Motor Logic® Plus II
Network Programming Guide

Instruction Bulletin
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SQUARE D

⚠ DANGER

UNQUALIFIED USER

- Read and understand this bulletin in its entirety before programming the Motor Logic® Plus II system.
- This equipment must be installed, programmed, and serviced only by qualified personnel.
- The application of this product requires expertise in the design and programming of control systems. Only persons with such expertise should be allowed to program, install, alter, and apply this product.
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.

Failure to follow these instructions will result in death or serious injury.

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SECTION 1— INTRODUCTION

This instruction bulletin describes how to program the Motor Logic® Plus II (MLPII) solid-state overload relay for use on Modbus® and DeviceNet™ networks.

RELATED DOCUMENTATION

The following documents contain additional information about the Motor Logic Plus II SSOLR and the DeviceNet system:

- 30072-451-04, *Motor Logic® Plus II Programmable Solid-State Overload Relay, Class 9065 Type SP2, Series A*, contains receiving, installation, and wiring instructions for the Motor Logic Plus II programmable solid-state overload relay.
- 30072-450-76*, Motor Logic® Plus Display, 9999MLPD,* provides installation information for the 9999MLPD display and instructions for programming Motor Logic Plus and Motor Logic Plus II solid-state overload relays with the display. This document is also available in Spanish (30072-451-23) and French (30072-451-22).
- 30072-451-24*, Motor Logic® Plus Motor Management System 9999MMS*, describes how to display and manage the settings and motor history of a Motor Logic Plus programmable solid-state overload relay (SSOLR).This document is also available in Spanish (30072-451-25) and French (30072-451-26).
- 30072-450-95*, Motor Logic® Plus DeviceNet Communication Module, 9999DN and 9999DN2*, contains the installation instructions for the Motor Logic Plus network communication module.
- 30072-450-20, *Motor Logic® Plus Network Communication Module Class 9999 Type MB11 Installation Guide.*
- 30072-013-102, *Motor Logic® Plus Network Communication Module Class 9999 Type MB11 and Type MB22 Programming Guide.*

For copies of these documents, contact your local Schneider Electric field office or obtain them from www.us.SquareD.com (under Technical Library).

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IMPORTANT USER INFORMATION

Only qualified persons, as defined in the National Electrical Code (NEC), who are familiar with the installation, maintenance, and operation of this device and the equipment onto which it is to be installed—as well as applicable local, state, and national regulations, industry standards, and accepted practices regarding the safety of personnel and equipment—should be permitted to install, maintain, or operate this device.

These instructions are provided only as a general guide to qualified persons and are not all-inclusive. They do not cover every application or circumstance that may arise in the installation, maintenance, or operation of this equipment. Users are advised to comply with all local, state, and national regulations, industry standards, and acceptable practices regarding safety of personnel and equipment.

ABBREVIATIONS

The following abbreviations are used in this document:

- CCKIT: Cable Configuration Kit
- CT(s): Current Transformer(s)
- DN2: DeviceNet Communication Module for Motor Logic Plus II
- FVR: Full Voltage Reversing
- FVNR: Full Voltage Non-Reversing
- MLP: Motor Logic Plus
- MLPII: Motor Logic Plus II
- MLPD: Motor Logic Plus Display
- MMS: Motor Management System Display
- SSOLR: Solid-state overload relay

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PRODUCT SUPPORT

For support and assistance, contact the Product Support Group. The Product Support Group is staffed from 8:00 am until 6:00 pm Eastern time to assist with product selection, start-up, and diagnosis of product or application problems. Emergency phone support is available 24 hours a day, 365 days a year.

Toll Free: 1-888-SquareD (888-778-2733) USA
Toll Free: 1-800-565-6699 Canada

E-mail: control.products.support@us.schneider-electric.com
E-mail: canadian.pss@ca.schneider-electric.com

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SECTION 2— PROGRAMMABLE PARAMETERS

NETWORK CONNECTIONS AND HARDWARE REQUIREMENTS

Table 1 describes the network connections possible for the MLPII SSOLR, the hardware requirements for the connections, and associated reference material. Refer to the reference material specified for your application in Table 1 before programming the MLPII SSOLR.

Table 1: Network Connections and Hardware Requirements

Network Connection Type	Programming Hardware Requirements	Reference Material
Modbus network connection	MLPII SSOLR connects directly to a Modbus Master	30072-451-21, Section 3
	9999MMS and 9999MMS-R Modbus Display Interface	
DeviceNet network connection	9999DN2 DeviceNet Communication Module mounts directly on a MLPII SSOLR	30072-450-95 and 30072-451-21, Section 4

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PARAMETER SETTINGS

⚠ WARNING

IMPROPER OR INADVERTENT SETTINGS

- Take care when modifying parameter settings while the motor is running.
- Disable network programming to prevent unauthorized changes.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Table 2: Parameters Definitions and Default Values

Description	Range/Values	Units	Default
Conductor multiplier		Integer	
SP2B6	1		1
SP2C6	1		1
SP216	1		1
SP226	1		1
SP236	1		1
SP246	10–200		15
SP256	10–200		30
SP266	10–200		60
Overcurrent	Current range of SSOLR	A	Minimum rating
SP2B6	0.5–2.3		0.5
SP2C6	2–9		2
SP216	6–27		6
SP226	10–45		10
SP236	20–90		20
SP246	60–135		60
SP256	120–270		120
SP266	240–540		240

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Table 2: Parameters Definitions and Default Values *(continued)*

Description	Range/Values	Units	Default
Undercurrent	0.5 x OC Min. to OC Max., Off	A	0.5xMin rating
SP2B6	0.25–2.3, 0 = Off		0.25
SP2C6	1–9, 0 = Off		1
SP216	3–27, 0 = Off		3
SP226	5–45, 0 = Off		5
SP236	10–90, 0 = Off		10
SP246	30–135, 0 = Off		30
SP256	60–270, 0 = Off		60
SP266	120–540, 0 = Off		120
Current unbalance	2–25, or OFF	%	6
Trip class	5, J5, 10, J10, 15, J15, 20, J20, 30, J30	—	20
Rapid cycle timer	0–500	Seconds	10
Cool down timer	2–500	Minutes	8
Dry well recovery timer	2–500	Minutes	20
Number of restarts after UC	0, 1, 2, 3, 4, A	—	0
Number of restarts after other faults	0, 1, oc1, 2, oc2, 3, oc3, 4, oc4, A, ocA	—	0
Undercurrent trip delay	2–60	Seconds	5
Ground fault	1–10 x MULT, Off = 999	A	2
Phase selection	1 phase or 3 phase	—	3 phase
Input 1 setup	Digital input or PTC	—	DIgital
PTC reset	Automatic (follows #RF) or Manual	—	Manual
Input 4 setup	Digital input or Remote reset	—	Remote reset
Output A & B on power up	Manual or Automatic	—	Manual
Reverse phase	Enabled or Disabled	—	Disabled
Phase rotation	ABC or ACB	—	ABC
Thermal capacity available reset level	0–99	%	25
Modbus address	1–247	Integer	1
Modbus communication parameters	C01, C02, C03, C04, C05, C06	—	C01
Modbus network program	Enabled or Disabled	—	Enabled
Modbus network watchdog	Enabled or Disabled	—	Disabled
Modbus watchdog for MLPII Output A	Enabled or Disabled	—	Disabled
Modbus watchdog for MLPII Output B	Enabled or Disabled	—	Disabled

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Table 2: Parameters Definitions and Default Values *(continued)*

Description	Range/Values	Units	Default
Undercurrent warning level		A	
SP2B6	.12–3		.25
SP2C6	.5–12		1
SP216	1.5–34		3
SP226	2.5–58		5
SP236	5–118		10
SP246	15–180		15
SP256	30–360		30
SP266	60–720		60
Overcurrent warning level		A	
SP2B6	.25–3		.5
SP2C6	1–12		2
SP216	3–35		6
SP226	5–60		10
SP236	10–120		20
SP246	15–225		30
SP256	30–450		60
SP266	60–900		120
Ground fault warning level	1–12 x MULT	A	2
Current unbalance warning level	2–200	%	25
DeviceNet address	0–63	Integer	63
DeviceNet baud rate	125, 250, 500	kbaud	125
DeviceNet network program	Enabled or Disabled	—	Enabled
DeviceNet network watchdog	Enabled or Disabled	—	Disabled
DeviceNet Watchdog for MLPII OutputA	Enabled or Disabled	—	Disabled
DeviceNet Watchdog for MLPII OutputB	Enabled or Disabled	—	Disabled

SETUP

Multiplication Factor (MULT) Register 40441

The multiplication factor (MULT) calculates the true current settings.

For MLPII SSOLRs SP2C6, SP2B6, SP216, SP226, and SP236, the MULT is always 1 and cannot be changed.

For MLPII SSOLRs SP246, SP256, and SP266, set the MULT equal to the effective turns ratio of the current transformers (CTs) used. For example, with 300:5 CTs and 2 passes through each window on the SSOLR, set MULT as follows:

$$MULT = 300/5/2 = 30$$

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Overcurrent Threshold (OC) Register 40442

⚠ WARNING

IMPROPER PROTECTION

- Set overcurrent threshold (OC) to the maximum service factor amperage of the motor.
- Refer to the motor manufacturer's instructions before setting this parameter.

Failure to follow these instructions can result in injury or equipment damage.

The overcurrent threshold (OC) sets the trip point of the SSOLR. Set the OC to the maximum service factor amperage of the motor. This value is typically between 110% and 120% of the full load amperage (FLA).

Undercurrent Threshold (UC) Register 40443

The undercurrent threshold (UC) sets the level of acceptable undercurrent. Typically, the UC is set to 80% of the motor's FLA. At 80%, the SSOLR will detect a loss of load for various pumps and motors. To disable the undercurrent protection, set the UC to 0, where 0 = OFF.

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Current Unbalance Threshold (CUB) Register 40444

⚠ CAUTION

MOTOR OVERHEATING

- The current unbalance level must be set to protect the wiring and motor equipment.
- The setting must conform to national and local safety regulations and codes.
- Refer to the motor manufacturer's instructions before setting this parameter.

Failure to follow these instructions can result in injury or equipment damage.

This function sets the percentage of the phase current unbalance (CUB) allowed by the motor. Most motor manufacturers recommend restricting motor operation to a CUB of 5% or less, at the service factor amperage. Use the formula below to calculate the setting of the CUB:

$$CUB = \left(\frac{I_{dmax}}{I_{ave}}\right) \times 100$$

CUB = current unbalance (%)
I_{ave} = average current
I_{dmax} = maximum deviation from the average current

NOTE: When CUB = 999, the current unbalance and single-phase current detection are disabled.

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Trip Class (TC) Register 40445

⚠ CAUTION

MOTOR OVERHEATING

- The trip class adjustment must be set to match the thermal heating characteristics of the motor.
- Refer to the motor manufacturer's instructions before setting this parameter.

Failure to follow these instructions can result in injury or equipment damage.

This function selects the trip class (TC) of the SSOLR.[1] The motor and application determine the setting (see Table 3). Consult the motor manufacturer if you are unsure of the trip class.

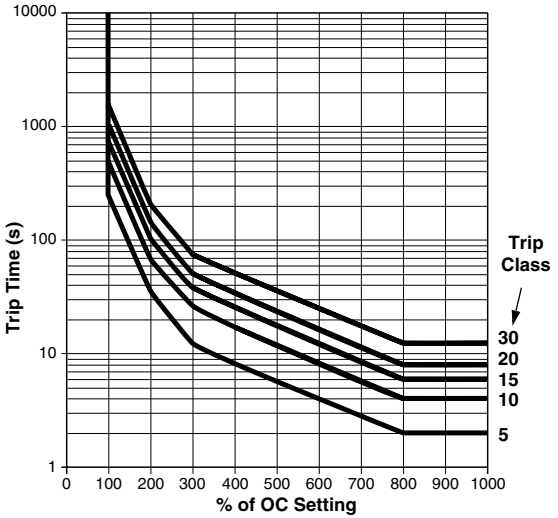
Table 3: Trip Class Definitions

Class	Related Application
5	For small, fractional horsepower motors with almost instantaneous acceleration. An extremely short trip time is required.
10 (fast)	For hermetic refrigerant motors, compressors, submersible pumps, and general-purpose IEC-rated motors that reach rated speed in less than 4 seconds
15	Available for specialized applications
20 (standard)	For most NEMA-rated, general-purpose motors
30 (slow)	For motors with acceleration times longer than 10 seconds, or with high inertia loads
J	For applications that require jam protection. Jam protection is enabled 1 minute after the motor starts. For motors that exceed 400% of the overcurrent limit, the trip time is always 2 seconds, regardless of the assigned trip class.To enable the jam protection feature, see Table 23 on page 52 and Table 64 on page 108.

[1] The trip class is determined by the time (in seconds) it takes for the overload relay to trip when carrying 600% of the overcurrent threshold setting (OC). *UL508, NEMA ICS 2 Part 4.*

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Figure 1: Trip Class Curves



Rapid Cycle Timer (RD1) Register 40446

The rapid cycle timer (RD1) controls the elapsed time (in seconds) between motor restarts. To protect the motor from rapid, successive power outages or short cycling caused by the motor controls, set RD1 between 20 and 30 seconds. To allow the motor to start immediately after power-up or after a normal shutdown, set RD1 to 0 seconds.

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Motor Cool-Down Timer/Restart Delay (RD2) Register 40447

⚠ CAUTION

MOTOR OVERHEATING

- The thermal reset parameter settings must allow sufficient time for the motor to cool after a thermal fault.
- Refer to the motor manufacturer's instructions before setting this parameter.

Failure to follow these instructions can result in injury or equipment damage.

The setting of RD2 determines the motor cooling time (in minutes) after a fault condition, such as

- A current unbalance (CUB) - see page 16
- A single-phasing fault (SP)
- An overload (when #RF is set to oc1 through ocA) - see page 18

Consult the motor manufacturer for the delay required for your motor. Normally, 5 to 10 minutes is sufficient.

NOTE: This SSOLR has a thermal memory feature and an associated thermal capacity available reset level that can inhibit a start after a fault. See the following section: "Thermal Capacity Available Reset Level (Register 40602)" on page 24.

Dry Well Recovery Timer/Restart Delay after Undercurrent (RD3) Register 40448

This timer determines the motor restart delay (in minutes) after an undercurrent fault (UC) - see page 15. It is often used in submersible pumping applications. The setting of RD3 depends on the recovery time of the water well, and varies from application to application.

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Number of Restarts after Undercurrent (#RU) Register 40449

⚠ DANGER

AUTOMATIC RESTART HAZARD

- Automatic Restart may only be used for machines or applications that present no danger in the event of automatically restarting, either to personnel or equipment.
- Equipment operation must conform to national and local safety regulations and codes.

Failure to follow these instructions can result in death, serious injury or equipment damage.

#RU determines the number of successive restart attempts after an undercurrent fault. The SSOLR allows up to four successive restart attempts after an undercurrent fault. When #RU is exceeded, the SSOLR trips and a manual restart is required. The #RU counter resets after the motor has been running for 1 minute.

For applications where automatic restart is not allowed, set #RU to 0. For continuous automatic restarts, set #RU to A.

Number of Restarts after Faults Other Than Undercurrent (#RF) Register 40450

#RF allows you to program the SSOLR for:

- Continuous automatic restarts (#RF = A)
- The number of restarts allowed after a PTC, CUB, or SP fault (#RF = 1, 2, 3, or 4). When the #RF counter is greater than this setting, the SSOLR requires a manual or network restart.
- The number of restarts allowed after a PTC, CUB, SP, or OC fault (#RF = oc1, oc2, oc3, oc4, or ocA)
- Manual restart only (#RF = 0)

The #RF counter resets after the motor has been running for more than 1 minute.

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Undercurrent Trip Delay (UCTD) Register 40451

The undercurrent trip delay (UCTD) determines how long the SSOLR will allow an undercurrent condition before it trips on an undercurrent fault (UC). Typically, UCTD is set to 5 seconds.

Modbus/DeviceNet Program and Watchdog/Idle Setup (Register 40412 Bits 0–7)

The Modbus and DeviceNet ports on the MLPII SSOLR can be set up to enable or disable the network programs and watchdog independently. To program the SSOLR, the associated port must have the network program enabled. You can protect the SSOLR from unauthorized program changes by disabling the network programs.

If the watchdog protection is enabled, the SSOLR will flag a communication loss fault and open the appropriate relay, if there is no active communication for more than 10 seconds, or if the DeviceNet port receives an idle message. Bits 0–7 of this register are used to enable or disable these features.

Writing a “1” to a Bit location makes the statements in Table 3 true. By default, both the Modbus and DeviceNet programs are enabled and the watchdogs are disabled.

Table 4: Network Communications Setup Word Bit Description

Bit	Description
Bit 0	Modbus network program enabled
Bit 1	Modbus network watchdog fault relay timer enabled
Bit 2	DeviceNet network program enabled
Bit 3	DeviceNet network watchdog fault relay timer enabled
Bit 4	Modbus network watchdog OUTA timer enabled
Bit 5	Modbus network watchdog OUTB timer enabled
Bit 6	DeviceNet network watchdog or Idle OUTA timer enabled
Bit 7	DeviceNet network watchdog or Idle OUTB timer enabled
Bit 15	Reserved[1]

[1] Do not write to reserved bits.

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Ground Fault Current Threshold (Register 40452)

⚠ DANGER

IMPROPER FAULT PROTECTION

- Ground fault trip levels must be set to protect the wiring and motor equipment.
- Ground fault settings must conform to national and local safety regulations and codes.

