Digital Input 10
400796	401606	Digital Input 11
400797	401607	Digital Input 12
400798	401608	Digital Input 13
400799	401609	Digital Input 14
400800	401610	Digital Input 15
400801	401611	Digital Input 16
400802	401612	Digital Input 17
400803	401613	Digital Input 18
400804	401614	Digital Input 19
400805	401615	Digital Input 20
400806	401616	Digital Input 21
400807	401617	Analog Input 01
400808	401618	Analog Input 02
400809	401619	Analog Input 03
400810	401620	Analog Input 04
400811	401621	Analog Input 05
400812	401622	Analog Input 06
400813	401623	Analog Input 07
400814	401624	*Reserved for additional input*
400815	401625	
400816	401626	
400817	401627	
400818	401628	
400819	401629	
400820	401630	
400821	401631	
400822	401632	Defined Common Fault
400823	401633	Software Controlled RDO#1
400824	401634	Software Controlled RDO#2
400825	401635	Software Controlled RDO#3
400826	401636	Software Controlled RDO#4
400827	401637	*Reserved for factory use*
400828	401638	
400829	401639	
400830	401640	
400831	401641	
400832	401642	
400833	401643	
400834	401644	
400835	401645	
400836	401646	
400837	401647	

8.4.4 Relay Driver Outputs

Status. Registers 400838- 400839 contain the status (active or not active) of the relay driver outputs (RDOs). Each register is a 16-bit word and each individual bit corresponds to one RDO. Figure 8-7 illustrates how the RDO status codes are stored.

The RDO is active if the corresponding bit is set (equal to 1). The example in Figure 8-6 shows that RDOs 7, 8, 12, 18, 23, and 30 are active.

To identify the functions assigned to the RDOs, check registers 400840- 400870.

Setup. Registers 400840- 400870 contain the RDO function and setpoint information. The function assigned to the RDO is indicated by the event codes shown in the first byte of the register. Event codes are listed in the table in Section 8.4.6. Setpoints are for analog inputs only; otherwise setpoint=0.

Register	RDO Number Corresponding to Each Bit															
400838	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
400839	—	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

Figure 8-5 RDO Status Registers

Register	RDO Status: 0 = Not Set (not active), 1 = Set (active)															
400838	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0
400839	—	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0

Figure 8-6 RDO Status Example

8.4.5 System Event Codes

Event codes are contained in registers 401500 through 401515. Each register is a 16-bit word, and each bit corresponds to a system event code. Figure 8-7 illustrates how the event codes are stored in the system event stack registers. The numbers 0- 255 in Figure 8-7 correspond to the event codes shown in the System Event Codes table, Section 8.4.6. For example, number 6 corresponds to low fuel.

The condition indicated by the message code is active if the corresponding bit is set. Figure 8-8 shows register 401500 indicating low battery voltage, a high coolant temperature warning, and a low fuel condition.

Register	Event Code Indicated by Each Bit (See Section 8.4.6 for event code identification.)															
401500	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
401501	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
401502	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
401503	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
401504	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64
401505	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80
401506	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97	96
401507	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112
401508	143	142	141	140	139	138	137	136	135	134	133	132	131	130	129	128
401509	159	158	157	156	155	154	153	152	151	150	149	148	147	146	145	144
401510	175	174	173	172	171	170	169	168	167	166	165	164	163	162	161	160
401511	191	190	189	188	187	186	185	184	183	182	181	180	179	178	177	176
401512	207	206	205	204	203	202	201	200	199	198	197	196	195	194	193	192
401513	223	222	221	220	219	218	217	216	215	214	213	212	211	210	209	208
401514	239	238	237	236	235	234	233	232	231	230	229	228	227	226	225	224
401515	255	254	253	252	251	250	249	248	247	246	245	244	243	242	241	240

Figure 8-7 Event Codes Stored in System Event Stack Registers 401500 through 401515

Register	Event Code Status: 0 = Not Set, 1 = Set															
401500	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0

Figure 8-8 Event Code Status Example, Register 401500

8.4.6 System Event Code Table

The system event codes in the following table are used for relay driver output functions as well as for events in the event history and the event stack.

Code	Description
0	Emergency Stop
1	Overspeed
2	Overcrank
3	High Coolant Temperature Shutdown
4	Oil Pressure Shutdown
5	Low Coolant Temperature
6	Low Fuel Warning
7	High Coolant Temperature Warning
8	Oil Pressure Warning
9	Master Not In Auto
10	NFPA 110 Fault
11	Low Battery Voltage
12	High Battery Voltage
13	Battery Charger Fault
14	System Ready
15	Loss of ECM Comm
16	No Oil Pressure Signal
17	High Oil Temperature Shutdown
18	No Coolant Temperature Signal
19	Low Coolant Level
20	Speed Sensor Fault
21	Locked Rotor
22	Master Switch Error
23	Master Switch Open
24	Master Switch Off
25	AC Sensing Loss
26	Over Voltage
27	Under Voltage
28	Weak Battery
29	Over Frequency
30	Under Frequency
31	Load Shed kW Overload
32	Load Shed kW Under Frequency
33	Over Current
34	EPS Supplying Load
35	Internal Fault
36	Engine Cooldown Delay
37	Engine Start Delay
38	Starting Aid
39	Generator Running
40	Air Damper Control
41	Ground Fault
42	EEPROM Write Failure
43	Critical Overvoltage
44	Alternator Protect Shutdown
45	Air Damper Indicator
46	Digital Input 01
47	Digital Input 02
48	Digital Input 03
49	Digital Input 04
50	Digital Input 05
51	Digital Input 06
52	Digital Input 07
53	Digital Input 08
54	Digital Input 09
55	Digital Input 10
56	Digital Input 11
57	Digital Input 12
58	Digital Input 13
59	Digital Input 14
60	Digital Input 15
61	Digital Input 16
62	Digital Input 17
63	Digital Input 18
64	Digital Input 19
65	Digital Input 20
66	Digital Input 21
67	Analog Input 01
68	Analog Input 02
69	Analog Input 03
70	Analog Input 04
71	Analog Input 05
72	Analog Input 06
73	Analog Input 07
74	*Reserved for additional input*
75	*Reserved for additional input*
76	*Reserved for additional input*
77	*Reserved for additional input*
78	*Reserved for additional input*
79	*Reserved for additional input*
80	*Reserved for additional input*
81	*Reserved for additional input*
82	Defined Common Fault
83	Software Controlled RDO#1
84	Software Controlled RDO#2
85	Software Controlled RDO#3
86	Software Controlled RDO#4
99	Genset Parameter Warning
100	Genset S/N Mismatch Warning
101	Genset S/N Mismatch Shutdown
103	Protective Relay Overvoltage
104	Protective Relay Under Voltage
105	Protective Relay Overfrequency
106	Protective Relay Underfrequency
107	Protective Relay Reverse Power
108	Protective Relay Over Power
109	Protective Relay Loss of Field
110	Protective Relay Overcurrent Vr
111	Reverse Power Shutdown

Code	Description
112	Over Power Shutdown
113	Loss of Field Shutdown
114	Over Current Shutdown
115	Common Protective Relay Output
116	In Synch
117	Breaker Trip
118	Fuel Valve Relay
119	Pre Lube Relay
120	Air -Fuel Module Start
121	Oil Temperature Loss of Signal
122	High Oil Temperature Warning
123	Intake Air Temperature Loss of Signal
124	High Intake Air Temperature Warning
125	High Intake Air Temperature Shutdown
126	MDEC/ADEC Yellow Alarm
127	MDEC/ADEC Red Alarm
128	MDEC/ADEC Block Heater Control
129	Low Coolant Temperature Shutdown
130	MDEC/ADEC Load Shed Over Temperature
131	*Reserved For Future Use*
132	Engine Derate Active
133	Engine Stalled
134	J1939 CAN Engine Shutdown
135-174	Reserved for Future Use
175	No Oil Press1 Signal
176	No Oil Press2 Signal
177	No Cool Temp1 Signal
178	No Cool Temp2 Signal
179	Hi Cool Temp1 Shtdwn
180	Hi Cool Temp2 Shtdwn
181	Oil Press1 Shutdown
182	Oil Press2 Shutdown
183	Hi Cool Temp1 Warn
184	Hi Cool Temp2 Warn
185	Lo Cool Temp1 Warn
186	Lo Cool Temp2 Warn
187	Oil Press1 Warning
188	Oil Press2 Warning
189	Coolant Pressr Warn
190	No Cool Press Signal
191	Air -Fuel Module Start
192	No Dial Tone
193	Dialout Message Sent
194	No Modem at Powerup
195	Modem Connection Failed
196	Close Button Acknowledged
197	Open Button Acknowledged
198	Key Switch Locked
199	Key Switch Unlocked

Code	Description
200	Auto Button Acknowledged
201	Off Button Acknowledged
202	Run Button Acknowledged
203	Generator Circuit Breaker Closed
204	Generator Circuit Breaker Open
205	Utility circuit Breaker Closed
206	Utility Circuit Breaker Open
207	Common Warning
208	Common Load Shed
209	PGEN Common Warning
210	PGEN Common Fault
211	PGEN Comm Not Online
212	PGEN Duplicate ID
213	PGEN Missing Node
214	PGEN Extra Node
215	Auto Synch Disabled
216	Volts and Freq OK
217	Synch Frequency matched
218	Synch Phase matched
219	Synch Volts Matched
220	CB Trip to Shutdown Timeout
221	Dead Bus Sense Error
222	First On Fault
223	Fail to Synch Timeout
224	CB Close Fault
225	CB Close Attempts Fault
226	CB Open Fault
227	CB Current Fault
228	CB Common Fault
229	Contactor Output
230	Close Generator Circuit Breaker
231	External Breaker Trip
232	Remote Shutdown
233-241	Reserved for Future Use
242	Dual Starter App
243	Starter A Failure
244	Starter B Failure
245	Dual Starter B
246	Controller Setup Error
247	Phase Selection Error
248	Voltage Selection Error
249	Frequency Selection Error
250	kW Selection Error
251	EEPROM Block Initialized
252	Date Changed
253	Controller Initialized

8.4.7 Digital Auxiliary Input Functions

The following function ID codes are used in registers 400227- 400499 to identify the function that is assigned to each digital input. The functions are assigned through the controller keypad or using Monitor III or SiteTech software.

Function ID	Name	Notes
1	Warning	
2	Shutdown Type A	
3	Shutdown Type B	
4	Voltage Raise	
5	Voltage Lower	
6	VAR PF Mode	
7	Remote Shutdown	
8	Remote Reset	
9	Air Damper	
10	Low Fuel Warning	
11	Field Over Volts	
12	Idle Mode	ECM only
13	Battle Switch	
14	Ground Fault	
15	Bat Chgr Fault	
16	High Oil Temperature	
17	Low Coolant Lvl	
18	Low Coolant Temperature	ECM only (not user-assignable)
19	Breaker Closed	(not user-assignable)
20	Enable Synch	
21	AFM Shutdown	Waukesha only (not user-assignable)
22	Knock Shutdown	
23	Deton Warning	
24	Deton Shutdown	
25	Low Fuel Shutdown	(not user-assignable)
26	Utility CB Aux Contacts	
27	Auxiliary Open Command	
28	Auxiliary Close Command	
29	Speed Raise	
30	Speed Lower	
31	Auto Synch	
32	Synch Permissive	
33	Synch Test/Check	
34	Synch Reset	
35	First Enable	
36	First On Reset	
37	Load Enable	
38	kW Baseload Mode	
39	Load Ramp Hold	
40	Frequency Trim Enable	
41	Voltage Trim Enable	
42	System kW Control Enable	
43	System kVAR/PF Control Enable	
44	External kW Setpoint Enable	
45	External kVAR/PF Setpoint Enable	
46	kVAR Control Enable	
47	PF Control Enable	
48	Reactive Droop Enable	
49	Circuit Breaker Fault Reset	
50	Gen CB over Current Trip	
51	VSG Disable	

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) If the controller is not already in the MAN (manual) mode, press the Controller Mode button and then press the MAN mode button. (2) If the generator set is running, press and hold the Manual- Stop button for at least 2 seconds to stop the generator set. (3) Press the Controller Mode button and then press the controller Off mode button. (4) Disconnect the power to the battery charger, if equipped. (5) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

⚠ DANGER



Hazardous voltage.
Will cause severe injury or death.

Only authorized personnel should open the enclosure.

⚠ DANGER



Hazardous voltage.
Will cause severe injury or death.

This equipment must be installed and serviced by qualified electrical personnel.

Accessing the middle compartment on the control panel. Hazardous voltage will cause severe injury or death. On the controller base box and automatic voltage regulator, do not touch the terminals for voltage and current measurement. Disconnect all power sources and disable the generator set before servicing.

The following section covers controller connections, setpoints, examples of modbus communication, and lists of Modbus® registers.

The Decision-Maker® 8000 capability:

- Supports Modbus® RTU and TCP
- Use standard baud rates of 9600, 19200, 38400, 57600

For controller connection details, refer to the controller operation manual.



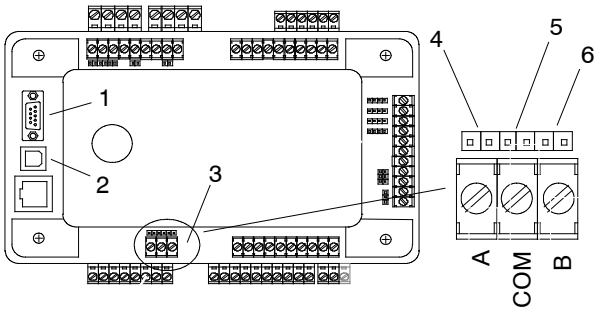
Figure 9-1 Decision-Maker® 8000 Controller

9.1 Connections

Note: Before working on the generator set or connected equipment, disable the generator set. Read and follow the safety precautions at the beginning of this section.

On the Decision-Maker® 8000, the Ethernet and RS-232 connection ports and the 120 Ω resistor for RS-485 are located on the controller base box. The RS-485 connections are located in the customer connections area in the bottom panel. See Figure 9-2 and Figure 9-3. For more detailed instructions about connections and changes to controller settings, refer to the controller operation manual.

Note: If experiencing communication issues over RS-485 connections, verify that the positive and negative wires are connected correctly. For the Decision-Maker® 8000, the blue, high (H) or positive (+), wire connects to the A terminal and the green, low (L) or negative (-), wire connects to the B terminal.



1. RS-232
2. Ethernet
3. RS-485 (2) port
4. Pull up jumper
5. 120 Ω resistor, RS-485
6. Pull down jumper

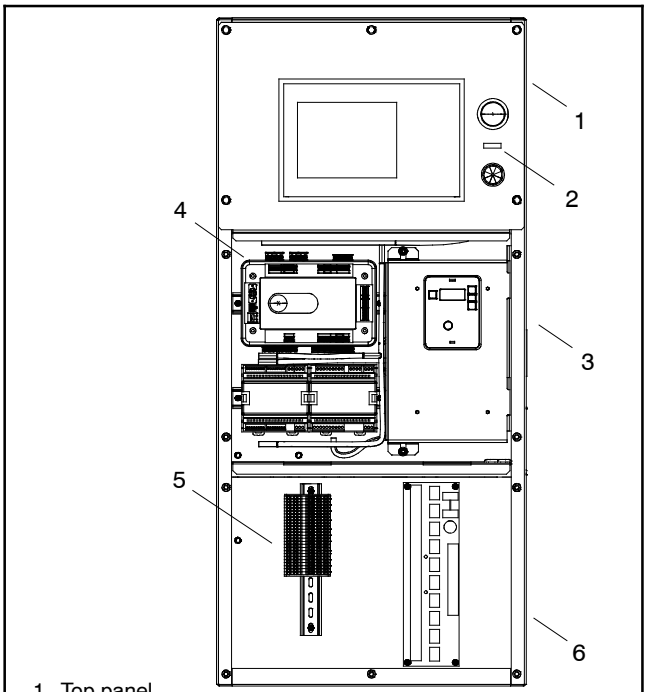
Figure 9-2 Modbus Connections

Important Setpoints in the Controller

Use the controller menus to change the following setpoints. Refer to the controller operation manual for instructions on changing settings.

- Comms Settings
  - Contr. address: 1 (default)
  - RS232(1) mode = [MODBUS- DIRECT]
  - RS232(2) mode = [MODBUS- DIRECT]
  - RS232(1)MBCSpd = **[9600, 19200, 38400, 57600] bps**
  - RS232(2)MBCSpd = **[9600, 19200, 38400, 57600] bps**
  - RS485(2)Conv. = [DISABLED, ENABLED]

Note: The Decision-Maker® 8000 has an internal converter for RS-485 communication.



1. Top panel
2. USB-A port
3. Middle (high voltage) panel
4. Base box
5. Customer connection area
6. Bottom panel

Figure 9-3 Communication Port Locations

9.2 Modbus Communication

Note: The controller connection must be correctly configured prior to the inital use. See the communication section in the operation manual.

9.2.1 Data Reading

For data reading, use the function Read Multiple Registers (See Section 9.3.1). The terminal sends a query and then, from the controller, receives either the normal response containing the requested data or the exceptional response indicating a read error.

- It is possible to use function 3 for reading (Read Multiple Registers, Section 9.3.1).
- It is not possible to read from the middle of a block of registers. The register number must correspond with the beginning of the data object. The only exception are the objects of “multipacket values” (registers 46367 - 46491) and “data part of the history record” (registers 46543 - 46667).
- All read registers must be implemented or supported. If an unimplemented register appears among the read registers, the controller returns an error message.
- Even unnamed values can be included among read registers. The read value must be treated as meaningless.
- The length of a block is 127 registers.

9.2.2 Data Writing

All data can be written by the function Write Multiple Registers (Section 9.3.3). Data up to 2 bytes can be written by the function Write Single Register (9.3.2). The terminal sends a query containing a written data and the controller either confirms it (normal response) or refuses it (exception response).

- For writing, it is possible to use function 6 (Write Single Register, Section 9.3.2) or function 16 (Write Multiple Registers, Section 9.3.3).
- Using function 16, it is possible to write a maximum of 16 registers at once.
- Data cannot be written from the middle. The register number must correspond with the beginning of the data object. Written data must be complete to perform writing of all requested data objects.
- All written registers must be implemented or supported. If an unimplemented register appears among the read registers, the controller returns an error message.
- Including unnamed registers in the written sequence is also possible. The controller confirms this writing but writing of unnamed registers is not performed.

9.2.3 Request:

- Address of target controller (1 - 32) - You can set or check your controller’s address in the controller setpoints (Setpoints -> Comms settings -> Contr.address).
- Modbus® function code - You can use the 3, 6, 16 Modbus® function code.
  - Function 3 (Read Multiple Registers)
  - Function 6 (Write Single Register)
  - Command 10
  - Function 16 (Write Multiple Registers)
- Number of registers (1 - 127) means how many registers you want to read.
- Cyclic Redundancy Check (CRC), no range. See Section 9.3.7.

Once a request is sent, a response is received. The response also has five parts:

- Address for responding controller (1 - 32), the same as the address in the request.
- Modbus® function code (3,6,16, ..), mostly the same as in the request.
- Length of data (1 - 127), here is specified the length of the transmitted data.
- Data (0 - FF), data are in the HEX form, length is defined above.
- Cyclic Redundancy Check (CRC), no range. See Section 9.3.7.

9.3 Modbus Protocol Description

- Direct connection
  - RS-232 and RS-485
  - 8 data bits
  - 1 stop bit
  - no parity
- Communication speed
  - 9600 / 19200 / 38400 / 57600 bps
- Transfer mode RTU
- Function codes
  - 3 (Read Multiple Registers)
  - 6 (Write Single Register)
  - 10 (Command)
  - 16 (Write Multiple Registers)
- The response to an incoming message depends on the communication speed. The delay is not shorter than the time needed to send/receive 3 and 1/2 characters.

9.3.1 Read Multiple Registers

Query (message to the controller)

Byte	Meaning	Note
0	Controller address (target controller)	1 to 32
1	3 = read multipe registers	Modbus function code
2 3	Communication object number - upper byte (MSB) - lower byte (LSB)	See the list of communication objects, Section 9.3.8. Number of the first register to be read.
4 5	Communication object length expressed by the number of registers - upper byte (MSB) - lower byte (LSB)	Greater than 0 Total number of registers to be read.
6 7	Cyclic Redundancy Check (CRC) - lower byte (LSB) - upper byte (MSB)	See Cyclid Redundancy Code, Section 9.3.7.

Standard response (from the controller)

Byte	Meaning	Note
0	Controller address (responding controller)	Same as in the query (1-32)
1	3 = Read multipe registers	Same as in the query
2	Length of read data in bytes (L)	Number of registers * 2
3 4	Data of the 1st register - upper byte (MSB) - lower byte (LSB)	
5 6	Data of the 2nd register - upper byte (MSB) - lower byte (LSB)	
...		
L + 1 L + 2	Data of the last register - upper byte (MSB) - lower byte (LSB)	
L + 3 L + 4	Cyclic Redundancy Check (CRC) - lower byte (LSB) - upper byte (MSB)	See Cyclic Redundancy Code, Section 9.3.7.

Exception response (from the controller)

Byte	Meaning	Note
0	Controller address (responding controller)	Same as in the query (1-32)
1	131 (3+128)	Modbus fun. number + 128
2	2	Illegal data address
3 4	Cyclic Redundancy Check (CRC) - lower byte (LSB) - upper byte (MSB)	See Cyclic Redundancy Code, Section 9.3.7.
Note: If an exception response is recieved, read the value register 24523 to determine the error. See Section 9.4 for more information.		

9.3.2 Write Single Register

Query (message to the controller)

Byte	Meaning	Note
0	Controller address (target controller)	1 to 32
1	6 = write single register	Modbus function code
2 3	Communication object number - upper byte (MSB) - lower byte (LSB)	The one register into which a value can be written.
4 5	Data - upper byte (MSB) - lower byte (LSB)	The value to be written.
6 7	Cyclic Redundancy Check (CRC) - lower byte (LSB) - upper byte (MSB)	See Cyclic Redundancy Code, Section 9.3.7.

Standard response (from the controller)

Byte	Meaning	Note
0	Controller address (responding controller)	Same as in the query (1 - 32)
1	6 = Write single register	Same as in the query
2 3	Communication object number - upper byte (MSB) - lower byte (LSB)	Same as in the query, the register that was written.
4 5	Data - upper byte (MSB) - lower byte (LSB)	Same as in the query, the data that was written.
6 7	Cyclic Redundancy Check (CRC) - lower byte (LSB) - upper byte (MSB)	See Cyclic Redundancy Code, Section 9.3.7.

Exception response (from the controller)

Byte	Meaning	Note
0	Controller address (responding controller)	Same as in the query (1 - 32)
1	134 (6+128)	Modbus fun. number + 128
2	2	Illegal data address
3 4	Cyclic Redundancy Check (CRC) - lower byte (LSB) - upper byte (MSB)	See Cyclic Redundancy Code, Section 9.3.7.
Note: If an exception response is recieved, the error can be determined by reading the value at register 24523. See Section 9.4 for more information.		

9.3.3 Write Multiple Registers

Query (message to the controller)

Byte	Meaning	Note
0	Controller address (target controller)	1 to 32
1	16 = write multipe registers	Modbus function mode
2 3	Communication object number - upper byte (MSB) - lower byte (LSB)	See list of communication objects. The number of the first register to be written.
4 5	Communication object length expressed by the number of registers - upper byte (MSB) - lower byte (LSB)	Greater than 0 The total number of registers to be written.
6	Length of written data in bytes (L)	Number of registers * 2
7 8	Data of the 1st register - upper byte (MSB) - lower byte (LSB)	The value to be written in the first register.
9 10	Data of the 2nd register - upper byte (MSB) - lower byte (LSB)	The value to be written into the second register.
...		
L + 5 L + 6	Data of the last register - upper byte (MSB) - lower byte (LSB)	The value to be written into the last register.
L + 7 L + 8	Cyclic Redundancy Check (CRC) - lower byte (LSB) - upper byte (MSB)	See Cyclic Redundancy Code, Section 9.3.7.

Standard response (from the controller)

Byte	Meaning	Note
0	Controller address (responding controller)	Same as in the query (1 - 32)
1	16 = write multipe registers	Same as in the query
2 3	Communication object number - upper byte (MSB) - lower byte (LSB)	Same as in the query The number of the first register that was written to.
4 5	Communication object length expressed by the number of registers - upper byte (MSB) - lower byte (LSB)	Same as in the query The number of the registers that were written to.
6 7	Cyclic Redundancy Check (CRC) - lower byte (LSB) - upper byte (MSB)	See Cyclic Redundancy Code, Section 9.3.7.

Exception response (from the controller)

Byte	Meaning	Note
0	Controller address (responding controller)	Same as in the query (1 - 32)
1	144 (16+128)	Function code + 128
2	2	Illegal data address
3 4	Cyclic Redundancy Check (CRC) - lower byte (LSB) - upper byte (MSB)	See Cyclic Redundancy Code, Section 9.3.7.

9.3.4 Alarm List Reading

Reading the alarm list simultaneously from multiple terminals is not possible. If one terminal starts reading, the alarm list is locked for other terminals and the locked terminal indicates an error message to another terminal. The alarm list is unlocked 5 seconds after last reading. The whole alarm list is stored in the cache memory at the moment of locking and the following reading of records is performed from this memory. Locking is done only while reading the first record. So the successive reading from the first to the last record is presumed to be at the time reading was initiated.

9.3.5 Alarm List Reading via Modbus

It is possible to read the alarm list via Modbus® as binary attributes of protection states. The range of registers given below are reserved for this function. See Figure 9-4.

Registers	Register addresses	Number of registers	Access	Data type
45751 to 45875	5750 to 5874	125	Reading	Domain
45876 to 46000	5875 to 5999	125	Reading	Domain
46201 to 46325	6200 to 6324	125	Reading	Domain

Figure 9-4 Alarm List Ranges

Each register in the alarm list carries information about two protections (Protection#1 and Protection#2). See the following examples in Figure 9-5.

Register	Protection#2	Protection#1
45753	Low Oil Level	High Oil Level
45754	Ignition Fault	Low Fuel Prsr
45755	High Fuel Prsr	NT-BIN 10
45759	Aux FaultSd	AuxWarnAlways
45760	AuxWarnRunning	LowCoolantLvl
45761	GroundFault	RemoteFltReset
45762	Remote GCB Btn	Aux SlowStop

Figure 9-5 Alarm List Example

Meaning of register content

Register map:	
Bit 0- 7	Protection #1
Bit 8- 15	Protection #2

Bit 0-2 Protection #1 Level 1	
Value	**Meaning**
0 (000)	Level 1 inactive
2 (010)	Level 1 active, confirmed
3 (011)	Level 1 active, blocked
4 (100)	Level 1 previously active, not confirmed yet
6 (110)	Level 1 active, not confirmed yet
7 (111)	Level 1 active, not confirmed yet, blocked

Bit 3-5 Protection #1 Level 2	
Value	**Meaning**
0 (000)	Level 2 inactive
2 (010)	Level 2 active, confirmed
3 (011)	Level 2 active, blocked
4 (100)	Level 2 previously active, not confirmed yet
6 (110)	Level 2 active, not confirmed yet
7 (111)	Level 2 active, not confirmed yet, blocked

Bit 6-7, Protection #1 Sensor failure	
Value	**Meaning**
0 (00)	Sensor failure not active
1 (01)	Sensor failure active, confirmed
2 (10)	Sensor failure previously active, not confirmed yet
3 (11)	Sensor failure active, not confirmed yet

Bit 8-10, Protection #2 Level 1	
Value	**Meaning**
0 (000)	Level 1 inactive
2 (010)	Level 1 active, confirmed
3 (011)	Level 1 active, blocked
4 (100)	Level 1 previously active, not confirmed yet
6 (110)	Level 1 active, not confirmed yet
7 (111)	Level 1 active, not confirmed yet, blocked

Bit 11-13, Protection #2 Level 2	
Value	**Meaning**
0 (000)	Level 2 inactive
2 (010)	Level 2 active, confirmed
3 (011)	Level 2 active, blocked
4 (100)	Level 2 previously active, not confirmed yet
6 (110)	Level 2 active, not confirmed yet
7 (111)	Level 2 active, not confirmed yet, blocked

Bit 14-15 Protection #2 Sensor failure	
Value	**Meaning**
0 (00)	Sensor failure not active
1 (01)	Sensor failure active, confirmed (or not configured as protection)
2 (10)	Sensor failure previously active, not confirmed yet
3 (11)	Sensor failure active, not confirmed yet

Alarm List for the Decision-Maker® 8000

The following is a list of alarm registers for the Decision-Maker® 8000.

Note: Some of these parameters are not alarm items. However, since these parameters are grouped with alarm type parameters, they are included in the following list.

Register	Protection#2	Protection#1
45753	Low Oil Level	High Oil Level
45754	Ignition Fault	Low Fuel Prsr
45755	High Fuel Prsr	NT-BIN 10
45756- 45758	Registers contains undefined or irrelevant parameters.	
45759	Aux FaultSd	AuxWarnAlways
45760	AuxWarnRunning	LowCoolantLvl
45761	GroundFault	RemoteFltReset
45762	Remote GCB Btn	Aux SlowStop
45763- 45806	Registers contains undefined or irrelevant parameters.	
45807	LowCrankBatVlt	LoBatteryWarn
45808	HiBatteryWarn	BattChargeFail
45809	IgnitionFault	LoPreLubePrsr
45810	Register contains undefined or irrelevant parameters.	
45811	OvercrankSd	UnderspeedSd
45812	OverspeedSd	DerateActive
45813	LoadShedActive	GCBClosedFbk
45814	EpsSupplyingLd	GenRunning
45815	HiExhstTempWrn	HiExhstDltaWrn
45816	CoolantTempWrn	CoolantTempSd
45817	LoOilPressurWr	LoOilPressurSd
45818	LowCoolantLvl	LowCoolantTemp
45819	NotInAutoAlarm	GenNotRdyArm
45820	EmergencyStop	CommonWarning
45821	CommonFault	LowFuelPrsrWrn
45822	FuelVlvFail2Op	FuelVlvFail2Cl
45823- 45864	Registers contains undefined or irrelevant parameters.	
45865	Oil Temp	Oil Pressure
45866	Coolant Temp	LftBankExhaust
45867	RitBankExhaust	AnlogAmbntTemp
45868	AirFuelMixTemp	Coolant Presur
45869- 45948	Registers contains undefined or irrelevant parameters.	
45949	SHAinCfgErr	PwrInitInAuto
45950	GcbFault	Lo PreLubPrsr
45951	Registers contains undefined or irrelevant parameters.	
45952	ECUDiagBlocked	Wrong config
45953	RTCbatteryFlat	System error
45954	UnauthorizCopy	Hi Batt Volt
45955	Gen V unbal	Gen I unbal
45956	LowCoolantTemp	LosExhstTemp

Register	Protection#2	Protection#1
45957	Derate Active	Overload SD
45958	LosCoolantTemp	LosOilPressure
45959	LosOilTemp	LosCoolntPresr
45960	Lo Batt Volt	LosFuelMixTemp
45961	Over Current	LosAmbientTemp
45962	Amb Derate Act	Dongle incomp
45963	Emergency stop	RPM
45964	CAN2 bus empty	ChrgAlternFail
45965	Sd Stop fail	Overspeed
45966	Underspeed	Pickup fail
45967	Sd ExtBattFlat	WrnServiceT1+2
45968	WrnServiceT3+4	Not lubricated
45969	Start fail	Start blocking
45970 - 45987	Registers contains undefined or irrelevant parameters.	
45988	Stp Sync fail	BOC L1 under
45989	BOC L2 under	BOC L3 under
45990	BOC L1 over	BOC L2 over
45991	BOC L3 over	Sd L1 over
45992	Sd L2 over	Sd L3 over
45993	BOC L12 under	BOC L23 under
45994	BOC L31 under	BOC L12 over
45995	BOC L23 over	BOC L31 over
45996	Sd L12 over	Sd L23 over
45997	Sd L31 over	Gen V L1-N
45998	Gen V L2-N	Gen V L3-N
45999	Gen V L1-L2	Gen V L2-L3
46000	Gen V L3-L1	Gen freq
46001 - 46200	Registers contains undefined or irrelevant parameters.	
46201	BOC fgen under	BOC fgen over
46202	BOC ReversePwr	MP L1 under
46203 - 46214	Registers contains undefined or irrelevant parameters.	
46215	BOC ShortCurr	BOC Overload

9.3.6 History Reading

Reading the history from multiple terminals simultaneously is not possible. Reading must be started by writing of an index of requested history records. If the index is not written, reading either the history header or the data part of the record is not possible. In this case, the controller returns an error message. If the terminal writes the index of requested records, the history reading is locked for other terminals (i.e. reading and writing of an index of requested record, reading of header and data part of the record). History is unlocked 5 seconds after the last history reading. Locked history is indicated to other terminals by an error message.

The requested history record is stored at the moment of locking in the cache memory and the following reading is performed from this memory.

9.3.7 Cyclic Redundancy Code Calculation

The Cyclical Redundancy Code (CRC) field allows the receiver to check the validity of the message. The CRC is based on the polynomial $x^{16}+x^{15}+x^2+1$. CRC is counted from all message bytes preceding the check field. The following is a function in C language to calculate the CRC. Note that “num” is the number of bytes.

```
unsigned short count_CRC (unsigned char *addr, int num)
{
  unsigned short CRC = 0xFFFF;
  int i;

  while (num- -)
  {
    CRC ^= *addr++;
    for (i = 0; i < 8; i++)
    {
      if (CRC & 1)
      {
        CRC >>= 1;
        CRC ^= 0xA001;
      }
      else
      {
        CRC >>= 1;
      }
    }
  }
  return CRC;
}
```

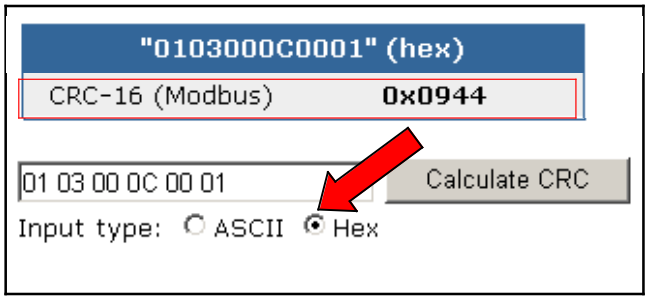


Figure 9-6 CRC Calculator

Controllers use the CRC- 16 (Modbus®). Data in examples in this manual are in HEX format.

9.3.8 Reserved Communication Objects

These objects are always available regardless of the controller software modification:

Registers (*)	Register addresses (*)	Number of registers	Access	Data type	Meaning
46347 - 46348	6346 - 6347	2	read/write	Time	Actual time
46349 - 46350	6348 - 6349	2	read/write	Date	Actual date
46351	6350	1	read/write	Unsigned8	Language index selected for displaying of texts specified by data type String (# 7)
46352 - 4653	6351 - 6352	2	read	Domain	Code of the last communication fault. See Error list, Section 9.4.
46354	6353	1	read	Unsigned8	Number of records in the alarm list
46355	6354	1	read	Unsigned16	Number of records in history (# 6)
46356	6355	1			Reserved (register not implemented)
46357	6356	1	read/write	Integer16	Index of requested history record (# 5)
46358	6357	1	write	Unsigned16	Remote key.
46359 - 46360	6358 - 6359	2	read/write	Unsigned32	For writing: command argument For reading: command release value (# 3)
46361	6360	1	write	Unsigned16	Command (# 3)
46362	6361	1			Reserved (register not implemented)
46363	6362	1	read/write	Unsigned8	User identification number (# 4)
46364	6363	1	write	Unsigned16	Entering of password for writing (# 4)
46365	6364	1			Reserved (register not implemented)
46366 - 46490	6365 - 6489	125	read	Domain	Values multipacket (#8)
46491	6490	1			Reserved (register not implemented)
46493 - 46541	6492 - 6540	50	read	String	Header of the particular history record (# 1)
46542	6541	1			Reserved (register not implemented)
46543 - 46667	6542 - 6666	125	read	Domain	Data part of the particular history record (# 2)
46668	6667	1			Reserved (register not implemented)
46669 - 46693	6668 - 6692	25	read	String	1. record in alarm list (# 1)

Registers (*)	Register addresses (*)	Number of registers	Access	Data type	Meaning
46694 - 46718	6693 - 6717	25	read	String	2. record in alarm list (# 1)
46719 - 46743	6718 - 6742	25	read	String	3. record in alarm list (# 1)
46744 - 46768	6743 - 6767	25	read	String	4. record in alarm list (# 1)
46769 - 46793	6768 - 6792	25	read	String	5. record in alarm list (# 1)
46794 - 46818	6793 - 6817	25	read	String	6. record in alarm list (# 1)
46819 - 46843	6818 - 6842	25	read	String	7. record in alarm list (# 1)
46844 - 46868	6843 - 6867	25	read	String	8. record in alarm list (# 1)
46869 - 46893	6868 - 6892	25	read	String	9. record in alarm list (# 1)
46894 - 46918	6893 - 6917	25	read	String	10. record in alarm list (# 1)
46919 - 46943	6918 - 6942	25	read	String	11. record in alarm list (# 1)
46944 - 46968	6943 - 6967	25	read	String	12. record in alarm list (# 1)
46969 - 46993	6968 - 6992	25	read	String	13. record in alarm list (# 1)
46994 - 47018	6993 - 7017	25	read	String	14. record in alarm list (# 1)
47019 - 47043	7018 - 7042	25	read	String	15. record in alarm list (# 1)
47044 - 47068	7043 - 7067	25	read	String	16. record in alarm list (# 1)
47069 - 47168	7068 - 7167	100			Reserved (registers not implemented)
(*) in DEC					

#1 - The result of reading an unused record is an empty string.

#2 - The result of reading an unused record is a domain with zero value.

#3 - Because a command is executed immediately after it is written, an argument must be written before a command code. When multiple registers are written, writing an argument and command simultaneously is recommended. As the argument has lower register address than command, the required sequence is maintained. See list of commands and Modbus® communication examples.

#4 - Before entering the password for writing, defining the user identification number is necessary. Enter the user identification number and password simultaneously. Entered password stays valid 5 minutes after the last successful writing.

#5 - The latest record has index 0, the older record has index - 1, next record has index - 2, and so on.

6 - Reading and writing is only possible when the history reading is not locked by another terminal. Also, the index must be written previously.

7 - Implicitly = 0.

#8 - “Values multipacket” contains values that are currently configured in the history record.

9.3.9 Access to Password Protected Objects

Dedicated communication objects are setpoints and commands that are protected by a password against writing. The set of protected objects is given in the controller configuration and is fixed for a particular controller.

In Decision-Maker® 8000 controllers, specifying access levels to protected objects for 8 different users is possible. For each user, a set of access attributes is defined and each user has a unique password. The user can gain permission for writing to 8 groups of objects with different access levels by entering their password. The objects are assigned into groups in the controller configuration.

9.3.10 Commands for the Controller

If commands are protected by levels 1 - 7, entering an appropriate user and his password first is necessary to enable commands.

Command (*)	Meaning	Argument (*)	Return Value (*)	
1	Engine start	01FE0000	02FD0000	OK
			2	Argument has not been written.
	Engine stop	02FD0000	000002FE	OK
			2	Argument has not been written.
	Horn reset	04FB0000	000004FC	OK
	Fault reset	08F70000	000008F8	OK
	ECU Fault reset	10EF0000	000010F0	OK
		other	1	Wrong argument
2	Close/open generator circuit breaker Clutch ON/OFF (ID)	11EE0000	000011EF	OK
			2	Argument has not been written.
	Close generator circuit breaker	11EF0000	000011F0	OK
			2	Argument has not been written.
	Open generator circuit breaker	11F00000	000011F1	OK
			2	Argument has not been written.
5	Reset from Init state (#1)	44440000	00004445	OK
			1	Not possible to perform.
(*) in HEX				

#1 - If the controller setpoints are not valid after it is switched on, the controller goes to a blocked state. In this state, it is necessary to modify the setpoints from the controller keypad and switch off and on the controller or from the external terminal and unblock the controller by **Reset from Init state** command. Another condition necessary to unblock the application function of the controller is valid configuration.

9.4 Error List

If the controller encounters an error when processing the query, it returns the exceptional response instead of the normal one to the terminal. An exception has always the value 2 (Illegal Data Address). After receiving the exceptional response, the terminal should read the communication object 24523 containing the last error specification. The meaning of an error can be found out from the following table.

MSB1 (*)	LSB1 (*)	MSB2 (*)	LSB2 (*)	Meaning
0	0	0	0	No error.
0	0	2	6	Comm. Object nonexistent.
0	0	1	6	Illegal access: Read (write) of the communication object. Object intended only for write (read).
255	0	0	8	Controller application is not active.
254	0	0	8	Inexpectant message
253	0	0	8	No more unread records in event history.
252	0	0	8	Setpoint not defined in controller configuration.
251	0	0	8	Bad write data length.
250	0	0	8	Invalid password.
249	0	0	8	No more free space in front for EEPROM.
248	0	0	8	Too long parameter.
247	0	0	8	Invalid controller configuration.
246	0	0	8	Undefined command.
245	0	0	8	Command can’t be done.
244	0	0	8	Too long data answer for peripheries (max. 4B).
243	0	0	8	Too long data for peripheries (max. 4B).
242	0	0	8	Unavailable peripheries.
241	0	0	8	Required operation isn’t available in peripheries.
240	0	0	8	Operation cannot be performed now, the terminal has to repeat the request. This error can occur when an operation with EEPROM memory (setpoint write, history record read) is required at the same time while an internal EEPROM write cycle takes place.
239	0	0	8	Controller programming can’t be carried out.
238	0	0	8	Write cannot be performed - power supply failure detected.
237	0	0	8	Another active call request is present. This error code can be returned by the controller as the response to the communication object. Object 24540 write - active call termination.
236	0	0	8	Programming error.
235	0	0	8	This error is reported by modem bridge in the case of a connection failure between the module and the addressed controller. The terminal can evaluate this error as a communication *timeout* with the controller.
234	0	0	8	Write cannot be performed - periphery not responding.
233	0	0	8	Write cannot be performed - setpoint nonexistent in any periphery.
232	0	0	8	Bad access code for communication from a remote terminal.

(*) in DEC

MSB1 (*)	LSB1 (*)	MSB2 (*)	LSB2 (*)	Meaning
231	0	0	8	Invalid controller address: value out of range 1 to 32 or already used. This error is a reaction on communication object. Object 24537 write.
230	0	0	8	Invalid controller address: value out of range 1 to 32 or already used. This error is a reaction on communication object. Object 24537 write.
229	0	0	8	Undefined action. A reaction on communication object. Object 24521 write.
228	0	0	8	Action (although defined) cannot be performed. A reaction on communication object. Object 24521 write.
227	0	0	8	Written object value is not acceptable.
226	0	0	8	No more free slots.
225	0	0	8	No connection.
224	0	0	8	Locked, block reading is active.
223	0	0	8	Locked, commanding is active.
222	0	0	8	Locked, the history reading is active.
221	0	0	8	Locked, the programming is active.
220	0	0	8	Communication error.
219	0	0	8	Request for - data
218	0	0	8	Request for - SMS
217	0	0	8	Request for - email
216	0	0	8	Request for - mobile email
215	0	0	8	Request for - fax
214	0	0	8	Wrong access code, the connection must be terminated.
213	0	0	8	Reserved for HW key
212	0	0	8	Reserved for DENOX
211	0	0	8	Unsufficient access rights.
210	0	0	8	The request can be submitted only by the administrator (User 0).
209	0	0	8	The administrator has entered a wrong user identification number.
208	0	0	8	Not possible to write, the communication object has forced value.
207	0	0	8	The administrator requests an unsupported operation.
206	0	0	8	Selected communication mode doesn’t allow required interface
205	0	0	8	Selected interface doesn’t allow required communication mode
204	0	0	8	HW data flow control for modem communication. Sending as answer to request to read 24437 communication object
203	0	0	8	SW data flow control for modem communication. Sending as answer to request to read 24437 communication object
202	0	0	8	Access denied from actual IP address.
201	0	0	8	Unknown fault.
200	0	0	8	Invalid register.
199	0	0	8	Reading of alarm list is locked.
198	0	0	8	Reading of history is locked.
197	0	0	8	Reading of alarm list has to be started by reading the first record.
196	0	0	8	The history record is not defined for reading of history.
195	0	0	8	It is not possible to request such number of registers.
(*) in DEC				

9.5 Data Types

The following table contains the communication objects data types and their representation in the data part of the communication function.

Data type	Meaning	Number of registers	Data part of the communication function[1]
Integer8	Signed integer - 8 bits	1	MSB1 = sign extension LSB1 LSB1 = comm. object value
Unsigned8	Unsigned integer - 8 bits	1	MSB1 = 0 LSB1 = comm. object value
Integer16	Signed integer - 16 bits	1	MSB1 = comm. object value, bits 15-8 LSB1 = comm. object value, bits 7-0
Unsigned16	Unsigned integer - 16 bits	1	MSB1 = comm. object value, bits 15-8 LSB1 = comm. object value, bits 7-0
Integer32	Signed integer - 32 bits	2	MSB1 = comm. object value, bits 31-24 LSB1 = comm. object value, bits 23-16 MSB2 = comm. object value, bits 15-8 LSB2 = comm. object value, bits 7-0
Unsigned32	Unsigned integer - 32 bits	2	MSB1 = comm. object value, bits 31-24 LSB1 = comm. object value, bits 23-16 MSB2 = comm. object value, bits 15-8 LSB2 = comm. object value, bits 7-0
Binary8	Binary number - 8 bits	1	MSB1 = 0 LSB1 = comm. object value
Binary16	Binary number - 16 bits	1	MSB1 = comm. object value, bits 15-8 LSB1 = comm. object value, bits 7-0
Binary32	Binary number - 32 bits	2	MSB1 = comm. object value, bits 31-24 LSB1 = comm. object value, bits 23-16 MSB2 = comm. object value, bits 15-8 LSB2 = comm. object value, bits 7-0
Char	ASCII character	1	MSB1 = 0 LSB1 = comm. object value
List	String list	1	MSB1 = 0 LSB1 = comm. object value
ShortStr	ASCII string of max. length of 15 characters (zero terminated string)	8	MSB1 = 1. character of the string LSB1 = 2. character of the string MSB2 = 3. character of the string LSB2 = 4. character of the string ...
LongStr	ASCII string of max. length of 31 characters (zero terminated string)	16	MSB1 = 1. character of the string LSB1 = 2. character of the string MSB2 = 3. character of the string LSB2 = 4. character of the string ...
Date	Date	2	MSB1 = BCD(day) LSB1= BCD(month) MSB2 = BCD(year) LSB2 = 0 example: MSB1 = 18 (HEX) LSB1 = 04 (HEX) MSB2 = 01 (HEX) LSB2 = 0 ⇒ Date = 18.4.(20)01
MSBx = register x, bits 15- 8 LSBx = register x, bits 7- 0			

Data type	Meaning	Number of registers	Data part of the communication function[1]
Time	Time	2	MSB1 = BCD(hour) LSB1 = BCD(minute) MSB2 = BCD(second) LSB2 = 0 example: MSB1 = 20 (HEX) LSB1 = 24 (HEX) MSB2 = 02 (HEX) LSB2 = 0 % Time = 20:24:02
Domain	Field n bytes C-declaratione: unsigned char x[n]	n	MSB1 = x[0] LSB1 = x[1] MSB2 = x[2] LSB2 = x[3] ... n is even number: MSBm-1 = x[n-2] LSBm = x[n-1] n is odd number: MSMm- = x[n-1] LSBm = 0
String	String (Zero terminated string)	Depends on register number	String characters coding depends on chosen language (8bit coding, EUC)
MSBx = register x, bits 15- 8 LSBx = register x, bits 7- 0			

9.6 Communication Status

Communication object number: 24571
Operation: Read only
Data type: Binary32

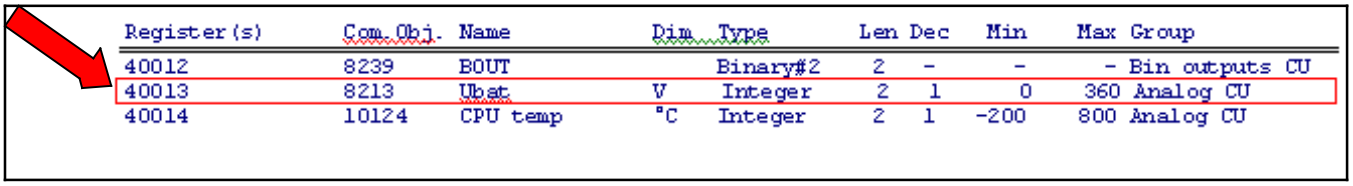
Bit	Meaning
Bit 0	Internal terminal in controller does not work (0 for other controllers)
Bit 1	Invalid controller software (based on CRC).
Bit 2	Invalid controller configuration (based on CRC).
Bit 3	In the event history is present at least one unread record.
Bit 4	P type setpoints are invalid. P type setpoints are representing the controller setpoints. Values of these setpoints can be set from connected terminals. If these setpoints are invalid, the application functions are blocked. Setpoints recovery is needed.
Bit 5	R type setpoints are invalid. R type setpoints are representing the data, that is only initialized from connected terminals, but its updating is made by the controller itself (e.g. statistic or time and date). If these setpoints are invalid, their change from the controller is blocked. Setpoint recovery is needed.
Bit 6	The event history was cleared.
Bit 7	The event history was filled up at least once.
Bit 8	P type setpoint change occurred (reading resets this bit).
Bit 9	R type setpoint change occurred (reading resets this bit).
Bit 10	Controller type (= 0)
Bit 11	Alarm list not empty.
Bit 12	Alarm list change (reading resets this bit).
Bit 13	New item added into alarm list (reading resets this bit).
Bit 14	Internal controller terminal is locked up for setpoint change.
Bit 15	Invalid configuration format.
Bit 16	Diagnostic codes change.
Bits 20	Controller type (= 0)
Bits 21- 17	Reserve (= 0)
Bits 22- 21	Password level for Setpoints and Commands write (Not applicabe for Decision-Maker® 8000 controllers).
Bit 23	Controller was initiated.
Bits 28- 24	Communication module version.
Bits 29	Remote terminal is connected.
Bits 30	Controller type (= 0)
Bits 31	Reserve (= 0)
(*) Controller type	

9.7 Examples of Modbus Communication

This chapter shows some examples of controller communication through Modbus®.

9.7.1 Battery Voltage - Reading (Read Multiple Registers)

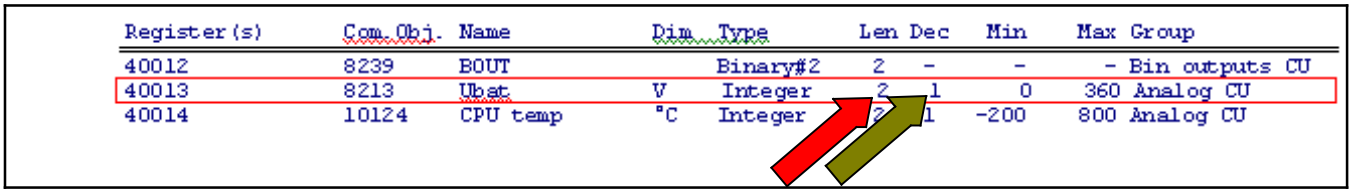
Request: 01 03 00 0C 00 01 44 09	
01	Controller address - see your controller settings
03	= Modbus® function code (Read Multiple Registers)
00 0C	= Register address: Register number (Ubat => 40013) - 40013 - 40001 = 12 DEC => 000C HEX - see your Cfg Image or list of dedicated communication objects, Section 9.3.8.
00 01	= Number of registers - 40013, it is one register = 01 DEC =>0001 HEX - you have to calculate number of register which you want read
09 44	= CRC - CRC has to be written LSB then MSB! See Section 9.3.7.



Register(s)	Com.Obj.	Name	Dim	Type	Len	Dec	Min	Max	Group
40012	8239	BOUT		Binary#2	2	-	-	-	Bin outputs CU
40013	8213	Ubat	V	Integer	2	1	0	360	Analog CU
40014	10124	CPU temp	°C	Integer	2	1	-200	800	Analog CU

Figure 9-7 Battery Voltage Modbus Register

Response: 01 03 02 00 DC B9 DD	
01	Controller address - see your controller settings.
03	= Modbus® function code (Read Multiple Registers)
02	= Length of read data in Bytes (in HEX) - 02 HEX => 2 DEC - define the length of data.
00 DC	= Value of battery voltage - DC HEX => 220 DEC => Batt. voltage is represented with 1 decimal => 22,0
VDC	- convert the data from hex to dec. Use the multiplication factor (In this case 0.1) !
DD B9	= CRC - check with your CRC, because of data validity.



Register(s)	Com.Obj.	Name	Dim	Type	Len	Dec	Min	Max	Group
40012	8239	BOUT		Binary#2	2	-	-	-	Bin outputs CU
40013	8213	Ubat	V	Integer	2	1	0	360	Analog CU
40014	10124	CPU temp	°C	Integer	2	1	-200	800	Analog CU

Figure 9-8 Battery Voltage Data Length and Number of Decimals

9.7.2 Values (Oil Temp, Oil Pressure, Coolant Temp) - Reading

Request: 01 03 00 0F 00 03 35 C8	
01	Controller address - see your controller settings
03	= Modbus® function code (Read Multiple Registers)
00 18	= Register address: Register number (40025) - 40001 = 24 DEC => 18 HEX
00 03	= Number of registers (40025 - Oil Temp, 40026 - Oil Pressure, 40027 - CoolantTemp) = 3 DEC = > 03 HEX
CC 85	= CRC (write LSB MSB !)

Register (s)	Name	Dim	Type	Len	Dec	Min	Max	Group
40025	Oil Temp	°F	Integer	2	1	0	3000	Analog Inputs 1
40026	Oil Pressure	PSI	Integer	2	1	0	1500	Analog Inputs 1
40027	Coolant Temperature	°F	Integer	2	1	0	3000	Analog Inputs 1

Figure 9-9 Values Modbus Register

Response: 01 03 06 00 27 00 2E 00 2B 35 64	
01	Controller address - see your controller settings.
03	= Modbus® function code (Read Multiple Registers)
06	= Length of read data in Bytes (in HEX)
06 C0	= 06C0 HEX => 1728 DEC => 172.8 °F (Divided by 10, DEC = 1, 1 Decimal)
02 A7	= 02A7 HEX => 679 DEC => 67.9 psi (Divided by 10, DEC = 1, 1 Decimal)
07 38	= 0738 HEX => 1848 DEC => 184.8 °F (Divided by 10, DEC = 1, 1 Decimal)
BB 92	= CRC

9.7.3 Binary Input - Reading

Request: 01 03 00 02 00 01 25 CA	
01	Controller address - see your controller settings.
03	= Modbus® function code (Read Multiple Registers)
00 02	= Register address: Register number (40003) - 40001 = 02 DEC => 02 HEX
00 01	= Number of registers (40003) = 01 DEC => 01 HEX
CA 25	= CRC (write LSB MSB !)

Response: 01 03 02 00 0A 38 43	
01	Controller address - see your controller settings
03	= Modbus® function code (Read Multiple Registers)
02	= Length of read data in Bytes (in HEX)
00 0A	= Object data value (Binary input = 00000000000001010 i.e. BI2 and BI4 are set)*
43 38	= CRC

* Table of binary inputs (BI)

BI16	BI15	BI14	BI13	BI12	BI11	BI10	BI9	BI8	BI7	BI6	BI5	BI4	BI3	BI2	BI1
		0				0				0				A	
0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
0 HEX = 0000 Binary				0 HEX = 0000 Binary				0 HEX = 0000 Binary				A HEX = 1010 Binary			

9.7.4 Password Decode - Reading

Request: 01 03 00 A0 00 02 C4 29	
01	Controller address
03	= Modbus® function code (Read Multiple Registers)
00 A0	= Register address: Register number (40161) - 40001 = 160 DEC => A0 HEX
00 02	= Number of registers (40161 and 40162) = 02 DEC => 02 HEX
29 C4	= CRC (write LSB MSB !)

Response: 01 03 04 68 73 90 00 7B 88	
01	Controller address
03	= Modbus® function code (Read Multiple Registers)
04	= Length of read data in Bytes (in HEX)
68 73 90 00	68739000 HEX => 1752403968 DEC = > password decode is 1752403968
88 7B	= CRC

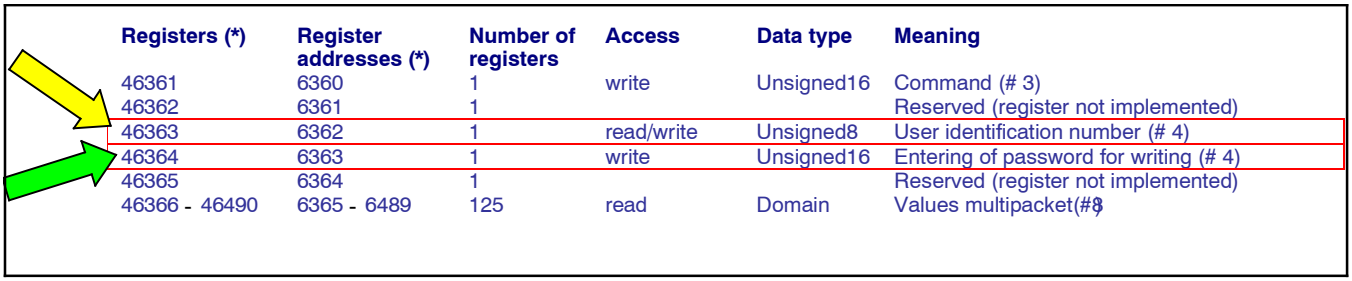
9.7.5 Generator Set Name - Reading

Request: 01 03 0B B8 00 08 C6 0D	
01	Controller address
03	= Modbus® function code (Read Multiple Registers)
0B B8	= Register address: Register number (43001) - 40001 = 3000 DEC => BB8 HEX
00 08	= Number of registers (43001 - 43008) = 08 DEC => 08 HEX
0D C6	= CRC (write LSB MSB !)

Response: 01 03 10 49 47 53 2D 4E 54 00 00 00 00 00 00 00 00 00 00 D7 6A	
01	Controller address
03	= Modbus® function code (Read Multiple Registers)
10	= Length of read data in Bytes (in HEX)
54 72	= Object data value (Tr)
61 69	= Object data value (ai)
6E 69	= Object data value (ni)
6E 67	= Object data value (ng)
35 00	= Object data value (5_)
00 00	= Object data value (_ _)
00 00	= Object data value (_ _)
00 00	= Object data value (_ _) =.> gen- set name is Training 5
D3 42	= CRC

9.7.6 User & Password - in Two Steps

Request: 01 06 18 DA 00 00 AE 91	
01	Controller address
06	= Modbus® function code (Write Single Register)
18 DA	= Register address: Object for user identification (46363) - 40001 = 6362 DEC => 18DA HEX
00 00	= ID of user; Administrator = 00 => 0000
91 AE	= CRC (write LSB MSB !)



Registers (*)	Register addresses (*)	Number of registers	Access	Data type	Meaning
46361	6360	1	write	Unsigned16	Command (# 3)
46362	6361	1			Reserved (register not implemented)
46363	6362	1	read/write	Unsigned8	User identification number (# 4)
46364	6363	1	write	Unsigned16	Entering of password for writing (# 4)
46365	6364	1			Reserved (register not implemented)
46366 - 46490	6365 - 6489	125	read	Domain	Values multipacket(#3)

Figure 9-10 User and Password Modbus Registers

Response: 01 06 18 DA 00 00 AE 91	
01	Controller address
06	= Modbus® command
18 DA	= Register address
00 00	= Release value
91 AE	= CRC

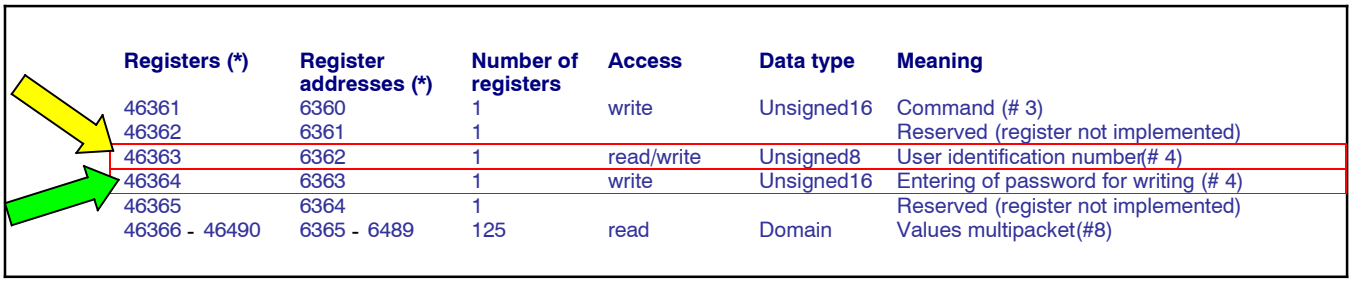
Request: 01 06 18 DB 00 00 FF 51	
01	Controller address
06	Modbus® function code (Write Single Register)
18 DB	Register address: Object for entering password (46364) - 40001 = 6363 DEC => 18DB HEX
00 00	= Password = 00 => 0000
51 FF	= CRC (write LSB MSB !)

Response: 01 06 18 DB 00 00 FF 51	
01	Controller address
06	Modbus® command
18 DB	Register address
00 00	= Release value
51 FF	CRC

Note: Before entering the password for writing, define the user identification number. Enter the user identification number and the password simultaneously. Entered password stays valid 5 minutes after the last successful writing.

9.7.7 User & Password - in One Step

Request: 01 10 18 DA 00 02 04 00 00 00 00 D4 8C	
01	Controller address
10	= Modbus® command (Write Multiple Register)
18 DA	= Register address: Object (46363) - 40001 = 6362 DEC => 18DA HEX
00 02	= number of Modbus® registers (user & password)
04	= data length in bytes (00 00 00 00)
00 00 00 00	= User identification “00 00” & password “00 00”
8C D4	= CRC (write LSB MSB !)



Registers (*)	Register addresses (*)	Number of registers	Access	Data type	Meaning
46361	6360	1	write	Unsigned16	Command (# 3)
46362	6361	1			Reserved (register not implemented)
46363	6362	1	read/write	Unsigned8	User identification number(# 4)
46364	6363	1	write	Unsigned16	Entering of password for writing (# 4)
46365	6364	1			Reserved (register not implemented)
46366 - 46490	6365 - 6489	125	read	Domain	Values multipacket(#8)

Figure 9-11 User and Password in One Step Modbus Registers

Response: 01,10,18,DA,00,02,66,93	
01	Controller address
10	= Modbus® command
18 DA	= Register address
00 02	= number of written Modbus® registers
93 66	= CRC

9.7.8 History - Reading

See Section 9.3.6 for more information about History reading.

Note: If you use ModScan32 PC tool, use the script for this issue.

1 of 3 - first the index of history record must be entered:

Request: 01 06 18 D4 00 00 CF 52	
01	Controller address
06	= Modbus® function code (Write Single Register)
18 D4	= Register address of the history index (46357)- 40001 = 6356 DEC => 18D4 HEX
00 00	= First history record (index = 0)
52 CF	= CRC (write LSB MSB !)

Response: 01 06 18 D4 00 00 CF 52

Registers (*)	Register addresses (*)	Number of registers	Access	Data type	Meaning
46354	6353	1	read	Unsigned8	Number of records in the alarm list
46356	6355	1			Reserved (register not implemented)
46357	6356	1	read/write	Integer16	Index of requested history record# (5)
46493 - 46541	6492 - 6540	50	read	String	Header of the particular history record# (1)
46543 - 46667	6542 - 6666	125	read	Domain	Data part of the particular history record# (2)
46668	6667	1			Reserved (register not implemented)
46669 - 46693	6668 - 6692	25	read	String	1. record in alarm list # 1)
46694 - 46718	6693 - 6717	25	read	String	2. record in alarm list # 1)
46719 - 46743	6718 - 6742	25	read	String	3. record in alarm list # 1)

Figure 9-12 History Dedicated Communication Objects Table

2 of 3 - reading of history record header:

Request: 01 03 19 5C 00 32 03 51	
01	Controller address
03	= Modbus® function code (Read Multiple Registers)
19 5C	= Register address of history record header (46493) *2 - 40001 = 6492 DEC =>195C HEX
00 32	= Number of registers > 46493 - 46541 => 50 DEC => 32 HEX
51 03	= CRC (write LSB MSB !)

Response: 01 03 64 4D 43 42 20 63 6C 6F 73 65 64 20 20 20 20 20 20 20 20 20 20 30 33 2F 30 39 2F 32 30 30 38 20 20 31 35 3A 34 34 3A 35 37 2E 39 00 ... 00 00 0E E0	
01	Controller address
03	= Modbus® function code (Read Multiple Registers)
64	= Length of read data in Bytes (in HEX)
4D .. 39...	= Object data value > 1.record in alarmlist is MCB closed 03.09.2008 15:44:57.9
E0 0E	= CRC

3 of 3 - reading of the data part of history record:

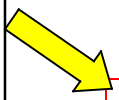
Request: 01 03 19 8E 00 7D E2 9C	
01	Controller address
03	= Modbus® function code (Read Multiple Registers)
19 8E	= Register address of history record header (46543) - 40001 = 6542 DEC => 198E HEX
00 7D	= Number of registers > 46542 - 46667 => 125 DEC => 7D HEX
9C E2	= CRC (write LSB MSB !)

Response: 01 03 FA 00 00 00 00 00 00 00 20 00 ... 00 00 F4 01 FD 00 FD 00 FD 00 00 00 00 00 00 00 00 64 20 00 00 00 00 64 00 D8 00 55 01 00 00 A1 00 7A 00 64 00 0A 00 18 00 00 00 00 ... 00 00 20 3B	
01	Controller address
03	= Modbus® function code (Read Multiple Registers)
FA	= Length of read data in Bytes (in HEX)
00 .. 00	= Object data value > for reading this data see table 7 History Record in Communication object description
3B 20	= CRC

9.7.9 AlarmList Reading

See Section 9.3.4 for more information about AlarmList reading.

Request: 01 03 1A 0C 00 19 43 B1	
01	Controller address
03	= Modbus® function code (Read Multiple Registers)
1A 0C	= Register address: Register number (46669) - 40001 = 6668 DEC => 1A0C HEX
00 19	= Number of registers > 46669 - 46693 => 25 DEC => 19 HEX
B1 43	= CRC (write LSB MSB !)



Registers (*)	Register addresses (*)	Number of registers	Access	Data type	Meaning
46354	6353	1	read	Unsigned8	Number of records in the alarm list
46357	6356	1	read/write	Integer16	Index of requested history record (# 5)
46364	6363	1	write	Unsigned16	Entering of password for wri ting (# 4)
46542	6541	1			Reserved (register not implemented)
46668	6667	1			Reserved (register not implemented)
46669 - 46693	6668 - 6692	25	read	String	1. record in alarm list (# 1)
46694 - 46718	6693 - 6717	25	read	String	2. record in alarm list (# 1)
46719 - 46743	6718 - 6742	25	read	String	3. record in alarm list (# 1)

Figure 9-13 AlarmList Dedicated Communication Objects Table

Response: 01 03 32 2A 53 64 20 53 44 20 31 32 ... 00 00 18 F5	
01	Controller address
03	= Modbus® function code (Read Multiple Registers)
32	= Length of read data in Bytes (in HEX)
2A 53	= Object data value (* S)
64 20	= Object data value (d _)
53 44	= Object data value (S D)
20 31	= Object data value (_ 1)
32 00 ...	= Object data value (2) = > 1.record in alarmlist is *Sd SD 12 (inactive, not accepted)
F5 18	= CRC

Response: 01 03 32 2A 53 64 20 53 44 20 31 32 ... 00 00 18 F5	
01	Controller address
03	= Modbus® function code (Read Multiple Registers)
32	= Length of read data in Bytes (in HEX)
21 2A	= Object data value (! *)
53 64	= Object data value (S d)
20 53	= Object data value (_ S)
44 20	= Object data value (D _)
31 32 ...	= Object data value (1 2) = > 1.record in alarmlist is !*Sd SD 12 (active, not accepted)
38 89	= CRC

9.8 Modbus Register

This section contains Modbus® registers for the Decision-Maker® 8000.

- For 500-1000REZK and 400-1000REZCK generator sets, refer to Section 9.8.1.
- For 1300REZCK generator sets, refer to Section 9.8.2.
- Refer to Figure 9-14 and Section 1.3 for definitions of terms and symbols used in the register tables.

Header	Description
Registers(s)	Register number; register address = register number - 1
Com. Obj.	Corresponding communication object number
Name	Communication object name
Dim	Value dimension
Type	Value data type (see Data types)
Len	Data length in Bytes (max. 64)
Dec	Number of decimals
Min	Value low limit
Max	Value high limit
Group	Group of setpoints/values

Figure 9-14 Modbus Table Definitions

9.8.1 Modbus Registers for 500-1000REZK and 400-1000REZCK Models

Register	Name	Data Type	Len	Dec	Min	Max	Dim	Group
40003	BIN	Binary#1	2	-	-	-		Bin inputs CU
40004	BIN-1	Binary#2	1	-	-	-		Binary Inputs
40012	BOUT	Binary#3	2	-	-	-		Bin outputs CU
40013	Ubat	Integer	2	1	0	360	V	Analog CU
40014	CPU temp	Integer	2	1	-200	800	°C	Analog CU
40024	Oil Temp	Integer	2	1	0	3000	°F	AnalogInputs 1
40025	Oil Pressure	Integer	2	1	0	1500	psi	AnalogInputs 1
40026	Coolant Temp	Integer	2	1	0	3000	°F	AnalogInputs 1
40027	LftBankExhaust	Integer	2	0	0	1500	°F	AnalogInputs 1
40028	RitBankExhaust	Integer	2	0	0	1500	°F	AnalogInputs 1
40029	AnlogAmbntTemp	Integer	2	1	0	3000	°F	AnalogInputs 1
40030	AirFuelMixTemp	Integer	2	1	0	3000	°F	AnalogInputs 1
40031	Coolant Presur	Integer	2	1	0	1500	psi	AnalogInputs 1
40104	Engine Speed	Integer	2	0	0	3000	RPM	ECU
40105	Throttle Pos	Integer	2	1	0	1000	%	ECU
40106	Bypass Vlv Pos	Integer	2	1	0	1000	%	ECU
40107	Gas Valve Pos	Integer	2	1	0	1000	%	ECU
40108	Inlet Gas Prsr	Integer	2	0	0	6400	kPa	ECU
40109	Gas Temp	Integer	2	0	-5	300	°F	ECU
40110	Inlet Air Temp	Integer	2	0	-5	410	°F	ECU
40111	MAT	Integer	2	0	-5	300	°F	ECU
40112	MAP 1	Integer	2	0	0	145	psi	ECU
40113	PTP 1	Integer	2	0	0	145	psi	ECU
40114	Battery Volts	Integer	2	1	0	32120	V	ECU
40115	Gas Correction	Integer	2	4	0	20000	-	ECU
40116	Eff Correction	Integer	2	4	0	20000	-	ECU
40117	Misfire Level	Integer	2	3	0	3000	-	ECU
40118	MAP 2	Integer	2	0	0	145	psi	ECU
40119	PTP 2	Integer	2	0	0	145	psi	ECU
40124-40125 (2)	EngHours	Integer	4	0	-	-	h	ECU
40137	VPIO BOUT1	Binary#15	1	-	-	-		VPIO

* Limit is defined by the value of the communication object of specified number.

Register	Name	Data Type	Len	Dec	Min	Max	Dim	Group
40138	VPIO BOUT2	Binary#16	1	-	-	-		VPIO
40139	VPIO BOUT3	Binary#17	1	-	-	-		VPIO
40140	VPIO BOUT4	Binary#18	1	-	-	-		VPIO
40158	SW version	Unsigned	1	1	0	255		Info
40159	SW branch	Unsigned	1	0	0	255		Info
40161-40162 (2)	PasswordDecode	Unsigned	4	0	-	-		Info
40163	Engine state	List#3	1	-	1380	1400		Info
40168	ControllerMode	List#5	1	-	1377	1379		Info
40171	CAN16	Binary	2	-	-	-		Info
40172	CAN32	Binary	2	-	-	-		Info
40177-40178 (2)	ECU FC	Unsigned	4	0	-	-		ECU diag
40179	ECU FMI	Unsigned	1	0	0	255		ECU diag
40180	ECU OC	Unsigned	1	0	0	255		ECU diag
40197	MaxLegCurrent	Integer	2	0	- 32768	32767	A	PLC
40200	AmbDerate%	Integer	2	0	- 32768	32767	%	PLC
40201	WaterDerate%	Integer	2	0	- 32768	32767	%	PLC
40202	Derate%	Integer	2	0	- 32768	32767	%	PLC
40203	MaxDerated%	Integer	2	0	- 32768	32767	%	PLC
40204	DeratedPower	Integer	2	0	- 32768	32767	kW	PLC
40205	AvgV L-N	Integer	2	0	- 32768	32767	V	PLC
40208	MaxVA-PerPh	Integer	2	0	- 32768	32767	VA	PLC
40209	RatedAmps	Integer	2	0	- 32768	32767	A	PLC
40210	MaxLegAmpPrct	Integer	2	0	- 32768	32767	%	PLC
40211	AvgV L-L	Integer	2	0	- 32768	32767	V	PLC
40212	KwLoadPrct	Integer	2	0	- 32768	32767	%	PLC
40213	RatedT	Integer	2	0	- 32768	32767	°F	PLC
40214	ExhstTempDiff	Integer	2	0	- 32768	32767	°F	PLC
40215	AvgCurrent	Integer	2	0	- 32768	32767	A	PLC
40216	ExhuastTwrnLvl	Integer	2	0	- 32768	32767	°F	PLC
40217	HiFreqLim	Integer	2	1	- 32768	32767	Hz	PLC
40218	LoFreqLim	Integer	2	1	- 32768	32767	Hz	PLC
40224	MinLoadedLevel	Integer	2	0	- 32768	32767	%	PLC
40225	MaxCrntKwPrct	Integer	2	0	- 32768	32767	%	PLC
40227	FanOffTemp	Integer	2	1	- 32768	32767	°F	PLC
40237	SHBIN1	Binary#36	1	-	-	-		SHBIN
40242	SHBOUT2	Binary#37	1	-	-	-		SHBOUT
40249	Gen V L1-N	Unsigned	2	0	0	8277*	V	Gener values
40250	Gen V L2-N	Unsigned	2	0	0	8277*	V	Gener values
40251	Gen V L3-N	Unsigned	2	0	0	8277*	V	Gener values
40252	Gen V	Unsigned	2	0	0	8277*	V	Gener values
40253	Gen V L1-L2	Unsigned	2	0	0	9673*	V	Gener values
40254	Gen V L2-L3	Unsigned	2	0	0	9673*	V	Gener values
40255	Gen V L3-L1	Unsigned	2	0	0	9673*	V	Gener values
40256	Gen freq	Unsigned	2	1	400	700	Hz	Gener values
40258	Gen curr L1	Unsigned	2	0	0	8275*	A	Gener values
40259	Gen curr L2	Unsigned	2	0	0	8275*	A	Gener values
40260	Gen curr L3	Unsigned	2	0	0	8275*	A	Gener values
40261	Pwr factor	Integer	1	2	-100	100		Gener values
40262	Load char	Char	1	-	-	-		Gener values
40264	Act power	Integer	2	0	0	8276*	kW	Gener values
40266	Act pwr L1	Integer	2	0	0	8276*	kW	Gener values
40267	Act pwr L2	Integer	2	0	0	8276*	kW	Gener values
40268	Act pwr L3	Integer	2	0	0	8276*	kW	Gener values
40269	React power	Integer	2	0	- 32768	32767	kVAr	Gener values
40271	React pwr L1	Integer	2	0	- 32768	32767	kVAr	Gener values
40272	React pwr L2	Integer	2	0	- 32768	32767	kVAr	Gener values
40273	React pwr L3	Integer	2	0	- 32768	32767	kVAr	Gener values
40274	Appar pwr	Integer	2	0	- 32768	32767	kVA	Gener values
40275	Appar pwr L1	Integer	2	0	- 32768	32767	kVA	Gener values

* Limit is defined by the value of the communication object of specified number.

Register	Name	Data Type	Len	Dec	Min	Max	Dim	Group
40276	Appar pwr L2	Integer	2	0	- 32768	32767	kVA	Gener values
40277	Appar pwr L3	Integer	2	0	- 32768	32767	kVA	Gener values
40278	Pwr factor L1	Integer	1	2	-100	100		Gener values
40279	Pwr factor L2	Integer	1	2	-100	100		Gener values
40280	Pwr factor L3	Integer	1	2	-100	100		Gener values
40281	Gen V unbal	Unsigned	2	0	0	200	%	Gener values
40282	Gen I unbal	Unsigned	2	0	0	200	%	Gener values
40285	Load char L1	Char	1	-	-	-		Gener values
40286	Load char L2	Char	1	-	-	-		Gener values
40287	Load char L3	Char	1	-	-	-		Gener values
40288	Bus V L1-N	Unsigned	2	0	0	9888*	V	Bus values
40289	Bus V L2-N	Unsigned	2	0	0	9888*	V	Bus values
40290	Bus V L3-N	Unsigned	2	0	0	9888*	V	Bus values
40291	Bus V	Unsigned	2	0	0	9888*	V	Bus values
40292	Bus V L1-L2	Unsigned	2	0	0	9907*	V	Bus values
40293	Bus V L2-L3	Unsigned	2	0	0	9907*	V	Bus values
40294	Bus V L3-L1	Unsigned	2	0	0	9907*	V	Bus values
40296	Bus freq	Unsigned	2	1	400	700	Hz	Bus values
40302	Bus V unbal	Unsigned	2	0	0	200	%	Bus values
40303	Slip freq	Integer	2	2	- 10000	10000	Hz	Gener values
40304	Angle	Integer	2	1	- 1800	1800	°	Gener values
40312	Volt match 123	Binary	1	-	-	-		Invisible
40315	RPM	Integer	2	0	0	8253*	RPM	Engine values
40320	StatLdShed	List#8	1	-	1415	1418		Load shedding
40359	BOUT-1	Binary#38	1	-	-	-		Binary Outputs
40417	Gas Flow	Integer	2	1	0	32760	L/s	ECU
40418	Mixture Flow	Integer	2	0	0	3276	L/s	ECU
40419	Delta Pressure	Integer	2	0	0	6400	kPa	ECU
40420	Calculated Pwr	Integer	2	0	0	6500	kW	ECU
40421	Measured Power	Integer	2	0	0	6500	kW	ECU
40422	Speed Refrnc	Integer	2	1	0	25000	RPM	ECU
40423	Throttle Pos	Integer	2	1	0	10000	%	ECU
40424	DesireFuelRate	Integer	2	2	0	6600	g/h	ECU
40425	Bypass Vlv Pos	Integer	2	1	0	1000	%	ECU
40426	Lambda Req	Integer	2	4	0	30000	-	ECU
40427	Eng Serial Num	Integer	2	0	0	-1	-	ECU
40428	Percent Load	Integer	2	0	0	125	%	ECU
40429	ECUAmbientTemp	Integer	2	0	-5	300	°F	ECU
43001-43008 (8)	Gen-set name	String0	16	-	-	-		Comms settings
43009	Nomin power	Unsigned	2	0	1	32000	kW	Basic settings
43010	Nomin current	Unsigned	2	0	1	10000	A	Basic settings
43011	CT ratio prim	Unsigned	2	0	1	15000	A	Basic settings
43012	CT ratio sec	List#13	1	-	1226	1227		Basic settings
43015	VT ratio	Unsigned	2	2	10	50000	V/V	Basic settings
43016	Vg InpRangeSel	List#14	1	-	1228	1229		Basic settings
43017	Vb VT ratio	Unsigned	2	2	10	50000	V/V	Basic settings
43018	Vb InpRangeSel	List#14	1	-	1228	1229		Basic settings
43019	GenNomV	Unsigned	2	0	10	34641	V	Basic settings
43020	GenNomVph-ph	Unsigned	2	0	17	60000	V	Basic settings
43021	BusNomV	Unsigned	2	0	10	34641	V	Basic settings
43022	BusNomVph-ph	Unsigned	2	0	17	60000	V	Basic settings
43023	FixVoltProtSel	List#15	1	-	1230	1231		Basic settings
43026	Nominal RPM	Unsigned	2	0	100	4000	RPM	Basic settings
43027	ControllerMode	List#5	1	-	1377	1379		Basic settings
43028	FltRes GoToMAN	List#16	1	-	1234	1235		Basic settings
43029	Local buttons	List#17	1	-	1236	1238		Basic settings
43030	DispBaklightTO	Unsigned	1	0	0	241	min	Basic settings
43031	CAN2emptDetect	List#16	1	-	1234	1235		Comms settings
43032	Starting RPM	Unsigned	2	0	0	1500	RPM	Engine params

* Limit is defined by the value of the communication object of specified number.

Register	Name	Data Type	Len	Dec	Min	Max	Dim	Group
43041	Min stab time	Unsigned	2	0	1	8313*	s	Engine params
43042	Max stab time	Unsigned	2	0	8259*	3600	s	Engine params
43047	Cooling time	Unsigned	2	0	0	3600	s	Engine params
43048	Cooldown optim	List#16	1	-	1234	1235		Engine params
43050	Stop time	Unsigned	2	0	0	240	s	Engine params
43055	Horn timeout	Unsigned	2	0	0	3601	s	Engine protect
43056	Overspeed	Unsigned	2	0	0	200	%	Engine protect
43067	Derating1 strt	Integer	2	0	-5	300	°F	ProcessControl
43068	Derating1 end	Integer	2	0	-5	300	°F	ProcessControl
43069	Derating1 pwr	Unsigned	2	0	0	100	%	ProcessControl
43070	Derating2 strt	Integer	2	1	0	3000	°F	ProcessControl
43071	Derating2 end	Integer	2	1	0	3000	°F	ProcessControl
43072	Derating2 pwr	Unsigned	2	0	0	100	%	ProcessControl
43091	OverldStrtEval	Unsigned	2	0	100	200	%	Gener protect
43092	2POvrldStEvDel	Unsigned	2	1	0	6000	s	Gener protect
43094	Ishort	Unsigned	2	0	100	500	%	Gener protect
43095	Ishort del	Unsigned	2	2	0	1000	s	Gener protect
43096	2Inom del	Unsigned	2	1	0	6000	s	Gener protect
43097	Gen >V BOC	Unsigned	2	0	8293*	150	%	Gener protect
43098	Gen >V Sd	Unsigned	2	0	50	150	%	Gener protect
43099	Gen <V BOC	Unsigned	2	0	20	8291*	%	Gener protect
43100	Gen V del	Unsigned	2	2	0	60000	s	Gener protect
43102	Gen >f	Unsigned	2	1	8298*	1500	%	Gener protect
43103	Gen <f	Unsigned	2	1	200	8296*	%	Gener protect
43104	Gen f del	Unsigned	2	2	0	60000	s	Gener protect
43155	AutoLd recon	List#16	1	-	1234	1235		Load shedding
43156	Ld recon delay	Unsigned	2	0	0	600	s	Load shedding
43157	Ld shed level	Integer	2	0	8890*	200	%	Load shedding
43158	Ld shed delay	Unsigned	2	1	0	6000	s	Load shedding
43159	Ld recon level	Integer	2	0	0	8884*	%	Load shedding
43160	AcallCH1-Type	List#25	1	-	1337	1345		Act. calls/SMS
43161	AcallCH2-Type	List#25	1	-	1337	1345		Act. calls/SMS
43162	AcallCH3-Type	List#25	1	-	1337	1345		Act. calls/SMS
43163-43178 (16)	AcallCH1-Addr	String0	32	-	-	-		Act. calls/SMS
43179-43194 (16)	AcallCH2-Addr	String0	32	-	-	-		Act. calls/SMS
43195-43210 (16)	AcallCH3-Addr	String0	32	-	-	-		Act. calls/SMS
43211	Warning	List#16	1	-	1234	1235		Act. calls/SMS
43212	Shutdown	List#16	1	-	1234	1235		Act. calls/SMS
43213	Slow stop	List#16	1	-	1234	1235		Act. calls/SMS
43214	Off load	List#16	1	-	1234	1235		Act. calls/SMS
43215	Mains protect	List#16	1	-	1234	1235		Act. calls/SMS
43216	BrkOpen&CoolDn	List#16	1	-	1234	1235		Act. calls/SMS
43217	Alarm only	List#16	1	-	1234	1235		Act. calls/SMS
43218	History record	List#16	1	-	1234	1235		Act. calls/SMS
43219	ECU Diag	List#16	1	-	1234	1235		Comms settings
43224	ResetActAlarms	List#16	1	-	1234	1235		Engine protect
43265	RunOnlyBlkDel1	Unsigned	2	1	0	30000	s	Engine protect
43266	RunOnlyBlkDel2	Unsigned	2	1	0	30000	s	Engine protect
43267	RunOnlyBlkDel3	Unsigned	2	1	0	30000	s	Engine protect
43268	BinInp delay 1	Unsigned	2	1	0	6000	s	Engine protect
43269	BinInp delay 2	Unsigned	2	1	0	6000	s	Engine protect
43270	BinInp delay 3	Unsigned	2	1	0	6000	s	Engine protect
43271	HiClntTmpWrLim	Integer	2	1	0	3000	°F	Analog protect
43272	Batt >V	Integer	2	1	80	400	V	Analog protect
43273	Batt <V	Integer	2	1	80	400	V	Analog protect
43274	Gen V unbal	Integer	2	0	0	200	%	Gener protect
43275	Gen I unbal	Integer	2	0	0	200	%	Gener protect
43276	HiClntTmpSdLim	Integer	2	1	0	3000	°F	Analog protect
43277	LowOilPrsWrLim	Integer	2	1	0	1500	psi	Analog protect

* Limit is defined by the value of the communication object of specified number.

Register	Name	Data Type	Len	Dec	Min	Max	Dim	Group
43278	LowOilPrsSdLim	Integer	2	1	0	1500	psi	Analog protect
43279	LoCoIntTempLim	Integer	2	1	0	3000	°F	Analog protect
43280	LoCIntPrsrLim	Integer	2	1	0	1500	psi	Analog protect
43281	HiFuelMixWrLim	Integer	2	1	0	3000	°F	Analog protect
43282	HiFuelMixSdLim	Integer	2	1	0	3000	°F	Analog protect
43283	OvrCrntWrnLim	Integer	2	0	0	150	%	Gener protect
43284	Overpower kW	Integer	2	0	300	1400	kW	Gener protect
43287	OvrCrntSdLim	Integer	2	0	0	200	%	Gener protect
43289	HiOilTempWrLim	Integer	2	1	0	3000	°F	Analog protect
43290	HiOilTempSdLim	Integer	2	1	0	3000	°F	Analog protect
43431	AirFuelMix Del	Unsigned	2	1	0	6000	s	Analog protect
43432	Batt volt del	Unsigned	2	1	0	6000	s	Analog protect
43433	Gen V unb del	Unsigned	2	1	0	6000	s	Gener protect
43434	Gen I unb del	Unsigned	2	1	0	6000	s	Gener protect
43436	LoCoIntTempDel	Unsigned	2	1	0	6000	s	Analog protect
43439	Overpower Del	Unsigned	2	1	0	6000	s	Gener protect
43441	OvrCrntWrn Del	Unsigned	2	1	0	6000	s	Gener protect
43443	OvrCrntSd Del	Unsigned	2	1	0	6000	s	Gener protect
43444	HiOilTemp Del	Unsigned	2	1	0	6000	s	Analog protect
43445	CoolntTemp Del	Unsigned	2	1	0	6000	s	Analog protect
43446	LowOilPresrDel	Unsigned	2	1	0	6000	s	Analog protect
43450	CoolantPrsrDel	Unsigned	2	1	0	6000	s	Analog protect
43513	EnNotInAutAlrm	Integer	2	0	0	1		PLC
43514	EnGenNotRdyAlr	Integer	2	0	0	1		PLC
43515	Fan On Delay	Integer	2	1	0	6000	s	PLC
43516	Fan On Temp	Integer	2	1	500	2500	°F	PLC
43517	FanOffTmpHystr	Integer	2	1	10	500	°F	PLC
43518	ESP-PRP-COP	List#0	2	1	0	20		PLC
43522	FaultInitToAut	Integer	2	0	0	1		PLC
43525	LowCrnkBatLim	Integer	2	1	0	360	V	PLC
43526	GcbFdbkDel	Integer	2	1	0	100	s	PLC
43575	Time stamp act	List#27	1	-	1346	1348		Date/Time
43576	Time stamp per	Unsigned	1	0	1	240	min	Date/Time
43587-43588 (2)	Run hours	Integer	4	0	-	-	h	Statistics
43589	Num starts	Unsigned	2	0	0	65535		Statistics
43590	NumUnscStarts	Unsigned	2	0	0	65535		Statistics
43591	Service time 1	Unsigned	2	0	0	65535	h	Statistics
43592	Service time 2	Unsigned	2	0	0	65535	h	Statistics
43593	Service time 3	Unsigned	2	0	0	65535	h	Statistics
43594	Service time 4	Unsigned	2	0	0	65535	h	Statistics
43595-43596 (2)	kWhours	Integer	4	0	-	-		Statistics
43597-43598 (2)	kVArhours	Integer	4	0	-	-		Statistics
43601	#SummerTimeMod	List#29	1	-	1349	1353		Date/Time
43640	CoolDnAfterBOC	List#36	1	-	1304	1305		Engine params
43641	Ld shed active	List#37	1	-	1333	1336		Load shedding
43642	DispBklStrtOff	List#16	1	-	1234	1235		Basic settings
43660	SHxOcol Detect	List#16	1	-	1234	1235		Comms settings
43746	Reverse power	Unsigned	1	0	0	50	%	Gener protect
43747	ReversePwr del	Unsigned	2	1	0	6000	s	Gener protect
43748	LB/UART Log	List#16	1	-	1234	1235		Comms settings
43749	TotalDownTime	Unsigned	2	0	0	65535	h	Statistics
43750	DnTimeReqToRun	Unsigned	2	0	0	65535	h	Statistics
43754	Acall+SMS lang	Unsigned	1	0	1	7		Act. calls/SMS
43755	ShutdownOvr	List#16	1	-	1234	1235		Act. calls/SMS
43766	Nominal freq	List#39	1	-	1232	1233		Basic settings
43769	ExcitationLoss	Integer	2	0	0	150	%	Gener protect
43770	ExctLoss del	Unsigned	2	1	0	6000	s	Gener protect
43774-43789 (16)	AcallCH4-Addr	String0	32	-	-	-		Act. calls/SMS
43790-43805 (16)	AcallCH5-Addr	String0	32	-	-	-		Act. calls/SMS

* Limit is defined by the value of the communication object of specified number.

Register	Name	Data Type	Len	Dec	Min	Max	Dim	Group
43806	AcallCH4-Type	List#25	1	-	1337	1345		Act. calls/SMS
43807	AcallCH5-Type	List#25	1	-	1337	1345		Act. calls/SMS
43815	UserBtn pulse	Unsigned	1	1	2	100	s	Basic settings
43816-43817 (2)	kVAhours	Integer	4	0	-	-		Statistics
43828	Prallel Fnc	List#41	1	-	1298	1299		ProcessControl
43829	Underspeed	Unsigned	2	0	3	9095*	RPM	Engine params
43830	LoadedLevel	Unsigned	2	0	0	100	%	Engine params
* Limit is defined by the value of the communication object of specified number.								

9.8.2 Modbus Registers for 1300REZCK Models

Register	Name	Data Type	Len	Dec	Min	Max	Dim	Group
40003	BIN	Binary#1	2	-	-	-		Bin inputs CU
40004	BIN-1	Binary#2	1	-	-	-		Binary Inputs
40012	BOUT	Binary#3	2	-	-	-		Bin outputs CU
40013	Ubat	Integer	2	1	0	360	V	Analog CU
40014	CPU temp	Integer	2	1	-200	800	°C	Analog CU
40104	Engine Speed	Integer	2	0	0	3000	RPM	ECU
40105	Throttle Pos	Integer	2	1	0	1000	%	ECU
40106	BypassPosition	Integer	2	1	0	1000	%	ECU
40107	GasValvePos	Integer	2	1	0	1000	%	ECU
40108	LubOilTemp	Integer	2	0	-5	300	°F	ECU
40109	CoolantTemp	Integer	2	0	-5	300	°F	ECU
40110	OilPressure	Integer	2	0	0	145	psi	ECU
40111	Intake Temp	Integer	2	0	-5	300	°F	ECU
40112	InletGasPress	Integer	2	0	0	6400	kPa	ECU
40113	P-WaterCircuit	Integer	2	0	0	145	psi	ECU
40114	T-WaterCircuit	Integer	2	0	-5	300	°F	ECU
40115	PreLubRemTime	Integer	2	0	0	300	s	ECU
40116	TurboSpeed	Integer	2	2	0	26000	kRPM	ECU
40117	T-TurboOil-In	Integer	2	0	-5	300	°F	ECU
40118	GasTemp	Integer	2	0	-5	300	°F	ECU
40119	P-Coolant	Integer	2	0	0	145	psi	ECU
40124-40125 (2)	EngHours	Integer	4	0	-	-	h	ECU
40137	VPIO BOUT1	Binary#15	1	-	-	-		VPIO
40138	VPIO BOUT2	Binary#16	1	-	-	-		VPIO
40139	VPIO BOUT3	Binary#17	1	-	-	-		VPIO
40140	VPIO BOUT4	Binary#18	1	-	-	-		VPIO
40158	SW version	Unsigned	1	1	0	255		Info
40159	SW branch	Unsigned	1	0	0	255		Info
40161-40162 (2)	PasswordDecode	Unsigned	4	0	-	-		Info
40163	Engine state	List#3	1	-	1326	1346		Info
40168	ControllerMode	List#5	1	-	1323	1325		Info
40171	CAN16	Binary	2	-	-	-		Info
40172	CAN32	Binary	2	-	-	-		Info
40173	Status	Binary#20	2	-	-	-		Invisible
40177-40178 (2)	ECU FC	Unsigned	4	0	-	-		ECU diag
40179	ECU FMI	Unsigned	1	0	0	255		ECU diag
40180	ECU OC	Unsigned	1	0	0	255		ECU diag
40197	MaxVA-PerPh	Integer	2	0	-32768	32767	VA	PLC
40199	MaxLegCurrent	Integer	2	0	-32768	32767	A	PLC
40200	RatedAmps	Integer	2	0	-32768	32767	A	PLC
40201	KwLoadPrct	Integer	2	0	-32768	32767	%	PLC
40202	MaxLegAmpPrct	Integer	2	0	-32768	32767	%	PLC
40203	PresntLoadPrct	Integer	2	0	-32768	32767	%	PLC
40205	Avg V L-N	Integer	2	0	-32768	32767	V	PLC
40206	Avg Current	Integer	2	0	-32768	32767	A	PLC
40207	Avg V L-L	Integer	2	0	-32768	32767	V	PLC
40210	AmbDerate %	Integer	2	0	-32768	32767	%	PLC
40211	FanOffTemp	Integer	2	0	-32768	32767	°F	PLC
40212	WaterDerate %	Integer	2	0	-32768	32767	%	PLC
40213	Derate%	Integer	2	0	-32768	32767	%	PLC
40215	Derated Power	Integer	2	0	-32768	32767	kW	PLC
40216	Rated T	Integer	2	0	-32768	32767	°F	PLC
40217	ExhstTmpWrnLvl	Integer	2	0	-32768	32767	°F	PLC
40218	FaultInitAutx3	Integer	2	0	-32768	32767		PLC
40219	EngState-x2	Integer	2	0	-32768	32767	-	PLC
40237	SHBIN1	Binary#30	1	-	-	-		SHBIN
40241	SHBOUT1	Binary#31	1	-	-	-		SHBOUT
40249	Gen V L1-N	Unsigned	2	0	0	8277*	V	Gener values

* Limit is defined by the value of the communication object of specified number.

Register	Name	Data Type	Len	Dec	Min	Max	Dim	Group
40250	Gen V L2-N	Unsigned	2	0	0	8277*	V	Gener values
40251	Gen V L3-N	Unsigned	2	0	0	8277*	V	Gener values
40252	Gen V	Unsigned	2	0	0	8277*	V	Gener values
40253	Gen V L1-L2	Unsigned	2	0	0	9673*	V	Gener values
40254	Gen V L2-L3	Unsigned	2	0	0	9673*	V	Gener values
40255	Gen V L3-L1	Unsigned	2	0	0	9673*	V	Gener values
40256	Gen freq	Unsigned	2	1	400	700	Hz	Gener values
40258	Gen curr L1	Unsigned	2	0	0	8275*	A	Gener values
40259	Gen curr L2	Unsigned	2	0	0	8275*	A	Gener values
40260	Gen curr L3	Unsigned	2	0	0	8275*	A	Gener values
40261	Pwr factor	Integer	1	2	-100	100		Gener values
40262	Load char	Char	1	-	-	-		Gener values
40264	Act power	Integer	2	0	0	8276*	kW	Gener values
40266	Act pwr L1	Integer	2	0	0	8276*	kW	Gener values
40267	Act pwr L2	Integer	2	0	0	8276*	kW	Gener values
40268	Act pwr L3	Integer	2	0	0	8276*	kW	Gener values
40269	React power	Integer	2	0	-32768	32767	kVAr	Gener values
40271	React pwr L1	Integer	2	0	-32768	32767	kVAr	Gener values
40272	React pwr L2	Integer	2	0	-32768	32767	kVAr	Gener values
40273	React pwr L3	Integer	2	0	-32768	32767	kVAr	Gener values
40274	Appar pwr	Integer	2	0	-32768	32767	kVA	Gener values
40275	Appar pwr L1	Integer	2	0	-32768	32767	kVA	Gener values
40276	Appar pwr L2	Integer	2	0	-32768	32767	kVA	Gener values
40277	Appar pwr L3	Integer	2	0	-32768	32767	kVA	Gener values
40278	Pwr factor L1	Integer	1	2	-100	100		Gener values
40279	Pwr factor L2	Integer	1	2	-100	100		Gener values
40280	Pwr factor L3	Integer	1	2	-100	100		Gener values
40281	Gen V unbal	Unsigned	2	0	0	200	%	Gener values
40282	Gen I unbal	Unsigned	2	0	0	200	%	Gener values
40285	Load char L1	Char	1	-	-	-		Gener values
40286	Load char L2	Char	1	-	-	-		Gener values
40287	Load char L3	Char	1	-	-	-		Gener values
40288	Bus V L1-N	Unsigned	2	0	0	9888*	V	Bus values
40289	Bus V L2-N	Unsigned	2	0	0	9888*	V	Bus values
40290	Bus V L3-N	Unsigned	2	0	0	9888*	V	Bus values
40291	Bus V	Unsigned	2	0	0	9888*	V	Bus values
40292	Bus V L1-L2	Unsigned	2	0	0	9907*	V	Bus values
40293	Bus V L2-L3	Unsigned	2	0	0	9907*	V	Bus values
40294	Bus V L3-L1	Unsigned	2	0	0	9907*	V	Bus values
40296	Bus freq	Unsigned	2	1	400	700	Hz	Bus values
40302	Bus V unbal	Unsigned	2	0	0	200	%	Bus values
40303	Slip freq	Integer	2	2	-10000	10000	Hz	Gener values
40304	Angle	Integer	2	1	-1800	1800	°	Gener values
40312	Volt match 123	Binary	1	-	-	-		Invisible
40315	RPM	Integer	2	0	0	8253*	RPM	Engine values
40320	StatLdShed	List#8	1	-	1361	1364		Load shedding
40359	BOUT-1	Binary#32	1	-	-	-		Binary Outputs
40417	T-Ambient	Integer	2	0	-5	300	°F	ECU
40418	T-InletAir	Integer	2	0	-5	410	°F	ECU
40419	MAP 1	Integer	2	0	0	145	psi	ECU
40420	PTP1	Integer	2	0	0	145	psi	ECU
40421	Battery Volts	Integer	2	1	0	32120	V	ECU
40422	GasCorrection	Integer	2	4	0	20000	-	ECU
40423	EffCorrection	Integer	2	4	0	20000	-	ECU
40424	MisfireLevel	Integer	2	3	0	3000	-	ECU
40425	KnockingLevel	Integer	2	0	0	100	-	ECU
40426	MAP 2	Integer	2	0	0	145	psi	ECU
40427	PTP 2	Integer	2	0	0	145	psi	ECU
40428	T-TurboOilOut	Integer	2	0	-400	3180	°F	ECU

* Limit is defined by the value of the communication object of specified number.