Failure to follow these instructions will result in death or serious injury.

- The SSOLR measures ground fault (GF) using a built-in zero sequence CT.

  NOTE: GF measurement is inaccurate when external CTs are used, and it is dependent on the CTs used.

- Ground fault determines the current leakage that indicates an insulation breakdown.

  *NOTE: **In case of short circuit to ground,** the overload relay will trip on ground fault.*

Table 5: Ground Fault Current Set Points

SSOLR Type	Minimum Set Point	Maximum GF Current
SP2B6	1 A	10 A
SP2C6	1 A	10 A
SP216	1 A	10 A
SP226	1 A	10 A
SP236	1 A	10 A
SP246	1 A x MULT	10 A x MULT
SP256	1 A x MULT	10 A x MULT
SP266	1 A x MULT	10 A x MULT

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Phase Selection (Register 40456, Bit 0)

The SSOLR can be configured for either single-phase or three-phase motor applications. When configured for single-phase motor applications, the SSOLR automatically disables the current unbalance, phase loss, single phase, and reverse phase protection features.

Input 1 Setup (Register 40456, Bits 1–2)

Input 1 can be configured as a digital input to report any hard-contact closure connected to it, or it can be configured as a PTC thermistor input. When Input 1 is configured as a PTC thermistor input, it can open or close the fault relay based on the motor temperature, as indicated by the measured impedance of the embedded motor PTC thermistor. If the measured impedance exceeds the trip level, the SSOLR will open the fault relay within 2 seconds.

Input 4 Setup (Register 40456, Bit 3)

Input 4 can be configured as a digital input to report any hard-contact closure connected to it, or it can be configured as a remote reset input. When Input 4 is configured as a remote reset input, it can open or close the fault relay based on the hard-contact signal it receives. If the SSOLR is in the faulted state, a momentary closure signal to Input 4 will reset the fault relay. If the signal to Input 4 is maintained for a duration greater than 5 seconds, the SSOLR will initiate a test trip.

Reverse Phase (Register 40456, Bits 4–5)

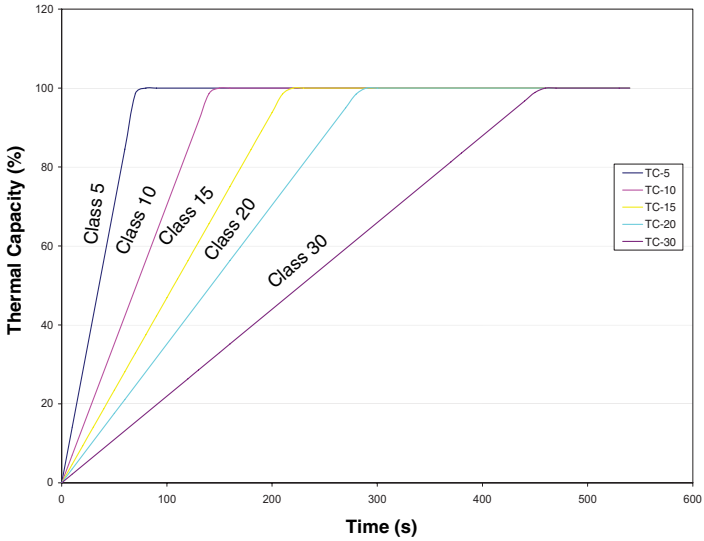
Reverse phase protection can be enabled or disabled. Disabled is the default setting. Reverse phase protection monitors the current going through each CT window, determines the sequence of the current, and compares it to the user-selected sequence. If the two are different, it opens the fault relay. The available sequences are ABC or ACB. ABC is the default setting.

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Thermal Capacity Available Reset Level (Register 40602)

The SSOLR has a thermal memory feature that is an approximate representation of the thermal state of the motor. As the current increases above the overcurrent (OC) setting, the thermal memory increases to represent heating of the motor. When the current falls below the OC setting, the thermal memory decreases to represent cooling of the motor. When the SSOLR trips on OC, the thermal capacity available is zero. This reset level allows the user to set a threshold for the thermal capacity available in the motor before allowing a restart. By default, the SSOLR will not allow a restart until there is 25% thermal capacity available.

Figure 2: Thermal Capacity Recovery Curve



Modbus Address (Register 40453)

MBAddress stores the address of the MLPII SSOLR when it is used as a Modbus device. Valid addresses are 1–247, except for 127 which is reserved. Every MLPII SSOLR responds to address 127. It is used to configure or commission the MLPII SSOLR with the Motor Logic® Plus Display (9999 MLPD), the Motor Logic® Plus Motor Management System (9999 MMS), or SOLUTIONS Software (9999 MLPS).

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Network Communications Setup (Register 40455)

⚠ WARNING

IMPROPER COMMUNICATION PORT USAGE

- Communication ports should be used for non-critical data transfers only.
- Contactor status and current level values reported over the communication ports are delayed by transmission time and should not be used for critical control decisions.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The MLPII SSOLR Modbus port can be configured to the settings described in Table 6. When configuring network communication, the values shown in the first column are written to the register to program the corresponding baud rate, parity, and stop bit.

Table 6: Network Communications Setup Word Bit Description

Value	Setting	Baud rate	Parity	Stop Bit
1	C01	19200	Even	1
2	C02	19200	Odd	1
3	C03	19200	None	1
4	C04	9600	Even	1
5	C05	9600	Odd	1
6	C06	9600	None	1

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Modbus/DeviceNet Program and Watchdog Setup (Register 40412, Bits 0–7)

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

Ensure that the operation of outputs A and B in Series A MLPII SSOLRs does not result in a hazardous situation during communication faults. Outputs A (13/14) and B (23/24) are programmed to hold their last state in the event of a communication fault regardless of the watchdog enable feature setting.

Failure to follow these instructions will result in death or serious injury.

The Modbus and DeviceNet ports on the MLPII SSOLR can be set up to enable or disable the network programs and watchdog protection independently. To program the SSOLR, the associated port must have the network program enabled. You can protect the SSOLR from unauthorized program changes by disabling the network program.

If watchdog protection is enabled, the SSOLR will flag a communication loss fault and open the appropriate relay, if there is no active communication for more than 10 seconds or the DeviceNet port receives an idle message. Bits 0–7 of this register are used to enable or disable these features. Writing a “1” to a bit will make the statement in Table 7 true. By default, both Modbus and DeviceNet programs are enabled and the watchdogs are disabled.

Table 7: Network Status Word Bit Description

Bit	Description
Bit 0	Modbus network program enabled
Bit 1	Modbus network watchdog fault relay timer enabled
Bit 2	DeviceNet network program enabled
Bit 3	DeviceNet network watchdog fault relay timer enabled
Bit 4	Modbus network watchdog OUTA timer enabled
Bit 5	Modbus network watchdog OUTB timer enabled
Bit 6	DeviceNet network watchdog/idle OUTA timer enabled
Bit 7	DeviceNet network watchdog/idle OUTB timer enabled
Bit 15	Reserved[1]

[1] Do not write to reserved bits.

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Watchdog or DeviceNet Idle Settings for Loss of Communications

Series A MLPII SSOLR

The MLPII SSOLR has a watchdog setting for the fault relay that can be enabled or disabled. The default setting is disabled. If the Series "A" MLPII SSOLR sees no active communication on the DeviceNet port for more than 10 seconds, then the fault relay will open if the watchdog is enabled. This watchdog setting is independent of the Modbus network watchdog setting. A manual reset is required to reset the fault relay following a loss of communication trip.

Series B MLPII SSOLR

The MLPII SSOLR also has watchdog settings for each relay output terminal (Terminals 95–96, 13–14, and 23–24) that are independent of each other and that can be enabled or disabled. Disabled is the default setting. If the Series "B" MLPII SSOLR sees no active communication on the DeviceNet port for more than 10 seconds, the relay(s) that have their watchdogs enabled will open. This watchdog setting is independent of the Modbus network watchdog setting. A manual reset is required to reset the fault relay following a loss of communications trip.

Resetting the Series "B" MLPII SSOLR following a loss of communications trip manually overrides the watchdog protection and the MLPII SSOLR will not trip again if communications remain lost indefinitely. The watchdog protection will be re-enabled once the MLPII SSOLR receives at least one valid message.

In the event of a DeviceNet Idle condition, the Series "B" MLPII SSOLR will react almost immediately to the idle message and open relays that have their watchdogs enabled without a 10 second delay.

DeviceNet Address (Register 40600)

DNAddr stores the address of the MLPII SSOLR when it is used as a DeviceNet device. Valid addresses are 0–63. The default address is 63.

DeviceNet Baud Rate (Register 40601)

DNBaudRt sets the baud rate at which the MLPII SSOLR communicates on the DeviceNet network. Valid baud rates are 125 kbaud, 250 kbaud, and 500 kbaud.The default baud rate is 125 kbaud.

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CONTROL

All relay outputs on the MLPII SSOLR can be commanded to open or close with various Modbus and DeviceNet commands.

Fault Relay (Register 40436)

The COMLINE register can be used to open or close the fault relay by writing the following values:

- 01H: Start/Reset
- 02H: Stop

Outputs A/B and Fault Relay (Register 40413, Bits 0–2)

The MLP2CMDSTAT register contains 16 bits and controls the SSOLR relays. Writing a "1" to a bit will make the statement in Table 8 true. The SSOLR default state is all relays open.

Table 8: Command State/Status Word Bit Description

Bit	Description
Bit 0	Output relay A is On (closed)
Bit 1	Output relay B is On (closed)
Bit 2	Fault Relay is on (closed)[1]

[1] Writing a "1" to this bit will reset the fault relay. Writing a "0" to this bit will have no effect on the SSOLR.

MB Assembly 103 (Register 40616, Bits 0–2)

The MBAssembly103 register contains 16 bits and controls the SSOLR Output B and Fault relays. Writing a "1" to a bit will make the statements in Table 9 true. The SSOLR default state is both relays open.

Table 9: MB Assembly 103 Word Bit Description

Bit	Description
Bit 0	Output relay A is On (closed)
Bit 1	Output relay B is On (closed)[1]
Bit 2	Fault relay is On (closed)[2]

[1] This bit is read only.

[2] Writing a "1" to this bit will reset the fault relay. Writing a "0" to this bit will have no effect on the SSOLR.

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Undercurrent Warning Threshold (Register 40612)

The undercurrent warning threshold (UCWarn) sets the level of acceptable undercurrent before a warning in indicated.

Overcurrent Warning Threshold (Register 40613)

The overcurrent warning threshold (OCWarn) sets the level of acceptable overcurrent before a warning is indicated.

Ground Fault Warning Threshold (Register 40614)

The ground fault warning threshold (GFWarn) sets the level of acceptable ground fault before a warning is indicated.

Current Unbalance Warning Threshold (Register 40615)

The current unbalance warning threshold (CUBWarn) sets the level of acceptable current unbalance before a warning is indicated.

Warning Enable (Register 40618, Bits 0–3)

The Warning Enable register contains 16 bits and enables or disables the warning levels. Writing a “1” to a bit will make the statements in Table 10 true.

Table 10: Warn Enable Word Bit Description

Bit	Description
Bit 0	Enable undercurrent warning
Bit 1	Enable overcurrent warning
Bit 2	Enable ground fault warning
Bit 3	Enable current unbalance warning

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Warn Status (40403, Bits 0–3)

The Warn Status register contains 16 bits and indicates the status of individual warning levels. Reading a bit as “1” will make the statements in Table 11 true.

Table 11: Warn Status Word Bit Description

Bit	Description
Bit 0	Undercurrent warning
Bit 1	Overcurrent warning
Bit 2	Ground fault warning
Bit 3	Current unbalance warning

STATUS

The following registers provide the status of inputs, outputs, and motor current. Refer to Table 12 for a complete list of available status information.

Operating Status Word (Register 40414)

The MLPIIOPRSTAT register contains 16 bits that describe the operating status of the SSOLR. Reading a “1” in any bit means the statement for that bit is true in Table 12.

Table 12: Operating Status Word Bit Description

Bit	Description
Bit 0	Output A is On (closed)
Bit 1	Output B is On (closed)
Bit 2	Motor is drawing current1
Bit 3	Modbus communication loss
Bit 4	Fault condition is present
Bit 5	Overcurrent trip condition
Bit 6	Ground fault condition
Bit 7	Global warning bit (UC, OC, GF, CUB warning present) Series B only
Bit 8	Trip relay is On (closed)
Bit 9	Input 1 is active
Bit 10	Input 2 is active
Bit 11	Input 3 is active

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Table 12: Operating Status Word Bit Description

Bit	Description
Bit 12	Input 4 is active
Bit 13	PTC warning
Bit 14	PTC trip 2
Bit 15	PTC short

[1] The MLPII SSOLR determines that the motor is drawing current when the measured current exceeds 1.25% of minimum FLA. For example, the 20–90 A model detects 250 mA current draw.

[2] The MLPII SSOLR will set the PTC trip bit 2 seconds after the threshold is crossed.

Raw Average Current (Register 40418)

This register contains the value of the average of the three phase currents A, B, and C.

Current Unbalance (Register 40420)

This register contains the calculated value of the current unbalance between the three phase currents as previously defined in this document.

Raw Current Phase C (Register 40430)

This register contains the value of the raw current flowing in phase C.

Raw Current Phase B (Register 40431)

This register contains the value of the raw current flowing in phase B.

Raw Current Phase A (Register 40432)

This register contains the value of the raw current flowing in phase A.

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SECTION 3— MODBUS NETWORK COMMUNICATION

INTRODUCTION

The Motor Logic® Plus and Motor Logic® Plus II family of products supports reading and writing to holding registers. Input points, output points, data, and setpoints are all treated as holding registers. 03 block read command, 06 single register write command, and a modified 16 multiple register write command are supported. The 16 multiple register write command can only be used to write to a single register.

MODBUS MEMORY ADDRESSING / REGISTER MAPPING

The Modbus uses two memory numbering schemes. The Modicon Modbus standard refers to registers and addresses, whereas the standard available from Modbus.org only refers to addresses.

If you are writing Ladder Logic for a PLC or using other Modbus tools that are written around the Modicon standard, register numbering is typical. The prefixes (references) are often used to automatically select which command set is used to read or write a memory location (coil, input or holding register). The MLPII SSOLR treats all inputs, outputs and setpoints as holding registers.

If you are writing embedded code for a micro controller or your own Modbus code, use the address numbering system. The Address is used by high level tools such as PLC programming software.

Modicon Modbus Standard

The Modicon Modbus standard uses two numbering systems for memory. The register map consists of different register types, such as coil (0X references), input (1X references) and holding registers (4X references). Each register type uses a different set of commands for reading and writing. The actual address sent in the bus message is one less than the register number minus the reference prefix (see the following discussion). Register numbering starts at 1 plus a reference prefix (for example, 400001 for holding registers) and addresses start at 0.

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Data Addresses in Modbus Messages (from Modicon Modbus Protocol Reference Guide PI-MBUS-300 Rev J)

All data addresses in Modbus messages are referenced to zero. The first occurrence of a data item is addressed as item number zero. For example, the coil known as “coil 1” in a programmable controller is addressed as “coil 0000” in the data address field of a Modbus message. Coil 127 decimal is addressed as “coil 007E” hex (126 decimal).

Holding register 40001 is addressed as “register 0000” in the data address field of the message. The function code field already specifies a holding register operation. Therefore, the “4XXXX” reference is implicit. Holding register 40108 is addressed as “register 006B” hex (107 decimal).

Modbus.org Standard

Another version of the Modbus standard is available at Modbus.org. This standard only uses one memory addressing system and does not contain references to registers as distinct from addresses or references to different register types.

SUPPORTED MODBUS COMMANDS

03 Read Holding Registers (from Modicon Modbus Standard)

This command reads the binary contents of the holding registers (4X references) in the slave. Broadcast is not supported. Appendix B lists the maximum parameters supported by various controller models.

Query

The query message specifies the starting register address and the quantity of registers to be read. Registers are addressed starting at zero, so registers 1–16 are addressed as “0-15”.

Table 13 on page 35 provides an example of a request to read registers 40108–40110 from a slave device.

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Table 13: Read Holding Registers Query

Field Name	Example (Hex)
Slave Address	11
Function	03
Starting Address Hi	00
Starting Address Lo	6B
No. of Points Hi	00
No. of Points Lo	03
Error Check (LRC or CRC)	—

Response

The register data in the response message are packed as two bytes per register, with the binary contents right justified within each byte. For each register, the first byte contains the high order bits and the second contains the low order bits.

Data is scanned in the slave at the rate of 125 registers per scan for 984–X8X controllers (984–685), and at the rate of 32 registers per scan for all other controllers. The response is returned when the data is completely assembled.

Table 14 provides an example of a response to the query in Table 13.

Table 14: Read Holding Registers—Response

Field Name	Example (Hex)
Slave Address	11
Function	03
Byte Count	06
Data Hi (Register 40108)	02
Data Lo (Register 40108)	2B
Data Hi (Register 40109)	00
Data Lo (Register 40109)	00
Data Hi (Register 40110)	00
Data Lo (Register 40110)	64
Error Check (LRC or CRC)	—

The contents of register 40108 are shown as the two byte values of 02 2B hex, or 555 decimal. The contents of registers 40109–40110 are 00 00 and 00 64 hex, or 0 and 100 decimal.

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03 (0x03) Read Holding Registers (from Modbus.org Standard)

This function code is used to read the contents of a contiguous block of holding registers in a remote device. The Request PDU specifies the starting register address and the number of registers to be read. Registers are addressed starting at zero, so registers 1–16 are addressed as “0-15”.

The register data in the response message are packed as two bytes per register, with the binary contents right justified within each byte.

For each register, the first byte contains the high order bits and the second contains the low order bits.

Request

Function Code	1 Byte	**0x03**
Starting Address	2 Bytes	0x0000 to 0xFFFF
Quantity of Registers	2 Bytes	1 to 125 (0x7D)

Response

Function Code	1 Byte	**0x03**
Byte Count	1 Bytes	2 x **N**[1]
Register Value	**N**[1] x 2 bytes	

[1] N = Quantity of registers.

Error

Error Code	1 Byte	**0x83**
Exception Code	1 Byte	01 or 02 or 03 or 04

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Table 15 illustrates a request to read registers 108–110.

Table 15: Request to Read Registers 108–110

Request		Response	
Field Name	**(Hex)**	**Field Name**	**(Hex)**
Function	03	Function	03
Starting Address Hi	00	Byte Count	06
Starting Address Lo	6B	Register Value Hi (108)	02
No. of Registers Hi	00	Register Value Lo (108)	2B
No. of Registers Lo	03	Register Value Hi (109)	00
Register Value Lo (109)	00	Register Value Hi (110)	00
		Register Value Lo (110)	64

The contents of register 108 are shown as the two byte values of 02 2B hex, or 555 decimal. The contents of registers 109–110 are 00 00 and 00 64 hex, or 0 and 100 decimal, respectively.

06 Preset Single Register (From Modicon Modbus Standard)

This function code presets a value into a single holding register (4X reference). When broadcast, the function code presets the same register reference in all attached slaves.

NOTE: This function overrides the controller's memory protect state. The preset value remains valid in the register until the next time the controller's logic solves the register contents. The register's value will remain if it is not programmed in the controller's logic.

Appendix B lists the maximum parameters supported by various controller models.

Query

The query message specifies the register reference to be preset. Registers are addressed starting at zero. For example, register 1 is addressed as “0”.

The requested preset value is specified in the query data field. M84 and 484 controllers use a 10-bit binary value, with the six high order bits set to zeros. All other controllers use 16-bit values.

Table 16 on page 38 provides an example of a request to preset register 40002 to 00 03 hex, in slave device 17.

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Table 16: Preset Single Register—Query

Field Name	Example (hex)
Slave Address	11
Function	06
Register Address Hi	00
Register Address Lo	01
Preset Data Hi	00
Preset Data Lo	03
Error Check (LRC or CRC)	—

Response

The normal response is an echo of the query, returned after the register contents have been preset. Table 17 provides an example of a response to the query in Table 16.

Table 17: Preset Single Register—Response

Field Name	Example (hex)
Slave Address	11
Function	06
Register Address Hi	00
Register Address Lo	01
Preset Data Hi	00
Preset Data Lo	03
Error Check (LRC or CRC)	—

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06 (0x06) Write Single Register (from Modbus.org Standard)

This function code is used to write a single holding register in a remote device. The Request PDU specifies the address of the register to be written. Registers are addressed starting at zero. For example, register 1 is addressed as “0.”

The normal response is an echo of the request, returned after the register contents have been written.

Request

Function Code	1 Byte	**0x06**
Register Address	2 Bytes	0x0000 to 0xFFFF
Registers Value	2 Bytes	0x0000 to 0xFFFF

Response

Function Code	1 Byte	**0x06**
Register Address	2 Bytes	0x0000 to 0xFFFF
Registers Value	2 Bytes	0x0000 to 0xFFFF

Error

Error Code	1 Byte	**0x86**
Exception Code	1 Byte	01 or 02 or 03 or 04

Table 18 provides an example of a request to write register 2 to 00 03 Hex.

Table 18: Request to Write Register 2 to 00 03 Hex

Request		Response	
Field Name	**(Hex)**	**Field Name**	**(Hex)**
Function	06	Function	06
Register Address Hi	00	Register Address Hi	00
Register Address Lo	01	Register Address Lo	01
Register Value Hi	00	Register Value Hi	00
Register Value Lo	03	Register Value Lo	03

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16 (10 Hex) Preset Multiple Registers (from Modicon Modbus Standard)

This function code presets values to a sequence of holding registers (4X references). When broadcast, the function presets the same register references in all attached slaves.

NOTE: This function overrides the controller's memory protect state. The preset values remain valid in the registers until the next time the controller's logic solves the register contents. The register values will remain if they are not programmed in the controller's logic.

Appendix B lists the maximum parameters supported by various controller models.

Query

The query message specifies the register references to be preset. Registers are addressed starting at zero. For example, register 1 is addressed as “0”.

The requested preset values are specified in the query data field. M84 and 484 controllers use a 10-bit binary value, with the six high order bits set to zeros. All other controllers use 16-bit values. Data is packed as two bytes per register.

Table 19 provides an example of a request to preset two registers starting at 40002 to 00 0A and 01 02 hex, in slave device 17.

Table 19: Preset Multiple Registers—Query

Field Name	Example (Hex)
Slave Address	11
Function	10
Starting Address Hi	00
Starting Address Lo	01
No. of Registers Hi	00
No. of Registers Lo	02
Byte Count	04
Data Hi	00
Data Lo	0A
Data Hi	01
Data Lo	02
Error Check (LRC or CRC)	—

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Response

The normal response returns the slave address, function code, starting address, and quantity of registers preset.

Table 20 provides an example of a response to the query shown in Table 19.

Table 20: Preset Multiple Registers

Field Name	Example (Hex)
Slave Address	11
Function	10
Starting Address Hi	00
Starting Address Lo	01
No. of Registers Hi	00
No. of Registers Lo	02
Error Check (LRC or CRC)	—

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16 (0x10) Write Multiple Registers (from Modbus.org Standard)

This function code is used to write a block of contiguous registers (approximately 1 to 120) in a remote device.

The requested written values are specified in the request data field. Data is packed as two bytes per register, with the binary contents right justified within each byte.

The normal response returns the function code, starting address, and quantity of registers written.

Request

Function Code	1 Byte	**0x10**
Starting Address	2 Bytes	0x0000 to 0xFFFF
Quantity of Registers	2 Bytes	0x0001 to 0x0078
Byte Count	1 Byte	2 x **N**[1]
Registers Value	N x 2 Bytes	Value

[1] N = Quantity of registers.

Response PDU

Function Code	1 Byte	**0x10**
Starting Address	2 Bytes	0x0000 to 0xFFFF
Quantity of Registers	2 Bytes	(0x7B)

Error

Error Code	1 Byte	**0x90**
Exception Code	1 Byte	01 or 02 or 03 or 04

Table 21 on page 43 provides an example of a request to write two registers starting at 2 to 00 0A and 01 02 Hex.

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Table 21: Request to Write Two Registers

Request		Response	
Field Name	**Example (Hex)**	**Field Name**	**Example (Hex)**
Function	**10**	Function	**10**
Starting Address Hi	**00**	Starting Address Hi	**00**
Starting Address Lo	**01**	Starting Address Lo	**01**
Quantity of Registers Hi	**00**	Quantity of Registers Hi	**00**
Quantity of Registers Lo	**02**	Quantity of Registers Lo	**02**
Byte Count	**04**	—	—
Registers Value Hi	**00**	—	—
Registers Value Lo	**0A**	—	—
Registers Value Hi	**01**	—	—
Registers Value Lo	**02**	—	—

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REGISTER MAP

Table 22: Read Only Registers

16 Bit Memory		Code and Description	Notes[1]
Hex	Register		
192	40403	WARNSTAT Warning status bits	Bit 0: Average current below UC warning threshold Bit 1: High phase above OC warning threshold Bit 2: Ground fault current above the GF warning threshold Bit 3: Current unbalance above the CUB warning threshold
193	40404	MLP2STAT2 MLPII addition status bits	Bit 10: Modbus remote display watchdog/idle condition Bit 11: Reserved[2] Bit 12: Modbus watchdog condition Bit 13: DeviceNet remote display watchdog/idle condition Bit 14: DeviceNet master in idle mode Bit 15: DeviceNet watchdog condition
194	40405	INFOPWRUP Power up (1–7) and information (8–15) bits	Bit 0: Power on reset Bit 1: Software reset indicator Bit 2: Brown-out reset Bit 3: Watchdog reset Bit 4: Stack over flow reset Bit 5: Stack under flow reset Bit 6: ROM (program code) check sum failure Bit 7: EEPROM check sum failure Bit 8: Phase rotation is ABC Bit 9: Phase rotation is ACB Bit 15: Demonstration unit
195	40406	INSTFLT Instantaneous fault bits	Bit 0: Reverse phase fault Bit 1: PTC overtemperature fault Bit 3: Undercurrent fault Bit 4: Overcurrent fault Bit 5: Ground fault Bit 6: Current unbalance fault Bit 7: Single phase fault Bit 8: PTC above warning level Bit 9: PTC shorted Bit 10: (Internal) reference voltage error Bit 11: No AC power
196	40407	PENDFLT Pending Fault bits	Bit 0: Reverse phase fault Bit 1: PTC overtemperature fault Bit 3: Undercurrent fault Bit 4: Overcurrent fault Bit 5: Ground fault Bit 6: Current unbalance fault Bit 7: Single phase fault Bit 9: PTC shorted Bit 10: (Internal) Reference voltage error Bit 11: No AC power

1 For registers that have bit information, reading a “1” in any bit means that the statement for that bit alone is true.

2 Do not write to reserved bit locations.

3 The four-fault history is based on the scheme where Bits 0–3 = Last Fault, Bits 4–7 = 2nd from the last fault, Bits 8–11 = 3rd from the last fault, and Bits 12–15 = 4th from the last fault.

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Table 22: Read Only Registers *(continued)*

16 Bit Memory		Code and Description	Notes[1]
Hex	**Register**		
197	40408	FAULTST Fault status bits	Bit 0: Reverse phase fault Bit 1: PTC overtemperature fault Bit 3: Undercurrent fault Bit 4: Overcurrent fault Bit 5: Ground fault Bit 6: Current unbalance fault Bit 7: Single phase fault Bit 9: PTC shorted Bit 10: (Internal) reference voltage error Bit 11: No AC power
198	40409	PTCOHMS PTC resistance (Ω)	Reserved[2]
199	40410	HOLDOFF Hold off status bits	Bit 0: Reverse phase fault Bit 1: Not enough available thermal capacity Bit 2: PTC too hot Bit 3: PTC shorted Bit 4: Test trip—reset button Bit 5: Test trip—remote reset closed Bit 10: (Internal error) reference voltage error Bit 11: (Internal error) no AC power Bit 14: (Internal error) power up. See Register 40405, Bits 3–7 Bit 15: (Internal error) EEPROM check sum failure
19A	40411	MANRESET Manual reset status bits	Bit 0: Reverse phase fault Bit 1: PTC overtemperature trip—manual restart Bit 3: #RU exceeded Bit 4: #RF exceeded Bit 5: Ground fault trip Bit 8: Manual reset was set during last power down Bit 9: PTC shorted Bit 10: (Internal) reference voltage error Bit 11: No AC power Bit 12: Test trip Bit 13: Modbus comm loss Bit 14: DeviceNet comm loss Bit 15: Force faulted

1 For registers that have bit information, reading a “1” in any bit means that the statement for that bit alone is true.

2 Do not write to reserved bit locations.

3 The four-fault history is based on the scheme where Bits 0–3 = Last Fault, Bits 4–7 = 2nd from the last fault, Bits 8–11 = 3rd from the last fault, and Bits 12–15 = 4th from the last fault.

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Table 22: Read Only Registers *(continued)*

16 Bit Memory		Code and Description	Notes[1]
Hex	Register		
19D	40414	MLP2OPRSTAT MLPII operating status	Bit 0: Output A is On or Closed Bit 1: Output B is On or Closed Bit 2: Motor is drawing current Bit 3: Modbus communication loss Bit 4: Fault condition Bit 5: Overcurrent trip condition Bit 6: Ground fault condition Bit 7: Global warning Bit (UC, OC, GF, CUB warning present, Series B only) Bit 8: Trip relay is closed Bit 9: Input 1 is active Bit 10: Input 2 is active Bit 11: Input 3 is active Bit 12: Input 4 is active Bit 13: PTC warning Bit 14: PTC trip Bit 15: PTC short
19E	40415	MMSCMDSTAT MMS command status	See Appendix B for MMS Memory Map
19F	40416	MMSOPRSTAT MMS operating status	See Appendix B for MMS Memory Map
1A1	40418	IAVE Raw average current	A (x100, x10, x1) multiplied by scale factor
1A3	40420	CUB[2] Current unbalance	0–100%
1A5	40422	THERM CAP[3] Thermal capacity remaining	0–100%
1A6	40423	GF[3] Ground fault current	A (x100, x10, x1), multiplied by scale factor

1 For registers that have bit information, reading a “1” in any bit means that the statement for that bit alone is true.

2 Do not write to reserved bit locations.

3 The four-fault history is based on the scheme where Bits 0–3 = Last Fault, Bits 4–7 = 2nd from the last fault, Bits 8–11 = 3rd from the last fault, and Bits 12–15 = 4th from the last fault.

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Table 22: Read Only Registers *(continued)*

16 Bit Memory		Code and Description	Notes[1]			
Hex	**Register**					
1A7	40424	TRIPRN/ERCODE Bit real-time errors and trip indicator *NOTE: Bits 2, 8, 9, and 10 do not apply to the MLPII SSOLR. They apply to the MLP SSOLR and are shown in this document for continuity between the product lines.*	Bit #	TRIPRN	Bit #	**ERCODE**
			0	Fault lockout	8	*Reserved* *Low voltage*
			1	Remote stop	9	*Reserved* *High voltage*
			2	*Reserved* *Contactor failure*	10	*Reserved* *Unbalance voltage*
			3	Undercurrent	11	Undercurrent
			4	Overcurrent	12	Phase reversal
			5	Ground fault	13	CUB
			6	CUB	14	CUB > 25%
			7	CUB >50%	15	CUB >50%
1A8	40425	FH NIBBLE_CODED 4-fault history[3] These four nibble-bits indicate a hex value that corresponds to the following faults. 01, 02, and 04 do not apply to the MLPII SSOLR. They apply to the MLP SSOLR and are shown in this document for continuity between the product lines.	Hex Value		Fault	
			01		*Reserved* *High voltage*	
			02		*Reserved* *Low voltage*	
			03		N/A	
			04		*Reserved* *Contactor failure*	
			05		N/A	
			06		Single phase	
			07		Ground fault	
			08		Current unbalance	
			09		N/A	
			A		Overcurrent	
			B		Undercurrent	

1 For registers that have bit information, reading a “1” in any bit means that the statement for that bit alone is true.

2 Do not write to reserved bit locations.

3 The four-fault history is based on the scheme where Bits 0–3 = Last Fault, Bits 4–7 = 2nd from the last fault, Bits 8–11 = 3rd from the last fault, and Bits 12–15 = 4th from the last fault.

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Table 22: Read Only Registers *(continued)*

16 Bit Memory		Code and Description	Notes[1]	
Hex	Register			
1A9	40426	PID 4-bit multiplier (scale factor), and 4-bit product ID	Bits 0–3 = MLP product ID, which is broken down below; Bits 4–7 = Multiplier (1 = 100; 2 = 10; 4 = 1); Bit 15 = 0 = MLP, SPXX; 1 = MLPII, SP2XX	
			Value of bits 3–0 (decimal/binary)	SSOLR Model
			1/0001	SPB4
			2/0010	SPB6 or SP2B6
			3/0011	SPC4
			4/0100	SPC6 or SP2C6
			5/0101	SP14
			6/0110	SP16 or SP216
			7/0111	SP24
			8/1000	SP26 or SP226
			9/1001	SP34
			10/1010	SP36 or SP236
			11/1011	SP44, SP54, and SP64
			12/1100	SP46, SP56, and SP66 SP246, SP256, and SP266
1AD	40430	IC Raw current phase C	A (x100, x10, x1) multiplied by scale factor	
1AE	40431	IB Raw current phase B	A (x100, x10, x1) multiplied by scale factor	
1AF	40432	IA Raw current phase A	A (x100, x10, x1) multiplied by scale factor	
1B0	40433	RD1 Remaining restart delay RD1	Seconds	
1B1	40434	RD2 Remaining restart delay RD2	Minutes	

1 For registers that have bit information, reading a “1” in any bit means that the statement for that bit alone is true.

2 Do not write to reserved bit locations.

3 The four-fault history is based on the scheme where Bits 0–3 = Last Fault, Bits 4–7 = 2nd from the last fault, Bits 8–11 = 3rd from the last fault, and Bits 12–15 = 4th from the last fault.

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Table 22: Read Only Registers *(continued)*

16 Bit Memory		Code and Description	Notes[1]	
Hex	Register			
1B2	40435	RD3 Remaining restart delay RD3	Minutes	
1B4	40437	Scale PowerLogic scale parameter		Default is model dependent SP2B6 = 100x SP2C6 = 100x SP216 = 10x SP226 = 10x SP236 = 10x SP246 = 1x SP256 = 1x SP266 = 1x

1 For registers that have bit information, reading a “1” in any bit means that the statement for that bit alone is true.

2 Do not write to reserved bit locations.

3 The four-fault history is based on the scheme where Bits 0–3 = Last Fault, Bits 4–7 = 2nd from the last fault, Bits 8–11 = 3rd from the last fault, and Bits 12–15 = 4th from the last fault.