Register	Name	Data Type	Len	Dec	Min	Max	Dim	Group
40429	GeneratedEner	Integer	2	0	-100	32767	MWh	ECU
40430	EngineState	Integer	2	0	0	13	-	ECU
40431	EngineTiming	Integer	2	1	0	500	-	ECU
40432	TEXAfterTurboR	Integer	2	0	-5	300	°F	ECU
43001-43008 (8)	Gen-set name	String0	16	-	-	-		Comms settings
43009	Nomin power	Unsigned	2	0	1	32000	kW	Basic settings
43010	Nomin current	Unsigned	2	0	1	10000	A	Basic settings
43011	CT ratio prim	Unsigned	2	0	1	15000	A	Basic settings
43012	CT ratio sec	List#13	1	-	1172	1173		Basic settings
43015	VT ratio	Unsigned	2	2	10	50000	V/V	Basic settings
43016	Vg InpRangeSel	List#14	1	-	1174	1175		Basic settings
43017	Vb VT ratio	Unsigned	2	2	10	50000	V/V	Basic settings
43018	Vb InpRangeSel	List#14	1	-	1174	1175		Basic settings
43019	GenNomV	Unsigned	2	0	10	34641	V	Basic settings
43020	GenNomVph-ph	Unsigned	2	0	17	60000	V	Basic settings
43021	BusNomV	Unsigned	2	0	10	34641	V	Basic settings
43022	BusNomVph-ph	Unsigned	2	0	17	60000	V	Basic settings
43023	FixVoltProtSel	List#15	1	-	1176	1177		Basic settings
43026	Nominal RPM	Unsigned	2	0	100	4000	RPM	Basic settings
43027	ControllerMode	List#5	1	-	1323	1325		Basic settings
43028	FltRes GoToMAN	List#16	1	-	1180	1181		Basic settings
43029	Local buttons	List#17	1	-	1182	1184		Basic settings
43030	DispBaklightTO	Unsigned	1	0	0	241	min	Basic settings
43031	CAN2emptDetect	List#16	1	-	1180	1181		Comms settings
43032	Starting RPM	Unsigned	2	0	0	1500	RPM	Engine params
43041	Min stab time	Unsigned	2	0	1	8313*	s	Engine params
43042	Max stab time	Unsigned	2	0	8259*	3600	s	Engine params
43047	Cooling time	Unsigned	2	0	0	3600	s	Engine params
43048	Cooldown optim	List#16	1	-	1180	1181		Engine params
43050	Stop time	Unsigned	2	0	0	240	s	Engine params
43055	Horn timeout	Unsigned	2	0	0	3601	s	Engine protect
43056	Overspeed	Unsigned	2	0	0	200	%	Engine protect
43067	Derating1 strt	Integer	2	0	-5	300	°F	ProcessControl
43068	Derating1 end	Integer	2	0	-5	300	°F	ProcessControl
43069	Derating1 pwr	Unsigned	2	0	0	100	%	ProcessControl
43070	Derating2 strt	Integer	2	0	-5	300	°F	ProcessControl
43071	Derating2 end	Integer	2	0	-5	300	°F	ProcessControl
43072	Derating2 pwr	Unsigned	2	0	0	100	%	ProcessControl
43091	OverldStrtEval	Unsigned	2	0	100	200	%	Gener protect
43092	2POvrldStEvDel	Unsigned	2	1	0	6000	s	Gener protect
43094	Ishort	Unsigned	2	0	100	500	%	Gener protect
43095	Ishort del	Unsigned	2	2	0	1000	s	Gener protect
43096	2Inom del	Unsigned	2	1	0	6000	s	Gener protect
43097	Gen >V BOC	Unsigned	2	0	8293*	150	%	Gener protect
43098	Gen >V Sd	Unsigned	2	0	50	150	%	Gener protect
43099	Gen <V BOC	Unsigned	2	0	20	8291*	%	Gener protect
43100	Gen V del	Unsigned	2	2	0	60000	s	Gener protect
43102	Gen >f	Unsigned	2	1	8298*	1500	%	Gener protect
43103	Gen <f	Unsigned	2	1	200	8296*	%	Gener protect
43104	Gen f del	Unsigned	2	2	0	60000	s	Gener protect
43155	AutoLd recon	List#16	1	-	1180	1181		Load shedding
43156	Ld recon delay	Unsigned	2	0	0	600	s	Load shedding
43157	Ld shed level	Integer	2	0	8890*	200	%	Load shedding
43158	Ld shed delay	Unsigned	2	1	0	6000	s	Load shedding
43159	Ld recon level	Integer	2	0	0	8884*	%	Load shedding
43160	AcallCH1-Type	List#25	1	-	1283	1291		Act. calls/SMS
43161	AcallCH2-Type	List#25	1	-	1283	1291		Act. calls/SMS
43162	AcallCH3-Type	List#25	1	-	1283	1291		Act. calls/SMS
43163-43178 (16)	AcallCH1-Addr	String0	32	-	-	-		Act. calls/SMS

* Limit is defined by the value of the communication object of specified number.

Register	Name	Data Type	Len	Dec	Min	Max	Dim	Group
43179-43194 (16)	AcallCH2-Addr	String0	32	-	-	-		Act. calls/SMS
43195-43210 (16)	AcallCH3-Addr	String0	32	-	-	-		Act. calls/SMS
43211	Warning	List#16	1	-	1180	1181		Act. calls/SMS
43212	Shutdown	List#16	1	-	1180	1181		Act. calls/SMS
43213	Slow stop	List#16	1	-	1180	1181		Act. calls/SMS
43214	Off load	List#16	1	-	1180	1181		Act. calls/SMS
43215	Mains protect	List#16	1	-	1180	1181		Act. calls/SMS
43216	BrkOpen&CoolDn	List#16	1	-	1180	1181		Act. calls/SMS
43217	Alarm only	List#16	1	-	1180	1181		Act. calls/SMS
43218	History record	List#16	1	-	1180	1181		Act. calls/SMS
43219	ECU Diag	List#16	1	-	1180	1181		Comms settings
43224	ResetActAlarms	List#16	1	-	1180	1181		Engine protect
43265	RunOnlyBlkDel1	Unsigned	2	1	0	30000	s	Engine protect
43266	RunOnlyBlkDel2	Unsigned	2	1	0	30000	s	Engine protect
43267	RunOnlyBlkDel3	Unsigned	2	1	0	30000	s	Engine protect
43268	BinInp delay 1	Unsigned	2	1	0	6000	s	Engine protect
43269	BinInp delay 2	Unsigned	2	1	0	6000	s	Engine protect
43270	BinInp delay 3	Unsigned	2	1	0	6000	s	Engine protect
43271	HiOilTempWrLim	Integer	2	0	-5	300	°F	Analog protect
43272	Batt >V	Integer	2	1	80	400	V	Analog protect
43273	Batt <V	Integer	2	1	80	400	V	Analog protect
43274	Gen V unbal	Integer	2	0	0	200	%	Gener protect
43275	Gen I unbal	Integer	2	0	0	200	%	Gener protect
43276	LoClntPrsrLim	Integer	2	0	0	145	psi	Analog protect
43277	LowOilPrsWrLim	Integer	2	0	0	145	psi	Analog protect
43278	HiClntTmpWrLim	Integer	2	0	-5	300	°F	Analog protect
43279	HiAmbTempWrLim	Integer	2	0	-5	300	°F	Analog protect
43280	OvrCrntWrnLim	Integer	2	0	0	150	%	Gener protect
43281	Overpower kW	Integer	2	0	0	1400	kW	Analog protect
43282	LoClntTempLim	Integer	2	0	0	300	°F	Analog protect
43283	HiExstTempLim	Integer	2	0	0	1200	°F	Analog protect
43284	OvrCrntSdLim	Integer	2	0	0	200	%	Gener protect
43285	HiFuelMixWrLim	Integer	2	0	-5	300	°F	Analog protect
43431	HiOilTemp Del	Unsigned	2	1	0	6000	s	Analog protect
43432	Batt volt del	Unsigned	2	1	0	6000	s	Analog protect
43433	Gen V unb del	Unsigned	2	1	0	6000	s	Gener protect
43434	Gen I unb del	Unsigned	2	1	0	6000	s	Gener protect
43435	LowOilPresrDel	Unsigned	2	1	0	6000	s	Analog protect
43436	CoolntPrssrDel	Unsigned	2	1	0	6000	s	Analog protect
43437	CoolntTemp Del	Unsigned	2	1	0	6000	s	Analog protect
43438	AmbientTempDel	Unsigned	2	1	0	6000	s	Analog protect
43439	OvrCrntWrn Del	Unsigned	2	1	0	6000	s	Gener protect
43440	Overpower Del	Unsigned	2	1	0	6000	s	Analog protect
43441	LoClntTempDel	Unsigned	2	1	0	6000	s	Analog protect
43442	ExstTempDel	Unsigned	2	1	0	6000	s	Analog protect
43443	OvrCrntSd Del	Unsigned	2	1	0	6000	s	Gener protect
43444	AirFuelMix Del	Unsigned	2	1	0	6000	s	Analog protect
43515	Fan On Delay	Integer	2	1	0	6000	s	PLC
43516	Fan On Temp	Integer	2	0	20	225	°F	PLC
43517	FanOffTmpHystr	Integer	2	0	1	50	°F	PLC
43522	FaultInitToAut	Integer	2	0	0	1		PLC
43525	LowCrnkBatLim	Integer	2	1	0	360	V	PLC
43526	GcbFdbkDel	Integer	2	1	0	100	s	PLC
43575	Time stamp act	List#27	1	-	1292	1294		Date/Time
43576	Time stamp per	Unsigned	1	0	1	240	min	Date/Time
43587-43588 (2)	Run hours	Integer	4	0	-	-	h	Statistics
43589	Num starts	Unsigned	2	0	0	65535		Statistics
43590	NumUnscStarts	Unsigned	2	0	0	65535		Statistics
43591	Service time 1	Unsigned	2	0	0	65535	h	Statistics

* Limit is defined by the value of the communication object of specified number.

Register	Name	Data Type	Len	Dec	Min	Max	Dim	Group
43592	Service time 2	Unsigned	2	0	0	65535	h	Statistics
43593	Service time 3	Unsigned	2	0	0	65535	h	Statistics
43594	Service time 4	Unsigned	2	0	0	65535	h	Statistics
43595-43596 (2)	kWhours	Integer	4	0	-	-		Statistics
43597-43598 (2)	kVArhours	Integer	4	0	-	-		Statistics
43601	#SummeTimeMod	List#29	1	-	1295	1299		Date/Time
43640	CoolDnAfterBOC	List#36	1	-	1250	1251		Engine params
43641	Ld shed active	List#37	1	-	1279	1282		Load shedding
43642	DispBklStrtOff	List#16	1	-	1180	1181		Basic settings
43660	SHxOcol Detect	List#16	1	-	1180	1181		Comms settings
43746	Reverse power	Unsigned	1	0	0	50	%	Gener protect
43747	ReversePwr del	Unsigned	2	1	0	6000	s	Gener protect
43748	LB/UART Log	List#16	1	-	1180	1181		Comms settings
43749	TotalDownTime	Unsigned	2	0	0	65535	h	Statistics
43750	DnTimeReqToRun	Unsigned	2	0	0	65535	h	Statistics
43754	Acall+SMS lang	Unsigned	1	0	1	7		Act. calls/SMS
43755	ShutdownOvr	List#16	1	-	1180	1181		Act. calls/SMS
43766	Nominal freq	List#39	1	-	1178	1179		Basic settings
43769	ExcitationLoss	Integer	2	0	0	150	%	Gener protect
43770	ExctLoss del	Unsigned	2	1	0	6000	s	Gener protect
43774-43789 (16)	AcallCH4-Addr	String0	32	-	-	-		Act. calls/SMS
43790-43805 (16)	AcallCH5-Addr	String0	32	-	-	-		Act. calls/SMS
43806	AcallCH4-Type	List#25	1	-	1283	1291		Act. calls/SMS
43807	AcallCH5-Type	List#25	1	-	1283	1291		Act. calls/SMS
43815	UserBtn pulse	Unsigned	1	1	2	100	s	Basic settings
43816-43817 (2)	kVAhours	Integer	4	0	-	-		Statistics
43828	Prallel Fnc	List#41	1	-	1244	1245		ProcessControl
43829	Underspeed	Unsigned	2	0	3	9095*	RPM	Engine params
43830	LoadedLevel	Unsigned	2	0	0	100	%	Engine params

* Limit is defined by the value of the communication object of specified number.

10.1 Introduction

The MCP 3000 Master Control Panel is used with the Decision-Maker® 6000 generator controller in the Decision-Maker® Paralleling System (DPS). This section contains the Modbus® data registers for the MCP 3000.

10.1.1 Modbus Connection

A Modbus/Ethernet converter is required. Order Modbus/Ethernet converter kit GM41143-KP2. Connect the Ethernet port on the MCP PLC to the Ethernet side of the converter. See Figure 10-1 for the PLC location on the MCP. Also see Figure 10-2 and Figure 10-4.

Install DC, control, and communication system wiring in separate conduit from AC power wiring. Refer to TP-6747 for DPS system installation, commissioning, and operation instructions.

10.1.2 Modbus/Ethernet Converter Setup

See TT-1405, provided with Modbus/Ethernet converter kit, for instructions to set up the converter. See Figure 10-3 for selected settings.

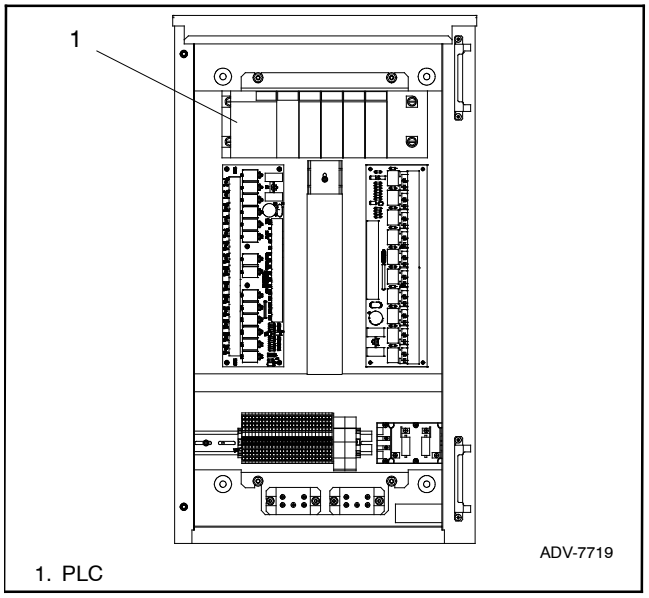


Figure 10-1 PLC Location on the MCP 3000

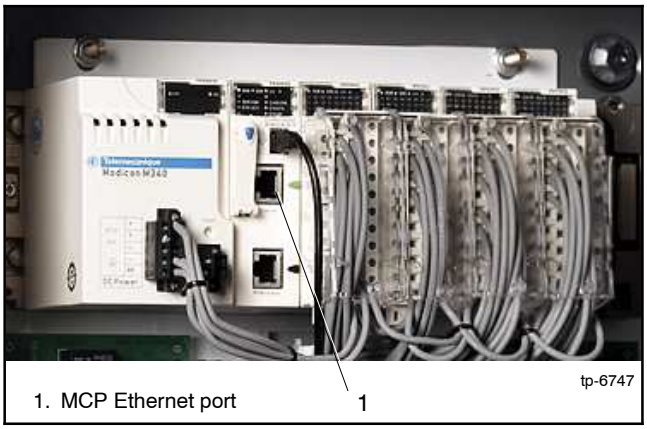


Figure 10-2 Ethernet Port Location on the MCP PLC

Setting	Value
IP Address	192.168.255.33
Protocol	Modbus/RTU, Master attached

Figure 10-3 Modbus/Ethernet Converter Settings

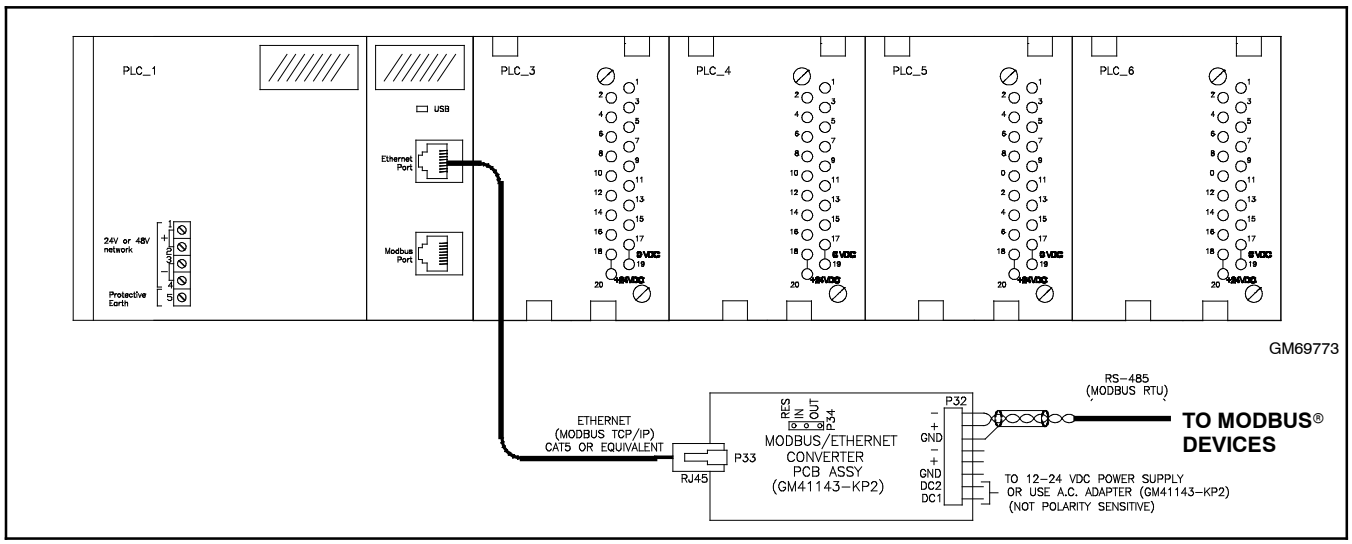


Figure 10-4 Modbus/Ethernet Converter Connection to the MCP

10.2 Modbus Data Map for DPS MCP 3000

Address	Bit	Description	Access	"0" State	"1" State
405000	0	ATS Start Signal Present	RO	False	True
	1	Generator Management Waiting for Stabilization	RO	False	True
	2	Generator Management Active	RO	False	True
	3	Generator Management Timing to Stop a Gen	RO	False	True
	4	Generator Management Timing to Start a Gen	RO	False	True
	5	Generator Management N Gens kept online mode	RO	False	True
	6	Generator Management N+1 Gens kept online mode	RO	False	True
	7	Generator Management Manual order selection	RO	False	True
	8	Generator Management Runtime order mode	RO	False	True
	9	Generator Management Disabled	RO	False	True
	10	Generator Management Enabled	RO	False	True
	11	GOL Load Add Active	RO	False	True
	12	kW Capacity Load Add Active	RO	False	True
	13	Under Frequency Load Shed Active	RO	False	True
	14	kW Over Load Shed Active	RO	False	True
	15	Engine Failure Load Shed Active	RO	False	True
405001	0	Reserved	RO	False	True
	1	Priority 2 Load Shed	RO	False	True
	2	Priority 3 Load Shed	RO	False	True
	3	Priority 4 Load Shed	RO	False	True
	4	Priority 5 Load Shed	RO	False	True
	5	Priority 6 Load Shed	RO	False	True
	6	Priority 7 Load Shed	RO	False	True
	7	Priority 8 Load Shed	RO	False	True
	8	Reserved	RO	False	True
	9	Priority 2 Load Add	RO	False	True
	10	Priority 3 Load Add	RO	False	True
	11	Priority 4 Load Add	RO	False	True
	12	Priority 5 Load Add	RO	False	True
	13	Priority 6 Load Add	RO	False	True
	14	Priority 7 Load Add	RO	False	True
	15	Priority 8 Load Add	RO	False	True

Address	Description	Access	Data Type	Units / Scaling	Remarks
405002	Average Total Voltage–AB	RO	INT	Volts (RMS)	
405003	Average Total Voltage–BC	RO	INT	Volts (RMS)	
405004	Average Total Voltage–CA	RO	INT	Volts (RMS)	
405005	Total kW	RO	INT	kW	
405006	Total kVA	RO	REAL	kVA	
405007	Total kVAR	RO	INT	kVAR	
405008	Total PF	RO	INT	PF X 100	- lagging, + leading
405009	Total Amps – A Phase	RO	INT	Amps (RMS)	
405010	Total Amps – B Phase	RO	INT	Amps (RMS)	
405011	Total Amps – C Phase	RO	INT	Amps (RMS)	

10.3 Generator 1 Data Map for DPS MCP 3000

Address	Description	Access	Data Type	Units / Scaling	Remarks
405100	Generator Volts–AB	RO	INT	Volts	
405101	Generator Volts–BC	RO	INT	Volts	
405102	Generator Volts–CA	RO	INT	Volts	
405103	Generator Power—Real	RO	INT	kW	
405104	Generator Power Factor	RO	INT	PF X 100	- lagging, + leading
405105	Generator Amps–A Phase	RO	INT	Amps	
405106	Generator Amps–B Phase	RO	INT	Amps	
405107	Generator Amps–C Phase	RO	INT	Amps	
405108	Generator Engine Speed	RO	INT	RPM	
405109	Generator Oil Pressure	RO	INT	kPA	
405110	Generator Water Temp	RO	INT	F	
405111	Generator Freq	RO	INT	Hz x 100	
405112	Generator Battery Voltage	RO	INT	Volts X 10	
405114	Generator Run Time Hours	RO	REAL	Hours x10	

Address	Bit	Description	Access	“0” State	“1” State
405116	0	Breaker Closed	RO	False	True
	1	Breaker Open	RO	False	True
	2	Breaker Fail to Close	RO	False	True
	3	Breaker Fail to Open	RO	False	True
	4	Breaker Overcurrent Trip	RO	False	True
	5	Synchronizing	RO	False	True
	6	Fail To Sync	RO	False	True
	7	System Ready	RO	False	True
	8	Genset Not in Auto	RO	False	True
	9	MB Comm Failure to Gen	RO	False	True
	10	MDEC Yellow Alarm	RO	False	True
	11	Generic Alarm	RO	False	True
405117	0	Emergency Stop SD	RO	False	True
	1	Overspeed SD	RO	False	True
	2	Overcrank SD	RO	False	True
	3	High Water Temp SD	RO	False	True
	4	Low Oil Pressure SD	RO	False	True
	5	NFPA 110 Fault SD	RO	False	True
	6	Low Coolant Level SD	RO	False	True
	7	Locked Rotor SD	RO	False	True
	8	MDEC Red SD	RO	False	True
	9	Low Coolant Temp SD	RO	False	True
	10	High Oil Temp SD	RO	False	True
	11	Dec550 SD	RO	False	True
	12	Overvoltage SD	RO	False	True
	13	Undervoltage SD	RO	False	True
	14	Overfrequency SD	RO	False	True
	15	Underfrequency SD	RO	False	True

Address	Bit	Description	Access	"0" State	"1" State
405118	0	Reverse Power SD	RO	False	True
	1	Overpower SD	RO	False	True
	2	Reverse Var SD	RO	False	True
	3	Overcurrent SD	RO	False	True
	4		RO	False	True
	5		RO	False	True
	6		RO	False	True
	7		RO	False	True
	8		RO	False	True
	9		RO	False	True
	10		RO	False	True
	11		RO	False	True
	12		RO	False	True
	13		RO	False	True
	14		RO	False	True
	15		RO	False	True
405119	0	Low Coolant Temp Alarm	RO	False	True
	1	Low Fuel Alarm	RO	False	True
	2	High Water Temp Alarm	RO	False	True
	3	Low Oil Pressure Alarm	RO	False	True
	4	Low Battery Alarm	RO	False	True
	5	High Battery Alarm	RO	False	True
	6	Battery Charger Failure	RO	False	True
	7	Weak Starting Battery	RO	False	True
	8	Overvoltage Trip	RO	False	True
	9	Undervoltage Trip	RO	False	True
	10	Overfrequency Trip	RO	False	True
	11	Underfrequency Trip	RO	False	True
	12	Reverse Power Trip	RO	False	True
	13	Overpower Trip	RO	False	True
	14	Reverse Var Trip	RO	False	True
	15	Overcurrent Trip	RO	False	True

10.4 Generator 2 Data Map for DPS MCP 3000

Address	Description	Access	Data Type	Units / Scaling	Remarks
405200	Generator Volts – AB	RO	INT	Volts	
405201	Generator Volts – BC	RO	INT	Volts	
405202	Generator Volts – CA	RO	INT	Volts	
405203	Generator Power – Real	RO	INT	kW	
405204	Generator Power Factor	RO	INT	PF x 100	- lagging, + leading
405205	Generator Amps – A Phase	RO	INT	Amps	
405206	Generator Amps – B Phase	RO	INT	Amps	
405207	Generator Amps – C Phase	RO	INT	Amps	
405208	Generator Engine Speed	RO	INT	RPM	
405209	Generator Oil Pressure	RO	INT	kPA	
405210	Generator Water Temp	RO	INT	F	
405211	Generator Freq	RO	INT	Hz x 100	
405212	Generator Battery Voltage	RO	INT	Volts x 10	
405214	Generator Run Time Hours	RO	REAL	Hours x 10	

Address	Bit	Description	Access	“0” State	“1” State
405216	0	Breaker Closed	RO	False	True
	1	Breaker Open	RO	False	True
	2	Breaker Fail to Close	RO	False	True
	3	Breaker Fail to Open	RO	False	True
	4	Breaker Overcurrent Trip	RO	False	True
	5	Synchronizing	RO	False	True
	6	Fail To Sync	RO	False	True
	7	System Ready	RO	False	True
	8	Genset Not in Auto	RO	False	True
	9	MB Comm Failure to Gen	RO	False	True
	10	MDEC Yellow Alarm	RO	False	True
	11	Generic Alarm	RO	False	True
	12				
	13				
	14				
	15				
405217	0	Emergency Stop SD	RO	False	True
	1	Overspeed SD	RO	False	True
	2	Overcrank SD	RO	False	True
	3	High Water Temp SD	RO	False	True
	4	Low Oil Pressure SD	RO	False	True
	5	NFPA 110 Fault SD	RO	False	True
	6	Low Coolant Level SD	RO	False	True
	7	Locked Rotor SD	RO	False	True
	8	MDEC Red SD	RO	False	True
	9	Low Coolant Temp SD	RO	False	True
	10	High Oil Temp SD	RO	False	True
	11	Dec550 SD	RO	False	True
	12	Overvoltage SD	RO	False	True
	13	Undervoltage SD	RO	False	True
	14	Overfrequency SD	RO	False	True
	15	Underfrequency SD	RO	False	True

Address	Bit	Description	Access	"0" State	"1" State
405218	0	Reverse Power SD	RO	False	True
	1	Overpower SD	RO	False	True
	2	Reverse VAR SD	RO	False	True
	3	Overcurrent SD	RO	False	True
	4		RO	False	True
	5		RO	False	True
	6		RO	False	True
	7		RO	False	True
	8		RO	False	True
	9		RO	False	True
	10		RO	False	True
	11		RO	False	True
	12		RO	False	True
	13		RO	False	True
	14		RO	False	True
	15		RO	False	True
405219	0	Low Coolant Temp Alarm	RO	False	True
	1	Low Fuel Alarm	RO	False	True
	2	High Water Temp Alarm	RO	False	True
	3	Low Oil Pressure Alarm	RO	False	True
	4	Low Battery Alarm	RO	False	True
	5	High Battery Alarm	RO	False	True
	6	Battery Charger Failure	RO	False	True
	7	Weak Starting Battery	RO	False	True
	8	Overvoltage Trip	RO	False	True
	9	Undervoltage Trip	RO	False	True
	10	Overfrequency Trip	RO	False	True
	11	Underfrequency Trip	RO	False	True
	12	Reverse Power Trip	RO	False	True
	13	Overpower Trip	RO	False	True
	14	Reverse Var Trip	RO	False	True
	15	Overcurrent Trip	RO	False	True

10.5 Generator 3 Data Map for DPS MCP 3000

Address	Description	Access	Data Type	Units / Scaling	Remarks
405300	Generator Volts – AB	RO	INT	Volts	
405301	Generator Volts – BC	RO	INT	Volts	
405302	Generator Volts – CA	RO	INT	Volts	
405303	Generator Power – Real	RO	INT	kW	
405304	Generator Power Factor	RO	INT	PF x 100	- lagging, + leading
405305	Generator Amps – A Phase	RO	INT	Amps	
405306	Generator Amps – B Phase	RO	INT	Amps	
405307	Generator Amps – C Phase	RO	INT	Amps	
405308	Generator Engine Speed	RO	INT	RPM	
405309	Generator Oil Pressure	RO	INT	kPA	
405310	Generator Water Temp	RO	INT	F	
405311	Generator Freq	RO	INT	Hz x 100	
405312	Generator Battery Voltage	RO	INT	Volts x 10	
405314	Generator Run Time Hours	RO	REAL	Hours x 10	

Address	Bit	Description	Access	"0" State	"1" State
405316	0	Breaker Closed	RO	False	True
	1	Breaker Open	RO	False	True
	2	Breaker Fail to Close	RO	False	True
	3	Breaker Fail to Open	RO	False	True
	4	Breaker Overcurrent Trip	RO	False	True
	5	Synchronizing	RO	False	True
	6	Fail To Sync	RO	False	True
	7	System Ready	RO	False	True
	8	Genset Not in Auto	RO	False	True
	9	MB Comm Failure to Gen	RO	False	True
	10	MDEC Yellow Alarm	RO	False	True
	11	Generic Alarm	RO	False	True
	12				
	13				
	14				
	15				
405317	0	Emergency Stop SD	RO	False	True
	1	Overspeed SD	RO	False	True
	2	Overcrank SD	RO	False	True
	3	High Water Temp SD	RO	False	True
	4	Low Oil Pressure SD	RO	False	True
	5	NFPA 110 Fault SD	RO	False	True
	6	Low Coolant Level SD	RO	False	True
	7	Locked Rotor SD	RO	False	True
	8	MDEC Red SD	RO	False	True
	9	Low Coolant Temp SD	RO	False	True
	10	High Oil Temp SD	RO	False	True
	11	Dec550 SD	RO	False	True
	12	Overvoltage SD	RO	False	True
	13	Undervoltage SD	RO	False	True
	14	Overfrequency SD	RO	False	True
	15	Underfrequency SD	RO	False	True

Address	Bit	Description	Access	"0" State	"1" State
405318	0	Reverse Power SD	RO	False	True
	1	Overpower SD	RO	False	True
	2	Reverse VAR SD	RO	False	True
	3	Overcurrent SD	RO	False	True
	4		RO	False	True
	5		RO	False	True
	6		RO	False	True
	7		RO	False	True
	8		RO	False	True
	9		RO	False	True
	10		RO	False	True
	11		RO	False	True
	12		RO	False	True
	13		RO	False	True
	14		RO	False	True
	15		RO	False	True
405319	0	Low Coolant Temp Alarm	RO	False	True
	1	Low Fuel Alarm	RO	False	True
	2	High Water Temp Alarm	RO	False	True
	3	Low Oil Pressure Alarm	RO	False	True
	4	Low Battery Alarm	RO	False	True
	5	High Battery Alarm	RO	False	True
	6	Battery Charger Failure	RO	False	True
	7	Weak Starting Battery	RO	False	True
	8	Overvoltage Trip	RO	False	True
	9	Undervoltage Trip	RO	False	True
	10	Overfrequency Trip	RO	False	True
	11	Underfrequency Trip	RO	False	True
	12	Reverse Power Trip	RO	False	True
	13	Overpower Trip	RO	False	True
	14	Reverse Var Trip	RO	False	True
	15	Overcurrent Trip	RO	False	True

10.6 Generator 4 Data Map for DPS MCP 3000

Address	Description	Access	Data Type	Units / Scaling	Remarks
405400	Generator Volts – AB	RO	INT	Volts	
405401	Generator Volts – BC	RO	INT	Volts	
405402	Generator Volts – CA	RO	INT	Volts	
405403	Generator Power – Real	RO	INT	kW	
405404	Generator Power Factor	RO	INT	PF x 100	- lagging, + leading
405405	Generator Amps – A Phase	RO	INT	Amps	
405406	Generator Amps – B Phase	RO	INT	Amps	
405407	Generator Amps – C Phase	RO	INT	Amps	
405408	Generator Engine Speed	RO	INT	RPM	
405409	Generator Oil Pressure	RO	INT	kPA	
405410	Generator Water Temp	RO	INT	F	
405411	Generator Freq	RO	INT	Hz x 100	
405412	Generator Battery Voltage	RO	INT	Volts x 10	
405414	Generator Run Time Hours	RO	REAL	Hours x 10	

Address	Bit	Description	Access	"0" State	"1" State
405416	0	Breaker Closed	RO	False	True
	1	Breaker Open	RO	False	True
	2	Breaker Fail to Close	RO	False	True
	3	Breaker Fail to Open	RO	False	True
	4	Breaker Overcurrent Trip	RO	False	True
	5	Synchronizing	RO	False	True
	6	Fail To Sync	RO	False	True
	7	System Ready	RO	False	True
	8	Genset Not in Auto	RO	False	True
	9	MB Comm Failure to Gen	RO	False	True
	10	MDEC Yellow Alarm	RO	False	True
	11	Generic Alarm	RO	False	True
	12				
	13				
	14				
	15				
405417	0	Emergency Stop SD	RO	False	True
	1	Overspeed SD	RO	False	True
	2	Overcrank SD	RO	False	True
	3	High Water Temp SD	RO	False	True
	4	Low Oil Pressure SD	RO	False	True
	5	NFPA 110 Fault SD	RO	False	True
	6	Low Coolant Level SD	RO	False	True
	7	Locked Rotor SD	RO	False	True
	8	MDEC Red SD	RO	False	True
	9	Low Coolant Temp SD	RO	False	True
	10	High Oil Temp SD	RO	False	True
	11	Dec550 SD	RO	False	True
	12	Overvoltage SD	RO	False	True
	13	Undervoltage SD	RO	False	True
	14	Overfrequency SD	RO	False	True
	15	Underfrequency SD	RO	False	True

Address	Bit	Description	Access	"0" State	"1" State
405418	0	Reverse Power SD	RO	False	True
	1	Overpower SD	RO	False	True
	2	Reverse VAR SD	RO	False	True
	3	Overcurrent SD	RO	False	True
	4		RO	False	True
	5		RO	False	True
	6		RO	False	True
	7		RO	False	True
	8		RO	False	True
	9		RO	False	True
	10		RO	False	True
	11		RO	False	True
	12		RO	False	True
	13		RO	False	True
	14		RO	False	True
	15		RO	False	True
405419	0	Low Coolant Temp Alarm	RO	False	True
	1	Low Fuel Alarm	RO	False	True
	2	High Water Temp Alarm	RO	False	True
	3	Low Oil Pressure Alarm	RO	False	True
	4	Low Battery Alarm	RO	False	True
	5	High Battery Alarm	RO	False	True
	6	Battery Charger Failure	RO	False	True
	7	Weak Starting Battery	RO	False	True
	8	Overvoltage Trip	RO	False	True
	9	Undervoltage Trip	RO	False	True
	10	Overfrequency Trip	RO	False	True
	11	Underfrequency Trip	RO	False	True
	12	Reverse Power Trip	RO	False	True
	13	Overpower Trip	RO	False	True
	14	Reverse VAR Trip	RO	False	True
	15	Overcurrent Trip	RO	False	True

10.7 Generator 5 Data Map for DPS MCP 3000

Address	Description	Access	Data Type	Units / Scaling	Remarks
405500	Generator Volts – AB	RO	INT	Volts	
405501	Generator Volts – BC	RO	INT	Volts	
405502	Generator Volts – CA	RO	INT	Volts	
405503	Generator Power – Real	RO	INT	kW	
405504	Generator Power Factor	RO	INT	PF x 100	- lagging, + leading
405505	Generator Amps – A Phase	RO	INT	Amps	
405506	Generator Amps – B Phase	RO	INT	Amps	
405507	Generator Amps – C Phase	RO	INT	Amps	
405508	Generator Engine Speed	RO	INT	RPM	
405509	Generator Oil Pressure	RO	INT	kPA	
405510	Generator Water Temp	RO	INT	F	
405511	Generator Freq	RO	INT	Hz x 100	
405512	Generator Battery Voltage	RO	INT	Volts x 10	
405514	Generator Run Time Hours	RO	REAL	Hours x 10	

Address	Bit	Description	Access	“0” State	“1” State
405516	0	Breaker Closed	RO	False	True
	1	Breaker Open	RO	False	True
	2	Breaker Fail to Close	RO	False	True
	3	Breaker Fail to Open	RO	False	True
	4	Breaker Overcurrent Trip	RO	False	True
	5	Synchronizing	RO	False	True
	6	Fail To Sync	RO	False	True
	7	System Ready	RO	False	True
	8	Genset Not in Auto	RO	False	True
	9	MB Comm Failure to Gen	RO	False	True
	10	MDEC Yellow Alarm	RO	False	True
	11	Generic Alarm	RO	False	True
	12				
	13				
	14				
	15				
405517	0	Emergency Stop SD	RO	False	True
	1	Overspeed SD	RO	False	True
	2	Overcrank SD	RO	False	True
	3	High Water Temp SD	RO	False	True
	4	Low Oil Pressure SD	RO	False	True
	5	NFPA 110 Fault SD	RO	False	True
	6	Low Coolant Level SD	RO	False	True
	7	Locked Rotor SD	RO	False	True
	8	MDEC Red SD	RO	False	True
	9	Low Coolant Temp SD	RO	False	True
	10	High Oil Temp SD	RO	False	True
	11	Dec550 SD	RO	False	True
	12	Overvoltage SD	RO	False	True
	13	Undervoltage SD	RO	False	True
	14	Overfrequency SD	RO	False	True
	15	Underfrequency SD	RO	False	True

Address	Bit	Description	Access	"0" State	"1" State
405518	0	Reverse Power SD	RO	False	True
	1	Overpower SD	RO	False	True
	2	Reverse VAR SD	RO	False	True
	3	Overcurrent SD	RO	False	True
	4		RO	False	True
	5		RO	False	True
	6		RO	False	True
	7		RO	False	True
	8		RO	False	True
	9		RO	False	True
	10		RO	False	True
	11		RO	False	True
	12		RO	False	True
	13		RO	False	True
	14		RO	False	True
	15		RO	False	True
405519	0	Low Coolant Temp Alarm	RO	False	True
	1	Low Fuel Alarm	RO	False	True
	2	High Water Temp Alarm	RO	False	True
	3	Low Oil Pressure Alarm	RO	False	True
	4	Low Battery Alarm	RO	False	True
	5	High Battery Alarm	RO	False	True
	6	Battery Charger Failure	RO	False	True
	7	Weak Starting Battery	RO	False	True
	8	Overvoltage Trip	RO	False	True
	9	Undervoltage Trip	RO	False	True
	10	Overfrequency Trip	RO	False	True
	11	Underfrequency Trip	RO	False	True
	12	Reverse Power Trip	RO	False	True
	13	Overpower Trip	RO	False	True
	14	Reverse VAR Trip	RO	False	True
	15	Overcurrent Trip	RO	False	True

10.8 Generator 6 Data Map for DPS MCP 3000

Address	Description	Access	Data Type	Units / Scaling	Remarks
405600	Generator Volts – AB	RO	INT	Volts	
405601	Generator Volts – BC	RO	INT	Volts	
405602	Generator Volts – CA	RO	INT	Volts	
405603	Generator Power – Real	RO	INT	kW	
405604	Generator Power Factor	RO	INT	PF x 100	- lagging, + leading
405605	Generator Amps – A Phase	RO	INT	Amps	
405606	Generator Amps – B Phase	RO	INT	Amps	
405607	Generator Amps – C Phase	RO	INT	Amps	
405608	Generator Engine Speed	RO	INT	RPM	
405609	Generator Oil Pressure	RO	INT	kPA	
405610	Generator Water Temp	RO	INT	F	
405611	Generator Freq	RO	INT	Hz x 100	
405612	Generator Battery Voltage	RO	INT	Volts x 10	
405614	Generator Run Time Hours	RO	REAL	Hours x 10	

Address	Bit	Description	Access	"0" State	"1" State
405616	0	Breaker Closed	RO	False	True
	1	Breaker Open	RO	False	True
	2	Breaker Fail to Close	RO	False	True
	3	Breaker Fail to Open	RO	False	True
	4	Breaker Overcurrent Trip	RO	False	True
	5	Synchronizing	RO	False	True
	6	Fail To Sync	RO	False	True
	7	System Ready	RO	False	True
	8	Genset Not in Auto	RO	False	True
	9	MB Comm Failure to Gen	RO	False	True
	10	MDEC Yellow Alarm	RO	False	True
	11	Generic Alarm	RO	False	True
	12				
	13				
	14				
	15				
405617	0	Emergency Stop SD	RO	False	True
	1	Overspeed SD	RO	False	True
	2	Overcrank SD	RO	False	True
	3	High Water Temp SD	RO	False	True
	4	Low Oil Pressure SD	RO	False	True
	5	NFPA 110 Fault SD	RO	False	True
	6	Low Coolant Level SD	RO	False	True
	7	Locked Rotor SD	RO	False	True
	8	MDEC Red SD	RO	False	True
	9	Low Coolant Temp SD	RO	False	True
	10	High Oil Temp SD	RO	False	True
	11	Dec550 SD	RO	False	True
	12	Overvoltage SD	RO	False	True
	13	Undervoltage SD	RO	False	True
	14	Overfrequency SD	RO	False	True
	15	Underfrequency SD	RO	False	True

Address	Bit	Description	Access	"0" State	"1" State
405618	0	Reverse Power SD	RO	False	True
	1	Overpower SD	RO	False	True
	2	Reverse VAR SD	RO	False	True
	3	Overcurrent SD	RO	False	True
	4		RO	False	True
	5		RO	False	True
	6		RO	False	True
	7		RO	False	True
	8		RO	False	True
	9		RO	False	True
	10		RO	False	True
	11		RO	False	True
	12		RO	False	True
	13		RO	False	True
	14		RO	False	True
	15		RO	False	True
405619	0	Low Coolant Temp Alarm	RO	False	True
	1	Low Fuel Alarm	RO	False	True
	2	High Water Temp Alarm	RO	False	True
	3	Low Oil Pressure Alarm	RO	False	True
	4	Low Battery Alarm	RO	False	True
	5	High Battery Alarm	RO	False	True
	6	Battery Charger Failure	RO	False	True
	7	Weak Starting Battery	RO	False	True
	8	Overvoltage Trip	RO	False	True
	9	Undervoltage Trip	RO	False	True
	10	Overfrequency Trip	RO	False	True
	11	Underfrequency Trip	RO	False	True
	12	Reverse Power Trip	RO	False	True
	13	Overpower Trip	RO	False	True
	14	Reverse VAR Trip	RO	False	True
	15	Overcurrent Trip	RO	False	True

10.9 Generator 7 Data Map for DPS MCP 3000

Address	Description	Access	Data Type	Units / Scaling	Remarks
405700	Generator Volts – AB	RO	INT	Volts	
405701	Generator Volts – BC	RO	INT	Volts	
405702	Generator Volts – CA	RO	INT	Volts	
405703	Generator Power – Real	RO	INT	kW	
405704	Generator Power Factor	RO	INT	PF x 100	- lagging, + leading
405705	Generator Amps – A Phase	RO	INT	Amps	
405706	Generator Amps – B Phase	RO	INT	Amps	
405707	Generator Amps – C Phase	RO	INT	Amps	
405708	Generator Engine Speed	RO	INT	RPM	
405709	Generator Oil Pressure	RO	INT	kPA	
405710	Generator Water Temp	RO	INT	F	
405711	Generator Freq	RO	INT	Hz x 100	
405712	Generator Battery Voltage	RO	INT	Volts x 10	
405714	Generator Run Time Hours	RO	REAL	Hours x 10	

Address	Bit	Description	Access	“0” State	“1” State
405716	0	Breaker Closed	RO	False	True
	1	Breaker Open	RO	False	True
	2	Breaker Fail to Close	RO	False	True
	3	Breaker Fail to Open	RO	False	True
	4	Breaker Overcurrent Trip	RO	False	True
	5	Synchronizing	RO	False	True
	6	Fail To Sync	RO	False	True
	7	System Ready	RO	False	True
	8	Genset Not in Auto	RO	False	True
	9	MB Comm Failure to Gen	RO	False	True
	10	MDEC Yellow Alarm	RO	False	True
	11	Generic Alarm	RO	False	True
	12				
	13				
	14				
	15				
405717	0	Emergency Stop SD	RO	False	True
	1	Overspeed SD	RO	False	True
	2	Overcrank SD	RO	False	True
	3	High Water Temp SD	RO	False	True
	4	Low Oil Pressure SD	RO	False	True
	5	NFPA 110 Fault SD	RO	False	True
	6	Low Coolant Level SD	RO	False	True
	7	Locked Rotor SD	RO	False	True
	8	MDEC Red SD	RO	False	True
	9	Low Coolant Temp SD	RO	False	True
	10	High Oil Temp SD	RO	False	True
	11	Dec550 SD	RO	False	True
	12	Overvoltage SD	RO	False	True
	13	Undervoltage SD	RO	False	True
	14	Overfrequency SD	RO	False	True
	15	Underfrequency SD	RO	False	True

Address	Bit	Description	Access	"0" State	"1" State
405718	0	Reverse Power SD	RO	False	True
	1	Overpower SD	RO	False	True
	2	Reverse VAR SD	RO	False	True
	3	Overcurrent SD	RO	False	True
	4		RO	False	True
	5		RO	False	True
	6		RO	False	True
	7		RO	False	True
	8		RO	False	True
	9		RO	False	True
	10		RO	False	True
	11		RO	False	True
	12		RO	False	True
	13		RO	False	True
	14		RO	False	True
	15		RO	False	True
405719	0	Low Coolant Temp Alarm	RO	False	True
	1	Low Fuel Alarm	RO	False	True
	2	High Water Temp Alarm	RO	False	True
	3	Low Oil Pressure Alarm	RO	False	True
	4	Low Battery Alarm	RO	False	True
	5	High Battery Alarm	RO	False	True
	6	Battery Charger Failure	RO	False	True
	7	Weak Starting Battery	RO	False	True
	8	Overvoltage Trip	RO	False	True
	9	Undervoltage Trip	RO	False	True
	10	Overfrequency Trip	RO	False	True
	11	Underfrequency Trip	RO	False	True
	12	Reverse Power Trip	RO	False	True
	13	Overpower Trip	RO	False	True
	14	Reverse VAR Trip	RO	False	True
	15	Overcurrent Trip	RO	False	True

10.10 Generator 8 Data Map for DPS MCP 3000

Address	Description	Access	Data Type	Units / Scaling	Remarks
405800	Generator Volts – AB	RO	INT	Volts	
405801	Generator Volts – BC	RO	INT	Volts	
405802	Generator Volts – CA	RO	INT	Volts	
405803	Generator Power – Real	RO	INT	kW	
405804	Generator Power Factor	RO	INT	PF x 100	- lagging, + leading
405805	Generator Amps – A Phase	RO	INT	Amps	
405806	Generator Amps – B Phase	RO	INT	Amps	
405807	Generator Amps – C Phase	RO	INT	Amps	
405808	Generator Engine Speed	RO	INT	RPM	
405809	Generator Oil Pressure	RO	INT	kPA	
405810	Generator Water Temp	RO	INT	F	
405811	Generator Freq	RO	INT	Hz x 100	
405812	Generator Battery Voltage	RO	INT	Volts x 10	
405814	Generator Run Time Hours	RO	REAL	Hours x 10	

Address	Bit	Description	Access	"0" State	"1" State
405816	0	Breaker Closed	RO	False	True
	1	Breaker Open	RO	False	True
	2	Breaker Fail to Close	RO	False	True
	3	Breaker Fail to Open	RO	False	True
	4	Breaker Overcurrent Trip	RO	False	True
	5	Synchronizing	RO	False	True
	6	Fail To Sync	RO	False	True
	7	System Ready	RO	False	True
	8	Genset Not in Auto	RO	False	True
	9	MB Comm Failure to Gen	RO	False	True
	10	MDEC Yellow Alarm	RO	False	True
	11	Generic Alarm	RO	False	True
	12				
	13				
	14				
	15				
405817	0	Emergency Stop SD	RO	False	True
	1	Overspeed SD	RO	False	True
	2	Overcrank SD	RO	False	True
	3	High Water Temp SD	RO	False	True
	4	Low Oil Pressure SD	RO	False	True
	5	NFPA 110 Fault SD	RO	False	True
	6	Low Coolant Level SD	RO	False	True
	7	Locked Rotor SD	RO	False	True
	8	MDEC Red SD	RO	False	True
	9	Low Coolant Temp SD	RO	False	True
	10	High Oil Temp SD	RO	False	True
	11	Dec550 SD	RO	False	True
	12	Overvoltage SD	RO	False	True
	13	Undervoltage SD	RO	False	True
	14	Overfrequency SD	RO	False	True
	15	Underfrequency SD	RO	False	True

Address	Bit	Description	Access	"0" State	"1" State
405818	0	Reverse Power SD	RO	False	True
	1	Overpower SD	RO	False	True
	2	Reverse VAR SD	RO	False	True
	3	Overcurrent SD	RO	False	True
	4		RO	False	True
	5		RO	False	True
	6		RO	False	True
	7		RO	False	True
	8		RO	False	True
	9		RO	False	True
	10		RO	False	True
	11		RO	False	True
	12		RO	False	True
	13		RO	False	True
	14		RO	False	True
	15		RO	False	True
405819	0	Low Coolant Temp Alarm	RO	False	True
	1	Low Fuel Alarm	RO	False	True
	2	High Water Temp Alarm	RO	False	True
	3	Low Oil Pressure Alarm	RO	False	True
	4	Low Battery Alarm	RO	False	True
	5	High Battery Alarm	RO	False	True
	6	Battery Charger Failure	RO	False	True
	7	Weak Starting Battery	RO	False	True
	8	Overvoltage Trip	RO	False	True
	9	Undervoltage Trip	RO	False	True
	10	Overfrequency Trip	RO	False	True
	11	Underfrequency Trip	RO	False	True
	12	Reverse Power Trip	RO	False	True
	13	Overpower Trip	RO	False	True
	14	Reverse VAR Trip	RO	False	True
	15	Overcurrent Trip	RO	False	True

Notes

11.1 Introduction

The M340 and M340+ ATS controllers use KBUS protocol for communication. Modbus®/KBUS converter kits are required for Modbus communication with these controllers. See Figure 11-2.

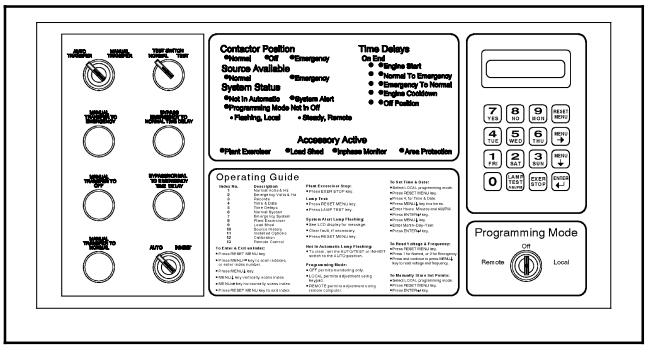


Figure 11-1 M340+ Controller

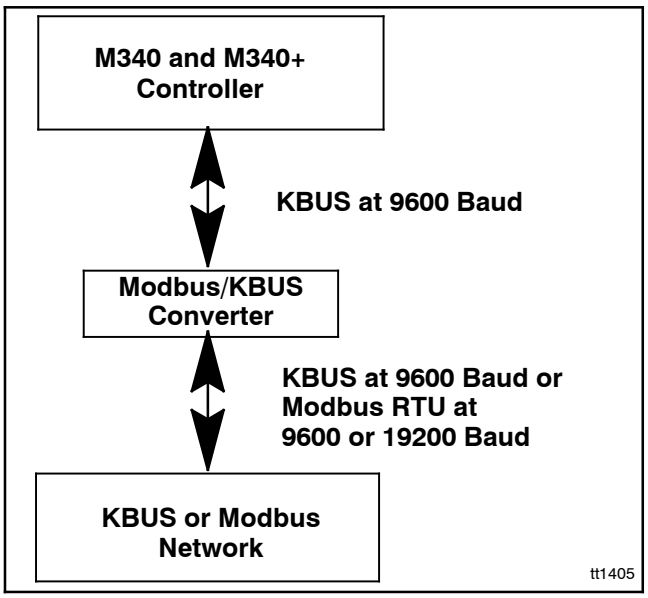


Figure 11-2 Modbus/KBUS Converter Function

Installing the Modbus/KBUS converter kit allows this controller to communicate with a personal computer running Monitor III software. For Modbus applications other than Monitor III, the Modbus master must be programmed to read the Modbus registers shown in this manual. A system designer trained in the application of Modbus protocol must write and thoroughly test the program before implementation.

11.2 Hardware and Connections

⚠ WARNING



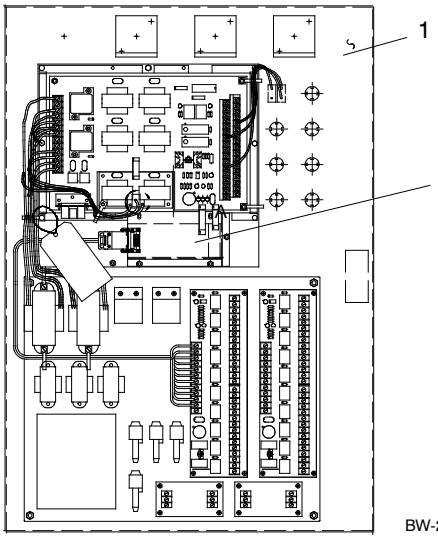
Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Move the generator set master switch to the OFF position. (2) Disconnect the power to the battery charger. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent starting of the generator set by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer.

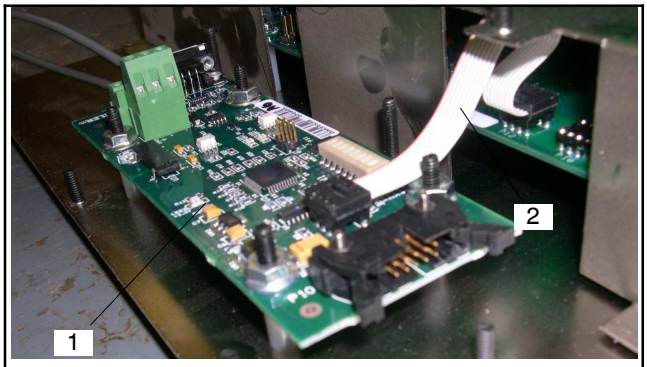
Modbus/KBUS converter kit GM41143-KP3 replaces RS-232 and RS-485 communication modules and allows the selection of either KBUS or Modbus communication. See Figure 11-3 and Figure 11-4 for the converter location inside the controller.

If your device is equipped with an RS-232/RS-485 communication module, remove the old communication module and ribbon cable before installing the new Modbus/KBUS converter and ribbon cable.



1. ATS enclosure door
2. Converter module location

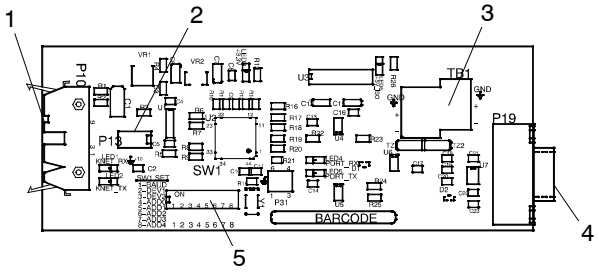
Figure 11-3 Modbus/KBUS Converter Location



1. Circuit board
2. Ribbon cable

Figure 11-4 Modbus/KBUS Converter Kit, Installed

Figure 11-5 shows the Modbus/KBUS converter circuit board connections and DIP switches. Refer to Installation Instructions TT-1405, provided with converter kit, for converter installation and connection instructions. Set converter DIP switches for baud rate, device type, and network address as described in TT-1405.



1. P10, ribbon cable connection for 340 generator set and power monitor
2. P13, ribbon cable connection for ATS controller
3. RS-485 connection TB1
4. RS-232 connection P19
5. DIP switches 1- 8

Figure 11-5 Modbus/KBUS Converter Board

11.3 Controller Setup

Configure the controller for remote communications by setting the parameters shown in Figure 11-6. See TT-1405 and the controller Operation Manual for more information.

Device	Menu or Index	Parameter	Setting
M340 or M340+ATS Controller	Index 13, Remote Control and Monitoring Settings	Remote Control, On-Line?	YES
		Local, LAN, Remote, or Remote Area Network	Select the appropriate setting for your connection type. Use Local for Ethernet connections. See TT-1405 for more information.
		Address	Any *
		Baud rate	9600 †

* The network address for Series 340 devices is set using DIP switches on the converter module and will override the network address on the controller.

† This baud rate must be set at 9600 to match the KBUS side of the Modbus/KBUS converter. It may be different from the Modbus baud rates of other devices in the system.

Figure 11-6 Controller Settings for Modbus Communication

11.4 Modbus Registers

Refer to Section 1.3 for definitions of terms and symbols used in the register tables.

Register	Data Description	Access	Data Type	Range/Units
40001				
40002	System Time	RO	WORD	
40003	Day of Week	RO	WORD	
40004	Month	RO	WORD	1- 12
40005	Day	RO	WORD	1- 31
40006	Year	RO	WORD	
40007	Week of Month	RO	WORD	
40008	Time Not In Normal Since Reset	RO	WORD	hrs
40009	Time In Emergency Since Reset			hrs
40010	Days of Operation Since Reset			days
40011	Transfers Since Reset			
40012	Month of Reset			1- 12
40013	Day of Reset			1- 31
40014	Year of Reset			
40015	Time Not In Normal	RO	WORD	hrs
40016	Time In Emergency	RO	WORD	hrs
40017	Days of Operation	RO	WORD	days
40018	Transfers	RO	WORD	
40019	Month in Operation	RO	WORD	1- 12
40020	Day in Operation	RO	WORD	1- 31
40021	Year in Operation	RO	WORD	
40022	Voltage A- B Normal	RO	WORD	volts
40023	Voltage B- C Normal	RO	WORD	volts
40024	Voltage C- A Normal	RO	WORD	volts
40025	Freq. A- C Normal	RO	WORD	Hz
40026	Voltage A- B Emerg.	RO	WORD	volts
40027	Voltage B- C Emerg.	RO	WORD	volts
40028	Voltage C- A Emerg.	RO	WORD	volts
40029	Freq. A- C Emerg.	RO	WORD	Hz
40030	Exerciser Time Remaining	RO	WORD	
40031	Month of Last Exercise	RO	WORD	1- 12
40032	Day of Last Exercise	RO	WORD	1- 31
40033	Year of Last Exercise	RO	WORD	
40034	Time of Last Outage	RO	WORD	
40035	Month of Last Outage	RO	WORD	1- 12
40036	Day of Last Outage	RO	WORD	1- 31
40037	Year of Last Outage	RO	WORD	
40038	Duration of Last Outage	RO	WORD	
40039	History Event #1 Code	RO	WORD	code
40040	History Event #2 Code	RO	WORD	code
40041	History Event #2 Month	RO	WORD	1- 12
40042	History Event #2 Day	RO	WORD	1- 31
40043	History Event #2 Year	RO	WORD	
40044	History Event #3 Code	RO	WORD	code
40045	History Event #3 Month	RO	WORD	1- 12
40046	History Event #3 Day	RO	WORD	1- 31

Register	Data Description	Access	Data Type	Range/Units
40047	History Event #3 Year	RO	WORD	
40048	History Event #4 Code	RO	WORD	code
40049	History Event #4 Month	RO	WORD	1- 12
40050	History Event #4 Day	RO	WORD	1- 31
40051	History Event #4 Year	RO	WORD	
40052	Alert Code	RO	WORD	Alert Code
40064	Status	RO	WORD[0- 7]	0- 1: Sw. Position (00=undefined; 01=Normal; 10=Emerg.; 11=undefined)
				2: Normal Source Available
				3: Emerg. Source Available
				4- 5: Prog. Mode Sw. (00=Off; 01=Remote; 10=Local; 11= undefined)
				6: Test Sw. In Auto
				7: Manual Transfer Mode
40066	Settings	RO	WORD[0- 7]	0: Plant Exerciser Enabled
				1: Load Shed Enabled
				2: In Phase Monitor Enabled
				3: Area Protection Enabled
				4: Normal Phase Sequence (0=ABC; 1=BAC)
				5: Emerg. Phase Sequence (0=ABC; 1=BAC)
				6: Normal Number of Phases (0=Single; 1=Three)
				7: Emerg. Number of Phases (0=Single; 1=Three)
400677	Settings	RO	WORD[4- 6]	4: Extended Time Delays Enabled
				5: Manual Override Enabled
				6: Load Transfer Enabled
40078	Off to Emergency Time Delay	RO	WORD	0-5940 seconds; 0x7FFF if NOT M340+
40079	Off to Normal Time Delay	RO	WORD	0-5940 seconds; 0x7FFF if NOT M340+
40080	Engine Start Time Delay	RO	WORD	
40081	Normal to Emerg. Time Delay	RO	WORD	
40082	Emerg. To Normal Time Delay	RO	WORD	
40083	Engine Cooldown Time Delay	RO	WORD	
40084	Before Emerg. Time Delay	RO	WORD	
40085	After Emerg. Time Delay	RO	WORD	
40086	Sequence to Emerg. Time Delay	RO	WORD	
40087	Return to Emerg. Loads	RO	WORD	(1-9)
40088	Before Normal Time Delay	RO	WORD	
40089	After Normal Time Delay	RO	WORD	
40090	Sequence to Normal Time Delay	RO	WORD	
40091	Return to Normal Loads	RO	WORD	(1-9)
40092	Over Voltage Dropout Normal	RO	WORD	
40093	Over Voltage Pickup Normal	RO	WORD	
40094	Under Voltage Pickup Normal	RO	WORD	
40095	Under Voltage Dropout Normal	RO	WORD	
40096	Over Frequency Dropout Normal	RO	WORD	
40097	Over Frequency Pickup Normal	RO	WORD	
40098	Under Frequency Pickup Normal	RO	WORD	
40099	Under Frequency Dropout Normal	RO	WORD	
40100	Over Voltage Dropout Emerg.	RO	WORD	
40101	Over Voltage Pickup Emerg.	RO	WORD	

Register	Data Description	Access	Data Type	Range/Units
40102	Under Voltage Pickup Emerg.	RO	WORD	
40103	Under Voltage Dropout Emerg.	RO	WORD	
40104	Over Frequency Dropout Emerg.	RO	WORD	
40105	Over Frequency Pickup Emerg.	RO	WORD	
40106	Under Frequency Pickup Emerg.	RO	WORD	
40107	Under Frequency Dropout Emerg.	RO	WORD	
40108	System Voltage Normal	RO	WORD	
40109	System Frequency Normal	RO	WORD	
40110	System Voltage Emerg.	RO	WORD	
40111	System Frequency Emerg.	RO	WORD	
40120-40124	Designation	RO	WORD*5	9 chars, 1 per byte, first char = LSB, last byte ignored
40125-40134	Load Description	RO	WORD*10	20 chars, 1 per byte, first char = LSB
40135-40144	Location	RO	WORD*10	20 chars, 1 per byte, first char = LSB
40145-40153	Branch	RO	WORD*9	18 chars, 1 per byte, first char = LSB
40154-40171	Options	RO	WORD*18	36 chars, 1 per byte, first char = LSB
40172-40174	Serial No.	RO	WORD*3	6 chars, 1 per byte, first char = LSB
40175-40177	Controller Serial No.	RO	WORD*3	6 chars, 1 per byte, first char = LSB
40178-40179	Switch Size in Amps	RO	WORD*2	4 chars, 1 per byte, first char = LSB
40180	Number of Poles	RO	WORD	1 char, first char = LSB
40194	Calendar Start Time #1	RO	WORD	
40195	Calendar Run Time #1	RO	WORD	
40196	Calendar Start Time #2	RO	WORD	
40197	Calendar Run Time #2	RO	WORD	
40198	Calendar Start Time #3	RO	WORD	
40199	Calendar Run Time #3	RO	WORD	
40200	Calendar Start Time #4	RO	WORD	
40201	Calendar Run Time #4	RO	WORD	
40202	Calendar Start Time #5	RO	WORD	
40203	Calendar Run Time #5	RO	WORD	
40204	Day of Week #1 (Calendar)	RO	WORD	
40205	First Week of Month #1 (Calendar)	RO	WORD	
40206	Second Week of Month #1 (Calendar)	RO	WORD	
40207	Day of Week #2 (Calendar)	RO	WORD	
40208	First Week of Month #2 (Calendar)	RO	WORD	
40209	Second Week of Month #2 (Calendar)	RO	WORD	
40210	Day of Week #3 (Calendar)	RO	WORD	
40211	First Week of Month #3 (Calendar)	RO	WORD	
40212	Second Week of Month #3 (Calendar)	RO	WORD	
40213	Day of Week #4 (Calendar)	RO	WORD	
40214	First Week of Month #4 (Calendar)	RO	WORD	
40215	Second Week of Month #4 (Calendar)	RO	WORD	
40216	Day of Week #5 (Calendar)	RO	WORD	
40217	First Week of Month #5 (Calendar)	RO	WORD	
40218	Second Week of Month #5 (Calendar)	RO	WORD	

Register	Data Description	Access	Data Type	Range/Units
40219	Day of Week #1 (14- day)	RO	WORD	
40220	Second Day of Week #1 (14- day)	RO	WORD	
40221	Week #1 (14- day)	RO	WORD	
40222	Day of Week #2 (14- day)	RO	WORD	
40223	Second Day of Week #2 (14- day)	RO	WORD	
40224	Week #2 (14- day)	RO	WORD	
40225	Day of Week #3 (14- day)	RO	WORD	
40226	Second Day of Week #3 (14- day)	RO	WORD	
40227	Week #3 (14- day)	RO	WORD	
40228	Day of Week #4 (14- day)	RO	WORD	
40229	Second Day of Week #4 (14- day)	RO	WORD	
40230	Week #4 (14- day)	RO	WORD	
40231	Day of Week #5 (14- day)	RO	WORD	
40232	Second Day of Week #5 (14- day)	RO	WORD	
40233	Week #5 (14- day)	RO	WORD	
40234	First Day of Week #1 (7- day)	RO	WORD	
40235	Second Day of Week #1 (7- day)	RO	WORD	
40236	First Day of Week #2 (7- day)	RO	WORD	
40237	Second Day of Week #2 (7- day)	RO	WORD	
40238	First Day of Week #3 (7- day)	RO	WORD	
40239	Second Day of Week #3 (7- day)	RO	WORD	
40240	First Day of Week #4 (7- day)	RO	WORD	
40241	Second Day of Week #4 (7- day)	RO	WORD	
40242	First Day of Week #5 (7- day)	RO	WORD	
40243	Second Day of Week #5 (7- day)	RO	WORD	
40300	Timed Run Time	RW	WORD	minutes

11.5 M340/M340+ Alert Codes

Alert Code	Description
1	N Overvoltage AB
2	N Overvoltage BC
3	N Overvoltage CA
4	N Undervoltage AB
5	N Undervoltage BC
6	N Undervoltage CA
7	N Overfrequency
8	N Underfrequency
9	N Phase Loss
10	E Overvoltage AB
11	E Overvoltage BC
12	E Overvoltage CA
13	E Undervoltage AB
14	E Undervoltage BC
15	E Undervoltage CA
16	E Overfrequency
17	E Underfrequency
18	E Phase Loss

Alert Code	Description
19	N Overvoltage 1-phase
20	N Undervoltage 1-phase
21	N Overfrequency 1-phase
22	N Underfrequency 1-phase
23	E Overvoltage1-phase
24	E Undervoltage1-phase
25	E Overfrequency 1-phase
26	E Underfrequency 1-phase
27	Aux. Sw. Fault
28	Double Aux. Sw. Fault
29	Transfer Hang
30	Power Down Error
31	RAM Error
32	Memory Error
33	Manual Transfer
34	Remote Fault #1
35	Remote Fault #2

Notes

12.1 Specifications

The MPAC™ 1000 controller's Modbus® communication capability:

- Supports industry-standard Modbus® RTU protocol.
- Can use Modbus® TCP protocol with the addition of a Modbus/Ethernet converter.
- Connects to a Modbus® master singly over an RS-232 line.
- Uses RS-485 connections to connect to a Modbus® master singly or over an RS-485 network.
- Connects to an Ethernet network using a Modbus/ Ethernet converter.
- Uses standard baud rates of 9600 or 19200.

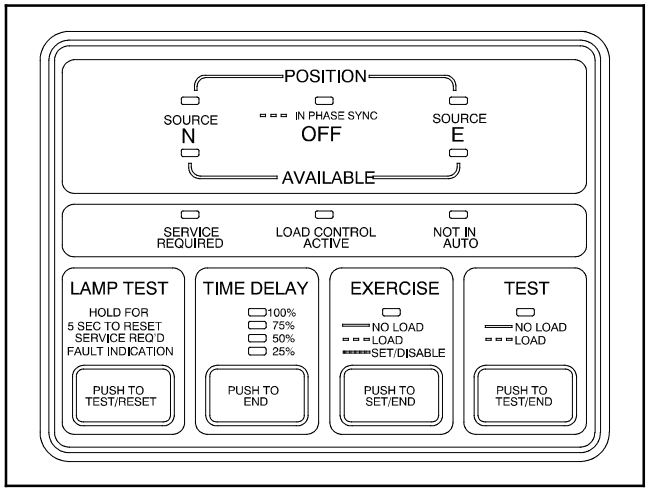


Figure 12-1 MPAC™ 1000 Controller

12.2 Hardware Connections

⚠ DANGER



Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

Servicing the transfer switch. Hazardous voltage will cause severe injury or death. Deenergize all power sources before servicing. Turn off the main circuit breakers of all transfer switch power sources and disable all generator sets as follows: (1) Move all generator set master controller switches to the OFF position. (2) Disconnect power to all battery chargers. (3) Disconnect all battery cables, negative (-) leads first. Reconnect negative (-) leads last when reconnecting the battery cables after servicing. Follow these precautions to prevent the starting of generator sets by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer. Before servicing any components inside the enclosure: (1) Remove all jewelry. (2) Stand on a dry, approved electrically insulated mat. (3) Test circuits with a voltmeter to verify that they are deenergized.

NOTICE

Electrostatic discharge damage. Electrostatic discharge (ESD) damages electronic circuit boards. Prevent electrostatic discharge damage by wearing an approved grounding wrist strap when handling electronic circuit boards or integrated circuits. An approved grounding wrist strap provides a high resistance (about 1 megohm), *not a direct short*, to ground.

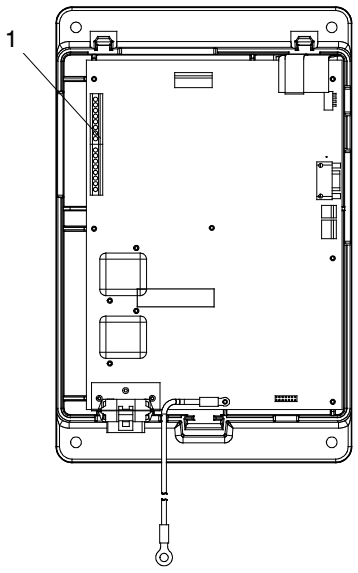
Note: Install communication conductors in raceways, cables, or conduit separate from AC power conductors.

The controller uses a non-isolated RS-485 port with connection speeds of 9.6 kbps and 19.2 kbps.

Connection Procedure

1. Disconnect power to the transfer switch by opening switches or circuit breakers before opening the enclosure.

2. Open the controller housing and locate terminal strip TB1. See Figure 12-2.



1. Terminal strip TB1 (inputs, output, Modbus connections)

Figure 12-2 ATS Controller, Cover Removed

3. Connect the Modbus® input and output to the terminals shown in Figure 12-3. Use #12-24 AWG twisted-pair shielded cable; Belden cable #9841 or equivalent is recommended. Connect A to negative (-), B to positive (+), and the shield to ground as shown in Figure 12-3.

4. Tighten the connections to 0.5 Nm (4.4 in. lb.).

5. Replace the controller housing cover.

6. Close and lock the transfer switch enclosure door before reconnecting the power.

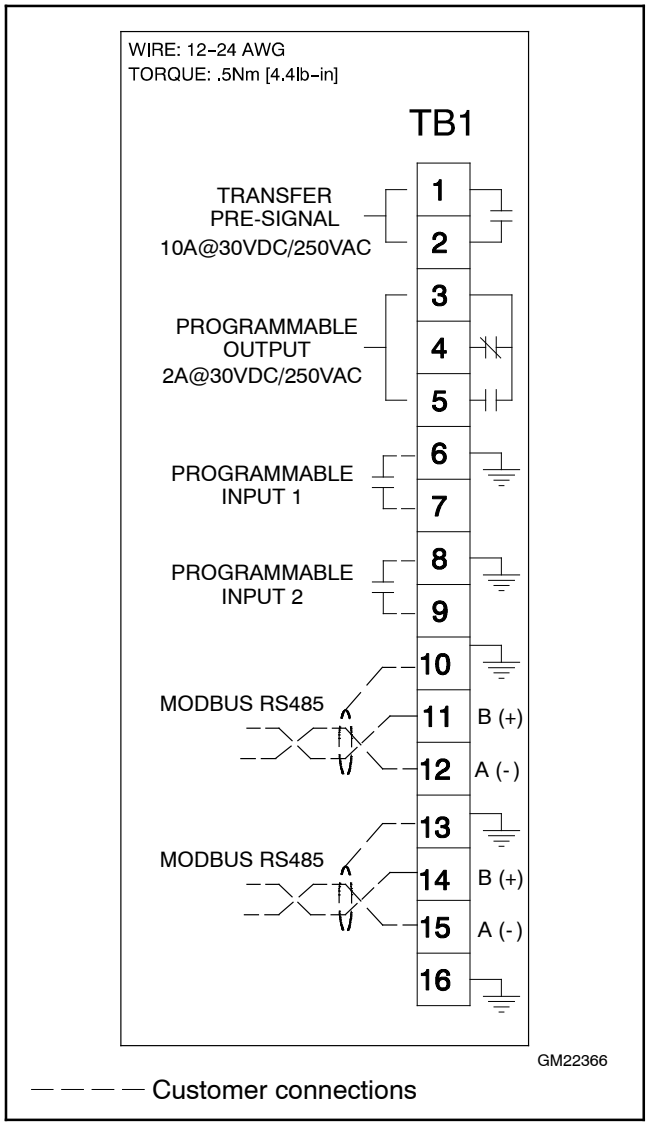


Figure 12-3 Terminal Strip TB1 Connections

12.3 Controller Setup

Use a personal computer (PC) running the ATS Controller Setup Program to set the address and baud rate of the Modbus® network interface port. Refer to the Setup Program Operation Manual for instructions for using the program, including creating data windows.

Follow the instructions in the Setup Program Operation Manual to use the Network Interface Port data window to check and set the address and baud rate of the Modbus® network interface port to match the other devices in the network. See Figure 12-4.

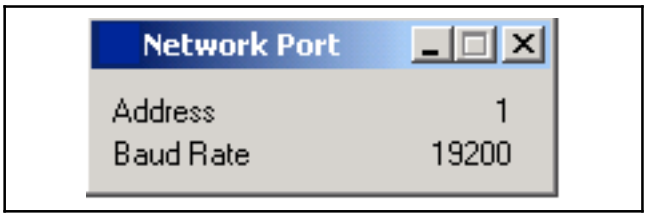


Figure 12-4 Network Interface Port Display Window

The Network Interface Port display window shows the address and baud rate of the Modbus® network interface port.

Use the Network Interface Port setup window to set the Modbus® network interface port to communicate with the other devices in the network. See Figure 12-5.

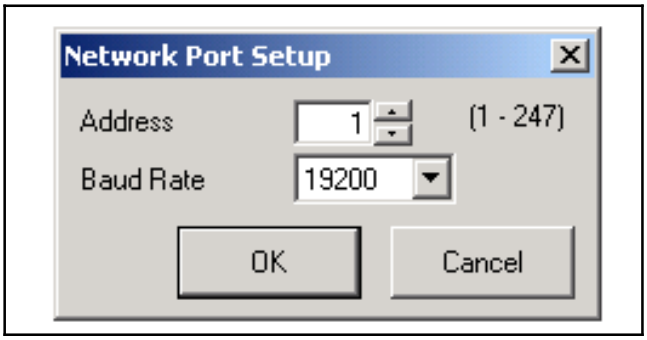


Figure 12-5 Network Interface Port Setup Window

Choose a unique network address for each device in the network. Type in the address or use the up and down arrows. Choose the baud rate from the drop-down list. Allowable baud rates are 9600 and 19200 baud. Select the baud rate to match the other devices on the network.

12.4 Modbus Registers

Refer to Section 1.3 for definitions of terms and symbols used in the register tables.

Time delays, setpoints, inputs and outputs, and other user-defined parameters are programmed using the Setup Program. Refer to the Setup Program Operation Manual for instructions. See the List of Related Materials for document part numbers.

12.4.1 Guide to the Register Map

Description	Registers
Monitoring	40001 - 40021
Setup	40022 - 40030
Time delays	400032 - 40044
Trip point settings	40045 - 40064
Outputs (event code)	40066 - 40089
Inputs (event code)	40090 - 40099
Event history	40150 - 40550
I/O status	40600 - 40605
Active time delay	40650 - 40652
Accessories	40740 - 40742
DIP switch positions	40743
Pre/post transfer delays	40750 - 40785
Common alarms	40800 - 40864
Exerciser	40900 - 40994
Last outage	41010 - 41013
Customer-defined descriptions *	41110 - 41149
Code versions	41200 - 41205
Time/date	41250 - 41254
Maintenance history	41300 - 41351
Disable manual exercise	41352
Device ID	49999
* Descriptions entered through Setup or Monitor III software.	

12.4.2 Modbus Registers

Register	Data Description	Access	Data Type	Range/Units
40001	System Overview	RO	WORD [0:14]	0- 1: Contactor Position (00 = Off; 01 = Normal; 10 = Emerg; 11 = Fault)
				2: Preferred Source (0 = Source1; 1= Source2)
				3- 12: Top Event on Warning Stack
				13: Preferred Source Available (0 = No, 1 = Yes)
				14: Standby Source Available (0 = No, 1 = Yes)
40002	SourceA Line-Neutral L1-L0	RO	WORD	Volts AC * 10
40003	SourceA Line-Neutral L2-L0	RO	WORD	Volts AC * 10
40004	SourceA Line-Neutral L3-L0	RO	WORD	Volts AC * 10
40005	SourceB Line-Neutral L1-L0	RO	WORD	Volts AC * 10
40006	SourceB Line-Neutral L2-L0	RO	WORD	Volts AC * 10
40007	SourceB Line-Neutral L3-L0	RO	WORD	Volts AC * 10
40008	SourceA Line Voltage L1-L2	RO	WORD	Volts AC * 10
40009	SourceA Line Voltage L2-L3	RO	WORD	Volts AC * 10
40010	SourceA Line Voltage L3-L1	RO	WORD	Volts AC * 10
40011	SourceB Line Voltage L1-L2	RO	WORD	Volts AC * 10
40012	SourceB Line Voltage L2-L3	RO	WORD	Volts AC * 10
40013	SourceB Line Voltage L3-L1	RO	WORD	Volts AC * 10
40014	SourceA Frequency	RO	WORD	Hz * 10

Register	Data Description	Access	Data Type	Range/Units
40015	SourceB Frequency	RO	WORD	Hz * 10
40016	*Reserved for future use*			Return 0
40017	*Reserved for future use*			Return 0
40018	*Reserved for future use*			Return 0
40019	*Reserved for future use*			Return 0
40020	*Reserved for future use*			Return 0
40021	*Reserved for future use*			Return 0
40022	Source Phase Sequence Actual	RO	WORD[0:3]	0- 1: SourceA 01 = ABC; 00 = CBA; 10 = N/A; 11 = ERR
				2- 3: SourceB 01 = ABC; 00 = CBA; 10 = N/A; 11 = ERR
40023	Source Phase Sequence Expected	RW	WORD[0]	0: 1 = ABC; 0 = CBA
40024	SourceA Nominal Voltage	RW	WORD	Volts AC * 10
40025	SourceB Nominal Voltage	RW	WORD	Volts AC * 10
40026	SourceA Nominal Frequency	RW	WORD	Hz * 10
40027	SourceB Nominal Frequency	RW	WORD	Hz * 10
40028	SourceA Number of Phases	RW	WORD	1 or 3
40029	SourceB Number of Phases	RW	WORD	1 or 3
40030	Rated Amperage	RW	WORD	0- 4000
40032	SourceA Engine Start Time Delay (ID 0x0001)	RW	WORD	0- 6 sec
40033	SourceB Engine Start Time Delay (ID 0x0002)	RW	WORD	0- 6 sec
40034	SourceA Ext Engine Start Time Delay (ID 0x0003)	RW	WORD	0- 5999 sec
40035	SourceB Ext Engine Start Time Delay (ID 0x0004)	RW	WORD	0- 5999 sec
40036	SourceA Engine Cooldown Time Delay (ID 0x0005)	RW	WORD	0- 5999 sec
40037	SourceB Engine Cooldown Time Delay (ID 0x0006)	RW	WORD	0- 5999 sec
40038	Preferred to Standby Time Delay (ID 0x0007)	RW	WORD	0- 5999 sec
40039	Standby to Preferred Time Delay (ID 0x0008)	RW	WORD	0- 5999 sec
40040	Off to Preferred Time Delay (ID 0x0009)	RW	WORD	0- 5999.9 sec * 10
40041	Off to Standby Time Delay (ID 0x000A)	RW	WORD	0- 5999.9 sec * 10
40042	Acquire Standby Source (ID 0x000B)	RW	WORD	1- 5999 sec
40043	InPhase Monitor Synch (ID 0x000C)	RW	WORD	1- 5999 sec
40044	*Reserved for future use*			Return 0
40045	SourceA Over Volt Dropout Trip Point	RW	WORD	(105 - 135) % of rated source voltage
40046	SourceA Over Volt Pickup Trip Point	RW	WORD	(95 - 100)% of over voltage dropout point
40047	SourceA Under Volt Pickup Trip Point	RW	WORD	(85 - 100) % of rated source voltage
40048	SourceA Under Volt Dropout Trip Point	RW	WORD	(75 - 98) % of overvoltage pickup point
40049	SourceA Voltage Debounce Time	RW	WORD	Sec * 10 (0.1- 9.9)
40050	SourceB Over Volt Dropout Trip Point	RW	WORD	(105 - 135) % of rated source voltage
40051	SourceB Over Volt Pickup Trip Point	RW	WORD	(95 - 100)% of over voltage dropout point
40052	SourceB Under Volt Pickup Trip Point	RW	WORD	(85 - 100) % of rated source voltage
40053	SourceB Under Volt Dropout Trip Point	RW	WORD	(75 - 98) % of overvoltage pickup point
40054	SourceB Voltage Debounce Time	RW	WORD	Sec * 10 (0.1- 9.9)
40055	SourceA Over Freq Dropout Trip Point	RW	WORD	(101 - 105) % of overfreq pickup point
40056	SourceA Over Freq Pickup Trip Point	RW	WORD	(105 - 120) % of rated source freq

Register	Data Description	Access	Data Type	Range/Units
40057	SourceA Under Freq Dropout Trip Point	RW	WORD	(95 - 99) % of underfreq pickup point
40058	SourceA Under Freq Pickup Trip Point	RW	WORD	(80 - 95)% of rated system frequency
40059	SourceA Freq Dropout Time	RW	WORD	Sec * 10 (0.1- 15.0)
40060	SourceB Over Freq Dropout Trip Point	RW	WORD	(101 - 105) % of overfreq pickup point
40061	SourceB Over Freq Pickup Trip Point	RW	WORD	(105 - 120) % of rated source freq
40062	SourceB Under Freq Dropout Trip Point	RW	WORD	(95 - 99) % of underfreq pickup point
40063	SourceB Under Freq Pickup Trip Point	RW	WORD	(80 - 95)% of rated system frequency
40064	SourceB Freq Dropout Time	RW	WORD	Sec * 10 (0.1- 15.0)
40065	ATS Controller Output	RW	WORD	Event Code (see Section 12.4.3)
40066	I/O Module 1 Output 1	RW	WORD	Event Code (see Section 12.4.3)
40067	I/O Module 1 Output 2	RW	WORD	Event Code (see Section 12.4.3)
40068	I/O Module 1 Output 3	RW	WORD	Event Code (see Section 12.4.3)
40069	I/O Module 1 Output 4	RW	WORD	Event Code (see Section 12.4.3)
40070	I/O Module 1 Output 5	RW	WORD	Event Code (see Section 12.4.3)
40071	I/O Module 1 Output 6	RW	WORD	Event Code (see Section 12.4.3)
40072	I/O Module 2 Output 1	RW	WORD	Event Code (see Section 12.4.3)
40073	I/O Module 2 Output 2	RW	WORD	Event Code (see Section 12.4.3)
40074	I/O Module 2 Output 3	RW	WORD	Event Code (see Section 12.4.3)
40075	I/O Module 2 Output 4	RW	WORD	Event Code (see Section 12.4.3)
40076	I/O Module 2 Output 5	RW	WORD	Event Code (see Section 12.4.3)
40077	I/O Module 2 Output 6	RW	WORD	Event Code (see Section 12.4.3)
40078	I/O Module 3 Output 1	RW	WORD	Event Code (see Section 12.4.3)
40079	I/O Module 3 Output 2	RW	WORD	Event Code (see Section 12.4.3)
40080	I/O Module 3 Output 3	RW	WORD	Event Code (see Section 12.4.3)
40081	I/O Module 3 Output 4	RW	WORD	Event Code (see Section 12.4.3)
40082	I/O Module 3 Output 5	RW	WORD	Event Code (see Section 12.4.3)
40083	I/O Module 3 Output 6	RW	WORD	Event Code (see Section 12.4.3)
40084	I/O Module 4 Output 1	RW	WORD	Event Code (see Section 12.4.3)
40085	I/O Module 4 Output 2	RW	WORD	Event Code (see Section 12.4.3)
40086	I/O Module 4 Output 3	RW	WORD	Event Code (see Section 12.4.3)
40087	I/O Module 4 Output 4	RW	WORD	Event Code (see Section 12.4.3)
40088	I/O Module 4 Output 5	RW	WORD	Event Code (see Section 12.4.3)
40089	I/O Module 4 Output 6	RW	WORD	Event Code (see Section 12.4.3)
40090	TSI1 Event	RW	WORD	Event Code (see Section 12.4.3)
40091	TSI2 Event	RW	WORD	Event Code (see Section 12.4.3)
40092	I/O Module 1 Input 1	RW	WORD	Event Code (see Section 12.4.3)
40093	I/O Module 1 Input 2	RW	WORD	Event Code (see Section 12.4.3)
40094	I/O Module 2 Input 1	RW	WORD	Event Code (see Section 12.4.3)
40095	I/O Module 2 Input 2	RW	WORD	Event Code (see Section 12.4.3)
40096	I/O Module 3 Input 1	RW	WORD	Event Code (see Section 12.4.3)
40097	I/O Module 3 Input 2	RW	WORD	Event Code (see Section 12.4.3)
40098	I/O Module 4 Input 1	RW	WORD	Event Code (see Section 12.4.3)
40099	I/O Module 4 Input 2	RW	WORD	Event Code (see Section 12.4.3)
40150	Events 0 - 19	RO	WORD*100	Time, Date, Code (see Section 12.4.3), Param1, Param2
40250	Events 20 - 39	RO	WORD*100	Time, Date, Code (see Section 12.4.3), Param1, Param2
40350	Events 40 - 59	RO	WORD*100	Time, Date, Code (see Section 12.4.3), Param1, Param2
40450	Events 60 - 79	RO	WORD*100	Time, Date, Code (see Section 12.4.3), Param1, Param2

Register	Data Description	Access	Data Type	Range/Units
40550	Events 80 - 99	RO	WORD*100	Time, Date, Code (see Section 12.4.3), Param1, Param2
40600	SCRDOs (software-controlled relay driver outputs)	RW	WORD[0:1]	X0 = Off; X1 = On; 0X = Unassigned; 1X = Assigned
40601	MLB (main logic board) I/O Status	RO	WORD [0:4]	One bit per I/O: Bit 0=Programmable Output Bit 1=Programmable Input #1 Bit 2=Programmable Input #2 Bit 3=Fixed Output LSDO Bit 4=Fixed Output Source 2 Engine Start
40602	I/O Module1 I/O Status	RO	WORD [0:7]	For each I/O module: Bit 0=Programmable Output #1 Bit 1=Programmable Output #2 Bit 2=Programmable Output #3 Bit 3=Programmable Output #4 Bit 4=Programmable Output #5 Bit 5=Programmable Output #6 Bit 6=Programmable Input #1 Bit 7=Programmable Input #2
40603	I/O Module2 I/O Status	RO	WORD [0:7]	
40604	I/O Module3 I/O Status	RO	WORD [0:7]	
40605	I/O Module4 I/O Status	RO	WORD [0:7]	
40650	Active Time Delay Number	RO	WORD	
40651	Active Time Delay Remaining	RO	WORD	Seconds
40652	Active Time Delay Preset	RO	WORD	Seconds
40740	Accessory Setup	RW	WORD [0:15]	0: Enable Engine Start Extended Time Delay
				1: Reserved for future use (always 0)
				2: Enable In Phase Monitor
				3: Reserved for future use (always 0)
				4: Commit to Transfer
				5: Peak Shave Delay Bypass
				6- 7: Reserved for future use (always 0)
				8: In Phase Transition Angle (0=Lagging; 1=Leading)
				9- 15: In Phase Transition Angle
40741	No. of I/O Modules	RW	WORD	1- 4
40742	Accessory Status	RO	WORD[0:4]	0: Exercise In Progress
				1: In Phase Monitor Active
				2: Load Shed In Progress
				3: Peak Shaving In Progress
				4: Test Occurring
40743	DIP Switch Position	RO	WORD[0:4]	0: Transfer Inhibited
				1: Loaded/Unloaded Test
				2: Exercise Inhibited
				3: Loaded/Unloaded Exercise (Push Button Only) (0=Unloaded; 1=Loaded)
				4: Exercise Interval (Push Button Only) (0=1 week; 1=2 week)
40750	Before Transfer to Source 1 Mtr Load Discon. Output	RW	WORD	0- 3600 Sec
40751	Before Transfer Source 1 Delay #1	RW	WORD	0- 3600 Sec
40752	Before Transfer Source 1 Delay #2	RW	WORD	0- 3600 Sec
40753	Before Transfer Source 1 Delay #3	RW	WORD	0- 3600 Sec
40754	Before Transfer Source 1 Delay #4	RW	WORD	0- 3600 Sec
40755	Before Transfer Source 1 Delay #5	RW	WORD	0- 3600 Sec
40756	Before Transfer Source 1 Delay #6	RW	WORD	0- 3600 Sec
40757	Before Transfer Source 1 Delay #7	RW	WORD	0- 3600 Sec
40758	Before Transfer Source 1 Delay #8	RW	WORD	0- 3600 Sec

Register	Data Description	Access	Data Type	Range/Units
40759	After Transfer to Source 1 Mtr Load Discon. Output	RW	WORD	0- 3600 Sec
40760	After Transfer Source 1 Delay #1	RW	WORD	0- 3600 Sec
40761	After Transfer Source 1 Delay #2	RW	WORD	0- 3600 Sec
40762	After Transfer Source 1 Delay #3	RW	WORD	0- 3600 Sec
40763	After Transfer Source 1 Delay #4	RW	WORD	0- 3600 Sec
40764	After Transfer Source 1 Delay #5	RW	WORD	0- 3600 Sec
40765	After Transfer Source 1 Delay #6	RW	WORD	0- 3600 Sec
40766	After Transfer Source 1 Delay #7	RW	WORD	0- 3600 Sec
40767	After Transfer Source 1 Delay #8	RW	WORD	0- 3600 Sec
40768	Before Transfer to Source 2 Mtr Load Discon. Output	RW	WORD	0- 3600 Sec
40769	Before Transfer Source 2 Delay #1	RW	WORD	0- 3600 Sec
40770	Before Transfer Source 2 Delay #2	RW	WORD	0- 3600 Sec
40771	Before Transfer Source 2 Delay #3	RW	WORD	0- 3600 Sec
40772	Before Transfer Source 2 Delay #4	RW	WORD	0- 3600 Sec
40773	Before Transfer Source 2 Delay #5	RW	WORD	0- 3600 Sec
40774	Before Transfer Source 2 Delay #6	RW	WORD	0- 3600 Sec
40775	Before Transfer Source 2 Delay #7	RW	WORD	0- 3600 Sec
40776	Before Transfer Source 2 Delay #8	RW	WORD	0- 3600 Sec
40777	After Transfer to Source 2 Mtr Load Discon. Output	RW	WORD	0- 3600 Sec
40778	After Transfer Source 2 Delay #1	RW	WORD	0- 3600 Sec
40779	After Transfer Source 2 Delay #2	RW	WORD	0- 3600 Sec
40780	After Transfer Source 2 Delay #3	RW	WORD	0- 3600 Sec
40781	After Transfer Source 2 Delay #4	RW	WORD	0- 3600 Sec
40782	After Transfer Source 2 Delay #5	RW	WORD	0- 3600 Sec
40783	After Transfer Source 2 Delay #6	RW	WORD	0- 3600 Sec
40784	After Transfer Source 2 Delay #7	RW	WORD	0- 3600 Sec
40785	After Transfer Source 2 Delay #8	RW	WORD	0- 3600 Sec
40800- 40864	Common Event Alarms	RW	WORD * 65 [0:15]	0- 14: Event code of defined common alarm (DCA) (see Section 12.4.3)
				15: 0=Not assigned to DCA; 1= Assigned to DCA
40900	Plant Exerciser Mode	RW	WORD	0 = Push Button Mode; 1 = Calendar Only; 2 = Calendar w/ Override
40901	Length Push Button Exercise	RW	WORD	1- 5999 Minutes
40902	Time of Push Button Exercise	RO	WORD	Minutes since midnight
40903	Initial Date of Push Button Exercise	RO	WORD [0:15]	0- 4: Day of Month
				5- 8: Month of Year
				9- 15: Year + 2000 (2000- 2127)
40905	Enabled / Loaded / Interval Code / Repeat Rate Next Cal. Event	RW	WORD[0:8]	0: 0 = Disabled; 1 = Enabled
				1: 0 = Unloaded; 1 = Loaded
				2- 3: Interval Code (00 = DMO; 01 = day; 10 = week; 11 = month)
				4- 7: Repeat Rate (1- 12)
				8: 0 = Not Running; 1 = Running (read only)
40906	Start Time Next Cal. Event	RW	WORD	Minutes since midnight
40907	Start Date Next Cal. Event	RW	WORD [0:15]	0- 4: Day of Month
				5- 8: Month of Year
				9- 15: Year + 2000 (2000- 2127)
40908	Run Time Next Cal. Event	RW	WORD	1- 5999 Minutes

Register	Data Description	Access	Data Type	Range/Units
40910	Enabled / Loaded / Interval Code / Repeat Rate Exer. Event #1	RW	WORD[0:8]	0: 0 = Disabled; 1 = Enabled
				1: 0 = Unloaded; 1 = Loaded
				2-3: Interval Code (00 = DMO; 01 = day; 10 = week; 11 = month)
				4-7: Repeat Rate (1-12)
				8: 0 = Not Running; 1 = Running (read only)
40911	Start Time Exer. Event #1	RW	WORD	Minutes since midnight
40912	Start Date Exer. Event #1	RW	WORD [0:15]	0-4: Day of Month
				5-8: Month of Year
				9-15: Year + 2000 (2000-2127)
40913	Run Time Exer. Event #1	RW	WORD	1-5999 Minutes
40914-40994	Exer. Events #2-#21 (same as above)	RW	WORD * 80	Same structure as Exer. Event #1
41010	Last Outage Time	RO	WORD	Minutes since midnight
41011	Last Outage Date	RO	WORD [0:15]	0-4: Day of Month
				5-8: Month of Year
				9-15: Year + 2000 (2000-2127)
41012-41013	Duration of Last Outage	RO	WORD * 2	Minutes
41110-41119	Designation	RW	WORD * 10	20 ASCII characters
41120-41129	Load Description	RW	WORD * 10	20 ASCII characters
41130-41139	Branch Description	RW	WORD * 10	20 ASCII characters
41140-41149	Location	RW	WORD * 10	20 ASCII characters
41200	ATS Controller Code Revision	RO	WORD [0:15]	0-7: Minor Version
				8-15: Major Version
41201	PIC Code Revision	RO	WORD [0:15]	0-7: Minor Version
				8-15: Major Version
41202	I/O Module1 Code Revision	RO	WORD [0:15]	0-7: Minor Version (return 0 if not installed)
				8-15: Major Version (return 0 if not installed)
41203	I/O Module2 Code Revision	RO	WORD [0:15]	0-7: Minor Version (return 0 if not installed)
				8-15: Major Version (return 0 if not installed)
41204	I/O Module3 Code Revision	RO	WORD [0:15]	0-7: Minor Version (return 0 if not installed)
				8-15: Major Version (return 0 if not installed)
41205	I/O Module4 Code Revision	RO	WORD [0:15]	0-7: Minor Version (return 0 if not installed)
				8-15: Major Version (return 0 if not installed)
41250	Time	RW	WORD	Minutes since midnight
41251	Date (day)	RW	WORD [0:15]	0-4: Day of Month
	Date (month)			5-8: Month of Year
	Date (year)			9-15: Year + 2000 (2000-2127)
41252	Adjust for daylight savings time	RW	WORD [0]	0: 0 = do not adjust; 1 = adjust
41253	Date to move clock forward (day)	RW	WORD [0:15]	0-4: Day of Month
	Date to move clock forward (month)			5-8: Month of Year
	Date to move clock forward (year)			9-15: Year + 2000 (2000-2127)
41254	Date to move clock backward (day)	RW	WORD [0:15]	0-4: Day of Month
	Date to move clock backward (month)			5-8: Month of Year
	Date to move clock backward (year)			9-15: Year + 2000 (2000-2127)

Register	Data Description	Access	Data Type	Range/Units
41300-41301	Minutes not in Preferred Total	RO	WORD * 2	minutes (most significant word first)
41302-41303	Minutes not in Preferred since Reset	RO	WORD * 2	minutes (most significant word first)
41304-41305	Minutes in Standby Total	RO	WORD * 2	minutes (most significant word first)
41306-41307	Minutes in Standby since Reset	RO	WORD * 2	minutes (most significant word first)
41308-41309	Minutes of Operation Total	RO	WORD * 2	minutes (most significant word first)
41310-41311	Minutes of Operation since Reset	RO	WORD * 2	minutes (most significant word first)
41312	Switch Transfers Total	RO	WORD	
41313	Switch Transfers since Reset	RO	WORD	
41314	Failures to Transfer Total	RO	WORD	
41315	Failures to Transfer since Reset	RO	WORD	
41316	Loss of Preferred Transfers Total	RO	WORD	
41317	Loss of Preferred Transfers since Reset	RO	WORD	
41318	Transfer Time N->E	RO	WORD	milliseconds
41319	Transfer Time E->N	RO	WORD	milliseconds
41320	System Start Date	RO	WORD [0:15]	0-4: Day of Month
				5-8: Month of Year
				9-15: Year + 2000 (2000-2127)
41321	Last Maintenance Date	RO	WORD [0:15]	0-4: Day of Month
				5-8: Month of Year
				9-15: Year + 2000 (2000-2127)
41350	Maintenance/Test & Manual Actions	WO	WORD [0:9]	0: Reset Maintenance Records
				1: Start Peak Shave
				2: End Peak Shave
				3: Start Remote Test
				4: End Remote Test
				5: Force Transfer to OFF
				6: Resume Program Trans. Operation
				7: End Current Time Delay
				8: Remote Manual Exercise Start
				9: Remote Manual Exercise End
41351	Clear Event Log	WO	WORD[0]	0: 1=Clear Log
41352	Disable Manual Exercise	RW	WORD[0]	0: 0=Enabled; 1=Disabled
49999	Device ID	RO	WORD	MPAC ®1000 ATS controller= 19

12.4.3 Event Codes

Event codes are used in the Event History registers 40150-40599.