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CAUTION

EXCEEDING THE STORAGE LIMIT

- Set points in Motor Logic® Plus II SSOLRs are stored in a nonvolatile EEPROM. The EEPROM retains the set points in its memory for years without power applied.
- The network may read the EEPROM register locations an unlimited number of times. Limit the network register writes to set point changes only.
- Do not exceed 100,000 network register write cycles. This will permanently damage the Motor Logic® Plus II EEPROM.

Failure to follow these instructions can result in equipment damage.

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Table 23: Read/Write Registers

16 Bit Memory		Code and Description	Range	Default
Hex	Register			
19B	40412	NETWKSTAT Network status	Bit 0: Modbus program enabled Bit 1: FLT relay Modbus network watchdog enabled Bit 2: DeviceNet network program enabled Bit 3: FLT relay DeviceNet network watchdog enabled Bit 4: OutA Modbus network watchdog enabled Bit 5: OutB Modbus network watchdog enabled Bit 6: OutA DeviceNet network watchdog or idle enabled Bit 7: OutB DeviceNet network watchdog or idle enabled Bit 8: ICF message is not present or present (read only bit) Bit 15: 0 = Relays A and B remain OFF on power up 1 = Auto restart of relays A and B (restored to last state)	5
19C	40413	MLP2CMDSTAT MLPII output command status	Bit 0: Output relay A enable Bit 1: Output relay B enable Bit 2: Fault relay enable[4]	0
1B3	40436	COM-LINE Command line	01H: Start/reset 02H: Stop 03H: Display lock 04H: Display unlock 09H: Clear motor run timer 0AH: Clear last fault	
1B8	40441	MULT[1] CT/turns effective ratio	1 or 10–200	Sizes B–3: 1 Size 4: 15 Size 5: 30 Size 6: 60

1 For the SP246, SP256, and SP266 SSOLRs, the OC, UC, and GF range and default are equal to MULT times the range and default of the SP2C6 SSOLR. The value of MULT is fixed at 1 for sizes B–3 and cannot be changed.

2 The network watchdog feature (when enabled) opens the SSOLR fault relay when the device does not receive a valid communication within a 10 second period.

3 Do not write reserved bits.

4 Writing a “1” to this bit will reset the fault relay, writing a “0” to this bit will have no effect on the SSOLR.

5 The values read over the Modbus network are actual values X scale factor. Scale factors are as follows: SP2B6, SP2C6 scale factor = 100; SP216–SP236 scale factor = 10; SP246, SP256 SP266 scale factor = 1.

6 See Register 40617 in Table 23 on page 56.

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Table 23: Read/Write Registers *(continued)*

16 Bit Memory		Code and Description	Range	Default
Hex	Register			
1B9	40442	OC Overcurrent threshold	OL current range	Min. rating
1BA	40443	UC Undercurrent threshold	0.5 x OC Min. to OC Max., Off	0.5 x OC Min.
1BB	40444	CUB Current unbalance threshold	2–25% or Off (999)	6%
1BC	40445	TC Overcurrent trip class	5, J5, 10, J10, 15, J15, 20, J20, 30, J30 *(J = Jam protection enabled)* **Class** / **Decimal** 5 / 5 J5 / 133 10 / 10 J10 / 138 15 / 15 J15 / 143 20 / 20 J20 / 148 30 / 30 J30 / 158	20
1BD	40446	RD1 Rapid cycle timer	0–500 seconds	10
1BE	40447	RD2 Restart delay after all faults except undercurrent	2–500 minutes	8
1BF	40448	RD3 Restart delay after undercurrent	2–500 minutes	20

1 For the SP246, SP256, and SP266 SSOLRs, the OC, UC, and GF range and default are equal to MULT times the range and default of the SP2C6 SSOLR. The value of MULT is fixed at 1 for sizes B–3 and cannot be changed.

2 The network watchdog feature (when enabled) opens the SSOLR fault relay when the device does not receive a valid communication within a 10 second period.

3 Do not write reserved bits.

4 Writing a “1” to this bit will reset the fault relay, writing a “0” to this bit will have no effect on the SSOLR.

5 The values read over the Modbus network are actual values X scale factor. Scale factors are as follows: SP2B6, SP2C6 scale factor = 100; SP216–SP236 scale factor = 10; SP246, SP256 SP266 scale factor = 1.

6 See Register 40617 in Table 23 on page 56.

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Table 23: Read/Write Registers *(continued)*

16 Bit Memory		Code and Description	Range	Default
Hex	**Register**			
1C0	40449	#RU Number of restarts after undercurrent	0, 1, 2, 3, 4, A (automatic) **RU Values** 0–4 0–4 A 5	0
1C1	40450	#RF Number of restarts after all faults except undercurrent	0, 1, oc1, 2, oc2, 3, oc3, 4, oc4, A, ocA 0 = manual, A = continuous, oc = automatic restart after RD2 expires **RF Value** **Decimal Value** 0 1 1 2 oc1 3 2 4 oc2 5 3 6 oc3 7 4 8 oc4 9 A 10 ocA 11	0
1C2	40451	UCTD Undercurrent trip delay	2–60 seconds	5
1C3	40452	GF[5] Ground fault current threshold	1–10 x MULT, 999 = Off	2A
1C4	40453	MbADDR RS-485 slave address	1–247	1
1C5	40454	MTIM Motor run timer	0–65,000 hours	0

[1] For the SP246, SP256, and SP266 SSOLRs, the OC, UC, and GF range and default are equal to MULT times the range and default of the SP2C6 SSOLR. The value of MULT is fixed at 1 for sizes B–3 and cannot be changed.

[2] The network watchdog feature (when enabled) opens the SSOLR fault relay when the device does not receive a valid communication within a 10 second period.

[3] Do not write reserved bits.

[4] Writing a “1” to this bit will reset the fault relay, writing a “0” to this bit will have no effect on the SSOLR.

[5] The values read over the Modbus network are actual values X scale factor. Scale factors are as follows: SP2B6, SP2C6 scale factor = 100; SP216–SP236 scale factor = 10; SP246, SP256 SP266 scale factor = 1.

[6] See Register 40617 in Table 23 on page 56.

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Table 23: Read/Write Registers *(continued)*

16 Bit Memory		Code and Description	Range	Default
Hex	Register			
1C6	40455	MLP2COMS Communications setup	See “Network Communications Setup (Register 40455)” on page 25.	C01
1C7	40456	MLP2INPUT Input setup	Bit 0: Single phase application Bit 1: Input 1 is a PTC input. Bit 2: PTC trip reset follow #RF Bit 3: Input 4 is a digital input. Bit 4: Phase rotation sequence is ACB. Bit 5: Reverse phase trip is enabled.	0
257	40600	DnADDR DeviceNet address (MAC ID)	0–63	63

1 For the SP246, SP256, and SP266 SSOLRs, the OC, UC, and GF range and default are equal to MULT times the range and default of the SP2C6 SSOLR. The value of MULT is fixed at 1 for sizes B–3 and cannot be changed.

2 The network watchdog feature (when enabled) opens the SSOLR fault relay when the device does not receive a valid communication within a 10 second period.

3 Do not write reserved bits.

4 Writing a “1” to this bit will reset the fault relay, writing a “0” to this bit will have no effect on the SSOLR.

5 The values read over the Modbus network are actual values X scale factor. Scale factors are as follows: SP2B6, SP2C6 scale factor = 100; SP216–SP236 scale factor = 10; SP246, SP256 SP266 scale factor = 1.

6 See Register 40617 in Table 23 on page 56.

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Table 23: Read/Write Registers *(continued)*

16 Bit Memory		Code and Description	Range	Default
Hex	**Register**			
258	40601	DnBaudRt DeviceNet baud rate	0 = 125 k 1 = 250 k 2 = 500 k	0
259	40602	ThermCapAvail Thermal capacity available restart level (%)	0–99	25
25D	40606	CfgOptions MLPII configuration option bits	Bit 0: Reserved[3] Bit 1: Reserved[3] Bit 2: Ground fault inhibit enabled Bit 3: Rapid cycle invoked on power-up Bit 6: Phase rotation monitoring enabled Bit 7: OutB WarnLinkMask enabled[6] Bit 8: Reserved[3]	6
263	40612	UCWarn[5] Undercurrent warning threshold SP2B6 SP2C6 SP216 SP226 SP236 SP246 SP256 SP266	 .12–3 Amps .5–12 Amps 1.5–34 Amps 2.5–58 Amps 5–118 Amps 15–180 Amps 30–360 Amps 60–720 Amps	.5 x OC Min

1 For the SP246, SP256, and SP266 SSOLRs, the OC, UC, and GF range and default are equal to MULT times the range and default of the SP2C6 SSOLR. The value of MULT is fixed at 1 for sizes B–3 and cannot be changed.

2 The network watchdog feature (when enabled) opens the SSOLR fault relay when the device does not receive a valid communication within a 10 second period.

3 Do not write reserved bits.

4 Writing a “1” to this bit will reset the fault relay, writing a “0” to this bit will have no effect on the SSOLR.

5 The values read over the Modbus network are actual values X scale factor. Scale factors are as follows: SP2B6, SP2C6 scale factor = 100; SP216–SP236 scale factor = 10; SP246, SP256 SP266 scale factor = 1.

6 See Register 40617 in Table 23 on page 56.

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Table 23: Read/Write Registers *(continued)*

16 Bit Memory		Code and Description	Range	Default
Hex	Register			
264	40613	OCWarn[5] overcurrent warning threshold		
		SP2B6	.25–3 Amps	0.5
		SP2C6	1–12 Amps	2
		SP216	3–35 Amps	6
		SP226	5–60 Amps	10
		SP236	10–120 Amps	20
		SP246	15–225 Amps	30
		SP256	30–450 Amps	60
		SP266	60–900 Amps	120
265	40614	GFWarn[5] Ground fault warning threshold	1–12 X MULT	2
266	40615	CUBWarn[5] Current unbalance warning threshold	2–200 %	25
267	40616	MBAssembly103 Modbus Assembly	Bit 0: Output relay A enable Bit 1: Output relay B enable Bit 2: Fault relay enable[4]	0
268	40617	WarnLinkMask	Bit 0: UC Warning link to OutB enabled Bit 1: OC Warning link to OutB enabled Bit 2: GF Warning link to OutB enabled Bit 3: CUB Warning link to OutB enabled	0
269	40618	WarnEnable Warning enable mask	Bit 0: Undercurrent warning enabled Bit 1: Overcurrent warning enabled Bit 2: Ground fault warning enabled Bit 3: Current unbalance warning enabled	0

1 For the SP246, SP256, and SP266 SSOLRs, the OC, UC, and GF range and default are equal to MULT times the range and default of the SP2C6 SSOLR. The value of MULT is fixed at 1 for sizes B–3 and cannot be changed.

2 The network watchdog feature (when enabled) opens the SSOLR fault relay when the device does not receive a valid communication within a 10 second period.

3 Do not write reserved bits.

4 Writing a “1” to this bit will reset the fault relay, writing a “0” to this bit will have no effect on the SSOLR.

5 The values read over the Modbus network are actual values X scale factor. Scale factors are as follows: SP2B6, SP2C6 scale factor = 100; SP216–SP236 scale factor = 10; SP246, SP256 SP266 scale factor = 1.

6 See Register 40617 in Table 23 on page 56.

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Configuration Options (Register 40606)

Ground fault inhibit can be enabled or disabled with Bit 2. Enabled is the default setting.

The default configuration of the rapid cycle timer (RD1) is set to work in the same manner as the SSOLR. This means that the RD1 timer prevents the fault relay from closing after power up and motor shutdowns. Setting Bit 3 to “1” causes the SSOLR to invoke the rapid cycle timer only at power up (that is, to disregard the rapid cycle timer after normal motor shutdowns).

Reverse phase protection is enabled or disabled with Register 40456. Disabled is the default setting. However, the phase rotation is still monitored when the protection is disabled at Register 40456, resulting in the consumption of a small amount of processing time. Bit 6 of the Configuration Options register can be used to disable monitoring of phase rotation to maximize SSOLR performance.

The default configuration of the Output B relay fault link is disabled. When this feature is enabled, Output B will close, if the SSOLR warns on WarnLink mask (OC, UC, GF, CUB).

Output B Linked to Fault(s) (Register 40617)

Any fault can be linked to the Output B relay by configuring the FaultLinkMask (Register 40617) and enabling the feature that causes Output B to energize on the selected fault(s) by setting Bit 7 in the Configuration Options (Register 40606).

For example, if Bit 5 of Register 40617 and Bit 7 of Register 40606 are set and all of the other bits are clear, then Output B will energize after a ground fault occurs.

NOTE: It is recommended that DeviceNet Output Assembly 103 and MBAssembly103 are used for PLC control when this feature is used. This way, the Output B relay will not be inadvertently set or cleared when periodic control messages are sent to the overload relay.

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MODBUS COMMUNICATION TROUBLESHOOTING

Refer to Tables 24 and 25 (pages 58–59) for Modbus network communication troubleshooting.

Table 24: Modbus Network System Using Solutions Software or PowerLogic SMS-3000 Software

Symptom	Problem	Solution
Cannot find one or more nodes on the Modbus network.	The address is set improperly on the SSOLR. Duplicate addresses cause communication errors.	Set the address correctly on the SSOLR.
	The wiring to the SSOLR is incorrect.	Check the wiring. Refer to the SSOLR instruction bulletin, 30072-451-04.
	The RS-232 comm port is not sending data.	Ensure that the RS-232 comm port settings match the network settings (baud rate, parity, stop bits, and data bits). Test the RS-232 comm port on the PC, following the procedures below. You will need a voltmeter and the 9999MLPS Solutions software. 1. Exit the Solutions software. Leave the RS-485 converter plugged into the RS-232 port on your PC, but unplug the communication module from the SSOLR. Halt all communication on the RS-232 port. 2. Set the voltmeter to the 10 V ⎓ range. Measure the voltage on terminals A and B of the communication module. Be sure to ground the (–) probe of the voltmeter. No voltage should be present at terminals A or B on the communication module. If voltage is present on either terminal, another program may be using the RS-232 port on the PC, preventing communication to the network. 3. Start the Solutions software and wait for the Comm Port Configuration screen to display. The Comm Port status should show that the port is closed (there still should be no voltage at terminals A or B on the communication module). 4. Click the **OK** button to open the RS-232 port. If the Solutions software cannot find the RS-232 port, run-time error 8002 (Invalid port number) is displayed. If the port is busy, run-time error 8005 (Port already open) is displayed. 5. After the RS-232 port is opened, the Main Menu is displayed. Use the positive (+) probe of the voltmeter to verify that the voltages are: • 4 V ⎓ at terminal RD (B) of the RS-485 converter and at terminal A of the communication module. • 0 V ⎓ at terminal B of the communication module. If the voltages are reversed on the communication module (A = 0 V ⎓ and B = 4 V ⎓), the polarity is not correct. Switch the transmit pair and the receive pair. If the measurement on terminal A of the communication module is not 4 V ⎓ , the Solutions software will display a time-out error and you will not be able to communicate with the SSOLR.

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Table 24: Modbus Network System Using Solutions Software or PowerLogic SMS-3000 Software *(continued)*

Symptom	Problem	Solution
Cannot communicate with one or more nodes on the Modbus network.	Modbus port settings are set incorrectly on the PC.	Check the PC serial port. Refer to the SSOLR bulletin, 30072-451-04. Ensure that the communication parameters are set correctly.
	The wiring connection for the RS-232 to RS-485 converter is incorrect.	Check the wiring based. Refer to the SSOLR bulletin, 30072-451-04.
	The communications parameter settings are incorrect.	Verify that the Modbus master device settings match the network settings (baud rate, parity, stop bits, and data bits).

Table 25: Modbus Network Connected to a PLC

Symptom	Problem	Solution
Cannot find one or more nodes on the Modbus network.	The address is set improperly on the SSOLR. Duplicate addresses cause communication errors.	Set the address correctly on the SSOLR.
	The wiring to the SSOLR is incorrect.	Check the wiring. Refer to the SSOLR bulletin, 30072-451-04.
	The network cabling is disconnected or broken.	Verify that the wires are securely connected to the network adapters. If the connections are OK, check the network wires. If necessary, use an ohmmeter to verify the continuity of each wire.
	The polarity in the connection between the SSOLR and the RS-485 network is incorrect.	Verify the network connections based on the wiring schematic. If you have a custom-designed installation that does not use the RS-232 to RS-485 converter, try switching the connections at terminals A and B. If possible, send a Start or Stop command from the Modbus master device to the SSOLR; if the transmit pair polarity is correct, the Start and Stop commands will be executed whether or not the SSOLR returns an acknowledgement.
Cannot communicate with one or more nodes on the Modbus network.	Incorrect communication parameter settings.	Configure the network parameters for the Modbus port of the PLC to match the Motor Logic Plus II network parameters.
	The wiring connections are incorrect.	Check the wiring. Refer to the SSOLR bulletin, 30072-451-04.
	Software parameters within the PLC program are incorrect.	Ensure that the communication parameters are set correctly.

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SECTION 4— DEVICENET NETWORK COMMUNICATION[1]

DeviceNet Overview (DeviceNet Specification, Volume 1, Chapter 1)

The DeviceNet low-level controller-area network (CAN) provides a communication link between simple industrial devices (such as actuators and sensors) and controlling devices. The network transports control information and the properties of the device being controlled. It permits operation in either master/slave or peer-to-peer mode.

The DeviceNet powered four-wire network operates in a trunkline dropline configuration and supports up to 64 nodes.