Code	Description
1	End Time Delay Button
2	Test Button
3	Exercise Button
4	Lamp Test Button
5	Service Required Reset
6	Exerciser Set
7	Maintenance DIP Switch
8	Exerciser Loaded DIP Switch
9	Test Loaded DIP Switch
10	One/Two Week DIP Switch
11	Disable Exercise DIP Switch
12	Supervised Switch in Manual
13	Supervised Immediate Transfer
14	Supervised Switch in Auto
15	Source N Preferred
16	Source E Preferred
17- 45	*Reserved*
46	I/O Module Timeout
47	I/O Module Bus Error
48- 54	*Reserved for future use*
55	No Function Defined
56	Preferred Source Available
57	Standby Source Available
58	Contactor in Preferred Position
59	Contactor in Standby Position
60	Contactor in Off Position
61	Contactor in Source N Position
62	Contactor in Source E Position
63	Not in Auto
64	Load Control Active
65	Low Battery on Standby Source
66	Exerciser Started
67	Test Mode Active
68	Peak Shave Active
69	Non-Emergency Transfer
70	Load Bank Activate
71	Start Source N Generator
72	Start Source E Generator
73	In Phase Monitor Waiting for Synch
74	Common Alarm
75	Source N Under Voltage
76	Source N Over Voltage
77	Source N Loss of Phase
78	Source N Phase Rotation Error
79	Source N Over Frequency
80	Source N Under Frequency
81	Source E Under Voltage
82	Source E Over Voltage
83	Source E Loss of Phase
84	Source E Phase Rotation Error
85	Source E Over Frequency
86	Source E Under Frequency
87	Failure to Acquire Standby
88	Failure to Transfer
89	I/O Module Comms Lost
90	I/O Module Not Found
91	I/O Module Not Installed
92	Aux. Switch Fault
93	Aux. Switch Open
94	Load Control Output #0
95	Load Control Output #1
96	Load Control Output #2
97	Load Control Output #3
98	Load Control Output #4
99	Load Control Output #5
100	Load Control Output #6
101	Load Control Output #7
102	Load Control Output #8
103	Modbus Controlled RDO #1
104	Modbus Controlled RDO #2
105	Modbus Controlled RDO #3
106	Modbus Controlled RDO #4
107	3 Source System Disable
108- 114	*Reserved for future use*
115	No Function Defined
116	Forced Transfer to Off
117	Peak Shave Mode
118	Inhibit Transfer
119	Remote End Time Delay
120	Remote Test
121	Low Battery Voltage
122	Remote Common Alarm
123	Bypass Contactor Disable
124	3 Source System Disable
125- 131	*Reserved for future use*
132	Contactor Moved
133	EEPROM Access Warning
134	Internal Fault
135	System Ready
136	Critical Service Required
137	Non-Critical Service Required
138	System Parameter Changed
139	Source N Available
140	Source E Available
141	Over Frequency Source E

Code	Description
142	Under Frequency Source E
143	Loss of Phase Source E
144	Phase Rotation Error Source E
145	Over Voltage L1-L2 Source E
146	Over Voltage L2-L3 Source E
147	Over Voltage L3-L1 Source E
148	Under Voltage L1-L2 Source E
149	Under Voltage L2-L3 Source E
150	Under Voltage L3-L1 Source E
151 - 201	*Reserved*
202	Partial Meter Read
203 - 209	*Reserved for future use*
210	History Read from EEPROM
212	DCA Read from EEPROM
213	Exercise Time Updated
214	Network Settings Updated
211	Settings Read from EEPROM
215	Transfer Mode Changed
216	Default History Loaded
217	Default Settings Loaded
218	Default Common Alarms Loaded
219 - 222	*Reserved for future use*
223	Modbus Force Transfer to Off
224	Modbus Peak Shave
225	Modbus System Test
232	System Ready

Notes

13.1 Specifications

The MPAC™ 1500 controller's Modbus® communication capability:

- Supports industry-standard Modbus® RTU protocol through the RS-485 serial ports.
- Uses Modbus® TCP protocol through the Ethernet port.
- Uses RS-485 connections to a single Modbus® master or a network of devices.
- Connects directly to an Ethernet network (RJ-45 connector on the main logic board).
- Uses standard baud rates of 9600, 19200, or 57600.

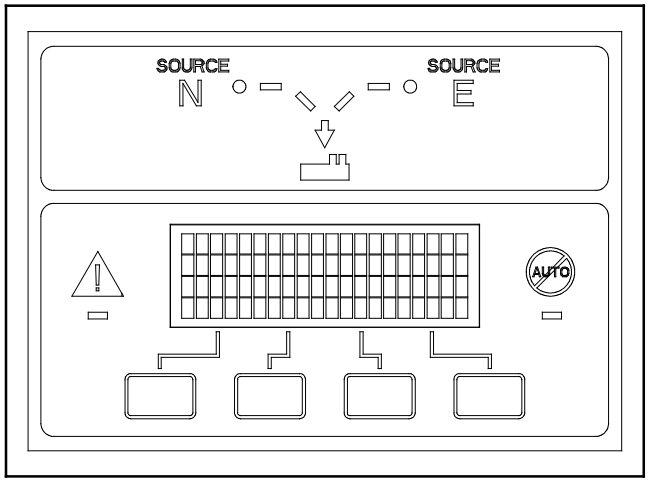


Figure 13-1 MPAC™ 1500 Controller Identification

13.2 Hardware Connections

DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

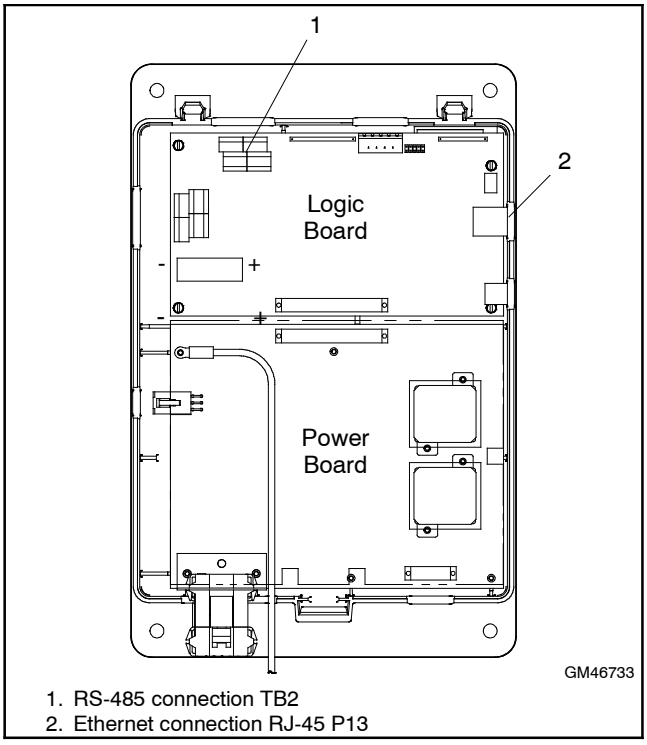
Servicing the transfer switch. Hazardous voltage will cause severe injury or death. Deenergize all power sources before servicing. Turn off the main circuit breakers of all transfer switch power sources and disable all generator sets as follows: (1) Move all generator set master controller switches to the OFF position. (2) Disconnect power to all battery chargers. (3) Disconnect all battery cables, negative (-) leads first. Reconnect negative (-) leads last when reconnecting the battery cables after servicing. Follow these precautions to prevent the starting of generator sets by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer. Before servicing any components inside the enclosure: (1) Remove all jewelry. (2) Stand on a dry, approved electrically insulated mat. (3) Test circuits with a voltmeter to verify that they are deenergized.

NOTICE

Electrostatic discharge damage. Electrostatic discharge (ESD) damages electronic circuit boards. Prevent electrostatic discharge damage by wearing an approved grounding wrist strap when handling electronic circuit boards or integrated circuits. An approved grounding wrist strap provides a high resistance (about 1 megohm), *not a direct short*, to ground.

The controller uses a non-isolated RS-485 port with connection speeds of 9.6, 19.2, and 57.6 kbps.

1. Disconnect power to the transfer switch by opening switches or circuit breakers before opening the enclosure.
2. Ethernet connection: Use CAT5 network cable to connect to RJ-45 connector P13 on the controller. See Figure 13-2 for the connector location.



1. RS-485 connection TB2
2. Ethernet connection RJ-45 P13

Figure 13-2 ATS Controller, Cover Removed

3. RS-485 connection:

   a. Remove the controller housing cover to gain access to connector TB2.. See Figure 13-2.

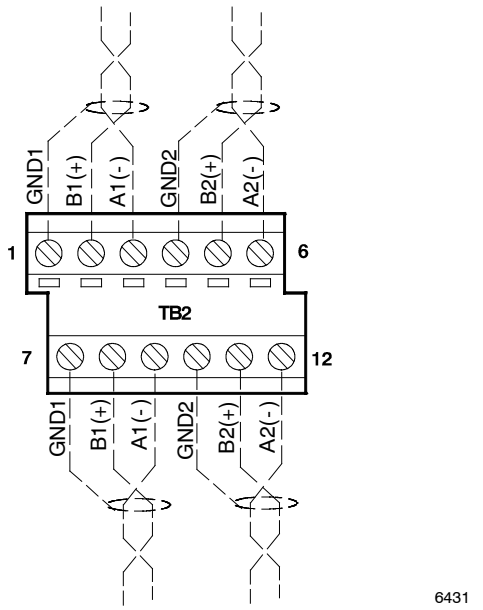
   b. Use #12- 24 AWG twisted-pair shielded cable; Belden cable #9841 or equivalent is recommended. Connect the Modbus® input and output to terminal strip TB2. See Figure 13-3. Connect A to negative (-), B to positive (+), and the shield to ground as shown in Figure 13-3.

   c. Tighten the connections to 0.5 Nm (4.4 in. lb.).

   d. Replace the controller housing cover.

4. Close and lock the transfer switch enclosure door before reconnecting the power.

Note: Install communication conductors in raceways, cables, or conduit separate from AC power conductors.



Note: Belden cable #9841 or equivalent is recommended.

Figure 13-3 RS-485 Connections

13.3 Controller Setup

Set the controller communications settings through the controller user interface. Navigate to the Communications Setup screen and set the parameters for serial or ethernet communication as shown in Figure 13-4. Refer to the ATS Operation/Installation for more detailed instructions. See List of Related Materials in the Introduction to this manual.

Set the baud rate of the Modbus® network interface port to match the other devices in the network. Allowable baud rates are 9600,19200, and 57600 baud.

Choose a unique network address for each device in the network.

The MPAC™ 1500 controller does not operate as a Modbus-to-Ethernet converter for other devices in a network. For multiple device networks connected to the personal computer through the Ethernet, use a Modbus-to-Ethernet converter for the other devices in the network. See TT-1405, provided with the converter, for connection instructions.

Setting	Range	Needed for Connection Type:			Notes
		Serial	Remote Serial (modem)	Ethernet	
Modbus Server TCP	Enabled or Disabled			X	Enable for network communication through the ethernet port.
Modbus Server Port 1	Enabled or Disabled	X	X		Enable for Modbus communication through serial port 1 on the main logic board.
Modbus Server Port 2	Enabled or Disabled	X	X		Enable for Modbus communication through serial port 2 on the main logic board.
Modbus Addr Port 1	001- 247 default 1	X	X		Address for RS-485 serial port 1 (on the main logic board). Each port must have a different address.
Modbus Addr Port 2	001- 247 default 2	X	X		Address for RS-485 serial port 2 (on the main logic board). Each port must have a different address.
Baud Rate Port 1	9600, 19200, 57600	X	X		Baud rate in bits per second for serial communication between the controller and a personal computer's COM port. All devices in a network must use the same baud rate.
Baud Rate Port 2	9600, 19200, 57600	X	X		
Modbus TCP Unit ID				X	Factory-set to 3. A unit ID is required for Modbus over TCP communication. The unit ID for TCP communication is analogous to the Modbus address for serial communication through the RS-485 ports.
IP Address				X	Obtain from your local network administrator. Every device on the network must have a unique IP address.
Subnet Mask				X	Obtain from your local network administrator.
MAC Address	Factory-set	—	—	X	Hardware address, entered at the factory. Not adjustable. Appears only in the Communications View on the controller's display.

Figure 13-4 Communication Settings

13.4 Modbus Registers

Refer to Section 1.3 for definitions of terms and symbols used in the register tables.

Time delays, setpoints, inputs and outputs, and other user-defined parameters are programmed using the Setup Program. Refer to the Setup Program Operation Manual for instructions. See the List of Related Materials for document part numbers.

13.4.1 Guide to the Register Map

Description	Registers
Monitoring	40001 - 40054
Setup *	40057-40058
Time delays	400059-40077
Trip point settings	40078-40107
Outputs (event code)	40108-40153
Modules types	40154-40161
I/O status	40194-40255
Remote I/O descriptions	40260-40349
Accessories	40740-40742
DIP switch positions	40743
Pre/post transfer delays	40750-40787
Common alarms	40800-40864
Exerciser	40905-40994
Last outage	41010-41013
Customer-defined descriptions †	41110-41149
Password-protected factory settings *	41150-41167
Code versions	41200-41201
MAC address	41202
Time/date	41250-41254
Maintenance history	41300-41320
Manual operations	41350-41352
Event history	42150-42854
Calibration *	43400-43429
Device ID	49999

* Distributor-level password required to write to these registers
† Descriptions entered through Monitor III software

13.4.2 Passwords

Note: Password-protected parameters are factory-set and should not require changes unless the transfer switch controller is replaced.

If the transfer switch controller needs replacement, some password-protected settings may need to be changed after the new controller assembly is installed. Setup registers, serial numbers, and calibration registers require the distributor-level password, which is not the same as the setup or test passwords for the transfer switch. Distributors must contact the Kohler Power Systems Service Department to obtain the distributor-level password.

Send the data register and the password in the same request. For example, send register 43400 and 43401 together to change the calibration of the L1L2N (normal source) voltage.

13.4.3 Modbus Registers

Register	Data Description	Access	Data Type	Range/Units
40001	System Overview	RO	WORD [0:14]	0- 1: Contactor Position (00 = Off; 01 = Normal; 10 = Emerg; 11 = Fault)
				2: Preferred Source (0 = Source1; 1= Source2)
				3- 12: Top Event on Warning Stack
				13: Preferred Source Available (0 = No, 1 = Yes)
				14: Standby Source Available (0 = No, 1 = Yes)
				15: Reserved for future use (always 0)
40002	Source N Line- Neutral L1- L0	RO	WORD	Volts AC * 10
40003	Source N Line- Neutral L2- L0	RO	WORD	Volts AC * 10
40004	Source N Line- Neutral L3- L0	RO	WORD	Volts AC * 10
40005	Source E Line- Neutral L1- L0	RO	WORD	Volts AC * 10
40006	Source E Line- Neutral L2- L0	RO	WORD	Volts AC * 10
40007	Source E Line- Neutral L3- L0	RO	WORD	Volts AC * 10
40008	Source N Line Voltage L1- L2	RO	WORD	Volts AC * 10
40009	Source N Line Voltage L2- L3	RO	WORD	Volts AC * 10
40010	Source N Line Voltage L3- L1	RO	WORD	Volts AC * 10
40011	Source E Line Voltage L1- L2	RO	WORD	Volts AC * 10
40012	Source E Line Voltage L2- L3	RO	WORD	Volts AC * 10
40013	Source E Line Voltage L3- L1	RO	WORD	Volts AC * 10
40014	Source N Frequency	RO	WORD	Hz * 10
40015	Source E Frequency	RO	WORD	Hz * 10
40016	Current L1	RO	WORD	Amps * 10
40017	Current L2	RO	WORD	Amps * 10
40018	Current L3	RO	WORD	Amps * 10
40019	Closed Transition In Phase Degree Delta	RO	WORD	Degrees
40020- 40038	Reserved for future use	—	—	Return 0
40039	Closed-Programmed Transition Override Mode	RW	WORD	0 = Auto Override, 1 = Non-Automatic
40040	Password for writing register 40042	WO	WORD	0-32768
40041	Synchronous Voltage Phase Angle	RO	WORD	0-10 degrees
40042	Synchronous Voltage Differential	RW	WORD	0%-5%
40043	Synchronous Frequency Differential	RW	WORD	0.0Hz.-0.3Hz. (Hz * 0.1)
40044	Service Entrance Type	RW	WORD	0 = None; 1 = Insulated Case Circuit Breaker, 2 = Molded Case Circuit Breaker, 3 = Contactor
40045	Phase Rotation Actual	RO	WORD	0 = disabled; 1 = ABC; 2 = CBA (MSB = Normal; LSB = Emerg.)
40046	Phase Rotation Expected	RW	WORD	0 = disabled; 1 = ABC; 2 = CBA
40047	Nominal Normal Voltage	RW	WORD	Volts AC * 10
40048	Nominal Emergency Voltage	RW	WORD	Volts AC * 10
40049	Nominal Normal Frequency	RW	WORD	Hz * 10
40050	Nominal Emergency Frequency	RW	WORD	Hz * 10
40051	Normal Number of Phases	RW	WORD	1 or 3
40052	Emergency Number of Phases	RW	WORD	1 or 3
40053	Rated Amperage	RW	WORD	0- 4000
40054	Reserved for future use	—	—	Return 0
40055	Proprietary	—	—	—
40056	Proprietary	—	—	—

Register	Data Description	Access	Data Type	Range/Units
40057	Transition Mode	RW	WORD [0:4]	0-1: 00 = Open; 01 = Programmed; 10 = Closed; 11 = Reserved
	Mode of Operation			2-3: 01 = Genset to Util; 10 = Util to Util; 00 = Genset to Genset; 11 = Util to Gen-Gen
	Supervised Transfer Control Switch Position			4: 0 = Auto; 1 = Manual
40058	Password for writing register 40057	WO	WORD	0 - 32768
40059	Normal Engine Start Time Delay	RW	WORD	0-10 sec
40060	Emergency Engine Start Time Delay	RW	WORD	0-10 sec
40061	Normal Ext. Engine Start Time Delay	RW	WORD	0-3600 sec
40062	Emergency Ext. Engine Start Time Delay	RW	WORD	0-3600 sec
40063	Normal Engine Cooldown	RW	WORD	0-3600 sec
40064	Emergency Engine Cooldown	RW	WORD	0-3600 sec
40065	Standby to Preferred	RW	WORD	0-3600 sec
40066	Preferred to Standby	RW	WORD	0-3600 sec
40067	Off (Preferred to Standby - Prog. Transition)	RW	WORD	0-3600 sec
40068	Off (Standby to Preferred - Prog. Transition)	RW	WORD	0-3600 sec
40069	Fail to Acquire Preferred	RW	WORD	1-3600 sec (1-300 sec for closed transition)
40070	Fail to Acquire Standby	RW	WORD	1-3600 sec (1-300 sec for closed transition)
40071	Fail to Synchronize	RW	WORD	1-3600 sec
40072	Fail to Synch. Enable	RW	WORD	0 = disabled; 1 = enabled
40073	Reserved for future use	—	—	Return 0
40074	Reserved for future use	—	—	Return 0
40075	Active Time Delay #	RO	WORD	
40076	Active Time Delay Remaining	RO	WORD	Seconds * 10
40077	Active Time Delay Preset	RO	WORD	Seconds * 10
40078	Normal Over Voltage Dropout	RW	WORD	105%-135% of Nominal
40079	Normal Over Voltage Pickup	RW	WORD	95%-100% of Nominal
40080	Normal Under Voltage Pickup	RW	WORD	85%-100% of Nominal
40081	Normal Under Voltage Dropout	RW	WORD	75%-98% of Pickup
40082	Normal Unbalance Enabled	RW	WORD	0 = disabled; 1 = enabled
40083	Normal Unbalance Voltage Dropout	RW	WORD	5%-20%
40084	Normal Unbalance Voltage Pickup	RW	WORD	3%-18%
40085	Normal Voltage Debounce Time	RW	WORD	0.1 - 9.9 sec * 10
40086	Emergency Over Voltage Dropout	RW	WORD	105%-135% of Nominal
40087	Emergency Over Voltage Pickup	RW	WORD	95%-100% of Nominal
40088	Emergency Under Voltage Pickup	RW	WORD	85%-100% of Nominal
40089	Emergency Under Voltage Dropout	RW	WORD	75%-98% of Pickup
40090	Emergency Unbalance Enabled	RW	WORD	0 = disabled; 1 = enabled
40091	Emergency Unbalance Voltage Dropout	RW	WORD	5%-20%
40092	Emergency Unbalance Voltage Pickup	RW	WORD	3%-18%
40093	Emergency Voltage Debounce Time	RW	WORD	0.1 - 9.9 sec * 10
40094	Normal Over Freq Dropout	RW	WORD	101%-105% of Pickup
40095	Normal Over Freq Pickup	RW	WORD	105%-120% of Nominal
40096	Normal Under Freq Dropout	RW	WORD	95%-99% of Pickup
40097	Normal Under Freq Pickup	RW	WORD	80%-95% of Nominal
40098	Normal Freq Dropout Time	RW	WORD	0.1 - 15.0 sec * 10
40099	Emergency Over Freq Dropout	RW	WORD	101%-105% of Pickup

Register	Data Description	Access	Data Type	Range/Units
40100	Emergency Over Freq Pickup	RW	WORD	105% - 120% of Nominal
40101	Emergency Under Freq Dropout	RW	WORD	95% - 99% of Pickup
40102	Emergency Under Freq Pickup	RW	WORD	80% - 95% of Nominal
40103	Emergency Freq Dropout Time	RW	WORD	0.1 - 15.0 sec * 10
40104	Reserved for future use	—	—	Return 0
40105	Reserved for future use	—	—	Return 0
40106	Reserved for future use	—	—	Return 0
40107	Reserved for future use	—	—	Return 0
40108	MLB Programmable Output #1	RW	WORD	Event Code
40109	MLB Programmable Output #2	RW	WORD	Event Code
40110	Reserved for future use	—	—	Return 0
40111	MLB Programmable Input #1	RW	WORD	Event Code
40112	MLB Programmable Input #2	RW	WORD	Event Code
40113	Reserved for future use	—	—	Return 0
40114	Expansion Board Address 1 Output #1	RW	WORD	Event Code
40115	Expansion Board Address 1 Output #2	RW	WORD	Event Code
40116	Expansion Board Address 1 Output #3	RW	WORD	Event Code
40117	Expansion Board Address 1 Output #4	RW	WORD	Event Code
40118	Expansion Board Address 1 Output #5	RW	WORD	Event Code
40119	Expansion Board Address 1 Output #6	RW	WORD	Event Code
40120	Expansion Board Address 2 Output #1	RW	WORD	Event Code
40121	Expansion Board Address 2 Output #2	RW	WORD	Event Code
40122	Expansion Board Address 2 Output #3	RW	WORD	Event Code
40123	Expansion Board Address 2 Output #4	RW	WORD	Event Code
40124	Expansion Board Address 2 Output #5	RW	WORD	Event Code
40125	Expansion Board Address 2 Output #6	RW	WORD	Event Code
40126	Expansion Board Address 3 Output #1	RW	WORD	Event Code
40127	Expansion Board Address 3 Output #2	RW	WORD	Event Code
40128	Expansion Board Address 3 Output #3	RW	WORD	Event Code
40129	Expansion Board Address 3 Output #4	RW	WORD	Event Code
40130	Expansion Board Address 3 Output #5	RW	WORD	Event Code
40131	Expansion Board Address 3 Output #6	RW	WORD	Event Code
40132	Expansion Board Address 4 Output #1	RW	WORD	Event Code
40133	Expansion Board Address 4 Output #2	RW	WORD	Event Code
40134	Expansion Board Address 4 Output #3	RW	WORD	Event Code
40135	Expansion Board Address 4 Output #4	RW	WORD	Event Code
40136	Expansion Board Address 4 Output #5	RW	WORD	Event Code
40137	Expansion Board Address 4 Output #6	RW	WORD	Event Code
40138-40143	Reserved for future use	—	—	Return 0
40144	Expansion Board Address 1 Input #1	RW	WORD	Event Code
40145	Expansion Board Address 1 Input #2	RW	WORD	Event Code
40146	Expansion Board Address 2 Input #1	RW	WORD	Event Code
40147	Expansion Board Address 2 Input #2	RW	WORD	Event Code
40148	Expansion Board Address 3 Input #1	RW	WORD	Event Code
40149	Expansion Board Address 3 Input #2	RW	WORD	Event Code
40150	Expansion Board Address 4 Input #1	RW	WORD	Event Code
40151	Expansion Board Address 4 Input #2	RW	WORD	Event Code
40152	Reserved for future use	—	—	Return 0
40153	Reserved for future use	—	—	Return 0

Register	Data Description	Access	Data Type	Range/Units
40154	Expansion Board Address 1 Board Type	RO	WORD	0 = No Board Installed; 1 = Standard; 2 = Power
40155	Expansion Board Address 2 Board Type	RO	WORD	0 = No Board Installed; 1 = Standard; 2 = Power
40156	Expansion Board Address 3 Board Type	RO	WORD	0 = No Board Installed; 1 = Standard; 2 = Power
40157	Expansion Board Address 4 Board Type	RO	WORD	0 = No Board Installed; 1 = Standard; 2 = Power
40158	Reserved for future use	—	—	Return 0
40159	Reserved for future use	—	—	Return 0
40160	Alarm Option Board	RO	WORD	0 = No Board Installed; 1 = Normal; 2 = Chicago; 3 = Silence
40161	Battery Option Board Installed	RO	WORD	0 = No Board Installed; 1 = Installed
40162-40193	Reserved for future use	—	—	Return 0
40194	MLB Output State	RO	WORD [0:1]	One bit per output
40195	MLB Input State	RO	WORD [0:1]	One bit per input
40196	Expansion Board #1 Outputs State	RO	WORD [0:X]	One bit per output
40197	Expansion Board #2 Outputs State	RO	WORD [0:X]	
40198	Expansion Board #3 Outputs State	RO	WORD [0:X]	
40199	Expansion Board #4 Outputs State	RO	WORD [0:X]	
40200	Expansion Board #1 Inputs State	RO	WORD [0:1]	One bit per input
40201	Expansion Board #2 Inputs State	RO	WORD [0:1]	
40202	Expansion Board #3 Inputs State	RO	WORD [0:1]	
40203	Expansion Board #4 Inputs State	RO	WORD [0:1]	
40250	Software Controlled Outputs State	RW	WORD [0:3]	One bit per output
40251	Software Controlled Outputs Assigned	RO	WORD [0:3]	One bit per output
40252	Remote Monitoring Input State	RO	WORD [0:4]	One bit per input
40253	Remote Monitoring Input Assigned	RO	WORD [0:4]	One bit per input
40260-40269	SCO #1 Description	RW	WORD*10	Software controller output
40270-40279	SCO #2 Description	RW	WORD*10	
40280-40289	SCO #3 Description	RW	WORD*10	
40290-40299	SCO #4 Description	RW	WORD*10	
40300-40309	Reserved for future use	—	—	Return 0 (all registers)
40310-40319	Remote Monitored Input #1 Description	RW	WORD*10	
40320-40329	Remote Monitored Input #2 Description	RW	WORD*10	

Register	Data Description	Access	Data Type	Range/Units
40330-40339	Remote Monitored Input #3 Description	RW	WORD*10	
40340-40349	Remote Monitored Input #4 Description	RW	WORD*10	
40350-40359	Reserved for future use	—	—	Return 0 (all registers)
40600-40698	Reserved for future use	—	—	Return 0 (all registers)
40699	Proprietary	—	—	
40700	Proprietary	—	—	
40740	Accessory Setup	RW	WORD [0:15]	0: Enable Engine Start Extended Time Delay
				1: Reserved for future use (always 0)
				2: Enable In Phase Monitor
				3: Remote Test Loading (0=Loaded; 1=Unloaded)
				4: Commit to Transfer
				5: Peak Shave Delay Bypass
				6: 3- Source Eng. Start Mode (0=pref. first; 1=both @ same time)
				7: 3- source Pref. Source Toggle
				8: In Phase Transition Angle (0=Lagging; 1=Leading)
				9- 15: In Phase Transition Angle
40741	Reserved for future use	—	—	Return 0
40742	Accessory Status	RO	WORD [0:6]	0: Exercise In Progress
				1: In Phase Monitor Active
				2: Load Control In Progress
				3: Peak Shaving In Progress
				4: Loaded Test Occurring
				5: Unloaded Test Occurring
				6: Auto-Loaded Test Occurring
40743	DIP Switch Position	RO	WORD [0:4]	0: Maintenance Mode
				1: Password Disabled
				2: Spare 3 On
				3: Spare 4 On
40744	Reserved for future use	—	—	Return 0
40750	Load Shed: Source N Disconnect Time#1	RW	WORD	0- 3600 Sec
40751	Load Shed: Source N Disconnect Time#2	RW	WORD	0- 3600 Sec
40752	Load Shed: Source N Disconnect Time#3	RW	WORD	0- 3600 Sec
40753	Load Shed: Source N Disconnect Time#4	RW	WORD	0- 3600 Sec
40754	Load Shed: Source N Disconnect Time#5	RW	WORD	0- 3600 Sec
40755	Load Shed: Source N Disconnect Time#6	RW	WORD	0- 3600 Sec
40756	Load Shed: Source N Disconnect Time#7	RW	WORD	0- 3600 Sec
40757	Load Shed: Source N Disconnect Time#8	RW	WORD	0- 3600 Sec

Register	Data Description	Access	Data Type	Range/Units
40758	Load Shed: Source N Disconnect Time#9	RW	WORD	0 - 3600 Sec
40759	Load Shed: Source E Reconnect Time #1	RW	WORD	0 - 3600 Sec
40760	Load Shed: Source E Reconnect Time #2	RW	WORD	0 - 3600 Sec
40761	Load Shed: Source E Reconnect Time #3	RW	WORD	0 - 3600 Sec
40762	Load Shed: Source E Reconnect Time #4	RW	WORD	0 - 3600 Sec
40763	Load Shed: Source E Reconnect Time #5	RW	WORD	0 - 3600 Sec
40764	Load Shed: Source E Reconnect Time #6	RW	WORD	0 - 3600 Sec
40765	Load Shed: Source E Reconnect Time #7	RW	WORD	0 - 3600 Sec
40766	Load Shed: Source E Reconnect Time #8	RW	WORD	0 - 3600 Sec
40767	Load Shed: Source E Reconnect Time #9	RW	WORD	0 - 3600 Sec
40768	Load Shed: Source E Disconnect Time #1	RW	WORD	0 - 3600 Sec
40769	Load Shed: Source E Disconnect Time #2	RW	WORD	0 - 3600 Sec
40770	Load Shed: Source E Disconnect Time #3	RW	WORD	0 - 3600 Sec
40771	Load Shed: Source E Disconnect Time #4	RW	WORD	0 - 3600 Sec
40772	Load Shed: Source E Disconnect Time #5	RW	WORD	0 - 3600 Sec
40773	Load Shed: Source E Disconnect Time #6	RW	WORD	0 - 3600 Sec
40774	Load Shed: Source E Disconnect Time #7	RW	WORD	0 - 3600 Sec
40775	Load Shed: Source E Disconnect Time #8	RW	WORD	0 - 3600 Sec
40776	Load Shed: Source E Disconnect Time #9	RW	WORD	0 - 3600 Sec
40777	Load Shed: Source N Reconnect Time #1	RW	WORD	0 - 3600 Sec
40778	Load Shed: Source N Reconnect Time #2	RW	WORD	0 - 3600 Sec
40779	Load Shed: Source N Reconnect Time #3	RW	WORD	0 - 3600 Sec
40780	Load Shed: Source N Reconnect Time #4	RW	WORD	0 - 3600 Sec
40781	Load Shed: Source N Reconnect Time #5	RW	WORD	0 - 3600 Sec
40782	Load Shed: Source N Reconnect Time #6	RW	WORD	0 - 3600 Sec
40783	Load Shed: Source N Reconnect Time #7	RW	WORD	0 - 3600 Sec
40784	Load Shed: Source N Reconnect Time #8	RW	WORD	0 - 3600 Sec
40785	Load Shed: Source N Reconnect Time #9	RW	WORD	0 - 3600 Sec

Register	Data Description	Access	Data Type	Range/Units
40786	Load Shed: Source N Number of Loads to Add	RW	WORD	1 - 9
40787	Load Shed: Source E Number of Loads to Add	RW	WORD	1 - 9
40788-40799	Reserved for future use	—	—	Return 0 (all registers)
40800-40864	Common Event Alarms	RW	WORD* 65 [0:15]	0 - 12: Msg Code of defined common alarm
				13: 0=Not audible alarm; 1 = Audible alarm
				14: 0=Not assigned to DCA #2; 1= Assigned to DCA #2
				15: 0=Not assigned to DCA #1; 1= Assigned to DCA #1
40900	Reserved for future use	—	—	Return 0
40901	Reserved for future use	—	—	Return 0
40902	Reserved for future use	—	—	Return 0
40903	Reserved for future use	—	—	Return 0
40905	Enabled / Loaded / Interval Code / Repeat Rate Next Cal. Event	RW	WORD [0:7]	0: 0 = Disabled; 1 = Enabled
				1: 0 = Unloaded; 1 = Loaded
				2 - 3: Interval Code (00 = DMO; 01 = day; 10 = week; 11 = month)
				4 - 7: Repeat Rate (1 - 12)
				8: 0 = Not Running; 1 = Running (read only)
40906	Start Time Next Cal. Event	RW	WORD	Minutes since midnight
40907	Start Date Next Cal. Event	RW	WORD [0:15]	0 - 4: Day of Month
				5 - 8: Month of Year
				9 - 15: Year + 2000 (2000 - 2128)
40908	Run Time Next Cal. Event	RW	WORD	1 - 5999 Minutes
40909	Reserved for future use	—	—	Return 0
40910	Enabled / Loaded / Interval Code / Repeat Rate Exer. Event #1	RW	WORD [0:7]	0: 0 = Disabled; 1 = Enabled
				1: 0 = Unloaded; 1 = Loaded
				2 - 3: Interval Code (00 = DMO; 01 = day; 10 = week; 11 = month)
				4 - 7: Repeat Rate (1 - 12)
				8: 0 = Not Running; 1 = Running (read only)
				9: 0 = N source; 1 = E source (Gen - Gen Only)
40911	Start Time Exer. Event #1	RW	WORD	Minutes since midnight
40912	Start Date Exer. Event #1	RW	WORD [0:15]	0 - 4: Day of Month
				5 - 8: Month of Year (Jan = 1, Feb = 2,… Dec = 12)
				9 - 15: Year + 2000 (2001 - 2128)
40913	Run Time Exer. Event #1	RW	WORD	1 - 5999 Minutes
40914-40994	Exer. Events #2 - #21 (same as above)	RW	WORD * 80	Same structure as Exer. Event #1
40995-40999	Reserved for future use	—	—	Return 0 (all registers)
41010	Last Outage Time	RO	WORD	Minutes since midnight
41011	Last Outage Date	RO	WORD [0:15]	0 - 4: Day of Month
				5 - 8: Month of Year
				9 - 15: Year + 2000 (2000 - 2128)
41012-41013	Duration of Last Outage	RO	WORD * 2	Minutes
41110-41119	Designation	RW	WORD * 10	20 ASCII characters

Register	Data Description	Access	Data Type	Range/Units
41120-41129	Load Description	RW	WORD * 10	20 ASCII characters
41130-41139	Branch Description	RW	WORD * 10	20 ASCII characters
41140-41149	Location	RW	WORD * 10	20 ASCII characters
41150-41154	ATS Serial Number	RW	WORD * 5	10 ASCII characters
41155	Password for registers 41150-41154	WO	WORD	0 - 32768
41156-41160	Controller Serial Number (FACTORY ONLY)	RW	WORD * 5	10 ASCII characters
41161	Password for registers 41156-41160	WO	WORD	0 - 32768 (FACTORY ONLY)
41162-41166	Contactor Serial Number	RW	WORD * 5	10 ASCII characters
41167	Password for registers 41162-41166	WO	WORD	0 - 32768
41168-41187	Reserved for future use	—	—	Return 0 (all registers)
41200	1500 Code Revision	RO	WORD [0:15]	0-7: Minor Version
				8-15: Major Version
41201	FPGA Revision	RO	WORD	0-7: Minor Version
41202	MAC Address (least significant bits only)	RO	WORD [0:14]	Bits 0-14 only
41250	Time	RW	WORD	Minutes since midnight
41251	Date (day)	RW	WORD [0:15]	0-4: Day of Month
	Date (month)			5-8: Month of Year (Jan = 1, Feb = 2,… Dec = 12)
	Date (year)			9-15: Year + 2000 (2001-2128)
41252	Adjust for daylight savings time	RW	WORD [0]	0: 0 = do not adjust; 1 = adjust
41253	Date to move clock forward (day of week)	RW	WORD [0:9]	0-2: Day of Month (Sun = 0, Mon = 1, … Sat = 6)
	Date to move clock forward (month)			3-6: Month of Year (Jan = 1, Feb = 2, … Dec = 12)
	Date to move clock forward (week of month)			7-9: Week of Month (1 - 4 only)
41254	Date to move clock backward (day of week)	RW	WORD [0:9]	0-2: Day of Month (Sun = 0, Mon = 1, … Sat = 6)
	Date to move clock backward (month)			3-6: Month of Year (Jan = 1, Feb = 2, … Dec = 12)
	Date to move clock backward (week of month)			7-9: Week of Month (1 - 4 only)
41255-41260	Reserved for future use	—	—	Return 0 (all registers)
41295	Close Transition Parallel Time	RO	WORD	milliseconds
41296	Transfer Time N->Open	RO	WORD	milliseconds
41297	Transfer Time N->Close	RO	WORD	milliseconds
41298	Transfer Time E->Open	RO	WORD	milliseconds
41299	Transfer Time E->Close	RO	WORD	milliseconds
41300-41301	Minutes not in Preferred Total	RO	WORD * 2	minutes (most significant word first)
41302-41303	Minutes not in Preferred since Reset	RO	WORD * 2	minutes (most significant word first)
41304-41305	Minutes in Standby Total	RO	WORD * 2	minutes (most significant word first)
41306-41307	Minutes in Standby since Reset	RO	WORD * 2	minutes (most significant word first)

Register	Data Description	Access	Data Type	Range/Units
41308-41309	Minutes of Operation Total	RO	WORD * 2	minutes (most significant word first)
41310-41311	Minutes of Operation since Reset	RO	WORD * 2	minutes (most significant word first)
41312	Switch Transfers Total	RO	WORD	
41313	Switch Transfers since Reset	RO	WORD	
41314	Failures to Transfer Total	RO	WORD	
41315	Failures to Transfer since Reset	RO	WORD	
41316	Loss of Preferred Transfers Total	RO	WORD	
41317	Loss of Preferred Transfers since Reset	RO	WORD	
41318	Transfer Time N->E	RO	WORD	milliseconds
41319	Transfer Time E->N	RO	WORD	milliseconds
41320	Last Maintenance Date	RO	WORD [0:15]	0-4: Day of Month 5-8: Month of Year (Jan = 1, Feb = 2,… Dec = 12) 9-15: Year + 2000 (2001-2128)
41321	Proprietary	—	—	
41322	Proprietary	—	—	
41323-41330	Reserved for Future Use	—	—	
41350	Maintenance/Test and Manual Operations	WO	WORD [0:9]	0: Reset Maintenance Records
				1: Start Peak Shave
				2: End Peak Shave
				3: Start Remote Loaded Test
				4: Start Remote Unloaded Test
				5: Reserved for future use (always 0)
				6: End Remote Test
				7: Force Transfer to OFF
				8: Resume Program Trans. Operation
				9: End Current Time Delay
41351	Auto-Load Run Time	WO	WORD	Minutes (sending any non-zero value starts test)
41352	Clear Event Log	WO	WORD [0]	0: 1=Clear Log
41353	Reserved for future use	—	—	Return 0
42150-42249	Events 0 - 19	RO	WORD * 100	Time, Date, Code, Param1, Param2
42250-42349	Events 20 - 39	RO	WORD * 100	Time, Date, Code, Param1, Param2
42350-42449	Events 40 - 59	RO	WORD * 100	Time, Date, Code, Param1, Param2
42450-42549	Events 60 - 79	RO	WORD * 100	Time, Date, Code, Param1, Param2
42550-42649	Events 80 - 99	RO	WORD * 100	Time, Date, Code, Param1, Param2
42650-42749	Reserved for future use	—	—	Return 0 (all registers)
42750	Event Window Start Time	RW	WORD	Minutes since midnight
42751	Event Window Start Date	RW	WORD [0:15]	0-4: Day of Month 5-8: Month of Year (Jan = 1, Feb = 2,… Dec = 12) 9-15: Year + 2000 (2000-2128)
42752	Event Window End Time	RW	WORD	Minutes since midnight

Register	Data Description	Access	Data Type	Range/Units
42753	Event Window End Date	RW	WORD [0:15]	0- 4: Day of Month
				5- 8: Month of Year (Jan = 1, Feb = 2,… Dec = 12)
				9- 15: Year + 2000 (2000- 2128)
42754	Number of Events in Window	RO	WORD	
42755- 42854	Windowed Events 0 - 19	RO	WORD* 100	Time, Date, Code, Param1, Param2
42900- 42949	Reserved for Future Use	—	—	Return 0 (all registers)
43400	Calibrate L1L2 Normal Source Voltage	WO	WORD	Volts * 10
43401	Password for 43400	WO	WORD	0 - 32768
43402	Calibrate L2L3 Normal Source Voltage	WO	WORD	Volts * 10
43403	Password for 43402	WO	WORD	0 - 32768
43404	Calibrate L3L1 Normal Source Voltage	WO	WORD	Volts * 10
43405	Password for 43404	WO	WORD	0 - 32768
43406	Calibrate L1L2 Emergency Source Voltage	WO	WORD	Volts * 10
43407	Password for 43406	WO	WORD	0 - 32768
43408	Calibrate L2L3 Emergency Source Voltage	WO	WORD	Volts * 10
43409	Password for 43408	WO	WORD	0 - 32768
43410	Calibrate L3L1 Emergency Source Voltage	WO	WORD	Volts * 10
43411	Password for 43410	WO	WORD	0 - 32768
43412	Calibrate L1L0 Normal Source Voltage	WO	WORD	Volts * 10
43413	Password for 43412	WO	WORD	0 - 32768
43414	Calibrate L2L0 Normal Source Voltage	WO	WORD	Volts * 10
43415	Password for 43414	WO	WORD	0 - 32768
43416	Calibrate L3L0 Normal Source Voltage	WO	WORD	Volts * 10
43417	Password for 43416	WO	WORD	0 - 32768
43418	Calibrate L1L0 Emergency Source Voltage	WO	WORD	Volts * 10
43419	Password for 43418	WO	WORD	0 - 32768
43420	Calibrate L2L0 Emergency Source Voltage	WO	WORD	Volts * 10
43421	Password for 43420	WO	WORD	0 - 32768
43422	Calibrate L3L0 Emergency Source Voltage	WO	WORD	Volts * 10
43423	Password for 43422	WO	WORD	0 - 32768
43424	Calibrate L1 Current	WO	WORD	Amps * 10
43425	Password for 43424	WO	WORD	0 - 32768
43426	Calibrate L2 Current	WO	WORD	Amps * 10
43427	Password for 43426	WO	WORD	0 - 32768
43428	Calibrate L3 Current	WO	WORD	Amps * 10
43429	Password for 43428	WO	WORD	0 - 32768
43450	Key Press Status	RO	WORD [0:3]	One bit per button
43500	User Defined Value	RW	WORD	For internal use

Register	Data Description	Access	Data Type	Range/Units
43501	User Defined Value	RW	WORD	For internal use
43502	User Defined Value	RW	WORD	For internal use
43503	User Defined Value	RW	WORD	For internal use
43504	User Defined Value	RW	WORD	For internal use
43505	User Defined Value	RW	WORD	For internal use
43506	User Defined Value	RW	WORD	For internal use
43507	User Defined Value	RW	WORD	For internal use
43508	User Defined Value	RW	WORD	For internal use
43509	User Defined Value	RW	WORD	For internal use
43552-43599	Reserved for future use			Return 0 (all registers)
43700	Controller Parameter Force Save Status	RW	WORD	0: Idle 1: Force the parameters to be saved 2. Parameters have been saved successfully
43701	Password for register 43550	WO	WORD	0 - 32768 (factory password)
43800	Reserved for future use	RW	WORD	0 = None, 1 = Time Based, 2 = Current Based
43801	Load Control Mode	RW	WORD	0 = None, 1 = Time Based, 2 = Current Based
43802	Source 1 Add Load Amperage	RW	WORD	0-4000 Amps
43803	Source 1 Remove Load Amperage	RW	WORD	0-4000 Amps
43804	Source 2 Add Load Amperage	RW	WORD	0-4000 Amps
43805	Source 2 Remove Load Amperage	RW	WORD	0-4000 Amps
43806	Source 1 Current Based Load Control Output 1 Enable	RW	WORD	0 = Disabled; 1= Enabled
43807	Source 1 Current Based Load Control Output 2 Enable	RW	WORD	0 = Disabled; 1= Enabled
43808	Source 1 Current Based Load Control Output 3 Enable	RW	WORD	0 = Disabled; 1= Enabled
43809	Source 1 Current Based Load Control Output 4 Enable	RW	WORD	0 = Disabled; 1= Enabled
43810	Source 1 Current Based Load Control Output 5 Enable	RW	WORD	0 = Disabled; 1= Enabled
43811	Source 1 Current Based Load Control Output 6 Enable	RW	WORD	0 = Disabled; 1= Enabled
43812	Source 1 Current Based Load Control Output 7 Enable	RW	WORD	0 = Disabled; 1= Enabled
43813	Source 1 Current Based Load Control Output 8 Enable	RW	WORD	0 = Disabled; 1= Enabled
43814	Source 1 Current Based Load Control Output 9 Enable	RW	WORD	0 = Disabled; 1= Enabled
43815	Source 1 Current Based Load Control Output 1 Add Priority	RW	WORD	1-9
43816	Source 1 Current Based Load Control Output 2 Add Priority	RW	WORD	1-9
43817	Source 1 Current Based Load Control Output 3 Add Priority	RW	WORD	1-9
43818	Source 1 Current Based Load Control Output 4 Add Priority	RW	WORD	1-9
43819	Source 1 Current Based Load Control Output 5 Add Priority	RW	WORD	1-9
43820	Source 1 Current Based Load Control Output 6 Add Priority	RW	WORD	1-9
43821	Source 1 Current Based Load Control Output 7 Add Priority	RW	WORD	1-9
43822	Source 1 Current Based Load Control Output 8 Add Priority	RW	WORD	1-9
43823	Source 1 Current Based Load Control Output 9 Add Priority	RW	WORD	1-9