Object Modeling (DeviceNet Specification, Volume 2, Chapter 1)

A DeviceNet node is modeled as a collection of **objects.** An object represents a product component. Objects are organized as follows:

- **Classes** are groups of objects with shared characteristics.
- **Instances** are the objects within the class**.** Each instance within a class has the same set of **behaviors** and **attributes,** but a unique set of attribute values.
- **Attributes** are characteristics of objects represented by values, which can vary. Attributes may provide status information or determine the object's **behaviors.**
- **Behaviors** are actions that an object takes in response to particular events.
- **Services** are operations that an object performs.
- **Instantiations** are creations of new object instances. Attribute values default to 0 unless otherwise specified.

Object Identification (DeviceNet Specification, Volume 2, Chapter 1)

Objects are identified using the following codes:

- The **MAC ID** distinguishes each node from all other nodes on the same network.
- The **Class ID** distinguishes each object class from all other classes accessible from the network.

[1] Contact the Open DeviceNet Vendor Association, Inc. for information and complete specifications.

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- The Instance ID, assigned to an object instance when it is created, distinguishes it from all other objects within the same class.
- The Attribute ID distinguishes each attribute from all other attributes of the same object.

Accessing Variables

Variables on the node are accessed using a key, called a Path, which is composed of:

- The Class ID
- The Instance ID
- The Attribute ID

The classes available in the SSOLR are grouped into three parts:

- Classes required for all equipment connected to the DeviceNet network, whatever their functionality
- Classes relating to the overload relay profile, as defined by the ODVA
- Classes relating to the Motor Logic® Plus II SSOLR, allowing access to all internal variables: configuration, adjustment, monitoring, etc.

Definition of Overload Profile (DeviceNet Specifications, Volume 2, Chapter 3-9)

The ODVA designates SSOLRs as device type 03_{hex}.

In accordance with this profile, the SSOLRs are interchangeable on the DeviceNet network with respect to their basic control services. However, the SSOLR must be configured through some means outside the DeviceNet interface, such as a network configuration tool or the Motor Logic® Plus Display.

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SOFTWARE CONFIGURATION

Software Configuration Using EDS Files and ICO Files

Software configuration of the DeviceNet network and the associated DeviceNet master requires use of the DeviceNet electronic data sheet (EDS) files, listed in Table 26.

The icon (ICO) files personalize the configuration software with a picture representation of the MLPII SSOLR.

The EDS and ICO files are available from Schneider Electric's Intelligent Motor Control Center web site, www.us.SquareD.com. Upload the EDS files to your system to access relevant files.

Table 26: EDS and ICO File References

SSOLR Catalog Number	EDS File Name	ICO File Name	Description
SP2B6	SP2B6_xx-xx-xx.eds	SP2B6_xx-xx-xx.ico	MLPII relay
SP2C6	SP2C6_xx-xx-xx.eds	SP2C6_xx-xx-xx.ico	MPLII relay
SP216	SP216_xx-xx-xx.eds	SP216_xx-xx-xx.ico	MPLII relay
SP226	SP226_xx-xx-xx.eds	SP226_xx-xx-xx.ico	MPLII relay
SP236	SP236_xx-xx-xx.eds	SP236_xx-xx-xx.ico	MPLII relay
SP246	SP246_xx-xx-xx.eds	SP246_xx-xx-xx.ico	MPLII relay
SP256	SP256_xx-xx-xx.eds	SP256_xx-xx-xx.ico	MPLII relay
SP266	SP266_xx-xx-xx.eds	SP266_xx-xx-xx.ico	MPLII relay
MMS-D w/SP2B6	SP2B6_xx-x-xx.eds	SP2B6_xx-xx-xx.ico	MLPII with MMS-D
MMS-D w/SP2C6	SP2C6_xx-x-xx.eds	SP2C6_xx-xx-xx.ico	MLPII with MMS-D
MMS-D w/SP216	SP216_xx-x-xx.eds	SP216_xx-xx-xx.ico	MLPII with MMS-D
MMS-D w/SP226	SP226_xx-x-xx.eds	SP226_xx-xx-xx.ico	MLPII with MMS-D
MMS-D w/SP236	SP236_xx-x-xx.eds	SP236_xx-xx-xx.ico	MLPII with MMS-D
MMS-D w/SP246	SP246_xx-x-xx.eds	SP246_xx-xx-xx.ico	MLPII with MMS-D
MMS-D w/SP256	SP256_xx-x-xx.eds	SP256_xx-xx-xx.ico	MLPII with MMS-D
MMS-D w/SP266	SP266_xx-x-xx.eds	SP266_xx-xx-xx.ico	MLPII with MMS-D
MMS-RD w/SP2B6	SP2B6_xx-x-xx.eds	SP2B6_xx-xx-xx.ico	MLPII with MMS-RD
MMS-RD w/SP2C6	SP2C6_xx-x-xx.eds	SP2C6_xx-xx-xx.ico	MLPII with MMS-RD
MMS-RD w/SP216	SP216_xx-x-xx.eds	SP216_xx-xx-xx.ico	MLPII with MMS-RD
MMS-RD w/SP226	SP226_xx-x-xx.eds	SP226_xx-xx-xx.ico	MLPII with MMS-RD
MMS-RD w/SP236	SP236_xx-x-xx.eds	SP236_xx-xx-xx.ico	MLPII with MMS-RD
MMS-RD w/SP246	SP246_xx-x-xx.eds	SP246_xx-xx-xx.ico	MLPII with MMS-RD

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Table 26: EDS and ICO File References *(continued)*

SSOLR Catalog Number	EDS File Name	ICO File Name	Description
MMS-RD w/SP256	SP256_xx-x-xx.eds	SP256_xx-xx-xx.ico	MLPII with MMS-RD
MMS-RD w/SP266	SP266_xx-x-xx.eds	SP266_xx-xx-xx.ico	MLPII with MMS-RD

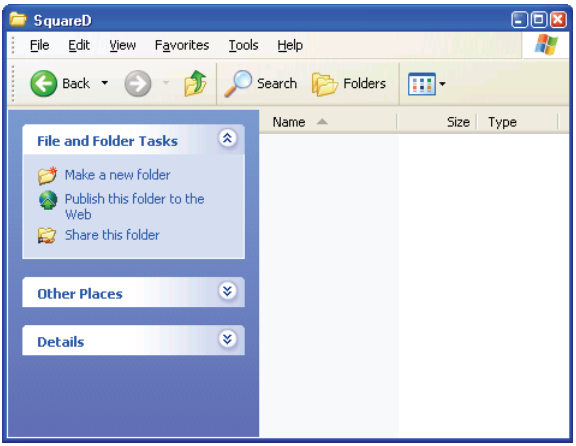
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Registering EDS Files

Follow the procedure in this section to register the EDS and ICO files listed in Table 26 on page 63.

1. Using Microsoft® Windows® Explorer and Microsoft Internet Explorer, create a directory on your hard drive named “SquareD” for downloading the EDS and ICO files. The remaining instructions of this procedure assume that the new directory has the path “C:\SquareD,” however it is acceptable to locate the SquareD directory in any folder structure.

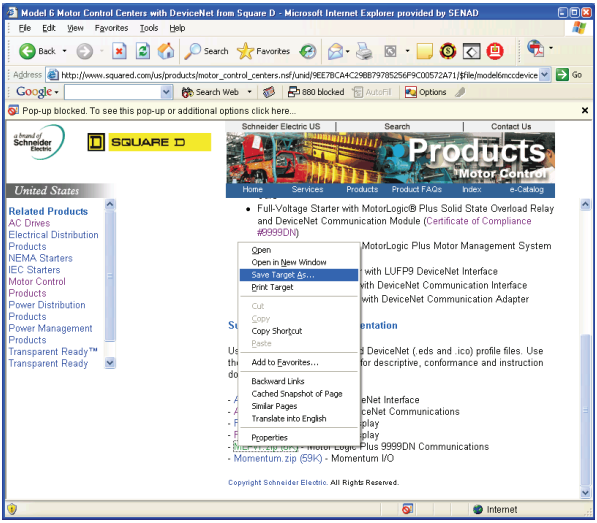
Figure 3: SquareD Directory



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2. Select the appropriate *.zip file from the Model 6 Motor Control Center with DeviceNet area of the Square D web site (www.us.SquareD.com) and save it to the SquareD directory. Click on the desired file name with the right mouse button to access a pop-up menu that contains a “Save Target As...” feature.

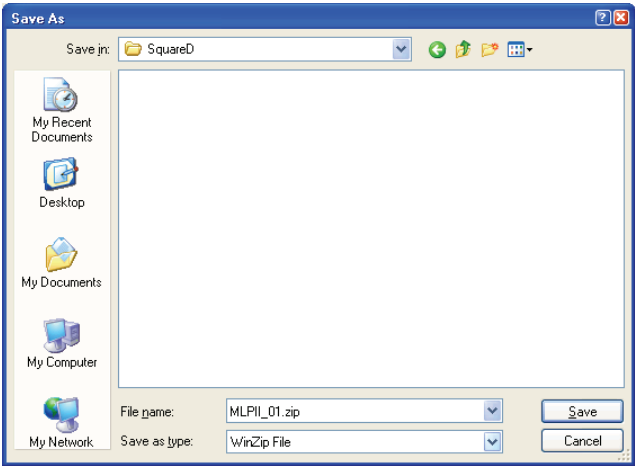
Figure 4: Model 6 Motor Control Center with DeviceNet



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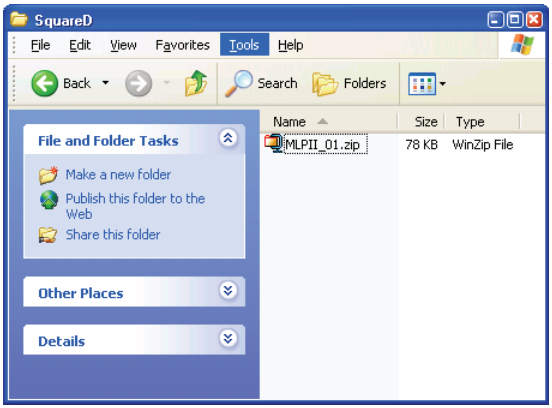
3. Browse to the SquareD directory and click the Save button.

Figure 5: Saving the *.zip File



4. Navigate to the SquareD directory and verify that the save operation was successful.

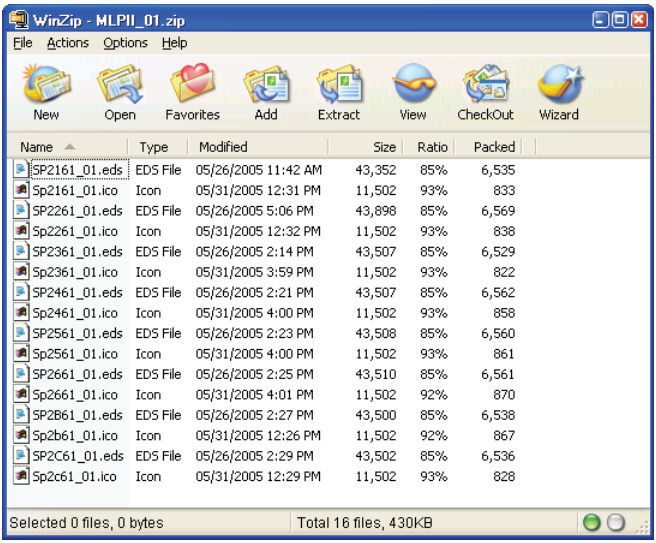
Figure 6: The *.zip File in the SquareD Directory



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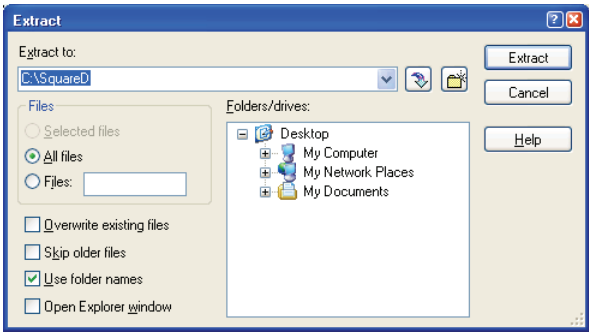
5. Open the *.zip file and ensure that the desired EDS and ICO files are present.

Figure 7: Open the *.zip File



6. Extract the contents of the *.zip file to the SquareD directory.

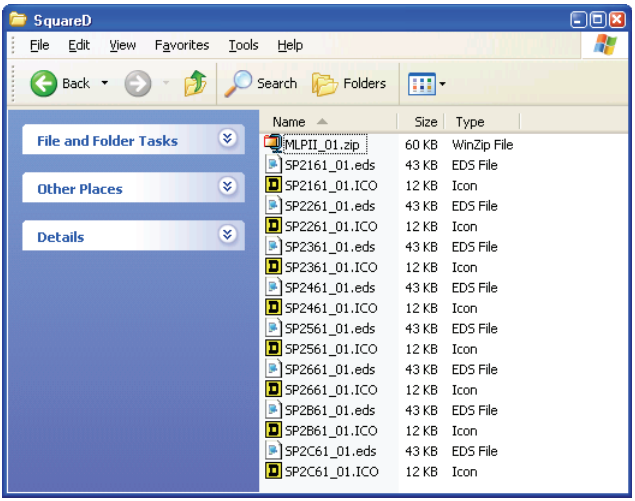
Figure 8: Extracting the Contents of the *.zip File



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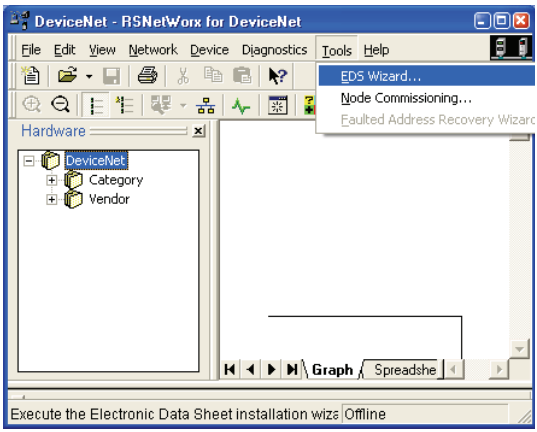
All MLPII SSOLR EDS and ICO files should now be visible in the SquareD directory.

Figure 9: EDS and ICO Files in the SquareD Directory



7. Using RSNetworx, select the EDS Wizard from Tools>EDS Wizard.

Figure 10: Selecting the EDS Wizard



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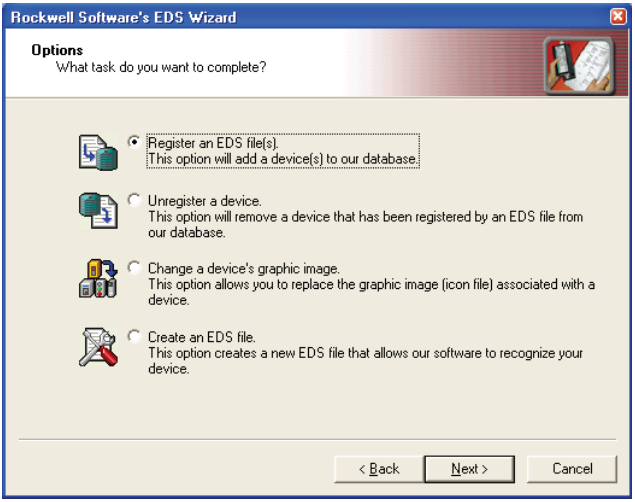
8. Click the Next button from the Welcome screen.

Figure 11: EDS Wizard Welcome Screen



9. Select the “Register an EDS file(s)” option. Then click the Next button.

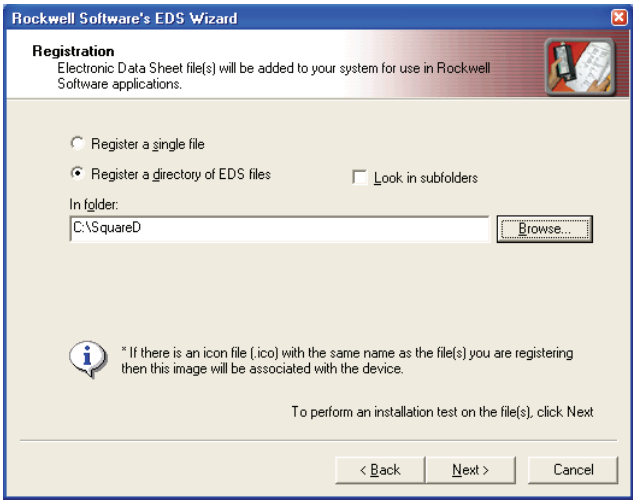
Figure 12: EDS Wizard Options



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10. Select the “Register a directory of EDS files” option and browse to C:\SquareD. Then click the Next button.

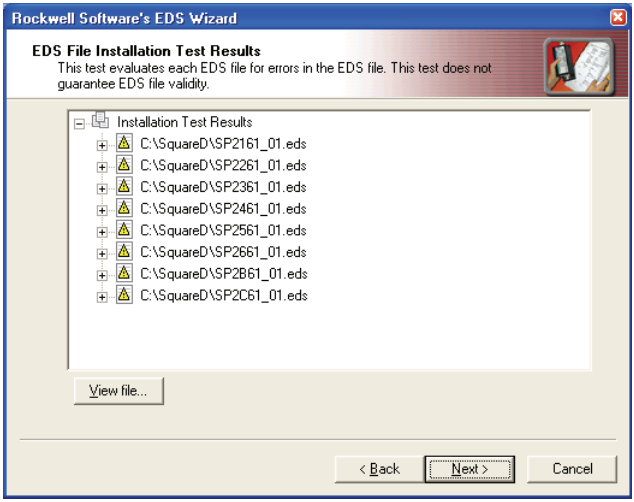
Figure 13: EDS Wizard Registration



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11. The EDS file evaluation screen appears. Yellow Warning symbols may appear next to the EDS files. The Warnings indicate that the help strings on some parameters exceed the recommended length of the software. This will not affect product operation. You may choose to view the files or Warnings in this screen. When finished, click the Next button.