Register	Data Description	Access	Data Type	Range/Units
43824	Source 1 Current Based Load Control Output 1 Remove Priority	RW	WORD	1-9
43825	Source 1 Current Based Load Control Output 2 Remove Priority	RW	WORD	1-9
43826	Source 1 Current Based Load Control Output 3 Remove Priority	RW	WORD	1-9
43827	Source 1 Current Based Load Control Output 4 Remove Priority	RW	WORD	1-9
43828	Source 1 Current Based Load Control Output 5 Remove Priority	RW	WORD	1-9
43829	Source 1 Current Based Load Control Output 6 Remove Priority	RW	WORD	1-9
43830	Source 1 Current Based Load Control Output 7 Remove Priority	RW	WORD	1-9
43831	Source 1 Current Based Load Control Output 8 Remove Priority	RW	WORD	1-9
43832	Source 1 Current Based Load Control Output 9 Remove Priority	RW	WORD	1-9
43833	Source 1 Current Based Load Control Output 1 Add Time	RW	WORD	0-3600
43834	Source 1 Current Based Load Control Output 2 Add Time	RW	WORD	0-3600
43835	Source 1 Current Based Load Control Output 3 Add Time	RW	WORD	0-3600
43836	Source 1 Current Based Load Control Output 4 Add Time	RW	WORD	0-3600
43837	Source 1 Current Based Load Control Output 5 Add Time	RW	WORD	0-3600
43838	Source 1 Current Based Load Control Output 6 Add Time	RW	WORD	0-3600
43839	Source 1 Current Based Load Control Output 7 Add Time	RW	WORD	0-3600
43840	Source 1 Current Based Load Control Output 8 Add Time	RW	WORD	0-3600
43841	Source 1 Current Based Load Control Output 9 Add Time	RW	WORD	0-3600
43842	Source 1 Current Based Load Control Output 1 Remove Time	RW	WORD	0-3600
43843	Source 1 Current Based Load Control Output 2 Remove Time	RW	WORD	0-3600
43844	Source 1 Current Based Load Control Output 3 Remove Time	RW	WORD	0-3600
43845	Source 1 Current Based Load Control Output 4 Remove Time	RW	WORD	0-3600
43846	Source 1 Current Based Load Control Output 5 Remove Time	RW	WORD	0-3600
43847	Source 1 Current Based Load Control Output 6 Remove Time	RW	WORD	0-3600
43848	Source 1 Current Based Load Control Output 7 Remove Time	RW	WORD	0-3600
43849	Source 1 Current Based Load Control Output 8 Remove Time	RW	WORD	0-3600
43850	Source 1 Current Based Load Control Output 9 Remove Time	RW	WORD	0-3600
43851	Source 2 Current Based Load Control Output 1 Enable	RW	WORD	0 = Disabled; 1= Enabled
43852	Source 2 Current Based Load Control Output 2 Enable	RW	WORD	0 = Disabled; 1= Enabled
43853	Source 2 Current Based Load Control Output 3 Enable	RW	WORD	0 = Disabled; 1= Enabled

Register	Data Description	Access	Data Type	Range/Units
43854	Source 2 Current Based Load Control Output 4 Enable	RW	WORD	0 = Disabled; 1= Enabled
43855	Source 2 Current Based Load Control Output 5 Enable	RW	WORD	0 = Disabled; 1= Enabled
43856	Source 2 Current Based Load Control Output 6 Enable	RW	WORD	0 = Disabled; 1= Enabled
43857	Source 2 Current Based Load Control Output 7 Enable	RW	WORD	0 = Disabled; 1= Enabled
43858	Source 2 Current Based Load Control Output 8 Enable	RW	WORD	0 = Disabled; 1= Enabled
43859	Source 2 Current Based Load Control Output 9 Enable	RW	WORD	0 = Disabled; 1= Enabled
43860	Source 2 Current Based Load Control Output 1 Add Priority	RW	WORD	1-9
43861	Source 2 Current Based Load Control Output 2 Add Priority	RW	WORD	1-9
43862	Source 2 Current Based Load Control Output 3 Add Priority	RW	WORD	1-9
43863	Source 2 Current Based Load Control Output 4 Add Priority	RW	WORD	1-9
43864	Source 2 Current Based Load Control Output 5 Add Priority	RW	WORD	1-9
43865	Source 2 Current Based Load Control Output 6 Add Priority	RW	WORD	1-9
43866	Source 2 Current Based Load Control Output 7 Add Priority	RW	WORD	1-9
43867	Source 2 Current Based Load Control Output 8 Add Priority	RW	WORD	1-9
43868	Source 2 Current Based Load Control Output 9 Add Priority	RW	WORD	1-9
43869	Source 2 Current Based Load Control Output 1 Remove Priority	RW	WORD	1-9
43870	Source 2 Current Based Load Control Output 2 Remove Priority	RW	WORD	1-9
43871	Source 2 Current Based Load Control Output 3 Remove Priority	RW	WORD	1-9
43872	Source 2 Current Based Load Control Output 4 Remove Priority	RW	WORD	1-9
43873	Source 2 Current Based Load Control Output 5 Remove Priority	RW	WORD	1-9
43874	Source 2 Current Based Load Control Output 6 Remove Priority	RW	WORD	1-9
43875	Source 2 Current Based Load Control Output 7 Remove Priority	RW	WORD	1-9
43876	Source 2 Current Based Load Control Output 8 Remove Priority	RW	WORD	1-9
43877	Source 2 Current Based Load Control Output 9 Remove Priority	RW	WORD	1-9
43878	Source 2 Current Based Load Control Output 1 Add Time	RW	WORD	0-3600
43879	Source 2 Current Based Load Control Output 2 Add Time	RW	WORD	0-3600
43880	Source 2 Current Based Load Control Output 3 Add Time	RW	WORD	0-3600
43881	Source 2 Current Based Load Control Output 4 Add Time	RW	WORD	0-3600
43882	Source 2 Current Based Load Control Output 5 Add Time	RW	WORD	0-3600
43883	Source 2 Current Based Load Control Output 6 Add Time	RW	WORD	0-3600

Register	Data Description	Access	Data Type	Range/Units
43884	Source 2 Current Based Load Control Output 7 Add Time	RW	WORD	0-3600
43885	Source 2 Current Based Load Control Output 8 Add Time	RW	WORD	0-3600
43886	Source 2 Current Based Load Control Output 9 Add Time	RW	WORD	0-3600
43887	Source 2 Current Based Load Control Output 1 Remove Time	RW	WORD	0-3600
43888	Source 2 Current Based Load Control Output 2 Remove Time	RW	WORD	0-3600
43889	Source 2 Current Based Load Control Output 3 Remove Time	RW	WORD	0-3600
43890	Source 2 Current Based Load Control Output 4 Remove Time	RW	WORD	0-3600
43891	Source 2 Current Based Load Control Output 5 Remove Time	RW	WORD	0-3600
43892	Source 2 Current Based Load Control Output 6 Remove Time	RW	WORD	0-3600
43893	Source 2 Current Based Load Control Output 7 Remove Time	RW	WORD	0-3600
43894	Source 2 Current Based Load Control Output 8 Remove Time	RW	WORD	0-3600
43895	Source 2 Current Based Load Control Output 9 Remove Time	RW	WORD	0-3600
43920	Prime Power Event Source 1 Duration	RW	WORD	(Hours * 0.1)
43921	Prime Power Event Source 2 Duration	RW	WORD	(Hours * 0.1)
43922	Prime Power Event Source 1 Count Down	RO	WORD*2	Minutes
43924	Prime Power Event Source 2 Count Down	RO	WORD*2	Minutes
43926	Prime Power Event Start/Stop	RW	WORD	0 = Stop, 1 = Start
43930	USB Data Logging Period	RW	WORD	0 = Seconds; 1 = Minutes, 2 = Hours; 3 = Days
43940	Min/Max Logging Period	RW	WORD	0 = Continuous; 1 = Calendar; 2 = Daily; 3 = Weekly
43941	Min/Max Logging Calendar Start Date (day)	RW	WORD [0:15]	0-4: Day of Month
	Min/Max Logging Calendar Start Date (month)			5-8: Month of Year (Jan = 1, Feb = 2, Dec = 12)
	Min/Max Logging Calendar Start Date (year)			9-15: Year + 2000 (2001-2128)
43942	Min/Max Logging Start Time	RW	WORD	Minutes
43943	Min/Max Logging Calendar Stop Date (day)	RW	WORD [0:15]	0-4: Day of Month
	Min/Max Logging Calendar Stop Date (month)			5-8: Month of Year (Jan = 1, Feb = 2, Dec = 12)
	Min/Max Logging Calendar Stop Date (year)			9-15: Year + 2000 (2001-2128)
43944	Min/Max Logging Stop Time	RW	WORD	Minutes
43945	Min/Max Logging Days	RW	WORD	Number of days in period
43946	Min/Max Logging Weeks	RW	WORD	Number of weeks in period
49999	Device ID	RO	WORD	MPAC™ 1500 ATS Controller = 0x17 (23)

13.4.4 Event Codes

Event codes are used in the following registers:

- Programmable inputs and outputs, registers 40108- 40153
- Common event alarms, registers 40800- 40864
- Event log registers 42150-42649

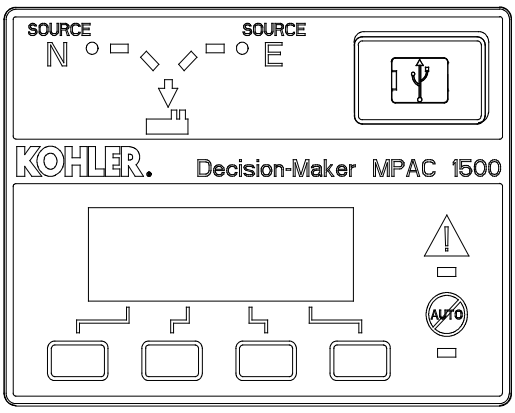
Code	Description
1	End Time Delay Button
2	Test Button
3	Exercise Button
4	Lamp Test Button
5	Service Required Reset
6	Maintenance DIP Switch Changed State
7	Password DIP Switch Changed State
8	Spare DIP Switch Changed State
9	Spare DIP Switch Changed State
10	Supervised Transfer Switch Changed State
11- 26	Reserved
27	New I/O Module Detected
28- 32	Reserved
33	No Output Function Defined
34	Preferred Source Available
35	Standby Source Available
36	Contactor in Preferred Position
37	Contactor in Standby Position
38	Contactor in Off Position
39	Contactor in Source N Position
40	Contactor in Source E Position
41	Not in Auto
42	Load Control Active
43	Low Battery on Standby Source
44	Exerciser Started
45	Test Mode Active
46	Peak Shave Active
47	Non-Emergency Transfer
48	Back- up Battery Low
49	Maintenance Mode Active
50	Load Bank Activate
51	Start Source N Generator
52	Start Source E Generator
53	In Phase Monitor Waiting for Synch
54	Common Alarm
55	Source N Under Voltage
56	Source N Over Voltage
57	Source N Voltage Unbalanced
58	Source N Loss of Phase
59	Source N Phase Rotation Error
60	Source N Over Frequency
61	Source N Under Frequency
62	Source E Under Voltage
63	Source E Over Voltage
64	Source E Voltage Unbalanced
65	Source E Loss of Phase
66	Source E Phase Rotation Error
67	Source E Over Frequency
68	Source E Under Frequency
69	Failure to Acquire Standby
70	Failure to Acquire Preferred
71	Failure to Transfer
72	I/O Module Comms Lost
73	Audible Alarm Status
74	Aux. Switch Fault
75	Aux. Switch Open
76	Load Control Output #0
77	Load Control Output #1
78	Load Control Output #2
79	Load Control Output #3
80	Load Control Output #4
81	Load Control Output #5
82	Load Control Output #6
83	Load Control Output #7
84	Load Control Output #8
85	Modbus Controlled RDO #1
86	Modbus Controlled RDO #2
87	Modbus Controlled RDO #3
88	Modbus Controlled RDO #4
89	3 Source System Disable Output
90	Common Alarm 2
91	Audible Alarm Has Been Silenced
92- 98	Reserved for future use
99	No Input Function Defined
100	Forced Transfer to Off
101	Peak Shave Mode
102	Inhibit Transfer
103	Remote End Time Delay
104	Remote Test
105	Low Battery Voltage
106	Remote Common Alarm
107	Bypass Contactor Disable
108	3 Source System Disable Input
109	Remote Monitor Input #1
110	Remote Monitor Input #2
111	Remote Monitor Input #3
112	Remote Monitor Input #4
113- 119	Reserved for future use
120	System Ready
121	Critical Service Required

Code	Description
122	Non- - Critical Service Required
123	System Parameter Changed
124	Source N Available
125	Source E Available
126	Over Frequency
127	Under Frequency
128	Loss of Phase
129	Phase Rotation Error
130	Over Voltage L1- - L2
131	Over Voltage L2- - L3
132	Over Voltage L3- - L1
133	Under Voltage L1- - L2
134	Under Voltage L2- - L3
135	Under Voltage L3- - L1
136	Voltage Unbalanced
137	History Log Saved
138- 147	Reserved
148	Inphase Synching
149- 174	Reserved for future use
175	Auto Loaded Test Complete
176- 200	Reserved for future use
201	Transfer Mode Changed
202	Default History Loaded
203	Reserved for future use
204	Default Settings Loaded
205	MLB Programmable Input Changed
206	MLB Programmable Output Changed
207	Exercise Loaded Changed
208	Test Loaded Changed
209	One/Two Week Exercise Changed
210	Disable Exercise Changed
211	Preferred Source Changed
212	Default Settings Loaded
213- 214	Reserved for future use
215	Backup Parameter File Loaded
216	Backup History File Loaded
217- 222	Reserved for future use
223	Modbus Force Transfer to Off
224	Modbus Peak Shave
225	Modbus System Test
226- 247	Reserved for future use
248	Battery Backup Output Changed
249- 250	Reserved for future use
251	A USB Device Has Been Connected
252	A USB Device Has Been Disconnected
256	System Ready

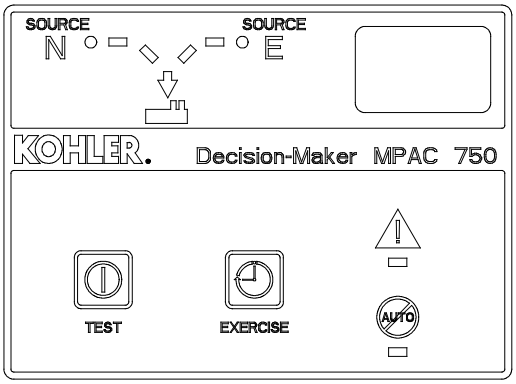
14.1 Specifications

The Decision-Maker® MPAC ATS controllers' Modbus® communication capability:

- Supports industry-standard Modbus® RTU protocol through the RS-485 serial ports.
- Uses Modbus® TCP protocol through the Ethernet port.
- Uses RS-485 connections to a single Modbus® master or a network of devices.
- Uses standard baud rates of 9600, 19200, or 57600.



Decision-Maker 1200 or 1500 Controller



Decision-Maker 750 Controller

Figure 14-1 Decision-Maker® MPAC Controllers

14.2 Hardware Connections

⚠ DANGER



Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

Servicing the transfer switch. Hazardous voltage will cause severe injury or death. Deenergize all power sources before servicing. Turn off the main circuit breakers of all transfer switch power sources and disable all generator sets as follows: (1) Move all generator set master controller switches to the OFF position. (2) Disconnect power to all battery chargers. (3) Disconnect all battery cables, negative (-) leads first. Reconnect negative (-) leads last when reconnecting the battery cables after servicing. Follow these precautions to prevent the starting of generator sets by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer. Before servicing any components inside the enclosure: (1) Remove all jewelry. (2) Stand on a dry, approved electrically insulated mat. (3) Test circuits with a voltmeter to verify that they are deenergized.

(Decision-Maker® 3+ and 550 Generator Controllers)

Servicing the transfer switch. Hazardous voltage will cause severe injury or death. Deenergize all power sources before servicing. Turn off the main circuit breakers of all transfer switch power sources and disable all generator sets as follows: (1) Press the generator set off/reset button to shut down the generator set. (2) Disconnect power to all battery chargers. (3) Disconnect all battery cables, negative (-) leads first. Reconnect negative (-) leads last when reconnecting the battery cables after servicing. Follow these precautions to prevent the starting of generator sets by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer. Before servicing any components inside the enclosure: (1) Remove all jewelry. (2) Stand on a dry, approved electrically insulated mat. (3) Test circuits with a voltmeter to verify that they are deenergized.

(RDC, DC, RDC2, DC2, Decision-Maker® 3000, 3500, 6000 and APM402 Generator Controllers)

NOTICE

Electrostatic discharge damage. Electrostatic discharge (ESD) damages electronic circuit boards. Prevent electrostatic discharge damage by wearing an approved grounding wrist strap when handling electronic circuit boards or integrated circuits. An approved grounding wrist strap provides a high resistance (about 1 megohm), *not a direct short*, to ground.

The controller is equipped with a Modbus port with an RS-485 connector. See Figure 14-2 for the RS-485 Modbus connector location.

Use serial connections to TB2 on the main logic board to connect the transfer switch to a personal computer for system monitoring, an optional remote annunciator, or a Modbus® network.

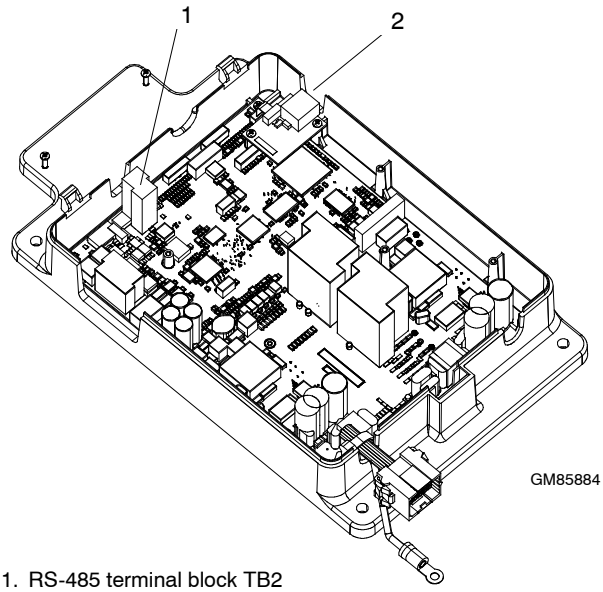
The serial port is an isolated RS-485 port with connection speeds of 9.6, 19.2, and 57.6 kbps.

Use Modbus® RTU (remote terminal unit) protocol for communication through the serial port.

Note: Modbus® applications require a Modbus® software driver written by a trained and qualified systems programmer.

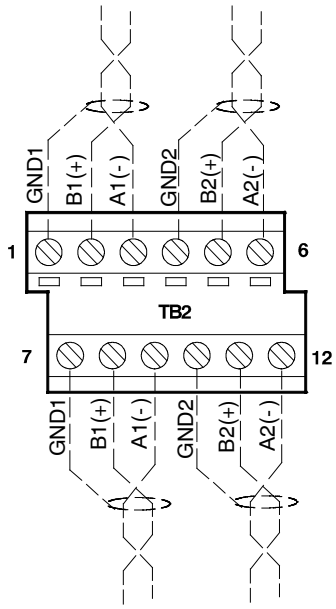
1. Disconnect power to the transfer switch by opening switches or circuit breakers before opening the enclosure.
2. RS-485 connection:
   a. Remove the controller housing cover to gain access to connector TB2.. See Figure 12-2.
   b. Use #12- 24 AWG twisted-pair shielded cable; Belden cable #9841 or equivalent is recommended. Connect the Modbus® input and output to terminal strip TB2. See Figure 14-3. Connect A to negative (-), B to positive (+), and the shield to ground as shown in Figure 14-3.
   c. Tighten the connections to 0.5 Nm (4.4 in. lb.).
   d. Replace the controller housing cover.
3. Close and lock the transfer switch enclosure door before reconnecting the power.

Note: Install communication conductors in raceways, cables, or conduit separate from AC power conductors.



1. RS-485 terminal block TB2
2. Ethernet connection

Figure 14-2 RS-485 Terminal Block Location



Note: Belden cable #9841 or equivalent is recommended.

Figure 14-3 RS-485 Connections

14.3 Communications Setup

Use the controller display and keypad or a personal computer with Kohler® SiteTech™ software connected to the USB port to set the communication parameters for serial or ethernet connections. The controller uses Modbus® communication protocol.

14.3.1 Modbus RTU Serial Communication Setup

Set the following communication parameters for serial communication. Also see Figure 14-4 for a summary of these settings.

Note: Modbus® applications require a Modbus® software driver written by a trained and qualified systems programmer.

Modbus Enabled. Set to True to allow Modbus® communication.

Modbus Baud Rate. Required for serial connections. The baud rate must match the baud rate of the connected PC.

Modbus Slave Addr. Assign a unique address between 001 and 247 to the serial port.

14.3.2 Modbus TCP Communication Setup

Work with your local network administrator to set the following communication parameters for Ethernet communication.

See Figure 14-4 for a summary of the following settings.

DHCP Enabled. Factory set to False. Setting this parameter to True enables dynamic host configuration protocol (DHCP), which allows a DHCP server to automatically assign a dynamic IP address, subnet mask, and default gateway to the MPAC controller. Work with your local network administrator to determine whether DHCP is required.

Static IP Address. The transfer switch may have a default IP address assigned at the factory. **Change the IP address to a static IP address owned by the user.** Obtain an IP address, subnet mask, and default gateway information from the local network administrator.

Static Subnet Mask. Obtain subnet mask information from the local network administrator. All devices that communicate with each other on the same local network must use the same subnet mask.

Static Default Gateway. Obtain gateway information from the local network administrator.

DHCP Server. Displayed for information only. Provide this value to the network administrator if there are problems with DHCP.

Modbus TCP Unit ID. The unit ID is required for Modbus over TCP communication. The unit ID for TCP communication is analogous to the Modbus address for serial communication through the RS-485 ports. The factory default setting is 2.

Modbus TCP Server Enabled. Enable (set to True) to enable TCP if the transfer switch is connected to a network for TCP/IP communication (for example, ethernet communication).

MAC address. The MAC hardware address is factory-set. It can be seen in the View>Communications Setup menus but not viewed or changed in the setup menus.

14.3.3 Setup Using the Controller Keypad

On Decision-Maker® 1200 or 1500 controllers, you can use the Set Communications menu or Kohler SiteTech software to set the communication parameters for serial connections. See the controller operation manual for detailed instructions.

The Modbus port on the controller circuit board is Port 0.

For MPAC 750 controllers, use SiteTech as described in the following section.

14.3.4 Setup Using SiteTech

Use a USB cable, male USB A to male USB mini-B, to connect the MPAC controller to a personal computer. Then use Kohler SiteTech software to set the communication parameters for serial or Ethernet connections. See the SiteTech Software Operation Manual for instructions.

SiteTech software is available only to Kohler authorized distributor and dealers.

Some parameter names in SiteTech are slightly different than what is shown on the controller display. Figure 14-4 shows both names.

Setting as shown in SiteTech and on the controller display	Range	Default	Notes
SiteTech: Modbus Enabled Controller: Modbus Server Port 0	True or False Enabled or Disabled	True Enabled	Enable for network communication through the ethernet port.
SiteTech: Modbus Baud Rate Controller: Baud Rate	9600, 19200, 57600	19200	Baud rate in bits per second for serial communication between the controller and a personal computer's COM port.
SiteTech: Modbus Slave Address Controller: Modbus Address	001-247	0	Address for the RS-485 serial port (on the logic board).
SiteTech: Modbus Parity Controller: (not shown on controller)	Read only	None	Not adjustable.
SiteTech: Modbus Stop Bits Controller: (not shown on controller)	Read only	1	Not adjustable.
SiteTech: DHCP Enabled Controller: DHCP Status	True or False Enabled or Disabled	False Disabled	Dynamic host communication protocol. Enable if required; check with your local network administrator.
SiteTech: Static IP Address Controller: IP Address	See notes.	*	Obtain from your local network administrator. Every device on the network must have a unique IP address.
SiteTech: Static Subnet Mask Controller: Subnet Mask	See notes.	*	Obtain from your local network administrator. All devices that communicate with each other on the same local network must use the same subnet mask.
SiteTech: Static Default Gateway Controller: Default Gateway	See notes.	*	Obtain from your local network administrator.
SiteTech: DHCP Server Controller: (not shown on controller)	Read only	—	Displayed in SiteTech for information only.
SiteTech: Modbus TCP Unit ID Controller: Modbus TCP Unit ID	001-247	002	The unit ID is required for Modbus over TCP communication.
SiteTech: Modbus TCP Server Enabled Controller: Modbus Server TCP	True or False Enabled or Disabled	True Enabled	Enable (set to True) to enable TCP/IP communication (for example, Ethernet communication).
SiteTech: MAC Address Controller: MAC Address (view menu only)	Not Adjustable	Factory-set	Hardware address, entered at the factory. Not adjustable.
* Do not use the factory settings for IP address, subnet mask, or default gateway. Obtain these settings from your local network administrator.			

Figure 14-4 Communication Parameters

14.4 Modbus Registers

Refer to Section 1.3 for definitions of terms and symbols used in the register tables.

Time delays, setpoints, inputs and outputs, and other user-defined parameters are programmed from the controller keypad (1200 and 1500 controllers) or using Kohler SiteTech software. Refer to the SiteTech Software Operation Manual for instructions. See the List of Related Materials for document part numbers.

Note: Kohler often uses extended Modbus registers which exceed 9,999. To illustrate the extended format, Kohler has added an extra digit to its register map to support registers above 9,999. For example: Holding register 9999 may be illustrated as 49999 in the traditional format or as 409999 in the extended format where the most significant digit still represents what type of Modbus register it is. Some software tools may have difficulty reading registers above 9,999.

14.4.1 Guide to the Register Map

Description	Registers
Monitoring	400001 - 400019
Setup *	400039-400058
Time delays	4000059-400077
Trip point settings	400078-400104
Outputs (event code)	400108-400113
I/O Module events	400114-400151
Expansion board type	400154-400161
I/O status	400194-400255
Remote I/O descriptions	400260-400349
Preferred source selection	400699-400700
Accessory setup	400740-400741
Accessory status	400742
DIP switch positions	400743
Time-based load control setup	400750-400787
Common alarms	400800-400863
Exerciser	400905-400993
Last outage	401010-401012
ATS information	401110-401149
Password-protected factory settings	401150-401167
Firmware information	401200-401206
Communication network information	401210-401223
UART0 configuration	401230-401234
Time/date	401250-401254
Controller history	401295-401352
Event history	402150-402854
Calibration	403400-403429
Current-based load control	403800-403895
Prime power mode	403920-403926
Min/max logging	403940-403946
Device ID	409999

14.4.2 Password-Protected Parameters

Note: Password-protected parameters are factory-set and should not require changes unless the transfer switch controller is replaced.

If the transfer switch controller needs replacement, some password-protected settings may need to be changed after the new controller assembly is installed. Setup registers, serial numbers, and calibration registers require the distributor-level password, which is not the same as the setup or test passwords for the transfer switch. Distributors must contact the Kohler Power Systems Service Department to obtain the distributor-level password.

Send the data register and the password in the same request. For example, send register 43400 and 43401 together to change the calibration of the L1-L2 (normal source) voltage.

14.4.3 Modbus Registers

Register	Data Description	Access	Data Type	Range/Units
400001	System Overview(Bitmap)	RO	WORD	
	Bits 0-1:Contactor Position (Enum)			0: Off 1: Source1 2: Source2 3: Source1Source2
	Bit 2:Preferred Source			0: Source1 1: Source2
	Bits 3-12:Active Event Code			See Figure 14-5 for event codes.
	Bit 13:Preferred Source Available			0: False 1: True
	Bit 14:Standby Source Available			0: False 1: True
	Bit 15: Reserved			Return 0
Source Metering				
400002	SourceA Line-Neutral L1-L0	RO	WORD	Volts AC * 10
400003	SourceA Line-Neutral L2-L0	RO	WORD	Volts AC * 10
400004	SourceA Line-Neutral L3-L0	RO	WORD	Volts AC * 10
400005	SourceB Line-Neutral L1-L0	RO	WORD	Volts AC * 10
400006	SourceB Line-Neutral L2-L0	RO	WORD	Volts AC * 10
400007	SourceB Line-Neutral L3-L0	RO	WORD	Volts AC * 10
400008	SourceA Line Voltage L1-L2	RO	WORD	Volts AC * 10
400009	SourceA Line Voltage L2-L3	RO	WORD	Volts AC * 10
400010	SourceA Line Voltage L3-L1	RO	WORD	Volts AC * 10
400011	SourceB Line Voltage L1-L2	RO	WORD	Volts AC * 10
400012	SourceB Line Voltage L2-L3	RO	WORD	Volts AC * 10
400013	SourceB Line Voltage L3-L1	RO	WORD	Volts AC * 10
400014	SourceA Frequency	RO	WORD	Hz * 10
400015	SourceB Frequency	RO	WORD	Hz * 10
400016	Current L1	RO	WORD	Amps * 10
400017	Current L2	RO	WORD	Amps * 10
400018	Current L3	RO	WORD	Amps * 10
400019	Closed Transition In Phase Degree Delta	RO	WORD	Degrees
400020- 400038	Reserved for future use	—	—	
400039	Closed-Programmed Transition Override Mode	RW	WORD	0 = Auto Override 1 = Non-Automatic
400040	Password for writing register 40039	WO	WORD	0-32768
400041	Synchronous Voltage Phase Angle	RW	WORD	0-10 degrees
400042	Synchronous Voltage Differential	RW	WORD	0%-5%
400043	Synchronous Frequency Differential	RW	WORD	0-3 (Hz * 10)
400044	Service Entrance Type (Enum)	RW	WORD	0: None 1: Insulated Case Circuit Breaker 2: Molded Case Circuit Breaker 3: Contactor
400045	Source Configuration Phase Rotation Actual	RO	WORD	
	Bits 0-1:Source 2 Phase Rotation (Enum)			0: Disabled 1: ABC 2: CBA
	Bits 8-9:Source 1 Phase Rotation (Enum)			0: Disabled 1: ABC 2: CBA
400046	Phase Rotation Expected (Enum)	RW	WORD	0: Disabled 1: ABC 2: CBA
400047	Nominal Normal Voltage	RW	WORD	Volts AC * 10
400048	Nominal Emergency Voltage	RW	WORD	Volts AC * 10
400049	Nominal Normal Frequency	RW	WORD	Hz * 10
400050	Nominal Emergency Frequency	RW	WORD	Hz * 10
400051	Normal Number of Phases	RW	WORD	1 or 3
400052	Emergency Number of Phases	RW	WORD	1 or 3
400053	Rated Amperage	RW	WORD	0-4000

Register	Data Description	Access	Data Type	Range/Units
400054	Reserved for future use	—	—	
400055	Proprietary	—	—	
400056	Proprietary	—	—	
400057	Transition/Operation Modes	RW	WORD	Bits 0-1: Transition Mode (Enum): 0: Open 1: Programmed 2: Closed 3: Reserved Bits 2-3: Operation Mode (Enum): 0: Genset to Genset 1: Genset To Utility 2: Utility to Genset-Genset 3: Utility to Utility Bit 4: Supervised Transfer Switch Position: 0: Auto 1: Manual
400058	Password for writing register 40057	WO	WORD	0 - 32768
Time Delays				
400059	Normal Engine Start Time Delay	RW	WORD	0-10 sec
400060	Emergency Engine Start Time Delay	RW	WORD	0-10 sec
400061	Normal Ext. Engine Start Time Delay	RW	WORD	0-3600 sec
400062	Emergency Ext. Engine Start Time Delay	RW	WORD	0-3600 sec
400063	Normal Engine Cooldown	RW	WORD	0-3600 sec
400064	Emergency Engine Cooldown	RW	WORD	0-3600 sec
400065	Standby to Preferred	RW	WORD	0-3600 sec
400066	Preferred to Standby	RW	WORD	0-3600 sec
400067	Off (Preferred to Standby - Prog. Transition)	RW	WORD	0-3600 sec
400068	Off (Standby to Preferred - Prog. Transition)	RW	WORD	0-3600 sec
400069	Fail to Acquire Preferred	RW	WORD	1-3600 sec (1-300 sec for closed transition)
400070	Fail to Acquire Standby	RW	WORD	1-3600 sec (1-300 sec for closed transition)
400071	Fail to Synchronize	RW	WORD	1-3600 sec
400072	Fail to Synch. Enable	RW	WORD	0 = disabled; 1 = enabled
400073-400074	Reserved			
Active Time Delay				
400075	Time Delay Number	RO	WORD	
400076	Time Remaining	RO	WORD	Seconds * 10
400077	Time Delay Preset	RO	WORD	Seconds * 10
Setpoints				
Voltage Setpoints				
400078	Normal Over Voltage Dropout	RW	WORD	106%-135% of Nominal
400079	Normal Over Voltage Pickup	RW	WORD	95%-100% of Nominal
400080	Normal Under Voltage Pickup	RW	WORD	85%-100% of Nominal
400081	Normal Under Voltage Dropout	RW	WORD	75%-98% of Pickup
400082	Normal Unbalance Enabled	RW	WORD	0 = disabled; 1 = enabled
400083	Normal Unbalance Voltage Dropout	RW	WORD	5%-20%
400084	Normal Unbalance Voltage Pickup	RW	WORD	3%-18%
400085	Normal Voltage Debounce Time	RW	WORD	0.1 - 9.9 sec * 10
400086	Emergency Over Voltage Dropout	RW	WORD	106%-135% of Nominal
400087	Emergency Over Voltage Pickup	RW	WORD	95%-100% of Nominal
400088	Emergency Under Voltage Pickup	RW	WORD	85%-100% of Nominal
400089	Emergency Under Voltage Dropout	RW	WORD	75%-98% of Pickup
400090	Emergency Unbalance Enabled	RW	WORD	0 = disabled; 1 = enabled
400091	Emergency Unbalance Voltage Dropout	RW	WORD	5%-20%
400092	Emergency Unbalance Voltage Pickup	RW	WORD	3%-18%
400093	Emergency Voltage Debounce Time	RW	WORD	0.1 - 9.9 sec * 10

Register	Data Description	Access	Data Type	Range/Units
Frequency Setpoints				
400094	Normal Over Freq Dropout	RW	WORD	101%-105% of Pickup
400095	Normal Over Freq Pickup	RW	WORD	105%-120% of Nominal
400096	Normal Under Freq Dropout	RW	WORD	95%-99% of Pickup
400097	Normal Under Freq Pickup	RW	WORD	80%-95% of Nominal
400098	Normal Freq Debounce Time	RW	WORD	0.1 - 15.0 sec * 10
400099	Emergency Over Freq Dropout	RW	WORD	101%-105% of Pickup
400100	Emergency Over Freq Pickup	RW	WORD	105%-120% of Nominal
400101	Emergency Under Freq Dropout	RW	WORD	95%-99% of Pickup
400102	Emergency Under Freq Pickup	RW	WORD	80%-95% of Nominal
400103	Emergency Freq Debounce Time	RW	WORD	0.1 - 15.0 sec * 10
400104-400107	Reserved			
Main Logic Board I/O Output Event Message Codes				See Figure 11-9 for event codes
400108	MLB Programmable Output #1	RW	WORD	Output Event Message Code
400109	MLB Programmable Output #2	RW	WORD	Output Event Message Code
400110	Reserved			
Input Event Message Codes				See Figure 11-9 for event codes.
400111	MLB Programmable Input #1	RW	WORD	Input Event Message Code
400112	MLB Programmable Input #2	RW	WORD	Input Event Message Code
400113	Reserved			
Expansion Board I/O Configuration				**Not applicable to the MPAC 750 controller.**
Outputs				
Expansion Board Address 1				**Not applicable to the MPAC 750 controller.**
400114	Output #1	RW	WORD	Output Event Message Code. See Figure 11-9 for event codes.
400115	Output #2	RW	WORD	
400116	Output #3	RW	WORD	
400117	Output #4	RW	WORD	
400118	Output #5	RW	WORD	
400119	Output #6	RW	WORD	
Expansion Board Address 2				**Not applicable to the MPAC 750 controller.**
400120	Output #1	RW	WORD	Output Event Message Code See Figure 11-9 for event codes.
400121	Output #2	RW	WORD	
400122	Output #3	RW	WORD	
400123	Output #4	RW	WORD	
400124	Output #5	RW	WORD	
400125	Output #6	RW	WORD	
Expansion Board Address 3				**Not applicable to the MPAC 750 controller.**
400126	Output #1	RW	WORD	Output Event Message Code See Figure 11-9 for event codes.
400127	Output #2	RW	WORD	
400128	Output #3	RW	WORD	
400129	Output #4	RW	WORD	
400130	Output #5	RW	WORD	
400131	Output #6	RW	WORD	
Expansion Board Address 4				**Not applicable to the MPAC 750 controller.**
400132	Output #1	RW	WORD	Output Event Message Code See Figure 11-9 for event codes.
400133	Output #2	RW	WORD	
400134	Output #3	RW	WORD	
400135	Output #4	RW	WORD	
400136	Output #5	RW	WORD	
400137	Output #6	RW	WORD	
400138-400143	Reserved			

Register	Data Description	Access	Data Type	Range/Units
Inputs				**Not applicable to the MPAC 750 controller.**
400144	Expansion Board Address 1 Input #1	RW	WORD	Input Event Message Code See Figure 11-9 for Input Event Message Code (Same as Main Logic Board Inputs)
400145	Expansion Board Address 1 Input #2	RW	WORD	
400146	Expansion Board Address 2 Input #1	RW	WORD	
400147	Expansion Board Address 2 Input #2	RW	WORD	
400148	Expansion Board Address 3 Input #1	RW	WORD	
400149	Expansion Board Address 3 Input #2	RW	WORD	
400150	Expansion Board Address 4 Input #1	RW	WORD	
400151	Expansion Board Address 4 Input #2	RW	WORD	
400152-400153	Reserved			
400154	Expansion Board Address 1 Board Type	RO	WORD	0 = No Board Installed 1 = Standard 2 = Power
400155	Expansion Board Address 2 Board Type	RO	WORD	
400156	Expansion Board Address 3 Board Type	RO	WORD	
400157	Expansion Board Address 4 Board Type	RO	WORD	
400158-400159	Reserved			
400160	Alarm Option Board	RO	WORD	0 = No Board Installed 1 = Norma 2 = Chicago 3 = Silence
400161	Battery Option Board Installed	RO	WORD	0 = No Board Installed 1 = Installed
400162-400193	Reserved			
Main Logic and Expansion Board User I/O Status				
400194	MLB Output State	RO	WORD	One bit per output
400195	MLB Input State	RO	WORD	One bit per input
400196	Expansion Board #1 Outputs State	RO	WORD	One bit per output
400197	Expansion Board #2 Outputs State	RO	WORD	One bit per output
400198	Expansion Board #3 Outputs State	RO	WORD	One bit per output
400199	Expansion Board #4 Outputs State	RO	WORD	One bit per output
400200	Expansion Board #1 Inputs State	RO	WORD	One bit per input
400201	Expansion Board #2 Inputs State	RO	WORD	One bit per input
400202	Expansion Board #3 Inputs State	RO	WORD	One bit per input
400203	Expansion Board #4 Inputs State	RO	WORD	One bit per input
400204-400209	Reserved			

Register	Data Description	Access	Data Type	Range/Units
MLB Hardware Output State (Bitmap)		RO	WORD	One bit per output
400210	0			Source 2 Engine Start Control
	1			Programmable Output 1
	2			Programmable Output 2
	3			Relay K1 Control
	4			Relay K2 Control
	5			Relay K3 Control
	6			Relay K4 Control
	7			Source 1 Available Indicator: 0:On 1:Off
	8			Contactor In Source 1 Position Indicator: 0:On 1:Off
	9			Source 2 Available Indicator: 0:On 1:Off
	10			Contactor In Source 2 Position Indicator: 0:On 1:Off
	11			Not in Auto Indicator 0:On 1:Off
	12			Warning Indicator 0:On 1:Off
	13			(Not Used) Diagnostic 1 Indicator: 0:On 1:Off
	14			(Not Used) Diagnostic 2 Indicator: 0:On 1:Off
	15			Voltage High Gain Select Control
400211	16			Not Used (USB Reset)
	17			Not Used (Phy Reset)
	18			Not Used (Battery Backup Check)
	19			Not Used (Battery Backup Control)
	20-31			Not Used
400212-400219	Reserved			
Active Events (Bitmap)		RO	WORD	One bit per event
400220	Events 0-15 Active			
400221	Events 16-31 Active			
400222	Events 32-47 Active			
400223	Events 48-63 Active			
400224	Events 64-79 Active			
400225	Events 80-95 Active			
400226	Events 96-111 Active			
400227	Events 112-127 Active			
400228	Events 128-143 Active			
400229	Events 144-159 Active			
400230	Events 160-175 Active			
400231	Events 176-191 Active			
400232	Events 192-207 Active			
400233	Events 208-223 Active			
400234	Events 224-239 Active			
400235	Events 240-255 Active			
400236-400249	Reserved			

Register	Data Description	Access	Data Type	Range/Units
Remote I/O Status				
400250	Software Controlled Outputs State	RW	WORD	One bit per output
400251	Software Controlled Outputs Assigned	RO	WORD	One bit per output
400252	Remote Monitoring Input State	RO	WORD	One bit per input
400253	Remote Monitoring Input Assigned	RO	WORD	One bit per input
400254 - 400259	Reserved			
Remote I/O Configuration				
Software Controlled Output Descriptions				
400260	SCO #1 Description	RW	WORD*10	20 ASCII characters
400270	SCO #2 Description	RW	WORD*10	20 ASCII characters
400280	SCO #3 Description	RW	WORD*10	20 ASCII characters
400290	SCO #4 Description	RW	WORD*10	20 ASCII characters
400300 - 400309	Reserved			
Remote Monitored Input Descriptions				
400310	Remote Monitored Input #1 Description	RW	WORD*10	20 ASCII characters
400320	Remote Monitored Input #2 Description	RW	WORD*10	20 ASCII characters
400330	Remote Monitored Input #3 Description	RW	WORD*10	20 ASCII characters
400340	Remote Monitored Input #4 Description	RW	WORD*10	20 ASCII characters
400350 - 400698	Reserved			
400699	Preferred Source Selection (Enum)	RW	WORD	0: Source2 1: Source1
400700	Factory Password	WO	WORD	0 - 32768
400701 - 400739	Reserved			
Accessory Setup (Bitmap)		RW	WORD	
400740	Bits 0-8: Configured Accessories (Bitmap)			
	0			Extended Engine Start
	1			Unused
	2			In-phase Monitor
	3			Remote Test Loading 0=Loaded 1=Unloaded
	4			Transfer Commit
	5			Peak-Shave Retransfer Delay Bypass
	6			Three-Source Engine Start Mode 0: Preferred First 1 :Both Simultaneously
	7			Three-Source Preferred Source Toggle
	8			Unused
	Bits 9-15: In-Phase Transition Angle			Degrees
400741	Reserved			
400742	Accessory Status (Bitmap)	RO	WORD	
	0			Exercise In Progress
	1			In Phase Monitor Active
	2			Load Control In Progress
	3			Peak Shave In Progress
	4			Loaded Test Occurring
	5			Unloaded Test Occurring
	6			Auto-Loaded Test Occurring
	7			Synchronous Check Occurring
	8			User Forcing To Off
400743	DIP Switch Position (Bitmap)	RO	WORD	
	0			Maintenance Mode
	1			Password Disabled
	2			Spare 3 On
	3			Spare 4 On
400744 - 400749	Reserved			

Register	Data Description	Access	Data Type	Range/Units
Time-Based Load Control Configuration				
400750	Load Shed: Source N Disconnect Time #1	RW	WORD	0-3600 Sec
400751	Load Shed: Source N Disconnect Time #2	RW	WORD	0-3600 Sec
400752	Load Shed: Source N Disconnect Time #3	RW	WORD	0-3600 Sec
400753	Load Shed: Source N Disconnect Time #4	RW	WORD	0-3600 Sec
400754	Load Shed: Source N Disconnect Time #5	RW	WORD	0-3600 Sec
400755	Load Shed: Source N Disconnect Time #6	RW	WORD	0-3600 Sec
400756	Load Shed: Source N Disconnect Time #7	RW	WORD	0-3600 Sec
400757	Load Shed: Source N Disconnect Time #8	RW	WORD	0-3600 Sec
400758	Load Shed: Source N Disconnect Time #9	RW	WORD	0-3600 Sec
400759	Load Shed: Source E Reconnect Time #1	RW	WORD	0-3600 Sec
400760	Load Shed: Source E Reconnect Time #2	RW	WORD	0-3600 Sec
400761	Load Shed: Source E Reconnect Time #3	RW	WORD	0-3600 Sec
400762	Load Shed: Source E Reconnect Time #4	RW	WORD	0-3600 Sec
400763	Load Shed: Source E Reconnect Time #5	RW	WORD	0-3600 Sec
400764	Load Shed: Source E Reconnect Time #6	RW	WORD	0-3600 Sec
400765	Load Shed: Source E Reconnect Time #7	RW	WORD	0-3600 Sec
400766	Load Shed: Source E Reconnect Time #8	RW	WORD	0-3600 Sec
400767	Load Shed: Source E Reconnect Time #9	RW	WORD	0-3600 Sec
400768	Load Shed: Source E Disconnect Time #1	RW	WORD	0-3600 Sec
400769	Load Shed: Source E Disconnect Time #2	RW	WORD	0-3600 Sec
400770	Load Shed: Source E Disconnect Time #3	RW	WORD	0-3600 Sec
400771	Load Shed: Source E Disconnect Time #4	RW	WORD	0-3600 Sec
400772	Load Shed: Source E Disconnect Time #5	RW	WORD	0-3600 Sec
400773	Load Shed: Source E Disconnect Time #6	RW	WORD	0-3600 Sec
400774	Load Shed: Source E Disconnect Time #7	RW	WORD	0-3600 Sec
400775	Load Shed: Source E Disconnect Time #8	RW	WORD	0-3600 Sec
400776	Load Shed: Source E Disconnect Time #9	RW	WORD	0-3600 Sec
400777	Load Shed: Source N Reconnect Time #1	RW	WORD	0-3600 Sec
400778	Load Shed: Source N Reconnect Time #2	RW	WORD	0-3600 Sec
400779	Load Shed: Source N Reconnect Time #3	RW	WORD	0-3600 Sec
400780	Load Shed: Source N Reconnect Time #4	RW	WORD	0-3600 Sec
400781	Load Shed: Source N Reconnect Time #5	RW	WORD	0-3600 Sec

Register	Data Description	Access	Data Type	Range/Units
400782	Load Shed: Source N Reconnect Time #6	RW	WORD	0-3600 Sec
400783	Load Shed: Source N Reconnect Time #7	RW	WORD	0-3600 Sec
400784	Load Shed: Source N Reconnect Time #8	RW	WORD	0-3600 Sec
400785	Load Shed: Source N Reconnect Time #9	RW	WORD	0-3600 Sec
400786	Load Shed: Source N Number of Loads to Add	RW	WORD	1-9
400787	Load Shed: Source E Number of Loads to Add	RW	WORD	1-9
400788 - 400799	Reserved			
Common Alarms				
400800	Common Alarm Event #1(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	Bit 13			Audible Alarm
	Bit 14			Assigned to Common Alarm 2
	Bit 15			Assigned to Common Alarm 1
400801	Common Alarm Event #2(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	Bit 13			Audible Alarm
	Bit 14			Assigned to Common Alarm 2
	Bit 15			Assigned to Common Alarm 1
400802	Common Alarm Event #3(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400803	Common Alarm Event #4(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400804	Common Alarm Event #5(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400805	Common Alarm Event #6(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400806	Common Alarm Event #7(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400807	Common Alarm Event #8(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400808	Common Alarm Event #9(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1

Register	Data Description	Access	Data Type	Range/Units
400809	Common Alarm Event #10(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400810	Common Alarm Event #11(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400811	Common Alarm Event #12(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400812	Common Alarm Event #13(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400813	Common Alarm Event #14(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400814	Common Alarm Event #15(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400815	Common Alarm Event #16(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400816	Common Alarm Event #17(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400817	Common Alarm Event #18(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400818	Common Alarm Event #19(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400819	Common Alarm Event #20(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1

Register	Data Description	Access	Data Type	Range/Units
400820	Common Alarm Event #21(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400821	Common Alarm Event #22(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400822	Common Alarm Event #23(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400823	Common Alarm Event #24(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400824	Common Alarm Event #25(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400825	Common Alarm Event #26(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400826	Common Alarm Event #27(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400827	Common Alarm Event #28(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400828	Common Alarm Event #29(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400829	Common Alarm Event #30(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400830	Common Alarm Event #31(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1