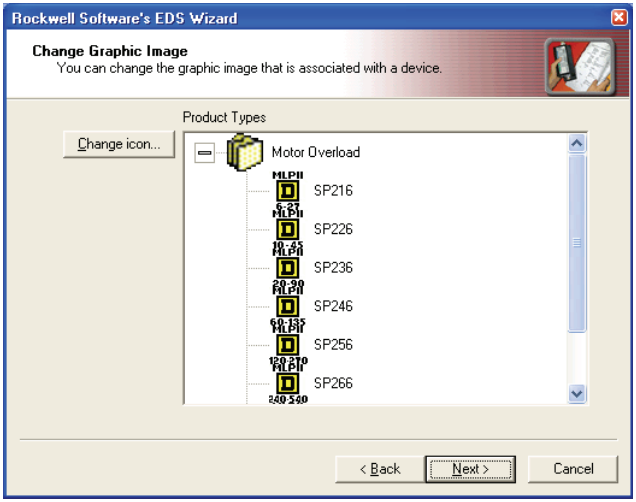
Figure 14: EDS File Installation Test Results



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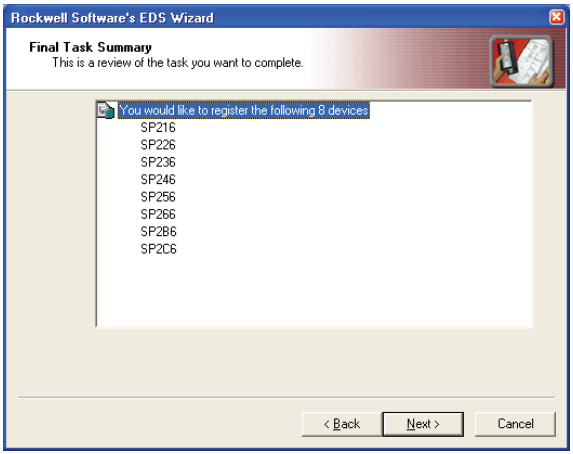
12. The graphic image screen appears displaying all of the icons for the MLPII SSOLRs. Click the Next button.

Figure 15: Change Graphic Image Screen



13. The summary screen confirms the devices that will be registered. If any of the devices you want to register do not appear in this list, perform this procedure again. Click the Next button if the list is complete.

Figure 16: Final Task Summary Screen



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14. You have successfully registered the MLPII SSOLRs using the EDS Wizard. Click the Finish button.

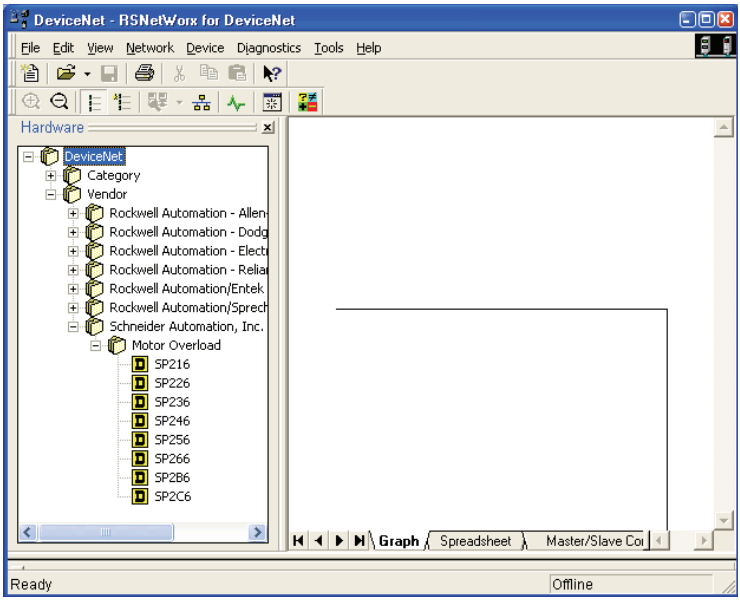
Figure 17: Completing the EDS Wizard



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15. For final verification, navigate to DeviceNet>Vendor>Schneider Automation, Inc.>Motor Overload on the left pane of RSNetWorx to see all of the devices.

Figure 18: Final Verification



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Faulted Node Recovery

Devices with shared addresses will stop communicating and go into the communication faulted mode. The Faulted Address Recovery Wizard (see Figure 19 on page 77) searches the network for devices with conflicting addresses, then lists the serial numbers of the faulted devices.

When commissioning multiple devices, you can record all serial numbers along with the device's location, panel number, or other identifying characteristics. You can use the serial number list to assign network addresses.

If serial numbers are not used, faulted devices display Faulted Node Recovery (FNR) indicators. The Identify Communication Faulted (ICF) indicator appears when the device receives an ICF request message. Table 27 lists the indicators for the MLPII SSOLR.

Table 27: MLPII SSOLR and MLPD Indicators

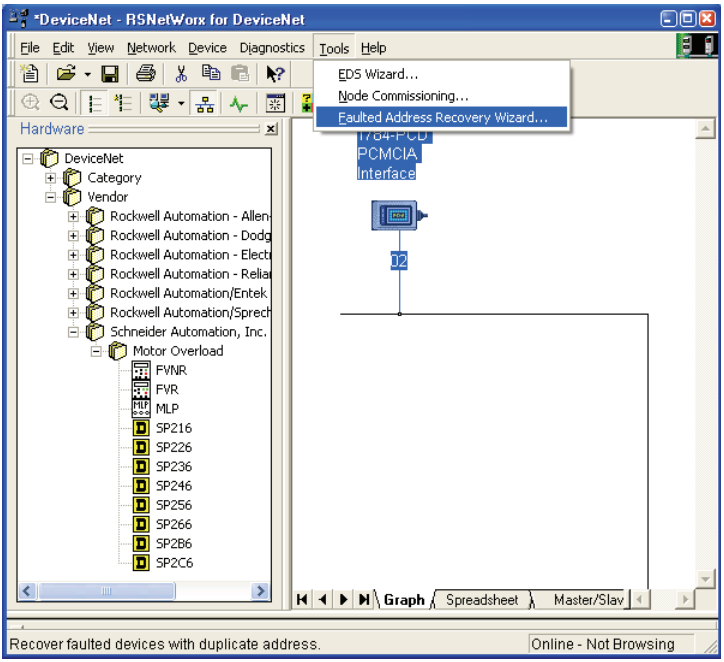
Product	Display Indicator	Performance
MLPII SSOLR	Status and Trip LEDs	The MLPII SSOLR alternately flashes the green status LED and the red trip LED while the ICF request is present. The fault relay remains unchanged.
MLPD with MLPII SSOLR	LCD Display	The MLPD displays “ICF” beneath the pending fault while the ICF request is present.
MMS with MLPII SSOLR	Status and Trip LEDs	The MLPII SSOLR alternately flashes the green status LED and the red trip LED while the ICF request is present. The fault relay remains unchanged.

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Using the Faulted Address Recovery Wizard

1. Select Tools>Faulted Address Recovery Wizard.

Figure 19: Selecting Faulted Address Recover Wizard



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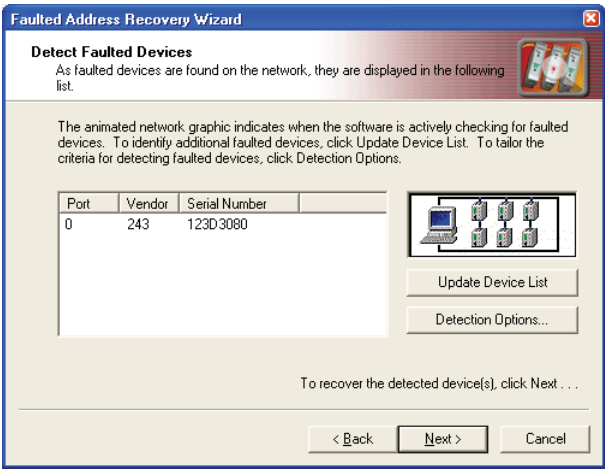
2. On the welcome screen, click the Next button.

Figure 20: Faulted Address Recovery Wizard Welcome Screen



3. The Wizard scans the entire network and lists the devices that are faulted. After the Wizard is finished scanning the network, click the Next button.

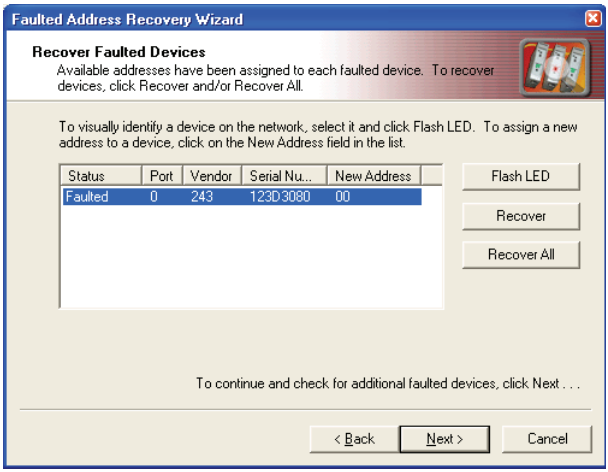
Figure 21: Scan for Faulted Devices



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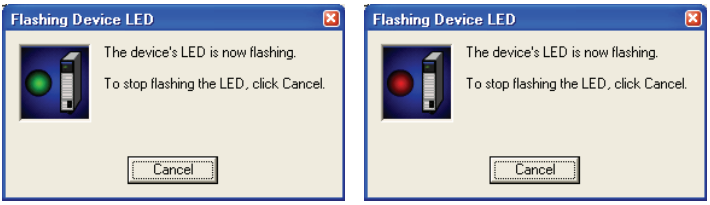
4. The recover faulted devices screen allows you to perform several actions on the faulted device. You can send a command to flash the LEDs on the faulted device to ensure that the Wizard has detected the correct device.

Figure 22: Recover Faulted Devices



The flashing device LED screen alternates the color of the screen LED from red to green. This action should match the behavior of the faulted device.

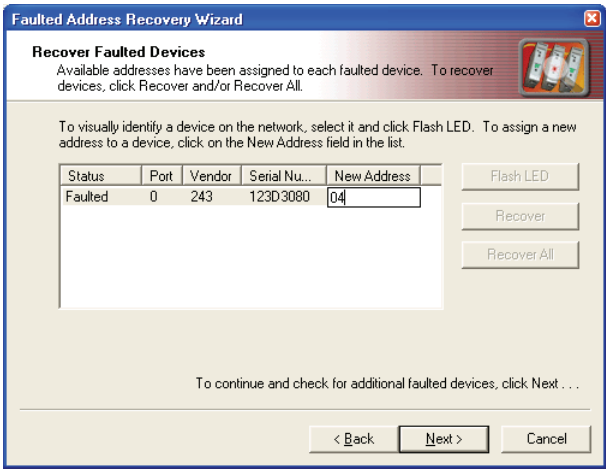
Figure 23: Flashing Device LED Screen



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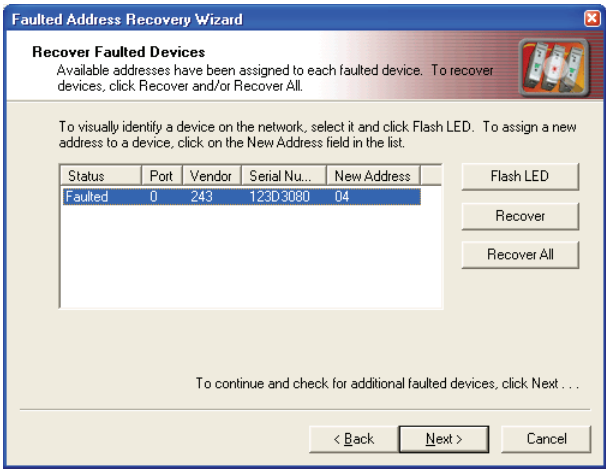
5. After confirming the location of the faulted device, you can change its address from the one automatically generated by the Wizard to another one. In this example, the address is changed from “00” to “04.”

Figure 24: Change Device Address



6. Once the identity of the faulted device and its address are known, the device may be recovered by clicking on the Recover button.

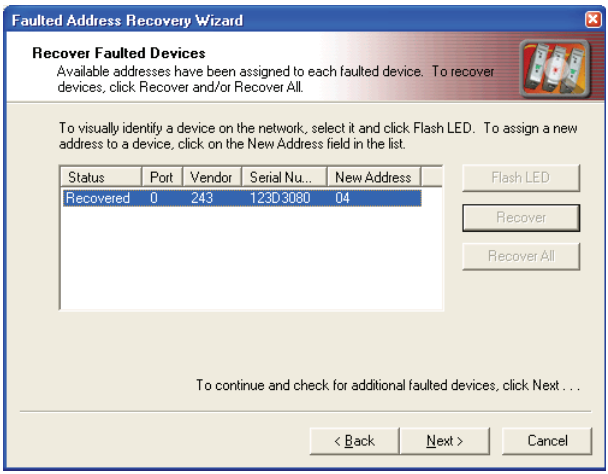
Figure 25: Recover Faulted Devices



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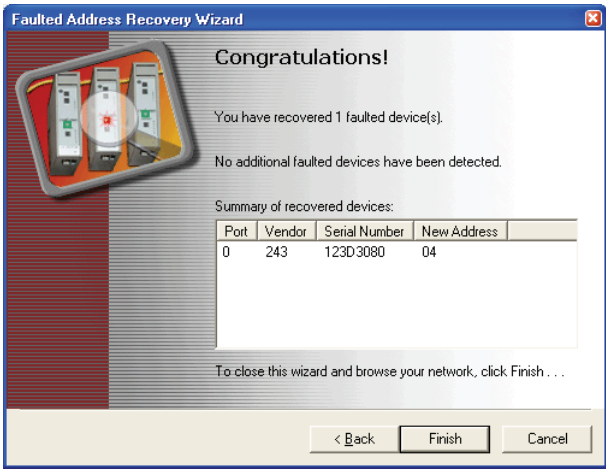
7. The status of the device will change from faulted to recovered. After all devices are recovered, click the Next button to go to the final summary screen.

Figure 26: Recover Faulted Devices (cont.)



8. The final summary screen lists all devices that were recovered. Click the Finish button to close the Wizard and return to the main RSNetWorx network panes.

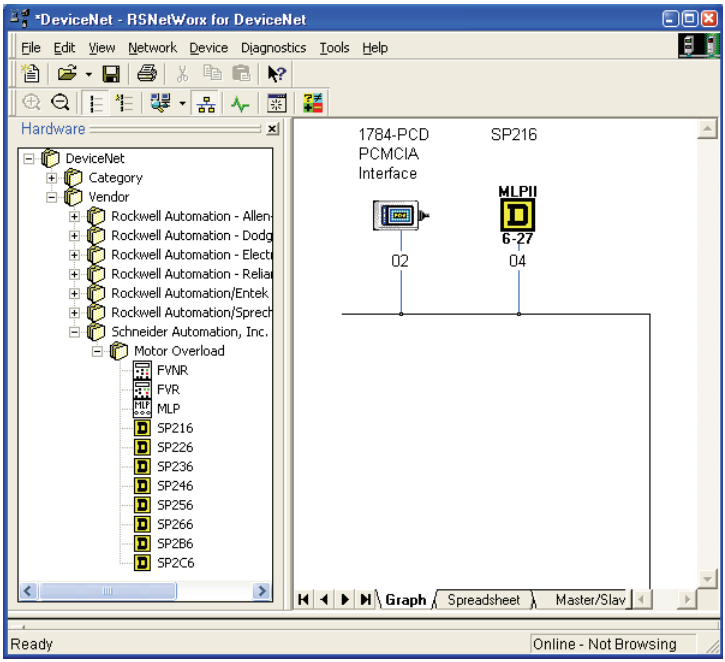
Figure 27: Recover Faulted Devices (cont.)



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9. The recovered faulted devices will now appear in the network pane.

Figure 28: Network Pane with Recovered Devices



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Configuration of the DeviceNet Parameters

A node's address and data must be programmed into the device before it can be added to a DeviceNet network.

Commissioning Nodes

Devices can be individually commissioned by:

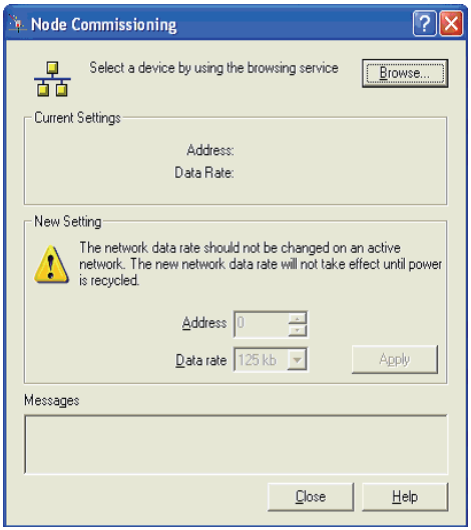
- Placing one unit on the network at a time, or
- Placing multiple units on the network that have individual default addresses

Use the Node Commissioning tool to configure the address and data (baud) rate of an individual device. If all of the units have default addresses and are placed on the network simultaneously, use the Faulted Address Recovery Wizard to commission the group of nodes.