Register	Data Description	Access	Data Type	Range/Units
400831	Common Alarm Event #32(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400832	Common Alarm Event #33(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400833	Common Alarm Event #34(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400834	Common Alarm Event #35(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400835	Common Alarm Event #36(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400836	Common Alarm Event #37(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400837	Common Alarm Event #38(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400838	Common Alarm Event #39(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400839	Common Alarm Event #40(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400840	Common Alarm Event #41(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400841	Common Alarm Event #42(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1

Register	Data Description	Access	Data Type	Range/Units
400842	Common Alarm Event #43(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400843	Common Alarm Event #44(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400844	Common Alarm Event #45(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400845	Common Alarm Event #46(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400846	Common Alarm Event #47(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400847	Common Alarm Event #48(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400848	Common Alarm Event #49(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400849	Common Alarm Event #50(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400850	Common Alarm Event #51(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400851	Common Alarm Event #52(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400852	Common Alarm Event #53(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1

Register	Data Description	Access	Data Type	Range/Units
400853	Common Alarm Event #54(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400854	Common Alarm Event #55(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400855	Common Alarm Event #56(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400856	Common Alarm Event #57(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400857	Common Alarm Event #58(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400858	Common Alarm Event #59(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400859	Common Alarm Event #60(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400860	Common Alarm Event #61(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400861	Common Alarm Event #62(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400862	Common Alarm Event #63(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400863	Common Alarm Event #64(Bitmap)	RW	WORD	
	Bits 0-12: Event Message Code			See Figure 14-5 for Event Message Codes.
	13			Audible Alarm
	14			Assigned to Common Alarm 2
	15			Assigned to Common Alarm 1
400864-400903	Reserved			

Register	Data Description	Access	Data Type	Range/Units
Exerciser Calendar				
400905	Next Exerciser Event	RW	WORD	
400905	Exerciser Summary (Bitmap)	RW	WORD	
	0			Enabled
	1			Loaded
	Bits 2-3 Interval (Enum)			
	0			Day of Month Occurrence
	1			Day
	2			Week
	3			Month
	Bits 4-7			Repeat Rate (1-12)
	8	RO		Running
	9	RO		Source (0 = Source1; 1 = Source 2)
400906	Start Time	RW	WORD	Minutes since midnight
400907	Start Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
400908	Run Time	RW	WORD	1-5999 Minutes
400909	Reserved			
Exerciser Event #1		RW	WORD	
400910	Exerciser Summary (Bitmap)		WORD	
	0			Enabled
	1			Loaded
	Bits 2-3 Interval (Enum)			
	0			Day of Month Occurrence
	1			Day
	2			Week
	3			Month
	Bits 4-7			Repeat Rate (1-12)
	8	RO		Running
	9	RO		Source (0 = Source1; 1 = Source 2)
400911	Start Time	RW	WORD	Minutes since midnight
400912	Start Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
400913	Run Time	RW	WORD	1-5999 Minutes
Exerciser Event #2		RW	WORD	
400914	Exerciser Summary (Bitmap)		WORD	
	0			Enabled
	1			Loaded
	Bits 2-3 Interval (Enum)			
	0			Day of Month Occurrence
	1			Day
	2			Week
	3			Month
	Bits 4-7			Repeat Rate (1-12)
	8	RO		Running
	9	RO		Source (0 = Source1; 1 = Source 2)
400915	Start Time	RW	WORD	Minutes since midnight
400916	Start Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
400917	Run Time	RW	WORD	1-5999 Minutes

Register	Data Description	Access	Data Type	Range/Units
Exerciser Event #3		RW	WORD	
400918	Exerciser Summary (Bitmap)		WORD	
	0			Enabled
	1			Loaded
	Bits 2-3 Interval (Enum)			
	0			Day of Month Occurrence
	1			Day
	2			Week
	3			Month
	Bits 4-7			Repeat Rate (1-12)
	8	RO		Running
	9	RO		Source (0 = Source1; 1 = Source 2)
400919	Start Time	RW	WORD	Minutes since midnight
400920	Start Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
400921	Run Time	RW	WORD	1-5999 Minutes
Exerciser Event #4		RW	WORD	
400922	Exerciser Summary (Bitmap)		WORD	
	0			Enabled
	1			Loaded
	Bits 2-3 Interval (Enum)			
	0			Day of Month Occurrence
	1			Day
	2			Week
	3			Month
	Bits 4-7			Repeat Rate (1-12)
	8	RO		Running
	9	RO		Source (0 = Source1; 1 = Source 2)
400923	Start Time	RW	WORD	Minutes since midnight
400924	Start Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
400925	Run Time	RW	WORD	1-5999 Minutes
Exerciser Event #5		RW	WORD	
400926	Exerciser Summary (Bitmap)		WORD	
	0			Enabled
	1			Loaded
	Bits 2-3 Interval (Enum)			
	0			Day of Month Occurrence
	1			Day
	2			Week
	3			Month
	Bits 4-7			Repeat Rate (1-12)
	8	RO		Running
	9	RO		Source (0 = Source1; 1 = Source 2)
400927	Start Time	RW	WORD	Minutes since midnight
400928	Start Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
400929	Run Time	RW	WORD	1-5999 Minutes

Register	Data Description	Access	Data Type	Range/Units
Exerciser Event #6		RW	WORD	
400930	Exerciser Summary (Bitmap)		WORD	
	0			Enabled
	1			Loaded
	Bits 2-3 Interval (Enum)			
	0			Day of Month Occurrence
	1			Day
	2			Week
	3			Month
	Bits 4-7			Repeat Rate (1-12)
	8	RO		Running
	9	RO		Source (0 = Source1; 1 = Source 2)
400931	Start Time	RW	WORD	Minutes since midnight
400932	Start Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
400933	Run Time	RW	WORD	1-5999 Minutes
Exerciser Event #7		RW	WORD	
400934	Exerciser Summary (Bitmap)		WORD	
	0			Enabled
	1			Loaded
	Bits 2-3 Interval (Enum)			
	0			Day of Month Occurrence
	1			Day
	2			Week
	3			Month
	Bits 4-7			Repeat Rate (1-12)
	8	RO		Running
	9	RO		Source (0 = Source1; 1 = Source 2)
400935	Start Time	RW	WORD	Minutes since midnight
400936	Start Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
400937	Run Time	RW	WORD	1-5999 Minutes
Exerciser Event #8		RW	WORD	
400938	Exerciser Summary (Bitmap)		WORD	
	0			Enabled
	1			Loaded
	Bits 2-3 Interval (Enum)			
	0			Day of Month Occurrence
	1			Day
	2			Week
	3			Month
	Bits 4-7			Repeat Rate (1-12)
	8	RO		Running
	9	RO		Source (0 = Source1; 1 = Source 2)
400939	Start Time	RW	WORD	Minutes since midnight
400940	Start Date (Bitmap)	RW	WORD[0:15]	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
400941	Run Time	RW	WORD	1-5999 Minutes

Register	Data Description	Access	Data Type	Range/Units
Exerciser Event #9		RW	WORD	
400942	Exerciser Summary (Bitmap)		WORD	
	0			Enabled
	1			Loaded
	Bits 2-3 Interval (Enum)			
	0			Day of Month Occurrence
	1			Day
	2			Week
	3			Month
	Bits 4-7			Repeat Rate (1-12)
	8	RO		Running
	9	RO		Source (0 = Source1; 1 = Source 2)
400943	Start Time	RW	WORD	Minutes since midnight
400944	Start Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
400945	Run Time	RW	WORD	1-5999 Minutes
Exerciser Event #10		RW	WORD	
400946	Exerciser Summary (Bitmap)		WORD	
	0			Enabled
	1			Loaded
	Bits 2-3 Interval (Enum)			
	0			Day of Month Occurrence
	1			Day
	2			Week
	3			Month
	Bits 4-7			Repeat Rate (1-12)
	8	RO		Running
	9	RO		Source (0 = Source1; 1 = Source 2)
400947	Start Time	RW	WORD	Minutes since midnight
400948	Start Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
400949	Run Time	RW	WORD	1-5999 Minutes
Exerciser Event #11		RW	WORD	
400950	Exerciser Summary (Bitmap)		WORD	
	0			Enabled
	1			Loaded
	Bits 2-3 Interval (Enum)			
	0			Day of Month Occurrence
	1			Day
	2			Week
	3			Month
	Bits 4-7			Repeat Rate (1-12)
	8	RO		Running
	9	RO		Source (0 = Source1; 1 = Source 2)
400951	Start Time	RW	WORD	Minutes since midnight
400952	Start Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
400953	Run Time	RW	WORD	1-5999 Minutes

Register	Data Description	Access	Data Type	Range/Units
Exerciser Event #12		RW	WORD	
400954	Exerciser Summary (Bitmap)		WORD	
	0			Enabled
	1			Loaded
	Bits 2-3 Interval (Enum)			
	0			Day of Month Occurrence
	1			Day
	2			Week
	3			Month
	Bits 4-7			Repeat Rate (1-12)
	8	RO		Running
	9	RO		Source (0 = Source1; 1 = Source 2)
400955	Start Time	RW	WORD	Minutes since midnight
400956	Start Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
400957	Run Time	RW	WORD	1-5999 Minutes
Exerciser Event #13		RW	WORD	
400958	Exerciser Summary (Bitmap)		WORD	
	0			Enabled
	1			Loaded
	Bits 2-3 Interval (Enum)			
	0			Day of Month Occurrence
	1			Day
	2			Week
	3			Month
	Bits 4-7			Repeat Rate (1-12)
	8	RO		Running
	9	RO		Source (0 = Source1; 1 = Source 2)
400959	Start Time	RW	WORD	Minutes since midnight
400960	Start Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
400961	Run Time	RW	WORD	1-5999 Minutes
Exerciser Event #14		RW	WORD	
400962	Exerciser Summary (Bitmap)		WORD	
	0			Enabled
	1			Loaded
	Bits 2-3 Interval (Enum)			
	0			Day of Month Occurrence
	1			Day
	2			Week
	3			Month
	Bits 4-7			Repeat Rate (1-12)
	8	RO		Running
	9	RO		Source (0 = Source1; 1 = Source 2)
400963	Start Time	RW	WORD	Minutes since midnight
400964	Start Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
400965	Run Time	RW	WORD	1-5999 Minutes

Register	Data Description	Access	Data Type	Range/Units
Exerciser Event #15		RW	WORD	
400966	Exerciser Summary (Bitmap)		WORD	
	0			Enabled
	1			Loaded
	Bits 2-3 Interval (Enum)			
	0			Day of Month Occurrence
	1			Day
	2			Week
	3			Month
	Bits 4-7			Repeat Rate (1-12)
	8	RO		Running
	9	RO		Source (0 = Source1; 1 = Source 2)
400967	Start Time	RW	WORD	Minutes since midnight
400968	Start Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
400969	Run Time	RW	WORD	1-5999 Minutes
Exerciser Event #16		RW	WORD	
400970	Exerciser Summary (Bitmap)		WORD	
	0			Enabled
	1			Loaded
	Bits 2-3 Interval (Enum)			
	0			Day of Month Occurrence
	1			Day
	2			Week
	3			Month
	Bits 4-7			Repeat Rate (1-12)
	8	RO		Running
	9	RO		Source (0 = Source1; 1 = Source 2)
400971	Start Time	RW	WORD	Minutes since midnight
400972	Start Date (Bitmap)	RW	WORD[0: 15]	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
400973	Run Time	RW	WORD	1-5999 Minutes
Exerciser Event #17		RW	WORD	
400974	Exerciser Summary (Bitmap)		WORD	
	0			Enabled
	1			Loaded
	Bits 2-3 Interval (Enum)			
	0			Day of Month Occurrence
	1			Day
	2			Week
	3			Month
	Bits 4-7			Repeat Rate (1-12)
	8	RO		Running
	9	RO		Source (0 = Source1; 1 = Source 2)
400975	Start Time	RW	WORD	Minutes since midnight
400976	Start Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
400977	Run Time	RW	WORD	1-5999 Minutes

Register	Data Description	Access	Data Type	Range/Units
Exerciser Event #18		RW	WORD	
400978	Exerciser Summary (Bitmap)		WORD	
	0			Enabled
	1			Loaded
	Bits 2-3 Interval (Enum)			
	0			Day of Month Occurrence
	1			Day
	2			Week
	3			Month
	Bits 4-7			Repeat Rate (1-12)
	8	RO		Running
	9	RO		Source (0 = Source1; 1 = Source 2)
400979	Start Time	RW	WORD	Minutes since midnight
400980	Start Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
400981	Run Time	RW	WORD	1-5999 Minutes
Exerciser Event #19		RW	WORD	
400982	Exerciser Summary (Bitmap)		WORD	
	0			Enabled
	1			Loaded
	Bits 2-3 Interval (Enum)			
	0			Day of Month Occurrence
	1			Day
	2			Week
	3			Month
	Bits 4-7			Repeat Rate (1-12)
	8	RO		Running
	9	RO		Source (0 = Source1; 1 = Source 2)
400983	Start Time	RW	WORD	Minutes since midnight
400984	Start Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
400985	Run Time	RW	WORD	1-5999 Minutes
Exerciser Event #20		RW	WORD	
400986	Exerciser Summary (Bitmap)		WORD	
	0			Enabled
	1			Loaded
	Bits 2-3 Interval (Enum)			
	0			Day of Month Occurrence
	1			Day
	2			Week
	3			Month
	Bits 4-7			Repeat Rate (1-12)
	8	RO		Running
	9	RO		Source (0 = Source1; 1 = Source 2)
400987	Start Time	RW	WORD	Minutes since midnight
400988	Start Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
400989	Run Time	RW	WORD	1-5999 Minutes

Register	Data Description	Access	Data Type	Range/Units
Exerciser Event #21		RW	WORD	
400990	Exerciser Summary (Bitmap)		WORD	
	0			Enabled
	1			Loaded
	Bits 2-3 Interval (Enum)			
	0			Day of Month Occurrence
	1			Day
	2			Week
	3			Month
	Bits 4-7			Repeat Rate (1-12)
	8	RO		Running
	9	RO		Source (0 = Source1; 1 = Source 2)
400991	Start Time	RW	WORD	Minutes since midnight
400992	Start Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
400993	Run Time	RW	WORD	1-5999 Minutes
400994-401009	Reserved			
Last Utility Outage Information				
401010	Last Outage Time	RO	WORD	Minutes since midnight
401011	Last Outage Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
401012	Duration of Last Outage	RO	WORD * 2	Minutes
401014 - 401109	Reserved			
ATS Information				
401110	Designation	RW	WORD * 10	20 ASCII characters
401120	Load Description	RW	WORD * 10	20 ASCII characters
401130	Branch Description	RW	WORD * 10	20 ASCII characters
401140	Location	RW	WORD * 10	20 ASCII characters
401150	ATS Serial Number	RW	WORD * 5	10 ASCII characters
401155	Password for registers 41150-41154	WO	WORD	0 - 32768
401156	Controller Serial Number	RW	WORD * 5	10 ASCII characters
401161	Password for registers 41156-41160	WO	WORD	0 - 32768 (factory password)
401162	Contactor Serial Number	RW	WORD * 5	10 ASCII characters
401167	Password for registers 41162-41166	WO	WORD	0 - 32768
401168 - 401199	Reserved			
Firmware Information				
401200	MpacDm Code Version (Bitmap)	RO	WORD	
	Bits 0-7			Minor Version
	Bits 8-15			Major Version
401201	FPGA Code Version (Bitmap)	RO	WORD	
	Bits 0-7			Minor Version
	Bits 8-15			Major Version
401202	FirmwareVersionUpdate			
401202	FirmwareVersionUpdateFileSize	WO	WORD * 2	
401204	FirmwareVersionUpdateReady	WO	WORD	0 = No; 1 = Yes
401205	FirmwareVersionFlashUpdateStatus	RO	WORD	0% - 100%
401206	FirmwareVersionLoadStatus	RO	WORD	1 = None; 1 = In Progress; 2 = Success; 3 = Invalid Packet; 4 = InvalidFileCrc
401206 - 401209	Reserved			

Register	Data Description	Access	Data Type	Range/Units
Communication Network Information				
401210	Ethernet Configuration			
401210	MAC Address	RO	WORD * 3	(most significant word first)
401213	IP Address	RW	WORD * 2	(most significant word first)
401215	Subnet Mask	RW	WORD * 2	(most significant word first)
401217	Default Gateway	RW	WORD * 2	(most significant word first)
401219	DHCP Server	RW	WORD * 2	(most significant word first)
401221	DHCP Enabled	RW	WORD	0 = No; 1 = Yes
401222	MNI_TCP_Unit Id	RW	WORD	
401223	Modbus TCP Server Enabled	RW	WORD	0 = No; 1 = Yes
401224 - 401229	Reserved			
UART0 Configuration				
401230	MNI_UART0_Enabled	RW	WORD	0 = No; 1 = Yes
401231	MNI_UART0_Server_Address	RW	WORD	
401232	MNI_UART0_Baudrate	RW	WORD	0 = 9600; 1 = 19200; 2 = 57600
401233	MNI_UART0_Parity	RO	WORD	
401234	MNI_UART0_Stop Bits	RO	WORD	
401235 - 401249	Reserved			
Date and Time Information				
401250	Present Time	RW	WORD	Minutes since midnight
401251	Present Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
Daylight Saving Time Information				
401252	Daylight Saving Time Control	RW	WORD	0 = Off; 1 = On
401253	Set Clock Forward Date (Bitmap)	RW	WORD	
	Bits 0-2			Day of Week (Sun = 0, Mon = 1, Sat = 6)
	Bits 3-6			Month of Year (1-12)
	Bits 7-9			Week of Month (1 - 4)
401254	Set Clock Backward Date (Bitmap)	RW	WORD	
	Bits 0-2			Day of Week (Sun = 0, Mon = 1, Sat = 6)
	Bits 3-6			Month of Year (1-12)
	Bits 7-9			Week of Month (1 - 4)
401255 - 401294	Reserved			
Controller Historical Information				
401295	Closed Transition Dual Source Connected Time	RO	WORD	milliseconds
401296	Source 1 to Open Time	RO	WORD	milliseconds
401297	Source 1 to Close Time	RO	WORD	milliseconds
401298	Source 2 to Open Time	RO	WORD	milliseconds
401299	Source 2 to Open Time	RO	WORD	milliseconds
401300	Minutes not in Preferred Total	RO	WORD * 2	minutes (most significant word first)
401302	Minutes not in Preferred since Reset	RO	WORD * 2	minutes (most significant word first)
401304	Minutes in Standby Total	RO	WORD * 2	minutes (most significant word first)
401306	Minutes in Standby since Reset	RO	WORD * 2	minutes (most significant word first)
401308	Minutes of Operation Total	RO	WORD * 2	minutes (most significant word first)
401310	Minutes of Operation since Reset	RO	WORD * 2	minutes (most significant word first)
401312	Switch Transfers Total	RO	WORD	
401313	Switch Transfers since Reset	RO	WORD	
401314	Failures to Transfer Total	RO	WORD	
401315	Failures to Transfer since Reset	RO	WORD	
401316	Loss of Preferred Transfers Total	RO	WORD	
401317	Loss of Preferred Transfers since Reset	RO	WORD	
401318	Transfer Time Source 1 to Source 2	RO	WORD	milliseconds
401319	Transfer Time Source 2 to Source 1	RO	WORD	milliseconds

Register	Data Description	Access	Data Type	Range/Units
401320	Last Maintenance Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
401321	System Start Date (Bitmap)	RW	WORD	
	Bits 0-4			Day of Month
	Bits 5-8			Month of Year
	Bits 9-15			Year - 2000 (0 to 128 = 2000 to 2128)
401322	Password for register 41321	WO	WORD	0 - 32768 (factory password)
401323 - 401349	Reserved			
Maintenance/Test & Manual Actions				
401350	Control Bitmap	WO	WORD	
	0			Reset Maintenance Records
	1			Start Peak Shave
	2			End Peak Shave
	3			Start Remote Loaded Test
	4			Start Remote Unloaded Test
	5			Unused
	6			End Remote Test
	7			Force Transfer to OFF
	8			Resume Operation (Reset Force Transfer to OFF)
	9			End Current Time Delay
	10			Start Synchronous Check
	11			End Synchronous Check
401351	Auto-Loaded Test Run Time	WO	WORD	Minutes (sending any non-zero value starts test)
401352	Clear Event Log	WO	WORD	0: 1=Clear Log
401353 - 401599	Reserved			
401600	Reserved HiTech Annunciator Control Blocks			
401600	Control Block 1	RW		
401601	Control Block 2	RW		
401602 - 402148	Reserved			
402149	EventNextEntryIndex	RO	WORD	
Event History				
402150	Each Event			
	Event Time	RO	WORD	Minutes since midnight
	Event Date (Bitmap)	RO	WORD	
	Bits 0-4		WORD	Day of Month
	Bits 5-8		WORD	Month of Year
	Bits 9-15		WORD	Year - 2000 (0 to 128 = 2000 to 2128)
	Events 0 - 19	RO	WORD*10 0	Time, Date, Code, Param1, Param2 See XX for event codes. Param1 and Param2 vary depending on the event code.
402250	Events 20 - 39	RO	WORD*10 0	Time, Date, Code, Param1, Param2 See XX for event codes. Param1 and Param2 vary depending on the event code.
402350	Events 40 - 59	RO	WORD*10 0	Time, Date, Code, Param1, Param2 See XX for event codes. Param1 and Param2 vary depending on the event code.
402450	Events 60 - 79	RO	WORD*10 0	Time, Date, Code, Param1, Param2 See XX for event codes. Param1 and Param2 vary depending on the event code.
402550	Events 80 - 99	RO	WORD*10 0	Time, Date, Code, Param1, Param2 See XX for event codes. Param1 and Param2 vary depending on the event code.
402650 - 402749	Reserved			

Register	Data Description	Access	Data Type	Range/Units
Selected Window of Events				
402750	Event Window Start Time	RW	WORD	Minutes since midnight
402751	Event Window Start Date (Bitmap)	RW	WORD	
	Bits 0-4		WORD	Day of Month
	Bits 5-8		WORD	Month of Year
	Bits 9-15		WORD	Year - 2000 (0 to 128 = 2000 to 2128)
402752	Event Window End Time	RW	WORD	Minutes since midnight
402753	Event Window End Date (Bitmap)	RW	WORD	
	Bits 0-4		WORD	Day of Month
	Bits 5-8		WORD	Month of Year
	Bits 9-15		WORD	Year - 2000 (0 to 128 = 2000 to 2128)
402754	Number of Events in Window	RO	WORD	
402755	Windowed Event History			
	Each Event			
	Event Time	RO	WORD	Minutes since midnight
	Event Date (Bitmap)	RO	WORD	
	Bits 0-4		WORD	Day of Month
	Bits 5-8		WORD	Month of Year
	Bits 9-15		WORD	Year - 2000 (0 to 128 = 2000 to 2128)
402755	Windowed Events 0 - 19	RO	WORD*10 0	Time, Date, Code, Param1, Parma2 (See Each Event Description in Event History)
402855 - 403399	Reserved			
Calibration Parameters				
403400	Calibrate L1 L2 Source1	WO	WORD	Volts * 10
403401	Password for 43400	WO	WORD	0 - 32768
403402	Calibrate L2 L3 Source1	WO	WORD	Volts * 10
403403	Password for 43402	WO	WORD	0 - 32768
403404	Calibrate L3 L1 Source1	WO	WORD	Volts * 10
403405	Password for 43404	WO	WORD	0 - 32768
403406	Calibrate L1 L2 Source2	WO	WORD	Volts * 10
403407	Password for 43406	WO	WORD	0 - 32768
403408	Calibrate L2 L3 Source2	WO	WORD	Volts * 10
403409	Password for 43408	WO	WORD	0 - 32768
403410	Calibrate L3 L1 Source2	WO	WORD	Volts * 10
403411	Password for 43410	WO	WORD	0 - 32768
403412	Calibrate L1 L0 Source1	WO	WORD	Volts * 10
403413	Password for 43412	WO	WORD	0 - 32768
403414	Calibrate L2 L0 Source1	WO	WORD	Volts * 10
403415	Password for 43414	WO	WORD	0 - 32768
403416	Calibrate L3 L0 Source1	WO	WORD	Volts * 10
403417	Password for 43416	WO	WORD	0 - 32768
403418	Calibrate L1 L0 Source2	WO	WORD	Volts * 10
403419	Password for 43418	WO	WORD	0 - 32768
403420	Calibrate L2 L0 Source2	WO	WORD	Volts * 10
403421	Password for 43420	WO	WORD	0 - 32768
403422	Calibrate L3 L0 Source2	WO	WORD	Volts * 10
403423	Password for 43422	WO	WORD	0 - 32768
403424	Calibrate L1	WO	WORD	Amps
403425	Password for 43424	WO	WORD	0 - 32768
403426	Calibrate L2	WO	WORD	Amps
403427	Password for 43426	WO	WORD	0 - 32768
403428	Calibrate L3	WO	WORD	Amps
403429	Password for 43428	WO	WORD	0 - 32768
403430 - 403449	Reserved			
403450	Panel Switch Status(Bitmap)	RO		
	0			Button 1
	1			Button 2
	2			Button 3
	3			Button 4

Register	Data Description	Access	Data Type	Range/Units
402451 - 403699	Reserved			
Controller Perform Parameter Save				
403700	Save Status (Enum)	RW	WORD	
	0			Idle (No save in process)
	1			Initiate the parameter save action
	2			Parameters have been saved successfully
403701	Password for register 43700	WO	WORD	0 - 32768 (factory password)
403702	Gap Begin			
403799	Gap End			
Current-Based Load Control Configuration				
403800	Source 1 Load Control Mode	RW	WORD	0 = None 1 = Time Based 2 = Current Based
403801	Source 2 Load Control Mode	RW	WORD	0 = None 1 = Time Based 2 = Current Based
403802	Source 1 Add Load Amperage	RW	WORD	0-4000 Amps
403803	Source 1 Remove Load Amperage	RW	WORD	0-4000 Amps
403804	Source 2 Add Load Amperage	RW	WORD	0-4000 Amps
403805	Source 2 Remove Load Amperage	RW	WORD	0-4000 Amps
403806	Source 1 Current Based Load Control Output 1 Enable	RW	WORD	0 = Disabled 1 = Enabled
403807	Source 1 Current Based Load Control Output 2 Enable	RW	WORD	0 = Disabled 1 = Enabled
403808	Source 1 Current Based Load Control Output 3 Enable	RW	WORD	0 = Disabled 1 = Enabled
403809	Source 1 Current Based Load Control Output 4 Enable	RW	WORD	0 = Disabled 1 = Enabled
403810	Source 1 Current Based Load Control Output 5 Enable	RW	WORD	0 = Disabled 1 = Enabled
403811	Source 1 Current Based Load Control Output 6 Enable	RW	WORD	0 = Disabled 1 = Enabled
403812	Source 1 Current Based Load Control Output 7 Enable	RW	WORD	0 = Disabled 1 = Enabled
403813	Source 1 Current Based Load Control Output 8 Enable	RW	WORD	0 = Disabled 1 = Enabled
403814	Source 1 Current Based Load Control Output 9 Enable	RW	WORD	0 = Disabled 1 = Enabled
403815	Source 1 Current Based Load Control Output 1 Add Priority	RW	WORD	1-9
403816	Source 1 Current Based Load Control Output 2 Add Priority	RW	WORD	1-9
403817	Source 1 Current Based Load Control Output 3 Add Priority	RW	WORD	1-9
403818	Source 1 Current Based Load Control Output 4 Add Priority	RW	WORD	1-9
403819	Source 1 Current Based Load Control Output 5 Add Priority	RW	WORD	1-9
403820	Source 1 Current Based Load Control Output 6 Add Priority	RW	WORD	1-9
403821	Source 1 Current Based Load Control Output 7 Add Priority	RW	WORD	1-9
403822	Source 1 Current Based Load Control Output 8 Add Priority	RW	WORD	1-9
403823	Source 1 Current Based Load Control Output 9 Add Priority	RW	WORD	1-9
403824	Source 1 Current Based Load Control Output 1 Remove Priority	RW	WORD	1-9
403825	Source 1 Current Based Load Control Output 2 Remove Priority	RW	WORD	1-9
403826	Source 1 Current Based Load Control Output 3 Remove Priority	RW	WORD	1-9
403827	Source 1 Current Based Load Control Output 4 Remove Priority	RW	WORD	1-9

Register	Data Description	Access	Data Type	Range/Units
403828	Source 1 Current Based Load Control Output 5 Remove Priority	RW	WORD	1-9
403829	Source 1 Current Based Load Control Output 6 Remove Priority	RW	WORD	1-9
403830	Source 1 Current Based Load Control Output 7 Remove Priority	RW	WORD	1-9
403831	Source 1 Current Based Load Control Output 8 Remove Priority	RW	WORD	1-9
403832	Source 1 Current Based Load Control Output 9 Remove Priority	RW	WORD	1-9
403833	Source 1 Current Based Load Control Output 1 Add Time	RW	WORD	0-3600 Seconds
403834	Source 1 Current Based Load Control Output 2 Add Time	RW	WORD	0-3600 Seconds
403835	Source 1 Current Based Load Control Output 3 Add Time	RW	WORD	0-3600 Seconds
403836	Source 1 Current Based Load Control Output 4 Add Time	RW	WORD	0-3600 Seconds
403837	Source 1 Current Based Load Control Output 5 Add Time	RW	WORD	0-3600 Seconds
403838	Source 1 Current Based Load Control Output 6 Add Time	RW	WORD	0-3600 Seconds
403839	Source 1 Current Based Load Control Output 7 Add Time	RW	WORD	0-3600 Seconds
403840	Source 1 Current Based Load Control Output 8 Add Time	RW	WORD	0-3600 Seconds
403841	Source 1 Current Based Load Control Output 9 Add Time	RW	WORD	0-3600 Seconds
403842	Source 1 Current Based Load Control Output 1 Remove Time	RW	WORD	0-3600 Seconds
403843	Source 1 Current Based Load Control Output 2 Remove Time	RW	WORD	0-3600 Seconds
403844	Source 1 Current Based Load Control Output 3 Remove Time	RW	WORD	0-3600 Seconds
403845	Source 1 Current Based Load Control Output 4 Remove Time	RW	WORD	0-3600 Seconds
403846	Source 1 Current Based Load Control Output 5 Remove Time	RW	WORD	0-3600 Seconds
403847	Source 1 Current Based Load Control Output 6 Remove Time	RW	WORD	0-3600 Seconds
403848	Source 1 Current Based Load Control Output 7 Remove Time	RW	WORD	0-3600 Seconds
403849	Source 1 Current Based Load Control Output 8 Remove Time	RW	WORD	0-3600 Seconds
403850	Source 1 Current Based Load Control Output 9 Remove Time	RW	WORD	0-3600 Seconds
403851	Source 2 Current Based Load Control Output 1 Enable	RW	WORD	0 = Disabled; 1= Enabled
403852	Source 2 Current Based Load Control Output 2 Enable	RW	WORD	0 = Disabled; 1= Enabled
403853	Source 2 Current Based Load Control Output 3 Enable	RW	WORD	0 = Disabled; 1= Enabled
403854	Source 2 Current Based Load Control Output 4 Enable	RW	WORD	0 = Disabled; 1= Enabled
403855	Source 2 Current Based Load Control Output 5 Enable	RW	WORD	0 = Disabled; 1= Enabled
403856	Source 2 Current Based Load Control Output 6 Enable	RW	WORD	0 = Disabled; 1= Enabled
403857	Source 2 Current Based Load Control Output 7 Enable	RW	WORD	0 = Disabled; 1= Enabled
403858	Source 2 Current Based Load Control Output 8 Enable	RW	WORD	0 = Disabled; 1= Enabled
403859	Source 2 Current Based Load Control Output 9 Enable	RW	WORD	0 = Disabled; 1= Enabled
403860	Source 2 Current Based Load Control Output 1 Add Priority	RW	WORD	1-9

Register	Data Description	Access	Data Type	Range/Units
403861	Source 2 Current Based Load Control Output 2 Add Priority	RW	WORD	1-9
403862	Source 2 Current Based Load Control Output 3 Add Priority	RW	WORD	1-9
403863	Source 2 Current Based Load Control Output 4 Add Priority	RW	WORD	1-9
403864	Source 2 Current Based Load Control Output 5 Add Priority	RW	WORD	1-9
403865	Source 2 Current Based Load Control Output 6 Add Priority	RW	WORD	1-9
403866	Source 2 Current Based Load Control Output 7 Add Priority	RW	WORD	1-9
403867	Source 2 Current Based Load Control Output 8 Add Priority	RW	WORD	1-9
403868	Source 2 Current Based Load Control Output 9 Add Priority	RW	WORD	1-9
403869	Source 2 Current Based Load Control Output 1 Remove Priority	RW	WORD	1-9
403870	Source 2 Current Based Load Control Output 2 Remove Priority	RW	WORD	1-9
403871	Source 2 Current Based Load Control Output 3 Remove Priority	RW	WORD	1-9
403872	Source 2 Current Based Load Control Output 4 Remove Priority	RW	WORD	1-9
403873	Source 2 Current Based Load Control Output 5 Remove Priority	RW	WORD	1-9
403874	Source 2 Current Based Load Control Output 6 Remove Priority	RW	WORD	1-9
403875	Source 2 Current Based Load Control Output 7 Remove Priority	RW	WORD	1-9
403876	Source 2 Current Based Load Control Output 8 Remove Priority	RW	WORD	1-9
403877	Source 2 Current Based Load Control Output 9 Remove Priority	RW	WORD	1-9
403878	Source 2 Current Based Load Control Output 1 Add Time	RW	WORD	0-3600 Seconds
403879	Source 2 Current Based Load Control Output 2 Add Time	RW	WORD	0-3600 Seconds
403880	Source 2 Current Based Load Control Output 3 Add Time	RW	WORD	0-3600 Seconds
403881	Source 2 Current Based Load Control Output 4 Add Time	RW	WORD	0-3600 Seconds
403882	Source 2 Current Based Load Control Output 5 Add Time	RW	WORD	0-3600 Seconds
403883	Source 2 Current Based Load Control Output 6 Add Time	RW	WORD	0-3600 Seconds
403884	Source 2 Current Based Load Control Output 7 Add Time	RW	WORD	0-3600 Seconds
403885	Source 2 Current Based Load Control Output 8 Add Time	RW	WORD	0-3600 Seconds
403886	Source 2 Current Based Load Control Output 9 Add Time	RW	WORD	0-3600 Seconds
403887	Source 2 Current Based Load Control Output 1 Remove Time	RW	WORD	0-3600 Seconds
403888	Source 2 Current Based Load Control Output 2 Remove Time	RW	WORD	0-3600 Seconds
403889	Source 2 Current Based Load Control Output 3 Remove Time	RW	WORD	0-3600 Seconds
403890	Source 2 Current Based Load Control Output 4 Remove Time	RW	WORD	0-3600 Seconds
403891	Source 2 Current Based Load Control Output 5 Remove Time	RW	WORD	0-3600 Seconds
403892	Source 2 Current Based Load Control Output 6 Remove Time	RW	WORD	0-3600 Seconds
403893	Source 2 Current Based Load Control Output 7 Remove Time	RW	WORD	0-3600 Seconds

Register	Data Description	Access	Data Type	Range/Units
403894	Source 2 Current Based Load Control Output 8 Remove Time	RW	WORD	0-3600 Seconds
403895	Source 2 Current Based Load Control Output 9 Remove Time	RW	WORD	0-3600 Seconds
403896 - 403919	Reserved			
Prime Power Mode Configuration				
403920	Prime Power Event Source 1 Duration	RW	WORD	(Hours * 0.1)
403921	Prime Power Event Source 2 Duration	RW	WORD	(Hours * 0.1)
403922	Prime Power Event Source 1 Count Down	RO	WORD*2	Minutes
403924	Prime Power Event Source 2 Count Down	RO	WORD*2	Minutes
403926	Prime Power Event Start/Stop	RW	WORD	0 = Stop 1 = Start
403927 - 403939	Reserved			
Minimum/Maximum Value Logging Configuration				
403940	Logging Period (Enum)	RW	WORD	
	0			Continuous
	1			Calendar
	2			Daily
	3			Weekly
403941	Calendar Period Configuration			
403941	Calendar Start Configuration			
403941	Calendar Start Date (Bitmap)	RW	WORD	
	Bits 0-4		WORD	Day of Month
	Bits 5-8		WORD	Month of Year
	Bits 9-15		WORD	Year - 2000 (0 to 128 = 2000 to 2128)
403942	Calendar Start Time	RW	WORD	Minutes Since Midnight
403943	Calendar Stop Configuration			
403943	Calendar Stop Date (Bitmap)	RW	WORD	
	Bits 0-4		WORD	Day of Month
	Bits 5-8		WORD	Month of Year
	Bits 9-15		WORD	Year - 2000 (0 to 128 = 2000 to 2128)
403944	Calendar Stop Time	RW	WORD	Minutes Since Midnight
403945	Days	RW	WORD	Number of days in period
403946	Weeks	RW	WORD	Number of weeks in period
403947 - 403999	Reserved			
404000 - 409998	Reserved For Internal Use Only			
409999	Device ID	RO	WORD	MPAC1500 = 0x17 (23) MPAC1200 = 0x1B (27) MPAC750 = 0x1A (26)

14.4.4 Event Codes

Figure 14-5 identifies the event codes. An X in a column indicates that the event code is used in that register(s). For example, event code 34, preferred source available, can appear in output registers 400108 or 400109.

Event Code	Description	System Overview Register 400001	Output Registers 400108, 400109	Input Registers 400111, 400112	Common Alarm Registers 400800 - 400863	Event History Registers 402150 - 402649
1	End Time Delay Button Hit	X				X
2	Test Button Hit	X				X
3	Set Exerciser Button Hit	X				X
4	Lamp Test Button Hit	X				X
5	Reset Service Required Button Hit	X				X
6	Maintenance Switch Active	X				X
7	Password Disabled Switch Active	X				X
8	Auto/Manual/Transfer Switch Hit	X				X
13	Audible Alarm				X	
14	Prime Power Run Start/Stop Button Hit	X				X
14	Assigned to Common Alarm 2				X	
15	Assigned to Common Alarm 1				X	
14	Prime Power Run Start/Stop Button Hit	X				X
27	New I2C Device Discovered	X				X
34	Preferred Source Available		X			
35	Standby Source Available		X			
36	Contactor is in Preferred Position		X			
37	Contactor is in Standby Position		X			
38	Contactor in Off Position	X	X			X
39	Contactor in Source1 Position	X	X			X
40	Contactor in Source2 Position	X	X			X
43	External Battery Low Voltage	X	X			X
44	Exerciser active	X	X			X
45	Test Mode is Active		X			
46	Peak Shave Mode is Active		X			
47	Non-Emergency Transfer is Act-ive(Peak Shave/Exerciser/Test)		X			
48	Maintenance Mode		X			
49	Load Bank Control is On		X			
50	Source 1 Engine Start Signal		X			
51	Source 2 Engine Start Signal		X			
52	In-phase Monitor Waiting for Synchronization		X			
53	Common Alarm Active		X			
54	Source 1 Under Voltage Condition		X			
55	Source 1 Over Voltage Condition		X			
56	Source 1 Phase Voltage Imbalance Condition		X			
57	Source 1 Loss of Phase Condition		X			
58	Source 1 Phase Rotation Error		X			
59	Source 1 Over Frequency Condition		X			
60	Source 1 Under Frequency Condition		X			
61	Source 2 Under Voltage Condition		X			
62	Source 2 Over Voltage Condition		X			
63	Source 2 Phase Voltage Imbalance Condition		X			
64	Source 2 Loss of Phase Condition		X			
65	Source 2 Phase Rotation Error		X			
66	Source 2 Over Frequency Condition		X			

Event Code	Description	System Overview Register 400001	Output Registers 400108, 400109	Input Registers 400111, 400112	Common Alarm Registers 400800 - 400863	Event History Registers 402150 - 402649
67	Source 2 Under Frequency Condition		X			
68	Fail To Acquire Standby Source	X	X			X
69	Fail To Acquire Preferred Source	X	X			X
70	Fail To Transfer	X	X			X
71	I2C Device Lost	X	X			X
73	Auxiliary Switch Fault	X	X			X
74	Auxiliary Switch Open	X	X			X
75	Load Control Output #0		X			
76	Load Control Output #1		X			
77	Load Control Output #2		X			
78	Load Control Output #3		X			
79	Load Control Output #4		X			
80	Load Control Output #5		X			
81	Load Control Output #6		X			
82	Load Control Output #7		X			
83	Load Control Output #8		X			
84	Software Controlled RDO #1 is Active		X			
85	Software Controlled RDO #2 is Active		X			
86	Software Controlled RDO #3 is Active		X			
87	Software Controlled RDO #4 is Active		X			
88	Three-Source System Disable		X			
89	Common Alarm #2		X			
90	Audible Alarm Silenced		X			
91	Fail To Open Source 1	X	X			X
92	Fail To Close Source 1	X	X			X
93	Fail To Open Source 2	X	X			X
94	Fail To Close Source 2	X	X			X
95	Source 1 Breaker Tripped	X	X			X
96	Source 2 Breaker Tripped	X	X			X
100	Force Transfer To Off	X		X		X
101	Peak Shave	X		X		X
102	Transfer Inhibited	X		X		X
103	Remote End Time Delay	X		X		X
104	Remote Test Start/Stop	X		X		X
105	Low Battery Input	X		X		X
106	Remote Common Alarm Input	X		X		X
107	Bypass Contactor Disabled	X		X		X
108	Three-Source System Disabled	X		X		X
109	User Input #1 is Active			X	X	
110	User Input #2 is Active			X	X	
111	User Input #3 is Active			X	X	
112	User Input #4 is Active			X	X	
113	Service Disconnect	X		X		X
120	System Ready				X	
121	Critical Service Required				X	
122	Non-Critical Service Required				X	
124	Source 1 is Available				X	
125	Source 2 is Available				X	
126	Over Frequency	X				X
127	Under frequency	X				X
128	Phase Loss	X				X
129	Phase Rotation Error	X				X
130	Over Voltage L1-L2	X				X

Event Code	Description	System Overview Register 400001	Output Registers 400108, 400109	Input Registers 400111, 400112	Common Alarm Registers 400800 - 400863	Event History Registers 402150 - 402649
131	Over Voltage L2-L3	X				X
132	Over Voltage L3-L1	X				X
133	Under Voltage L1-L2	X				X
134	Under Voltage L2-L3	X				X
135	Under Voltage L3-L1	X				X
136	Voltage Imbalance	X				X
137	History Saved To File	X				X
166	Supervised Transfer Waiting				X	
175	Auto-Loaded Test Timeout	X				X
207	Exerciser Loaded/Unloaded Changed	X				X
208	Test Loaded/Unloaded Changed	X				X
209	One-Week Exerciser Changed	X				X
210	Exerciser-Disabled Changed	X				X
211	Preferred-Source Changed	X				X
212	Default Parameters Loaded	X				X
223	Force Transfer To Off via Serial Communication	X				X
224	Peak Shave Command via Serial Communication	X				X
225	Test Command via Serial Communication	X				X

Figure 14-5 Event Codes

15.1 Introduction

The Power Monitor uses KBUS protocol for communication. The Modbus®/KBUS converter kit is required for Modbus communication with these devices. See Figure 15-2.

Installing the Modbus®/KBUS converter kit allows this controller to communicate with a personal computer running Monitor III software. For other Modbus applications, the Modbus master must be programmed to read the Modbus registers shown in this manual. A system designer trained in the application of Modbus® protocol must write and thoroughly test the program before implementation.

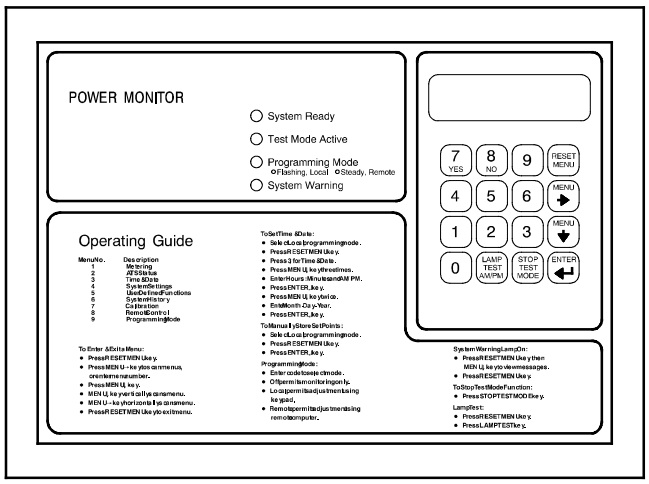


Figure 15-1 Power Monitor PM340

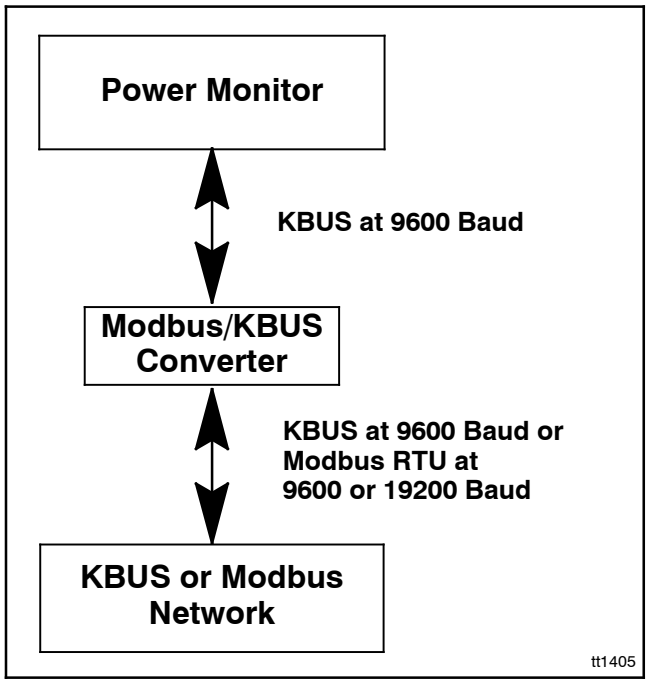
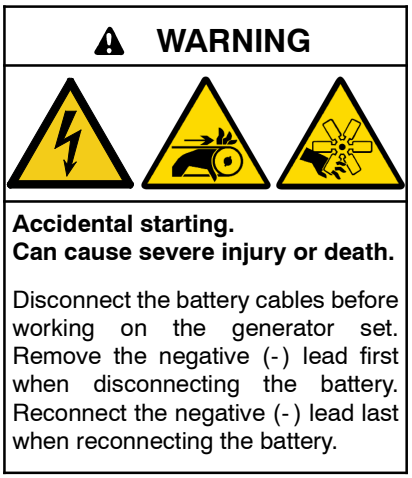


Figure 15-2 Modbus/KBUS Converter Function

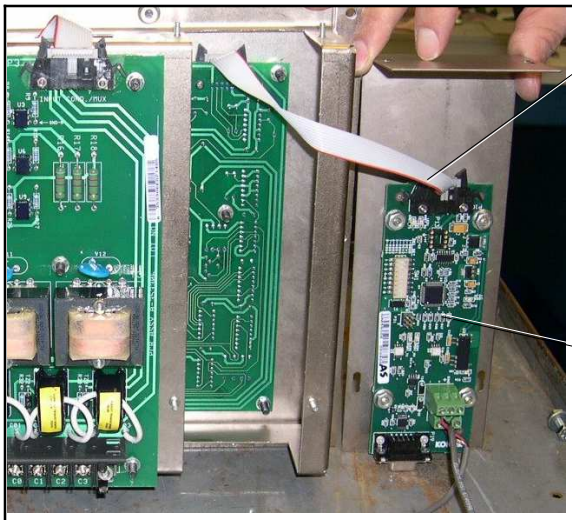
15.2 Hardware and Connections



Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Move the generator set master switch to the OFF position. (2) Disconnect the power to the battery charger. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent starting of the generator set by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer.

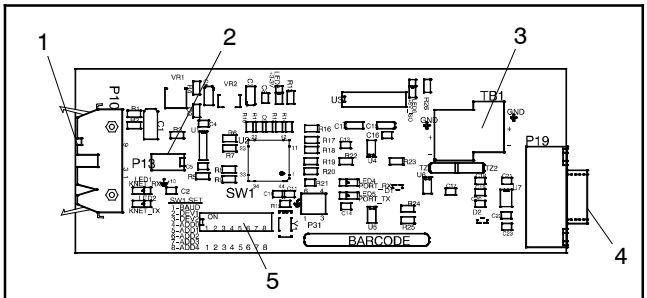
The Modbus/KBUS converter kit GM41143-KP3 replaces RS-232 and RS-485 communication modules and allows the selection of either KBUS or Modbus communication. See Figure 15-3 for the converter location inside the controller.

If your device is equipped with an RS-232/RS-485 communication module, remove the old communication module and ribbon cable before installing the new Modbus/KBUS converter and ribbon cable.



1. Ribbon cable
2. Converter board

Figure 15-3 Converter Module Location for Power Monitor



1. P10, ribbon cable connection for 340 generator set and power monitor
2. P13, ribbon cable connection for ATS controller
3. RS-485 connection TB1
4. RS-232 connection P19
5. DIP switches 1 - 8

Figure 15-4 Modbus/KBUS Converter Board

Figure 15-4 shows the Modbus/KBUS converter circuit board connections and DIP switches. Refer to Installation Instructions TT-1405, provided with the converter kit, for converter installation and connection instructions. Set the converter DIP switches for baud rate, device type, and network address as described in TT-1405.

15.3 Device Setup

Configure power monitor for remote communications by setting the parameters shown in Figure 15-5. See TT-1405 and the controller operation manual for more information.

Device	Menu or Index	Parameter	Setting
Power monitor	Menu 8, Remote Control	On Line	YES
		Local, LAN, Remote, or Remote Area Network	Select the appropriate setting for your connection type. Use Local for Ethernet connections. See TT-1405 for more information.
		Address	Any *
		Baud rate	9600 †

* The network address is set using DIP switches on the converter module and will override the network address on the controller.

† This baud rate must be set at 9600 to match the KBUS side of the Modbus/KBUS converter. It may be different from the Modbus baud rates of other devices in the system.

Figure 15-5 Controller Settings for Modbus Communication

15.4 Power Monitor Modbus Registers

Refer to Section 1.3 for definitions of terms and symbols used in the register tables.

Register	Data Description	Access	Data Type	Range/Units
40001				
40002	System Time	RO	WORD	
40003	Day of Week	RO	WORD	
40004	Month	RO	WORD	1-12
40005	Day	RO	WORD	1-31
40006	Year	RO	WORD	
40007	Week of Month	RO	WORD	
40008	Voltage L1-L2	RO	WORD	volts
40009	Voltage L2-L3	RO	WORD	volts
40010	Voltage L3-L1	RO	WORD	volts
40011	Frequency	RO	WORD	Hz * 10
40012	Voltage L1-L0	RO	WORD	volts
40013	Voltage L2-L0	RO	WORD	volts
40014	Voltage L3-L0	RO	WORD	volts
40015	Alert Code	RO	WORD	Alert Code
40016	Analog Input #1 Percentage	RO	WORD	% * 10
40017	Analog Input #2 Percentage	RO	WORD	% * 10
40019	Power Supply Voltage	RO	WORD	VDC * 10
40020	L1 Current	RO	WORD	amps
40021	L2 Current	RO	WORD	amps
40022	L3 Current	RO	WORD	amps
40023	Power Factor	RO	WORD	* 100
40024	Total Real Power	RO	WORD	kW
40025	Total Imaginary Power	RO	WORD	kVAR
40026	PF Lead/Lag	RO	WORD[0]	0: 0 = leading; 1 = lagging
40030	System Status	RO	WORD[0:7]	0-1: Switch Position (00=off; 01=Normal; 10=Emerg; 11=Undefined)
				2-3: Contactor Position (00=off; 01=Normal; 10=Emerg; 11=Undefined)
				4-5: Program Mode (00=off; 01=Remote; 10=Local; 11=Undefined)
40030, cont.	System Status	RO	WORD[0:7]	6: Test Mode Timed
				7: Test Mode Active
				8-15: Unused
40040	Aux 1 Delay Time	RO	WORD	sec.
40041	Aux 2 Delay Time	RO	WORD	sec.
40042	Aux 3 Delay Time	RO	WORD	sec.
40043	Aux 4 Delay Time	RO	WORD	sec.
40044	Aux 5 Delay Time	RO	WORD	sec.
40045	Aux 6 Delay Time	RO	WORD	sec.
40046	System Voltage	RO	WORD	volts, 105-14600
40047	System Frequency	RO	WORD	Hz, 48-62
40048	ATS Rating	RO	WORD	A, 0-3000
40049	Connection	RO	WORD[0:1]	0: 0=wye; 1=delta
				1: 0=single phase; 1=three phase
40056-40057	Time in Normal	RO	WORD*2	hours * 10
40058-40059	Time in Off	RO	WORD*2	hours * 10
40060-40061	Time in Emergency	RO	WORD*2	hours * 10
40062	Shutdown #1 Code	RO	WORD	code

Register	Data Description	Access	Data Type	Range/Units
40063	Shutdown #1 Month	RO	WORD	1 - 12
40064	Shutdown #1 Day	RO	WORD	1 - 31
40065	Shutdown #1 Year	RO	WORD	
40066	Shutdown #2 Code	RO	WORD	code
40067	Shutdown #2 Month	RO	WORD	1 - 12
40068	Shutdown #2 Day	RO	WORD	1 - 31
40069	Shutdown #2 Year	RO	WORD	
40070	Shutdown #3 Code	RO	WORD	code
40071	Shutdown #3 Month	RO	WORD	1 - 12
40072	Shutdown #3 Day	RO	WORD	1 - 31
40073	Shutdown #3 Year	RO	WORD	
40074	Shutdown #4 Code	RO	WORD	code
40075	Shutdown #4 Month	RO	WORD	1 - 12
40076	Shutdown #4 Day	RO	WORD	1 - 31
40077	Shutdown #4 Year	RO	WORD	
40095 - 40099	Designation	RO	WORD*5	9 chars, 1 per byte, first char = LSB, last byte ignored
40100 - 40109	Load Description	RO	WORD*10	20 chars, 1 per byte, first char = LSB
40110 - 40119	Location	RO	WORD*10	20 chars, 1 per byte, first char = LSB
40120 - 40132	Model No.	RO	WORD*13	26 chars, 1 per byte, first char = LSB
40133 - 40140	Spec. No.	RO	WORD*8	16 chars, 1 per byte, first char = LSB
40141 - 40143	Serial No.	RO	WORD*3	6 chars, 1 per byte, first char = LSB
40144 - 40146	Controller Serial No.	RO	WORD*3	6 chars, 1 per byte, first char = LSB
40147 - 40156	Analog Input #1 Description	RO	WORD*10	20 chars, 1 per byte, first char = LSB
40157 - 40166	Analog Input #2 Description	RO	WORD*10	20 chars, 1 per byte, first char = LSB
40167 - 40176	Auxiliary 1 Description	RO	WORD*10	20 chars, 1 per byte, first char = LSB
40177 - 40186	Auxiliary 2 Description	RO	WORD*10	20 chars, 1 per byte, first char = LSB
40187 - 40196	Auxiliary 3 Description	RO	WORD*10	20 chars, 1 per byte, first char = LSB
40197 - 40206	Auxiliary 4 Description	RO	WORD*10	20 chars, 1 per byte, first char = LSB
40207 - 40216	Auxiliary 5 Description	RO	WORD*10	20 chars, 1 per byte, first char = LSB
40217 - 40226	Auxiliary 6 Description	RO	WORD*10	20 chars, 1 per byte, first char = LSB
40300	Timed Run Time	RW	WORD	minutes

15.5 Alert Codes

Alert Code	Description
0	Auxiliary 1
1	Auxiliary 2
2	Auxiliary 3
3	Auxiliary 4
4	Auxiliary 5
5	Auxiliary 6
6	Test Mode Active
7	Internal Error
8	System Ready
9	Power Down Error

Appendix A Abbreviations

The following list contains abbreviations that may appear in this publication.

A, amp	ampere
ABDC	after bottom dead center
AC	alternating current
A/D	analog to digital
ADC	advanced digital control; analog to digital converter
adj.	adjust, adjustment
ADV	advertising dimensional drawing
Ah	amp-hour
AHWT	anticipatory high water temperature
AISI	American Iron and Steel Institute
ALOP	anticipatory low oil pressure
alt.	alternator
Al	aluminum
ANSI	American National Standards Institute (formerly American Standards Association, ASA)
AO	anticipatory only
APDC	Air Pollution Control District
API	American Petroleum Institute
approx.	approximate, approximately
AQMD	Air Quality Management District
AR	as required, as requested
AS	as supplied, as stated, as suggested
ASE	American Society of Engineers
ASME	American Society of Mechanical Engineers
assy.	assembly
ASTM	American Society for Testing Materials
ATDC	after top dead center
ATS	automatic transfer switch
auto.	automatic
aux.	auxiliary
avg.	average
AVR	automatic voltage regulator
AWG	American Wire Gauge
AWM	appliance wiring material
bat.	battery
BBDC	before bottom dead center
BC	battery charger, battery charging
BCA	battery charging alternator
BCI	Battery Council International
BDC	before dead center
BHP	brake horsepower
blk.	black (paint color), block (engine)
blk. htr.	block heater
BMEP	brake mean effective pressure
bps	bits per second
br.	brass
BTDC	before top dead center
Btu	British thermal unit
Btu/min.	British thermal units per minute
C	Celsius, centigrade
cal.	calorie
CAN	controller area network
CARB	California Air Resources Board
CB	circuit breaker
cc	cubic centimeter
CCA	cold cranking amps
ccw.	counterclockwise
CEC	Canadian Electrical Code
cert.	certificate, certification, certified
cfh	cubic feet per hour
cfm	cubic feet per minute
CG	center of gravity
CID	cubic inch displacement
CL	centerline
cm	centimeter
CMOS	complementary metal oxide substrate (semiconductor)
cogen.	cogeneration
com	communications (port)
coml	commercial
Coml/Rec	Commercial/Recreational
conn.	connection
cont.	continued
CPVC	chlorinated polyvinyl chloride
crit.	critical
CRT	cathode ray tube
CSA	Canadian Standards Association
CT	current transformer
Cu	copper
cUL	Canadian Underwriter's Laboratories
CUL	Canadian Underwriter's Laboratories
cu. in.	cubic inch
cw.	clockwise
CWC	city water-cooled
cyl.	cylinder
D/A	digital to analog
DAC	digital to analog converter
dB	decibel
dB(A)	decibel (A weighted)
DC	direct current
DCR	direct current resistance
deg., °	degree
dept.	department
DFMEA	Design Failure Mode and Effects Analysis
dia.	diameter
DI/EO	dual inlet/end outlet
DIN	Deutsches Institut fur Normung e. V. (also Deutsche Industrie Normenausschuss)
DIP	dual inline package
DPDT	double-pole, double-throw
DPST	double-pole, single-throw
DS	disconnect switch
DVR	digital voltage regulator
E, emer.	emergency (power source)
ECM	electronic control module, engine control module
EDI	electronic data interchange
EFR	emergency frequency relay
e.g.	for example (*exempli gratia)*
EG	electronic governor
EGSA	Electrical Generating Systems Association
EIA	Electronic Industries Association
EI/EO	end inlet/end outlet
EMI	electromagnetic interference
emiss.	emission
eng.	engine
EPA	Environmental Protection Agency
EPS	emergency power system
ER	emergency relay
ES	engineering special, engineered special
ESD	electrostatic discharge
est.	estimated
E-Stop	emergency stop
etc.	et cetera (and so forth)
exh.	exhaust
ext.	external
F	Fahrenheit, female
fglass.	fiberglass
FHM	flat head machine (screw)
fl. oz.	fluid ounce
flex.	flexible
freq.	frequency
FS	full scale
ft.	foot, feet
ft. lb.	foot pounds (torque)
ft./min.	feet per minute
ftp	file transfer protocol
g	gram
ga.	gauge (meters, wire size)
gal.	gallon
gen.	generator
genset	generator set
GFI	ground fault interrupter
GND, ⏚	ground
gov.	governor
gph	gallons per hour
gpm	gallons per minute
gr.	grade, gross
GRD	equipment ground
gr. wt.	gross weight
H x W x D	height by width by depth
HC	hex cap
HCHT	high cylinder head temperature
HD	heavy duty
HET	high exhaust temp., high engine temp.
hex	hexagon
Hg	mercury (element)
HH	hex head
HHC	hex head cap
HP	horsepower
hr.	hour
HS	heat shrink
hsg.	housing
HVAC	heating, ventilation, and air conditioning
HWT	high water temperature
Hz	hertz (cycles per second)
IC	integrated circuit
ID	inside diameter, identification
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IMS	improved motor starting
in.	inch
in. H_2O	inches of water
in. Hg	inches of mercury
in. lb.	inch pounds
Inc.	incorporated
ind.	industrial
int.	internal
int./ext.	internal/external
I/O	input/output
IP	iron pipe
ISO	International Organization for Standardization
J	joule
JIS	Japanese Industry Standard

k	kilo (1000)
K	kelvin
kA	kiloampere
KB	kilobyte (2^{10} bytes)
KBus	Kohler communication protocol
kg	kilogram
kg/cm^2	kilograms per square centimeter
kgm	kilogram-meter
kg/m^3	kilograms per cubic meter
kHz	kilohertz
kJ	kilojoule
km	kilometer
kOhm, kΩ	kilo-ohm
kPa	kilopascal
kph	kilometers per hour
kV	kilovolt
kVA	kilovolt ampere
kVAR	kilovolt ampere reactive
kW	kilowatt
kWh	kilowatt-hour
kWm	kilowatt mechanical
kWth	kilowatt-thermal
L	liter
LAN	local area network
L x W x H	length by width by height
lb.	pound, pounds
lbm/ft^3	pounds mass per cubic feet
LCB	line circuit breaker
LCD	liquid crystal display
ld. shd.	load shed
LED	light emitting diode
Lph	liters per hour
Lpm	liters per minute
LOP	low oil pressure
LP	liquefied petroleum
LPG	liquefied petroleum gas
LS	left side
L_{wa}	sound power level, A weighted
LWL	low water level
LWT	low water temperature
m	meter, milli (1/1000)
M	mega (10^6 when used with SI units), male
m^3	cubic meter
m^3/hr.	cubic meters per hour
m^3/min.	cubic meters per minute
mA	milliampere
man.	manual
max.	maximum
MB	megabyte (2^{20} bytes)
MCCB	molded-case circuit breaker
MCM	one thousand circular mils
meggar	megohmmeter
MHz	megahertz
mi.	mile
mil	one one-thousandth of an inch
min.	minimum, minute
misc.	miscellaneous
MJ	megajoule
mJ	millijoule
mm	millimeter
mOhm, mΩ	milliohm
MOhm, MΩ	megohm
MOV	metal oxide varistor
MPa	megapascal
mpg	miles per gallon
mph	miles per hour
MS	military standard
ms	millisecond
m/sec.	meters per second
MTBF	mean time between failure
MTBO	mean time between overhauls
mtg.	mounting
MTU	Motoren-und Turbinen-Union
MW	megawatt
mW	milliwatt
µF	microfarad
N, norm.	normal (power source)
NA	not available, not applicable
nat. gas	natural gas
NBS	National Bureau of Standards
NC	normally closed
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
Nm	newton meter
NO	normally open
no., nos.	number, numbers
NPS	National Pipe, Straight
NPSC	National Pipe, Straight-coupling
NPT	National Standard taper pipe thread per general use
NPTF	National Pipe, Taper-Fine
NR	not required, normal relay
ns	nanosecond
OC	overcrank
OD	outside diameter
OEM	original equipment manufacturer
OF	overfrequency
opt.	option, optional
OS	oversize, overspeed
OSHA	Occupational Safety and Health Administration
OV	overvoltage
oz.	ounce
p., pp.	page, pages
PC	personal computer
PCB	printed circuit board
pF	picofarad
PF	power factor
ph., ∅	phase
PHC	Phillips® head Crimptite® (screw)
PHH	Phillips® hex head (screw)
PHM	pan head machine (screw)
PLC	programmable logic control
PMG	permanent magnet generator
pot	potentiometer, potential
ppm	parts per million
PROM	programmable read-only memory
psi	pounds per square inch
psig	pounds per square inch gauge
pt.	pint
PTC	positive temperature coefficient
PTO	power takeoff
PVC	polyvinyl chloride
qt.	quart, quarts
qty.	quantity
R	replacement (emergency) power source
rad.	radiator, radius
RAM	random access memory
RDO	relay driver output
ref.	reference
rem.	remote
Res/Coml	Residential/Commercial
RFI	radio frequency interference
RH	round head
RHM	round head machine (screw)
rly.	relay
rms	root mean square
rnd.	round
ROM	read only memory
rot.	rotate, rotating
rpm	revolutions per minute
RS	right side
RTU	remote terminal unit
RTV	room temperature vulcanization
RW	read/write
SAE	Society of Automotive Engineers
scfm	standard cubic feet per minute
SCR	silicon controlled rectifier
s, sec.	second
SI	*Systeme international d'unites,* International System of Units
SI/EO	side in/end out
sil.	silencer
SN	serial number
SNMP	simple network management protocol
SPDT	single-pole, double-throw
SPST	single-pole, single-throw
spec	specification
specs	specification(s)
sq.	square
sq. cm	square centimeter
sq. in.	square inch
SS	stainless steel
std.	standard
stl.	steel
tach.	tachometer
TD	time delay
TDC	top dead center
TDEC	time delay engine cooldown
TDEN	time delay emergency to normal
TDES	time delay engine start
TDNE	time delay normal to emergency
TDOE	time delay off to emergency
TDON	time delay off to normal
temp.	temperature
term.	terminal
THD	total harmonic distortion
TIF	telephone influence factor
TIR	total indicator reading
tol.	tolerance
turbo.	turbocharger
typ.	typical (same in multiple locations)
UF	underfrequency
UHF	ultrahigh frequency
UL	Underwriter's Laboratories, Inc.
UNC	unified coarse thread (was NC)
UNF	unified fine thread (was NF)
univ.	universal
US	undersize, underspeed
UV	ultraviolet, undervoltage
V	volt
VAC	volts alternating current
VAR	voltampere reactive
VDC	volts direct current
VFD	vacuum fluorescent display
VGA	video graphics adapter
VHF	very high frequency
W	watt
WCR	withstand and closing rating
w/	with
w/o	without
wt.	weight
xfmr	transformer

Appendix B Noise and Wiring Practices

Electrical noise is an unwanted electrical signal that can cause errors in measurement, loss of control, malfunctions in microprocessor-based control systems, errors in data transfer between systems over communication links, or reductions in system performance.

Good system design and wiring practices can minimize noise levels and the effects of noise.

Noise, because of its random nature, is typically characterized by frequency distribution. Many noise sources are broad-spectrum, that is, they produce many frequencies distributed over a wide range. Broad-spectrum noise is particularly troublesome because it cannot be removed easily by filtering, and because it can affect a variety of systems in unpredictable ways. One common source of broad-spectrum noise is a switch, which can produce voltage and current changes when an electrical circuit is connected and disconnected.

Coupling is the transfer of signals between separate circuits. Signals from one circuit become noise in another. The amount of coupling is cumulative and is a function of the proximity of the circuits, their orientation, exposed area, and length of run. Minimize coupling by the following:

- Isolating circuits from each other by using separate raceways or conduit
- Separating circuits from each other by locating them as far apart as possible
- Enclosing circuits with a grounded metallic shield such as an enclosure, metallic conduit, or cable shield
- Running conductors perpendicular, rather than parallel, to each other
- Running wires loosely and randomly rather than bundling them tightly together
- Twisting a circuit's wires together in pairs

In an industrial environment, there are typically five types of circuits with different noise emission and rejection capabilities. The five types of circuits are as follows:

- **High-Power Distribution.** Circuits to high-power loads such as large electric motors and heaters can emit transient high levels of broad-spectrum noise. Loads on high-power distribution circuits are nearly immune to noise.
- **General Purpose Power Distribution.** Circuits to medium-power loads such as lighting, offices, light-duty equipment, and small motors such as fans and pumps can emit transient, medium levels of broad-spectrum noise. Some electronic equipment, such as computers, emits constant levels of broad-spectrum noise in addition to transient broad-spectrum noise. Loads on general-purpose circuits, except for sensitive electronic equipment, are nearly immune to noise.
- **Control.** Control circuits include DC circuits and 120 VAC maximum AC circuits that operate at a low power level (less than 1 W). Typical circuits include circuits to switches, actuators, and dry-contact relays, including the generator engine-start circuit. Control circuits emit transient low levels of broad-spectrum noise and are fairly immune to noise.
- **Analog.** Analog circuits are low-voltage DC circuits that convey measurement information as relatively small changes in current or voltage. Typical circuits include those connected to the controller's analog inputs. Analog circuits create the lowest noise levels and are the most sensitive to noise.
- **Communication and Signaling.** Communication and signaling circuits are low-voltage circuits that convey information. Typical circuits include RS-232 and RS-485 serial communication lines, telephone lines, and computer network lines. These circuits create noise with frequencies related to the communication signaling rate. These circuits have some level of built-in noise immunity. Typical systems will detect or correct errors caused by noise below certain levels, but with a corresponding reduction in the data transfer rate.

When planning an installation, separate all of these types of circuits as much as possible to minimize the hazards of insulation failure, accidental miswiring, and noise coupling. For best results, install control circuits, analog circuits, and communication and signaling circuits separately. Combining circuit types is unavoidable in the controller's enclosure and some other areas.

Note: It is very important to isolate high- and medium-power circuits in raceways or conduit separate from the other types of circuits.

Appendix C Decison-Maker 550 Controllers, Versions Below 2.10

This section contains Modbus® registers for Decision-Maker®550 controller with application code versions numbered below 2.10 (for example, code version number 1.34). See Section 5.4 for instructions to determine the application code version number for your controller.

Guide to Register Map

Description	Registers
Monitoring	40001 - 40083
Electrical Output	40001 - 40027
Reserved	40028 - 40032
Engine Status	40033 - 40054
Reserved	40055 - 40060
Analog Input Status	40061 - 40068
Reserved	40069 - 40076
Digital Input status	40077 - 40078
Reserved	40079 - 40083
Maintenance	40084 - 40112
Time/Date	40113 - 40115
Time Delay Settings	40116 - 40124
Settings and Setpoints	40125 - 40146
Factory Setup	40147 - 40226
Digital Input Setup	40227 - 40499
Analog Input Setup	40500 - 40739
Remapped Registers *	40740 - 40837
Relay Driver Output Status	40838 - 40839
Relay Driver Output Setup	40840 - 40870
Event History	40871 - 41270
Miscellaneous Strings	41271 - 41295
Reserved and Write-Only Registers	41296 - 41308

Modbus Registers

Register	Parameter	Access	Data Type	Range/Units
40001	L1 - L2 Voltage	RO	WORD	Volts AC
40002	L2 - L3 Voltage	RO	WORD	Volts AC
40003	L3 - L1 Voltage	RO	WORD	Volts AC
40004	L1 - L0 Voltage	RO	WORD	Volts AC
40005	L2 - L0 Voltage	RO	WORD	Volts AC
40006	L3 - L0 Voltage	RO	WORD	Volts AC
40007	L1 Current	RO	WORD	Amps AC
40008	L2 Current	RO	WORD	Amps AC
40009	L3 Current	RO	WORD	Amps AC
40010	Frequency	RO	WORD	Hz x 100
40011	Total kW	RO	WORD	kW
40012	Percent Of Rated kW	RO	WORD	% Rated kW
40013	Total Power Factor	RO	SWORD	PF x 100
40014	L1 kW	RO	WORD	kW
40015	L1 Power Factor	RO	SWORD	PF x 100
40016	L2 kW	RO	WORD	kW
40017	L2 Power Factor	RO	SWORD	PF x 100
40018	L3 kW	RO	WORD	kW
40019	L3 Power Factor	RO	SWORD	PF x 100
40020	Total kVAR	RO	SWORD	kVAR
40021	L1 kVAR	RO	SWORD	kVAR
40022	L2 kVAR	RO	SWORD	kVAR
40023	L3 kVAR	RO	SWORD	kVAR
40024	Total kVA	RO	WORD	kVA
40025	L1 kVA	RO	WORD	kVA
40026	L2 kVA	RO	WORD	kVA
40027	L3 kVA	RO	WORD	kVA
40028	*Reserved for Future Use*	RO	WORD	
40029	*Reserved for Future Use*	RO	WORD	
40030	*Reserved for Future Use*	RO	WORD	
40031	*Reserved for Future Use*	RO	WORD	
40032	*Reserved for Future Use*	RO	WORD	
40033	Oil Pressure*	RO	WORD	kPa/psi
40034	Coolant Temperature*	RO	SWORD	°C/°F
40035	Engine Speed*	RO	WORD	rpm
40036	Local Battery Voltage*	RO	WORD	Volts DC x 10
40037	Fuel Pressure*	RO	WORD	kPa/psi (ECM only)
40038	Fuel Temperature*	RO	SWORD	°C/°F (ECM only)
40039	Fuel Rate*	RO	WORD	Liters/Hour x 100/Gallons/Hour x 100 (ECM only)
40040	Used Last Run*	RO	WORD	Liters/Gallons (ECM only)
40041	Coolant Pressure*	RO	WORD	kPa/psi (ECM only)
40042	Coolant Level*	RO	WORD	% x 10 (ECM only)
40043	Oil Temperature*	RO	SWORD	°C/°F (ECM only)
40044	Oil Level*	RO	WORD	% x 10 (ECM only)
40045	Crankcase Pressure*	RO	WORD	kPa/psi (ECM only)
40046	Ambient Temperature*	RO	SWORD	°C/°F (ECM only)
40047	ECM Battery Voltage*	RO	WORD	Volts DC x 10 (ECM only)
40048	ECM Status	RO	WORD	0 = ECM- Equipped, 1 = Non- ECM
40049	*Reserved for Future Use*	RO	WORD	
40050	*Reserved for Future Use*	RO	WORD	

*0x7FD6 = data unavailable. 0x7FFF = data is out of range.

Register	Parameter	Access	Data Type	Range/Units
40051	*Reserved for Future Use*	RO	WORD	
40052	*Reserved for Future Use*	RO	WORD	
40053	*Reserved for Future Use*	RO	WORD	
40054	System Event Stack	RO	7 WORDS	Word #1: System Events 0- 15 Word #2: System Events 16- 31 Word #3: System Events 32- 47 Word #4: System Events 48- 63 Word #5: System Events 64- 79 Word #6: System Events 80- 95 Word #7: System Events 96- 99 (bits 4- 15 unused) Event exists if individual bit is set. Refer to Message Codes Section in this Appendix for message codes and descriptions.
40061	Analog Input 00(Battery voltage)*	RO	WORD	Volts DC
40062	Analog Input 01*	RO	WORD	User-Defined
40063	Analog Input 02*	RO	WORD	User-Defined
40064	Analog Input 03*	RO	WORD	User-Defined
40065	Analog Input 04*	RO	WORD	User-Defined
40066	Analog Input 05*	RO	WORD	User-Defined
40067	Analog Input 06*	RO	WORD	User-Defined
40068	Analog Input 07*	RO	WORD	User-Defined
40069	*Reserved for Additional Input*	RO	WORD	
40070	*Reserved for Additional Input*	RO	WORD	
40071	*Reserved for Additional Input*	RO	WORD	
40072	*Reserved for Additional Input*	RO	WORD	
40073	*Reserved for Additional Input*	RO	WORD	
40074	*Reserved for Additional Input*	RO	WORD	
40075	*Reserved for Additional Input*	RO	WORD	
40076	*Reserved for Additional Input*	RO	WORD	
40077- 40078	Digital Input Status	RO	2 WORDS	Input is high if individual bit is set. 40077 Word #1 Digital Inputs 0- 15: Bit 0 Remote start contacts Bit 1 Emergency stop Bit 2 Low coolant level Bit 3 Digital Input #1 Bit 4 Digital Input #2 Bit 5 Digital Input #3 Bit 6 Digital Input #4 Bit 7 Digital Input #5 Bit 8 Digital Input #6 Bit 9 Digital Input #7 Bit 10 Digital Input #8 Bit 11 Digital Input #9 Bit 12 Digital Input #10 Bit 13 Digital Input #11 Bit 14 Digital Input #12 Bit 15 Digital Input #13
*0x7FD6 = data unavailable. 0x7FFF = data is out of range.				

Register	Parameter	Access	Data Type	Range/Units
40077- 40078, cont.	Digital Input Status	RO	2 WORDS	40078 Word #2 Digital Inputs 16- 23 (Bits 8- 15 Unused): Bit 0 Digital Input #14 Bit 1 Digital Input #15 Bit 2 Digital Input #16 Bit 3 Digital Input #17 Bit 4 Digital Input #18 Bit 5 Digital Input #19 Bit 6 Digital Input #20 Bit 7 Digital Input #21 Bit 8 Unused Bit 9 Unused Bit 10 Unused Bit 11 Unused Bit 12 Unused Bit 13 Unused Bit 14 Unused Bit 15 Unused
40079	*Reserved for Future Use*	RO	WORD	
40080	*Reserved for Future Use*	RO	WORD	
40081	*Reserved for Future Use*	RO	WORD	
40082	*Reserved for Future Use*	RO	WORD	
40083	*Reserved for Future Use*	RO	WORD	
40084	Total Number Of Starts	RO	WORD	Starts
40085	Total Run Time Hours	RO	LONG	Hrs. x 100 (LSW First)
40087	Total Run Time Loaded Hours	RO	LONG	Hrs. x 100 (LSW First)
40089	Total Run Time Unloaded Hours	RO	LONG	Hrs. x 100 (LSW First)
40091	Total Run Time kW Hours	RO	LONG	kW Hrs. (LSW First)
40093	RTSM (Run Time Since Maintenance) Total Hours	RO	LONG	Hrs. x 100 (LSW First)
40095	RTSM Loaded Hours	RO	LONG	Hrs. x 100 (LSW First)
40097	RTSM Unloaded Hours	RO	LONG	Hrs. x 100 (LSW First)
40099	RTSM kW Hours	RO	LONG	kW Hrs. (LSW First)
40101	Last Maintenance Date	RO	2 WORDS	Day| Month, Year
40103	Operating Days Since Maint.	RO	WORD	Days
40104	Number Of Starts Since Maint.	RO	WORD	Starts
40105	Last Start Date	RO	2 WORDS	Day| Month, Year
40107	Last Start Time	RO	WORD	Hr. |Min.
40108	Last Run Length	RO	WORD	Hrs. x 100
40109	Last Run Loaded	RO	WORD	0 = Unloaded, 1 = Loaded
40110	Timed Run Time	RW	WORD	Hr. | Min.
40111	Timed Run Remaining	RO	WORD	Hr. | Min.
40112	Is Timed Run Active	RO	WORD	1 = True, 0 = False
40113	Current Date	RW	2 WORDS	Day| Month, 2 Digit Year | Day Of Week (0 = Sunday)
40115	Current Time (24 Hr. Clock)	RW	WORD	Hr.|Min.
40116	Time Delay Engine Start	RW	WORD	Min. | Sec.
40117	Time Delay Starting Aid	RW	WORD	Min. | Sec.
40118	Time Delay Crank On	RW	WORD	Min. | Sec.
40119	Time Delay Crank Pause	RW	WORD	Min. | Sec.
40120	Time Delay Engine Cooldown	RW	WORD	Min. | Sec.
40121	Time Delay Crank Cycles	RW	WORD	Cycles
40122	Time Delay Overvoltage	RW	WORD	Min. | Sec.
40123	Time Delay Undervoltage	RW	WORD	Min. | Sec.
40124	Time Delay Load Shed kW	RW	WORD	Min. | Sec.
40125	Operating Mode	RW	WORD	1 = Standby, 2 = Prime Power
*0x7FD6 = data unavailable. 0x7FFF = data is out of range.				

Register	Parameter	Access	Data Type	Range/Units
40126	System Voltage	RW	WORD	Volts AC
40127	System Frequency	RW	WORD	Hz
40128	System Phase	RW	WORD	1 = 3 Phase Delta, 2 = 3 Phase Wye, 3 = Single Phase
40129	kW Rating	RW	WORD	kW
40130	Load Shed Output	RW	WORD	% of kW Rating
40131	Overvoltage	RW	WORD	% of System Voltage
40132	Undervoltage	RW	WORD	% of System Voltage
40133	Overfrequency	RW	WORD	% of System Frequency
40134	Underfrequency	RW	WORD	% of System Frequency
40135	Overspeed	RW	WORD	Hz
40136	Battery Voltage	RW	WORD	Volts DC x 10
40137	Low Battery Voltage	RW	WORD	Volts DC x 10
40138	High Battery Voltage	RW	WORD	Volts DC x 10
40139	Metric Units	RW	WORD	1 = True, 0 = False
40140	NFPA 110 Defaults Enabled	RW	WORD	1 = True, 0 = False
40141	Rated Current	RO	WORD	Amps AC
40142	*Reserved for Future Use*	RO	WORD	
40143	*Reserved for Future Use*	RO	WORD	
40144	*Reserved for Future Use*	RO	WORD	
40145	*Reserved for Future Use*	RO	WORD	
40146	*Reserved for Future Use*	RO	WORD	
40147	Final Assembly Date	RO	2 WORDS	Day| Month, Year
40149	Final Assembly Clock No.	RO	LONG	99999 Max (LSW First)
40151	Total Operating Days	RO	WORD	Days
40152	Model No.	RO	13 WORDS	26 Character String
40165	Spec. No.	RO	8 WORDS	16 Character String
40173	Genset Serial No.	RO	10 WORDS	20 Character String
40183	Alternator Part No.	RO	10 WORDS	20 Character String
40193	Engine Part Number	RO	10 WORDS	20 Character String
40203	Control No.	RO	LONG	(LSW First)
40205	Code Version	RO	3 WORDS	6 Character String
40208	Setup Lock	RO	WORD	1 = Locked, 0 = Unlocked
40209	Engine Model Number	RO	4 WORDS	8 Character String (ECM only)
40213	Engine Serial Number	RO	5 WORDS	10 Character String (ECM only)
40218	Unit Number	RO	5 WORDS	10 Character String (ECM only)
40223	ECM Serial Number	RO	4 WORDS	8 Character String (ECM only)
40227-40499:	**Digital Inputs**	RW	13 WORDS PER INPUT	For each digital input: Word #1: Enabled (1 = True, 0 = False | Function Code Word #2: Inhibit Time (Min.|Sec.) Word #3: Delay Time (Min.|Sec.) Words #4- 13: 10 words for 20-character description string. Refer to the Function Codes section in this Appendix for digital input function codes.
40227	Digital Input 01	RW	13 WORDS	
40240	Digital Input 02	RW	13 WORDS	
40253	Digital Input 03	RW	13 WORDS	
40266	Digital Input 04	RW	13 WORDS	
40279	Digital Input 05	RW	13 WORDS	
40292	Digital Input 06	RW	13 WORDS	
40305	Digital Input 07	RW	13 WORDS	
40318	Digital Input 08	RW	13 WORDS	
40331	Digital Input 09	RW	13 WORDS	
40344	Digital Input 10	RW	13 WORDS	
40357	Digital Input 11	RW	13 WORDS	
40370	Digital Input 12	RW	13 WORDS	

*0x7FD6 = data unavailable. 0x7FFF = data is out of range.

Register	Parameter	Access	Data Type	Range/Units
40383	Digital Input 13	RW	13 WORDS	For each digital input: Word #1: Enabled (1 = True, 0 = False | Function Code Word #2: Inhibit Time (Min.|Sec.) Word #3: Delay Time (Min.|Sec.) Words #4- 13: 10 words for 20-character description string. Refer to the Function Codes section in this Appendix for digital input function codes.
40396	Digital Input 14	RW	13 WORDS	
40409	Digital Input 15	RW	13 WORDS	
40422	Digital Input 16	RW	13 WORDS	
40435	Digital Input 17	RW	13 WORDS	
40448	Digital Input 18	RW	13 WORDS	
40461	Digital Input 19	RW	13 WORDS	
40474	Digital Input 20	RW	13 WORDS	
40487	Digital Input 21	RW	13 WORDS	
Note: *Cannot read past end of block*				
40500-40739:	**Analog Inputs**	RW	16 WORDS	For each analog input: Word #1: Warning/Shutdown Enable [bits 8,9] (1 = True, 0 = False) | Inhibit Time (Sec.) Word #2: Warn Time (Sec) | Sdwn Time (Sec.) Word #3: Lower Warn Limit Word #4: Upper Warn Limit Word #5: Lower Sdwn Limit Word #6: Upper Sdwn Limit Words #7- 16: 10 words for 20-character description string
40500	Analog Input 01 *(ECM only)*	RW	16 WORDS	
40516	Analog Input 02 *(ECM only)*	RW	16 WORDS	
40532	Analog Input 03	RW	16 WORDS	
40548	Analog Input 04	RW	16 WORDS	
40564	Analog Input 05	RW	16 WORDS	
40580	Analog Input 06	RW	16 WORDS	
40596	Analog Input 07	RW	16 WORDS	
Note: *Cannot read past end of block*				
40612	*Reserved for additional analog input*	RO	16 WORDS	For each analog input: Word #1: Warning/Shutdown Enable [bits 8,9] (1 = True, 0 = False) | Inhibit Time (Sec.) Word #2: Warn Time (Sec) | Sdwn Time (Sec.) Word #3: Lower Warn Limit Word #4: Upper Warn Limit Word #5: Lower Sdwn Limit Word #6: Upper Sdwn Limit Words #7- 16: 10 words for 20-character description string
40628	*Reserved for additional analog input*	RO	16 WORDS	
40644	*Reserved for additional analog input*	RO	16 WORDS	
40660	*Reserved for additionalanalog input*	RO	16 WORDS	
40676	*Reserved for additional analog input*	RO	16 WORDS	
40692	*Reserved for additional analog input*	RO	16 WORDS	
40708	*Reserved for additionalanalog input*	RO	16 WORDS	
40724	*Reserved for additional analog input*	RO	16 WORDS	
Note: *Cannot read past end of block*				
40740-40837:	**Defined Common Faults**	RW	1 WORD per DCF	For all DCFs: Selected (1 = True, 0 = False) | Setpoint (Analog inputs only)
40740	Emergency Stop	RW	1 WORD	
40741	Overspeed	RW	1 WORD	
40742	Overcrank	RW	1 WORD	
40743	High Coolant Temperature Shutdown	RW	1 WORD	
40744	Oil Pressure Shutdown	RW	1 WORD	
40745	Low Coolant Temperature	RW	1 WORD	**Note:** DCF and RDO on ECM only
40746	Low Fuel	RW	1 WORD	
40747	High Coolant Temperature Warning	RW	1 WORD	
40748	Oil Pressure Warning	RW	1 WORD	
40749	Master Not In Auto	RW	1 WORD	
40750	NFPA 110 Fault	RW	1 WORD	
40751	Low Battery Voltage	RW	1 WORD	
40752	High Battery Voltage	RW	1 WORD	
40753	Battery Charger Fault	RW	1 WORD	
40754	System Ready	RW	1 WORD	
40755	Loss of ECM Comm	RW	1 WORD	**Note:** DCF and RDO on ECM only
*0x7FD6 = data unavailable. 0x7FFF = data is out of range.				

Register	Parameter	Access	Data Type	Range/Units
40756	No Oil Pressure Signal	RW	1 WORD	
40757	High Oil Temperature Shutdown	RW	1 WORD	
40758	No Coolant Temperature Signal	RW	1 WORD	
40759	Low Coolant Level	RW	1 WORD	
40760	Speed Sensor Fault	RW	1 WORD	
40761	Locked Rotor	RW	1 WORD	
40762	Master Switch Error	RW	1 WORD	
40763	Master Switch Open	RW	1 WORD	
40764	Master Switch Off	RW	1 WORD	
40765	AC Sensing Loss	RW	1 WORD	
40766	Overvoltage	RW	1 WORD	
40767	Undervoltage	RW	1 WORD	
40768	Weak Battery	RW	1 WORD	
40769	Overfrequency	RW	1 WORD	
40770	Underfrequency	RW	1 WORD	
40771	Load Shed kW Overload	RW	1 WORD	
40772	Load Shed kW Underfrequency	RW	1 WORD	
40773	Over Current	RW	1 WORD	
40774	EPS Supplying Load	RW	1 WORD	
40775	Internal Fault	RW	1 WORD	
40776	Engine Cooldown Delay	RW	1 WORD	
40777	Engine Start Delay	RW	1 WORD	
40778	Starting Aid	RW	1 WORD	
40779	Generator Running	RW	1 WORD	
40780	Air Damper Control	RW	1 WORD	
40781	Ground Fault	RW	1 WORD	
40782	EEPROM Write Failure	RW	1 WORD	
40783	Critical Overvoltage	RW	1 WORD	
40784	Alternator Protect Shutdown	RW	1 WORD	
40785	Air Damper Indicator	RW	1 WORD	
40786	Digital Input 01	RW	1 WORD	
40787	Digital Input 02	RW	1 WORD	
40788	Digital Input 03	RW	1 WORD	
40789	Digital Input 04	RW	1 WORD	
40790	Digital Input 05	RW	1 WORD	
40791	Digital Input 06	RW	1 WORD	
40792	Digital Input 07	RW	1 WORD	
40793	Digital Input 08	RW	1 WORD	
40794	Digital Input 09	RW	1 WORD	
40795	Digital Input 10	RW	1 WORD	
40796	Digital Input 11	RW	1 WORD	
40797	Digital Input 12	RW	1 WORD	
40798	Digital Input 13	RW	1 WORD	
40799	Digital Input 14	RW	1 WORD	
40800	Digital Input 15	RW	1 WORD	
40801	Digital Input 16	RW	1 WORD	
40802	Digital Input 17	RW	1 WORD	
40803	Digital Input 18	RW	1 WORD	
40804	Digital Input 19	RW	1 WORD	
40805	Digital Input 20	RW	1 WORD	
40806	Digital Input 21	RW	1 WORD	

*0x7FD6 = data unavailable. 0x7FFF = data is out of range.

Register	Parameter	Access	Data Type	Range/Units
40807	Analog Input 01	RW	1 WORD	**Note:** Non-zero setpoint values apply only to Analog Inputs 1- 7.
40808	Analog Input 02	RW	1 WORD	
40809	Analog Input 03	RW	1 WORD	
40810	Analog Input 04	RW	1 WORD	
40811	Analog Input 05	RW	1 WORD	
40812	Analog Input 06	RW	1 WORD	
40813	Analog Input 07	RW	1 WORD	
40814	*Reserved for Additional Input*	RO	1 WORD	
40815	*Reserved for Additional Input*	RO	1 WORD	
40816	*Reserved for Additional Input*	RO	1 WORD	
40817	*Reserved for Additional Input*	RO	1 WORD	
40818	*Reserved for Additional Input*	RO	1 WORD	
40819	*Reserved for Additional Input*	RO	1 WORD	
40820	*Reserved for Additional Input*	RO	1 WORD	
40821	*Reserved for Additional Input*	RO	1 WORD	
40822 through 40837	*Reserved for Future Use*	RO		
Note: *Cannot read past end of block*				
40838	RDO Status - RDO1 - > RDO16	RO*	1 WORD	Output is high if individual bit is set. Bit 0 = RDO 1 *Software-controlled RDOs are RW.*
40839	RDO Status - RDO17 - > RDO31	RO*	1 WORD	Output is high if individual bit is set. Bit 0 = RDO 17 *Software-controlled RDOs are RW.*
Note: *Cannot read past end of block*				
40840	Relay Driver Output 01	RW	1 WORD	For RDOs: Message Code | Setpoint **Note:** Non-zero setpoint values apply only to RDOs assigned to analog inputs. See the Message Codes section in this Appendix for message codes.
40841	Relay Driver Output 02	RW	1 WORD	
40842	Relay Driver Output 03	RW	1 WORD	
40843	Relay Driver Output 04	RW	1 WORD	
40844	Relay Driver Output 05	RW	1 WORD	
40845	Relay Driver Output 06	RW	1 WORD	
40846	Relay Driver Output 07	RW	1 WORD	
40847	Relay Driver Output 08	RW	1 WORD	
40848	Relay Driver Output 09	RW	1 WORD	
40849	Relay Driver Output 10	RW	1 WORD	
40850	Relay Driver Output 11	RW	1 WORD	
40851	Relay Driver Output 12	RW	1 WORD	
40852	Relay Driver Output 13	RW	1 WORD	
40853	Relay Driver Output 14	RW	1 WORD	
40854	Relay Driver Output 15	RW	1 WORD	
40855	Relay Driver Output 16	RW	1 WORD	
40856	Relay Driver Output 17	RW	1 WORD	
40857	Relay Driver Output 18	RW	1 WORD	
40858	Relay Driver Output 19	RW	1 WORD	
40859	Relay Driver Output 20	RW	1 WORD	
40860	Relay Driver Output 21	RW	1 WORD	
40861	Relay Driver Output 22	RW	1 WORD	
40862	Relay Driver Output 23	RW	1 WORD	
40863	Relay Driver Output 24	RW	1 WORD	
40864	Relay Driver Output 25	RW	1 WORD	
40865	Relay Driver Output 26	RW	1 WORD	
*0x7FD6 = data unavailable. 0x7FFF = data is out of range.				

Register	Parameter	Access	Data Type	Range/Units
40866	Relay Driver Output 27	RW	1 WORD	For RDOs: Message Code | Setpoint **Note:** Non-zero setpoint values apply only to RDOs assigned to analog inputs. See the Message Codes section in this Appendix for message codes.
40867	Relay Driver Output 28	RW	1 WORD	
40868	Relay Driver Output 29	RW	1 WORD	
40869	Relay Driver Output 30	RW	1 WORD	
40870	Relay Driver Output 31	RW	1 WORD	
Note: *Cannot read past end of block*				
40871	Event History, Page 1 (1 - 10)	RO	40 WORDS	For event history: Message code|Setpoint* Hr.|Min. Day|Month, Year * Analog Inputs only See the Message Codes section in this Appendix for message codes ***Note:*** *Message code = 0xFFat end of history.*
40911	Event History, Page 2 (11 - 20)	RO	40 WORDS	
40951	Event History, Page 3 (21 - 30)	RO	40 WORDS	
40991	Event History, Page 4 (31 - 40)	RO	40 WORDS	
41031	Event History, Page 5 (41 - 50)	RO	40 WORDS	
41071	Event History, Page 6 (51 - 60)	RO	40 WORDS	
41111	Event History, Page 7 (61 - 70)	RO	40 WORDS	
41151	Event History, Page 8 (71 - 80)	RO	40 WORDS	
41191	Event History, Page 9 (81 - 90)	RO	40 WORDS	
41231	Event History, Page 10 (91 - 100)	RO	40 WORDS	
Note: *Cannot read past end of block*				
41271	Designation	RW	5 WORDS	9-Character String
41276	Load	RW	10 WORDS	20-Character String
41286	Location	RW	10 WORDS	20-Character String
Note: *Cannot read past end of block*				
41296-41305	*Reserved for Future Use*	RO	WORD	
Note: *Cannot read past end of block*				
41306	Start Timed Run	WO	WORD	1 = Start, 0 = No Start
41307	Stop Timed Run	WO	WORD	1 = Stop, 0 = No Stop
41308	Reset Maintenance Records	WO	WORD	1 = Reset, 0 = No Reset
*0x7FD6 = data unavailable. 0x7FFF = data is out of range.				

Message Codes: Event History, Common Fault, and RDO Byte Summary

Code	Display Message
0	Emergency Stop
1	Overspeed
2	Overcrank
3	High Coolant Temperature Shutdown
4	Oil Pressure Shutdown
5	Low Coolant Temperature **Note:** DCF and RDO on ECM only
6	Low Fuel
7	High Coolant Temperature Warning
8	Oil Pressure Warning
9	Master Not In Auto
10	NFPA 110 Fault
11	Low Battery Voltage
12	High Battery Voltage
13	Battery Charger Fault
14	System Ready
15	Loss of ECM Comm **Note:** DCF and RDO on ECM only
16	No Oil Pressure Signal
17	High Oil Temperature Shutdown
18	No Coolant Temperature Signal
19	Low Coolant Level
20	Speed Sensor Fault
21	Locked Rotor
22	Master Switch Error
23	Master Switch Open
24	Master Switch Off
25	AC Sensing Loss
26	Overvoltage
27	Undervoltage
28	Weak Battery
29	Overfrequency
30	Underfrequency
31	Load Shed kW Overload
32	Load Shed kW Underfrequency
33	Over Current
34	Emergency power supply (EPS) Supplying Load
35	Internal Fault
36	Engine Cooldown Delay
37	Engine Start Delay
38	Starting Aid
39	Generator Running
40	Air Damper Control
41	Ground Fault
42	EEPROM Write Failure
43	Critical Overvoltage
44	Alternator Protect Shutdown
45	Air Damper Indicator
46	Digital Input 01
47	Digital Input 02
48	Digital Input 03
49	Digital Input 04
50	Digital Input 05
51	Digital Input 06
52	Digital Input 07
53	Digital Input 08
54	Digital Input 09
55	Digital Input 10
56	Digital Input 11
57	Digital Input 12
58	Digital Input 13
59	Digital Input 14
60	Digital Input 15
61	Digital Input 16
62	Digital Input 17
63	Digital Input 18
64	Digital Input 19
65	Digital Input 20
66	Digital Input 21
67	Analog Input 01
68	Analog Input 02
69	Analog Input 03
70	Analog Input 04
71	Analog Input 05
72	Analog Input 06
73	Analog Input 07
74- 81	*Reserved for Future Use*

The following system message codes cannot be defined as common faults but can be assigned to RDOs and are referenced in the event stack and history.

Message Code	Description
82	Defined Common Fault
83	Software-Controlled RDO #1
84	Software-Controlled RDO #2
85	Software-Controlled RDO #3
86	Software-Controlled RDO #4
87- 98	*Reserved*

The following system message codes cannot be defined as common faults or assigned to RDOs but can be referenced in the event stack and history.

Message Code	Description
99	Genset Parameter Warning
100	Genset S/N Mismatch Warning
101	Genset S/N Mismatch Shutdown

Function Codes: Digital Auxiliary Input

Code	Name	Notes
1	Warning	
2	Shutdown Type A	
3	Shutdown Type B	
4	Voltage Raise	
5	Voltage Lower	
6	VARPf Mode	
7	Remote Shutdown	
8	Remote Reset	
9	Air Damper	
10	Low Fuel	
11	Field Over Voltage	
12	Idle Mode	*ECM only*
13	Battle Switch	
14	Ground Fault	
15	Bat Chgr Fault	
16	High Oil Temperature	
17	Low Coolant Lvl	
18	Low Coolant Temperature	*ECM only.* *Not user-assignable.*

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