To commission nodes:

1. From your desktop, click RSNetworx > Tools > Node Commissioning...

Figure 29: Node Commissioning Window

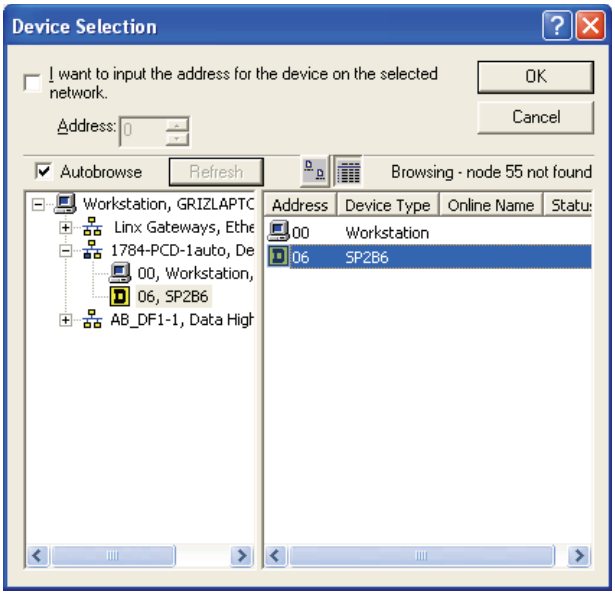


2. Click Browse, then select a node to change its address and data (baud) rate settings.

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3. Click Apply > Close to confirm the changes and close the window.

Figure 30: Device Selection Window

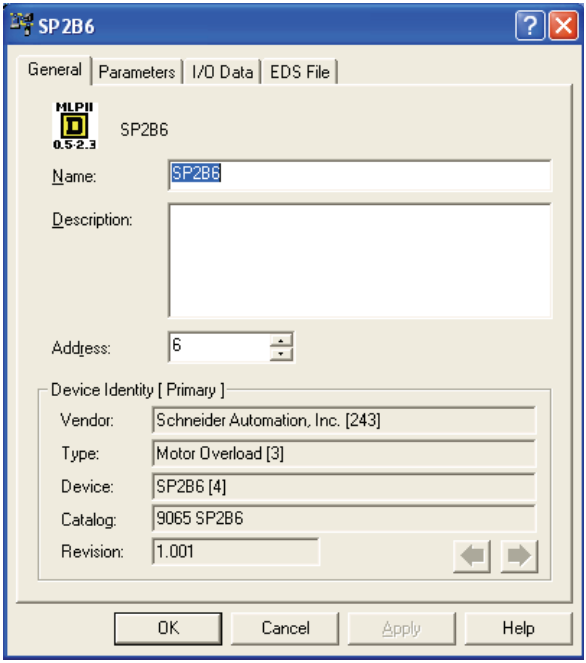


4. In the Device Selection window, select the network from the left pane. Then, to select a device, do one of the following:
   - — Check the “I want to input the address for...” check box, then manually enter the address.
   - — Select the node from the right pane.

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5. Click OK to confirm the changes and close the window.

Figure 31: MLPII General Properties Window



The MLPII SSOLR window displays the General properties of the SSOLR.

6. Change the address of this device to the new network address. (The address must be changed for each device placed on the network.)
7. Click OK to confirm the changes and close the window.

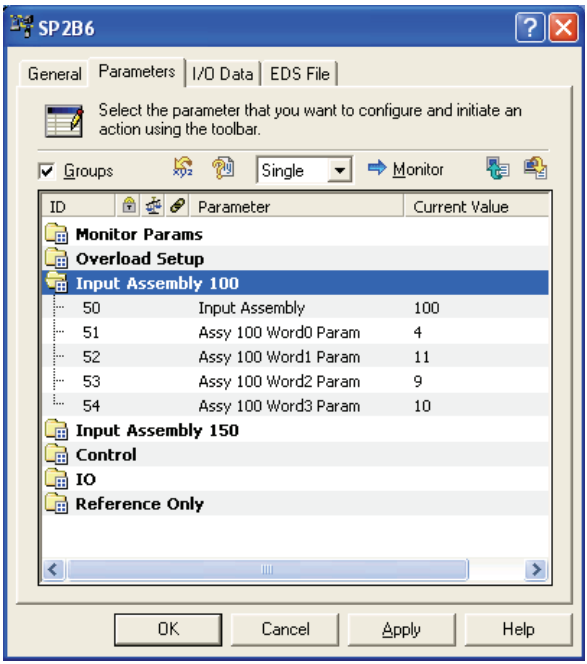
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Reading and Configuring the SSOLR Parameters

To read and configure the parameters of the devices:

1. Select Network > Online > Properties to open the properties window for the SSOLRs that you want to read or configure.
2. Select the Parameters tab and upload the parameters from the SSOLR when prompted.

Figure 32: MLPII SSOLR Parameters Properties Window



3. To configure a parameter, double-click the group name.

   The Parameter tab allows get/set access to the unit's parameters as specified by the EDS file registered in RSNetWorx.

   Table 28 on page 87 lists and describes the Motor Logic Plus II groups that you can configure. Each group contains the parameters needed for typical actions such as monitoring, SSOLR setup, and polled I/O configuration.

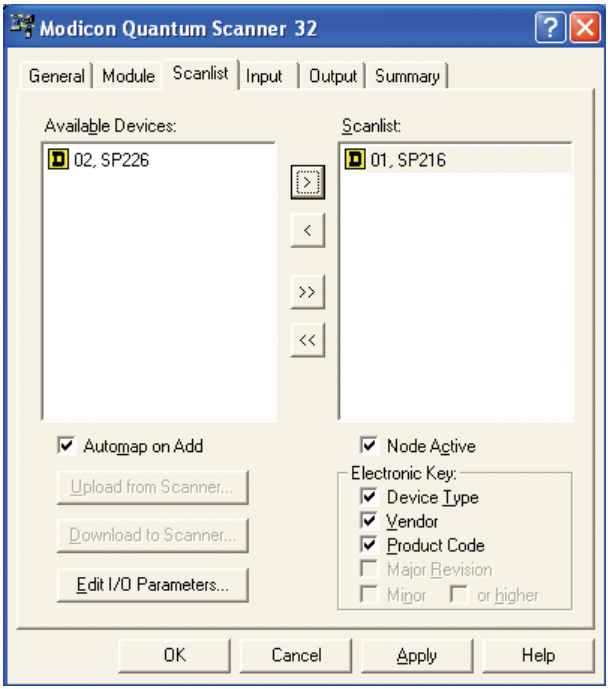
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Table 28: MLPII SSOLR Groups

Group	Description
Monitor Params	Real time parameters or data to be monitored. For example, currents, timers, and status.
SSOLR Setup	SSOLR set points.
Input Assembly 100	Parameters for configuring Input Assembly 100 for polled I/O.
Input Assembly 150	Parameters for configuring Input Assembly 150 for polled I/O.

4. Select the option from the Scanlist, or left-click the current value to change set points.
5. Click the Apply button or the Download to Scanner button to download the change.

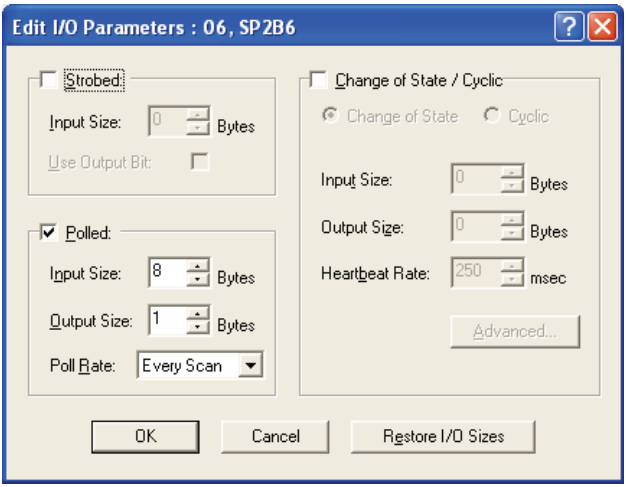
Figure 33: Scanlist Window for Scanner



6. Use the right and left arrows to add or remove the SSOLR from the Scanlist.

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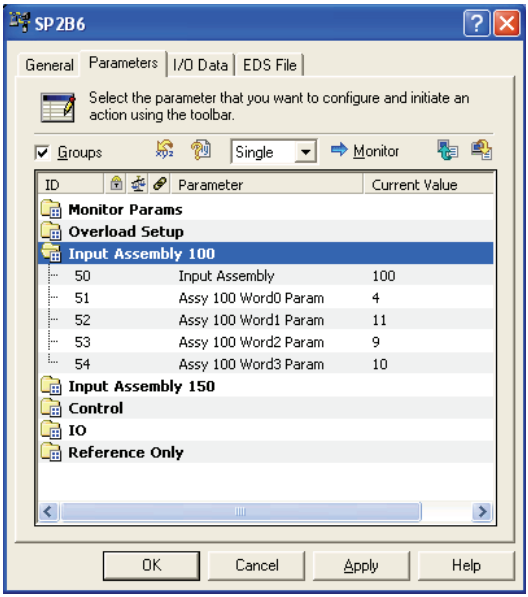
Figure 34: Edit I/O Parameters



NOTE: If changing the assembly default settings, also edit the I/O Parameters to match the assembly size. To do this, select the desired parameters to return in the assembly, then add the number of bytes returned.

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Figure 35: Assembly Parameters



Setting Up Custom Input Assemblies

To set up custom Input Assemblies.

1. Select the Input Assembly to configure, then change Parameter 50 to the input assembly used for polled I/O.
2. Select the data to be returned in a poll by programming the “Assy 1XX WordX Param” parameters to point to the parameters to be returned, using one of the following methods:
   - — Select the desired parameter from the printed data sheet.
   - — Browse the parameter lists in Parameters window.
3. To end the list of parameters to be returned, set 0 as the last parameter to return. Parameter 0 is invalid and will cause the assembly to end on the previous parameter.

   For example, set Parameter 50 to 100 to return Assembly 100. Then shorten the list of data returned by changing Parameter 54 to 0. Three pieces of data will return, each 2 bytes, for a total of 6

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bytes. In the scanner's Edit I/O Parameters window change the Polled Input Size to 6.

NOTE: Only one assembly is active at a time. Two programmable assemblies are included for flexibility of configurations (which allows two different factory defaults) and as a framework for future capabilities.

Configure the Network

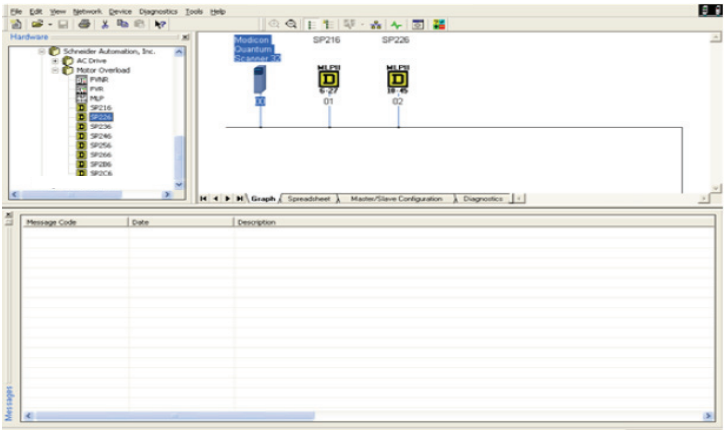
Follow the procedure below to configure the DeviceNet scanner using RSNetworx™ software. Figure 36 on page 91 shows a simple network with several Motor Logic Plus II SSOLRs.

1. Use the EDS Wizard to register the relevant EDS files: RSNetwork > Tools > EDS Wizard.
2. After the EDS files are registered, select Network > Single Pass Browse to load the DeviceNet products onto the network.

   With Single Pass Browse, the recovered nodes are automatically placed on the network.
3. Select the device from the Hardware list to display its icon in the right pane.
4. To change the default settings of a device, double-click on its icon, then do the following:
   a. In the General tab, change the default address to the preferred address.
   b. In the Parameters tab, change the assembly parameters.
   c. In the I/O Data tab, change the I/O settings.
   d. In the EDS File, change the EDS file (optional).
   e. Click Apply > OK.
5. Repeat Step 4 for each device that was added to the network or that requires configuring.

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Figure 36: EDS Wizard



Configiuring the DeviceNet Scanner

1. Open the Properties window for the scanner. See Figure 37 on page 92.
2. Select the Scanlist tab.
3. Move the desired devices from the Available Devices list to the Scanlist list. See Figure 38 on page 92.
4. Select the Input tab and review the input mapping. Make changes as desired. See Figure 39 on page 93.
5. Select the Output tab and review the output mapping. Make changes as desired.

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Figure 37: DeviceNet Scanner Properties Window

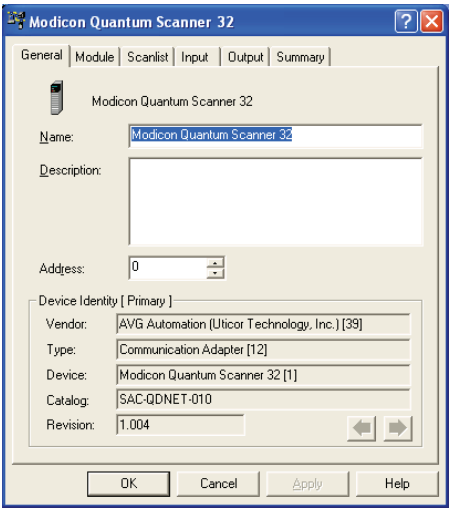
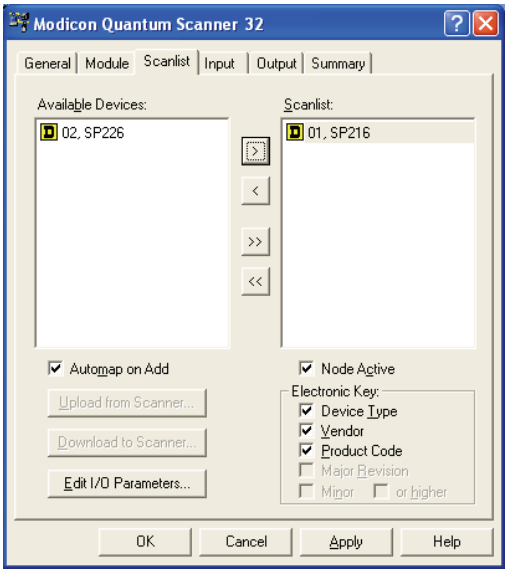
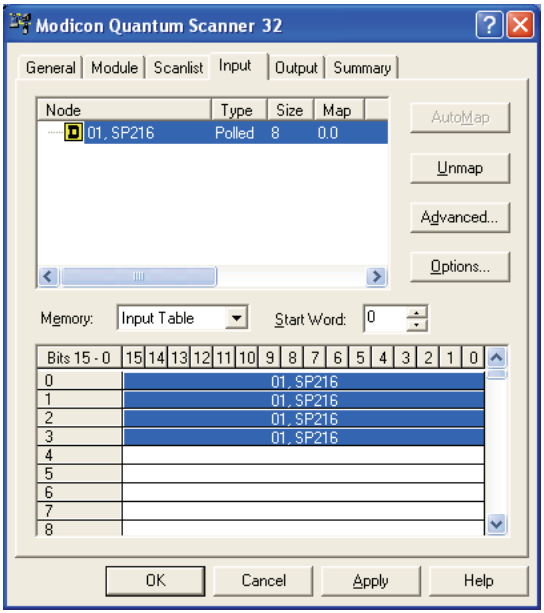


Figure 38: DeviceNet Scanner: Scanlist Tab



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Figure 39: DeviceNet Scanner: Input Tab



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OVERLOAD CLASSES—DEVICENET SPECIFICATION VOLUME 2, CHAPTERS 3-9

Table 29 identifies the device classes for SSOLRs.

Table 29: Object Model Definitions for SSOLRs

Object Class	Class ID	Need	No. of Instances	Effect on Behavior	Interface
Identity	01_{hex}	Req.	1	Supports the reset service	Message Router
Message Router	02_{hex}	Opt.	1	No effect	Explicit Message Connection
DeviceNet	03_{hex}	Req.	1	Configures node attributes	Message Router
Assembly	04_{hex}	Req.	3	Defines I/O data format	Message Router, Assembly, or Parameter Object
DeviceNet Connection	05_{hex}	Req.	2	Logical ports into or out of the device	I/O Connection or Message Router
Control Supervisor	29_{hex}	Req.	1	Manages SSOLR functions, operational states, and control	Message Router, Assembly, or Parameter Object
Overload	$2C_{hex}$	Req.	1	Provides SSOLR configuration	Message Router, Assembly, or Parameter Object
Acknowledge Handler	$2B_{hex}$	Opt.	1		I/O Connection or Message Router

Network Module Objects

Identity Object (Class ID 01_{hex})

The Identity Object provides general, identifying information about the device.

Table 30: Identity Object Class Code 0x01

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	Revision	UINT	1

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Table 31: Identity Object Class Code 0x01, Instance 1

Attribute ID	Access Rule	Name	Data Type, Bytes	Value
1	GET	Vendor ID	UINT	243
2	GET	Device Type	UINT	3
3	GET	Product Code, SP2B6	UINT, 2	4
		Product Code, SP2C6		5
		Product Code, SP216		6
		Product Code, SP226		7
		Product Code, SP236		8
		Product Code, SP246		9
		Product Code, SP256		10
		Product Code, SP266		11
		Product Code, MMS-D w/SP2B6		28
		Product Code, MMS-D w/SP2C6		29
		Product Code, MMS-D w/SP216		30
		Product Code, MMS-D w/SP226		31
		Product Code, MMS-D w/SP236		32
		Product Code, MMS-D w/SP246		33
		Product Code, MMS-D w/SP256		34
		Product Code, MMS-D w/SP266		35
		Product Code, MMS-RD w/SP2B6		52
		Product Code, MMS-RD w/SP2C6		53
		Product Code, MMS-RD w/SP216		54
		Product Code, MMS-RD w/SP226		55
		Product Code, MMS-RD w/SP236		56
		Product Code, MMS-RD w/SP246		57
		Product Code, MMS-RD w/SP256		58
		Product Code, MMS-RD w/SP266		59
4	GET	Revision	STRUCT of:	–
		Major	USINT, 1	1
		Minor	USINT, 1	1
5	GET	Status	WORD	–
6	GET	Serial Number	UDINT, 4	–

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Table 31: Identity Object Class Code 0x01, Instance 1

7	GET	Product Name, 9065 SP2B6	SHORT_STRING	SP2B6
		Product Name, 9065 SP2C6		SP2C6
		Product Name, 9065 SP216		SP216
		Product Name, 9065 SP226		SP226
		Product Name, 9065 SP236		SP236
		Product Name, 9065SP246		SP246
		Product Name, 9065 SP256		SP256
		Product Name, 9065 SP266		SP266
		Product Name, MMS-D		FVNR
		Prodcut Name, MMS-RD		FVR

Table 32: Attribute 5—Status (Class ID 01_{hex})

Bit	Definition
0	Owned by master (predefined master/slave connection)
2	Configured
8	Minor recoverable fault
9	Minor unrecoverable fault
10	Major recoverable fault
11	Major unrecoverable fault
Others	Reserved 0

Table 33: Class Service (Class ID 01_{hex})

Service Code	Service Name	Description
$0E_{hex}$	Get_Attribute_Single	Read an attribute

Table 34: Instance Service (Class ID 01_{hex})

Service Code	Service Name	Description
$0E_{hex}$	Get_Attribute_Single	Read an attribute
10_{hex}	Set_Attribute_Single	Write an attribute
05_{hex}	Reset	Reset DeviceNet module

Table 35: Message Router Object (Class ID 02_{hex})

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Revision 1	UINT	1

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DeviceNet Object (Class ID 03_{HEX})

The DeviceNet Object provides the status and configuration of a DeviceNet node.

Table 36: Class Attributes (Class ID 03_{hex})

Attribute ID	Access Rule	Name	Data Type	Value	Details
1	Get	Revision	UINT	1	—
2	Get	Max Instances	UINT	1	1 defined instance

Table 37: Instance Attributes (Class ID 03_{hex})

Attribute ID	Access	Name	Data Type	Value	Details
1	Get/Set	MAC ID	USINT	0–63	Ref = 63
2	Get/Set	Baud rate	USINT	0–2	0 = 125 k 1 = 250 k 2 = 500 k
3	Get/Set	BOI (BusOff interrupt)	BOOL	—	Upon BusOff event: 0: CAN component remains in BusOff 1: Component is reset—communication resumes
4	Get/Set	BusOff counter	USINT	0–255	Number of occurrences of BusOff state
5	Get	Allocation information	BYTE USINT	— 0–63	Allocation choice Master address (255 not allocated)

Table 38: Class Service (Class ID 03_{hex})

Service Code	Service Name	Description
$0E_{hex}$	Get_Attribute_Single	Read an attribute

Table 39: Instance Service (Class ID 03_{hex})

Service Code	Service Name	Description
$0E_{hex}$	Get_Attribute_Single	Read an attribute
10_{hex}	Set_Attribute_Single	Write an attribute
$4B_{hex}$	Allocate Master/Slave Connection Set	Allocation connection master/slave
$4C_{hex}$	Release Master/Slave Connection Set	Release connection master/slave

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Assembly Object Class Code 0x04

Output Assemblies[1]

Output Assemblies allow control of the SSOLR using a polled message. These assemblies allow the SSOLR to be reset and the output relays to be opened and closed.

Table 40: Output Assemblies

Fault Reset	0	No change
	1	Reset fault relay
OutA	0	Open output A relay
	1	Close output A relay
OutB	0	Open output B relay
	1	Close output B relay

Table 41: Assembly Object Class Instance 2

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
					Fault Reset		

Table 42: Assembly Object Class Instance 101

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
							Out A

Table 43: Assembly Object Class Instance103

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
					Fault Reset		Out A

Table 44: Assembly Object Class Instance104

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
						Out B	Out A

[1] When MMS-D or MMS-RD is used, Out A refers to Forward Run and Out B refers to Reverse Run.

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Table 45: Assembly Object Class Instance105

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
					Fault Reset	Out B	Out A

Table 46: Assembly Object Class Instance 134[1]

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
			MLPII OutB[2]	MLPII OutA[3]	Fault Reset	Out B	Out A

1 Assembly Object Class Instance only works with the MMS-D and the MMS-RD.

2 When MMS-D or MMS-RD is used, Out B refers to Reverse Run.

3 When MMS-D or MMS-RD is used, Out A refers to Forward Run.

Input Assemblies

The MLPII SSOLR supports two custom input assemblies. These assemblies are configured by selecting parameters. For input assembly 100, program attributes 7–10 of Class 0xB4 by selecting parameter instances from the Parameter Object Table. To end the list, program “0” for the parameter instance. The process is the same for input assembly 150, except attributes 25–74 of Class 0xB4 are used.

One very powerful attribute to use with the input assembly is the Device Status Attribute #121 of the Control Supervisor (0 x 29, 1, 0 x 79).

Table 47: Device Status, Control Supervisor Attribute 121, (0x29, 1, 0x79)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
–	–	–	–	–	–	Gnd Flt	Run Stat	In 4	In 3	In 2	In 1	Out B	Out A	Warn	Trip

Table 48: Device Status, Control Supervisor Attr. 121, Bit Description

Bit	Setting
Bit 0	1 = SSOLR is tripped
Bit 1	1 = Warning that a trip is pending
Bit 2	0 = Out A is open, 1 = Out A is closed
Bit 3	0 = Out B is open, 1 = Out B is closed
Bit 4	0 = Input 1 is open, 1 = Input 1 is closed
Bit 5	0 = Input 2 is open, 1 = Input 2 is closed

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Table 48: Device Status, Control Supervisor Attr. 121, Bit Description

Bit	Setting
Bit 6	0 = Input 3 is open, 1 = Input 3 is closed
Bit 7	0 = Input 4 is open, 1 = Input 4 is closed
Bit 8	0 = Motor is not running, 1 = Motor is running (current is present)
Bit 9	1 = Ground fault is present

Table 49: Trip Log 0–3, Control Supervisor Attribute 116–119, (0 x 29, 1, 0 x 74–0x77)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
–	–	–	–	–	–	–	CUB	PTC	UC	–	–	Gnd Flt	Phase Loss	OC	–

Table 50: Trip Log 0–3, Control Supervisor Attr. 116–119, Bit Description

Bit	Setting
Bit 1	1 = Overcurrent
Bit 2	1 = Phase loss
Bit 3	1 = Ground fault
Bit 4	—
Bit 5	—
Bit 6	1 = Undercurrent
Bit 7	1 = PTC
Bit 8	1 = Current unbalance

Table 51: Connection Object Class Code 0x05

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	Revision	UINT	1

Table 52: Connection Object—Class Code 0x05, Explicit

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	State	USINT	0 = Nonexistent 1 = Configuring 3 = Established 4 = Timed out
2	GET	Instance type	USINT	0 = Explicit
3	GET	Transport class trigger	BYTE	—

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Table 52: Connection Object—Class Code 0x05, Explicit *(continued)*

Attribute ID	Access Rule	Name	Data Type	Value
4	GET	Produced connection ID	UNIT	10xxxxxx011 xxxxxx = Node address
5	GET	Consumed connection ID	UINT	10xxxxxx100 xxxxxx = Node address
6	GET	Initial comm. characteristics	BYTE	—
7	GET	Produced connection size	UINT	8
8	GET	Consumed connection size	UINT	7
9	GET/SET	Expected packet rate	UINT	—
12	GET/SET	Watchdog timeout action	USINT	—
13	GET	Produced connection path length	UINT	—
14	GET	Produced connection path	—	—
15	GET	Consumed connection path length	UINT	—
16	GET	Consumed connection path	—	—

Table 53: Connection Object—Class Code 0x05, Polled

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	State	USINT	0 = Nonexistent 1 = Configuring 3 = Established 4 = Timed out
2	GET	Instance type	USINT	1 = I/O
3	GET	Transport class trigger	BYTE	—
4	GET	Produced connection id	UNIT	01111xxxxxx xxxxxx = Node address
5	GET	Consumed connection ID	UINT	10xxxxxx101 xxxxxx = Node address
6	GET	Initial comm. characteristics	BYTE	—
7	GET	Produced connection size	UINT	1–50
8	GET	Consumed connection size	UINT	0–8
9	GET/SET	Expected packet rate	UINT	—
12	GET/SET	Watchdog timeout action	USINT	—
13	GET	Produced connection path length	UINT	—
14	GET	Produced connection path	—	—
15	GET	Consumed connection path length	UINT	—
16	GET	Consumed connection path	—	—

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Table 54: Discrete Input Object—Class 0x08

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	Revision	UINT	1

Table 55: Discrete Input Object—Class 0x08, Instances 1 & 2

Attribute ID	Access Rule	Name	Data Type	Value
3	GET	Value	BOOL	0 = Off 1 = On

Table 56: Discrete Output Object—Class 0x09

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	Revision	UINT	1

Table 57: Discrete Output Object—Class 0x09, Instances 1, 2, 3

Attribute ID	Access Rule	Name	Data Type	Value
3	GET	Value, instance 1 MLPII fault relay	BOOL	0 = Off 1 = On
	GET/SET	Value, instance 2 Out A relay	BOOL	0 = Off 1 = On
	GET/SET	Value, instance 3 Out B relay	BOOL	0 = Off 1 = On

Table 58: Parameter Object—Class 0x0F

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	Revision	UINT	1

Table 59: Parameter Object—Class 0x0F, All Instances

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	Value	—	Actual value of parameter
2	GET	Link path size	USINT	6
3	GET	Link path	UINT	Depends on instance
4	GET	Descriptor	UINT	Depends on instance
5	GET	Data type	UINT	Depends on instance
6	GET	Data size	UINT	2

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Table 60: Parameter Object—Class 0x0F, Instances 1–25

Instance	Access Rule	Name	Data Type	Value
1	GET	L1 current	UINT	—
2	GET	L2 current	UINT	—
3	GET	L3 current	UINT	—
4	GET	Average current	UINT	—
5	GET	L1 current (%FLA)	UINT	—
6	GET	L2 current (%FLA)	UINT	—
7	GET	L3 current (%FLA)	UINT	—
8	GET	Avg. current(%FLA)	UINT	—
9	GET	% Thermal capacity used	UINT	—
10	GET	Ground fault current	UINT	—
11	GET	Current imbalance (%)	UINT	—
12	GET	OL time to reset	UINT	—
13	GET	Trip status bits	UINT	Bit 1: 1 = Overcurrent Bit 2: 1 = Phase loss Bit 3: 1 = Ground fault Bit 6: 1 = Undercurrent Bit 7: 1 = PTC Bit 8: 1 = CUB
14	GET	Warning status bits	UINT	
15	GET	Trip log 0	UINT	
16	GET	Trip log 1	UINT	
17	GET	Trip log 2	UINT	
18	GET	Trip log 3	UINT	
19	GET	Device status	UINT	Bit 0: Tripped Bit 1: Warning Bit 2: Out A is closed Bit 3: Out B is closed Bit 4: Input 1 is closed Bit 5: Input 2 is closed Bit 6: Input 3 is closed Bit 7: Input 4 is closed Bit 8: Motor is running Bit 9: Ground fault
20	GET	RD1 timer	UINT	0–500 seconds
21	GET	RD2 timer	UINT	2–500 minutes
22	GET	RD3 timer	UINT	2–500 minutes
23	GET	MULT (CT ratio)	UINT	—
24	GET	Run hours	UINT	0–65,000 hours
25	GET	MLPII OPRSTAT	UINT	—

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Table 61: Control Supervisor Object—Class Code 0x29

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	Revision	UINT	1
3	SET	Run 1, forward run in MLPII (closes Out A)	BOOL	0 = Stop, 1 = Run
4	SET	Run 2, reverse run in MLPII (closes Out B)	BOOL	0 = Stop, 1 = Run
7	GET	Forward running indicator	UINT	0,1
8	GET	Reverse running indicator	UINT	0,1
10	GET	Fault status	UINT	—
12	GET	Fault reset	UINT	—
13	GET	Fault code	UINT	—
14	GET	Warning code	UINT	—
114	GET	Trip status	UINT	Bit 1: 1 = Overcurrent Bit 2: 1 = Phase loss Bit 3: 1 = Ground fault Bit 6: 1 = Undercurrent Bit 7: 1 = PTC Bit 8: 1 = CUB Bit 14: 1 = AC power fault
115	GET	Warning status	UINT	
116	GET	Trip log 0	UINT	
117	GET	Trip log 1	UINT	
118	GET	Trip log 2	UINT	
119	GET	Trip log 3	UINT	
121	GET	Device status	UINT	Bit 0: Tripped Bit 1: Warning Bit 2: Out A is closed Bit 3: Out B is closed Bit 4: Input 1 is closed Bit 5: Input 2 is closed Bit 6: Input 3 is closed Bit 7: Input 4 is closed Bit 8: Motor is running Bit 9: Ground fault
126	GET/SET	Fault reset	BOOL	0 = reset, 1 = faulted
140	GET	INFOPWRUP		Bit 0: Power on reset Bit 1: Software reset indicator Bit 2: Brown-out-reset Bit 3: Watchdog reset Bit 4: Stack over flow reset Bit 5: Stack under flow reset Bit 6: ROM (program code) check sum failure Bit 7: EEPROM check sum failure Bit 8: Phase rotation is ABC Bit 9: Phase rotation is ACB Bit 15: Demonstration unit

[1] Do not write to reserved bits.

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Table 61: Control Supervisor Object—Class Code 0x29 *(continued)*

Attribute ID	Access Rule	Name	Data Type	Value
141	GET	INSTFLT		Bit 0: Reverse phase fault Bit 1: PTC overtemperature fault Bit 3: Undercurrent fault Bit 4: Overcurrent fault Bit 5: Ground fault Bit 6: Current unbalance fault Bit 7: Single phase fault Bit 8: PTC above warning level Bit 9: PTC shorted Bit 10: (Internal) Reference voltage error Bit 11: No AC power
142	GET	PENDFLT		Bit 0: Reverse phase fault Bit 1: PTC overtemperature fault Bit 3: Undercurrent fault Bit 4: Overcurrent fault Bit 5: Ground fault Bit 6: Current unbalance fault Bit 7: Single phase fault Bit 9: PTC shorted Bit 10: (Internal) Reference voltage error Bit 11: No AC power
143	GET	FAULTST		Bit 0: Reverse phase fault Bit 1: PTC overtemperature fault Bit 3: Undercurrent fault Bit 4: Overcurrent fault Bit 5: Ground fault Bit 6: Current unbalance fault Bit 7: Single phase fault Bit 9: PTC shorted Bit 10: (Internal) Reference voltage error Bit 11: No AC power
145	GET	HOLDOFF		Bit 0: Reverse phase Bit 1: Not enough thermal capacity Bit 2: PTC too hot Bit 3: PTC shorted Bit 4: Test trip-reset button Bit 5: Test trip-remote reset closed Bit 10: (Internal error) Reference voltage error Bit 11: (Internal error) No AC power Bit 14: (Internal error) Power up Bit 15: (Internal error) EEPROM check sum failure

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Table 61: Control Supervisor Object—Class Code 0x29 *(continued)*

Attribute ID	Access Rule	Name	Data Type	Value
146	GET	MANRESET		Bit 0: Reverse phase fault Bit 1: PTC overtemperature fault Bit 3: #RU exceeded Bit 4: #RF exceeded Bit 5: Ground fault trip Bit 8: Manual reset was set during last power down Bit 9: PTC shorted Bit 10: (Internal) reference voltage error Bit 11: No AC power Bit 12: Test trip Bit 13: Modbus comm loss Bit 14: DeviceNet comm loss Bit 15: Force faulted
147	GET	NEWKSTAT		Bit 0: Modbus program enable Bit 1: Modbus watchdog timer enable Bit 2: DeviceNet program enable Bit 3: Undercurrent fault Bit 8: DeviceNet ICF message present Bit 15: Outputs A&B last state on power up
148	GET	MLP2CMDSTAT		Bit 0: Output relay A On (closed) Bit 1: Output relay B On (closed) Bit 2: Fault relay On (closed)
149	GET	MLP2OPRSTAT		Bit 0: Output A is On or Closed Bit 1: Output B is On or Closed Bit 2: Motor is drawing current Bit 3: Modbus communication loss Bit 4: Fault condition Bit 5: Overcurrent trip condition Bit 6: Ground fault condition Bit 7: Global warning Bit (UC, OC, GF, CUB warning present, Series B only) Bit 8: Trip relay is closed Bit 9: Input 1 is active Bit 10: Input 2 is active Bit 11: Input 3 is active Bit 12: Input 4 is active Bit 13: PTC warning Bit 14: PTC trip Bit 15: PTC short
155	GET/SET	Modbus address		1–247
156	GET/SET	Modbus comm settings		C01, C02, C03, C04, C05, C06
157	GET/SET	MLP2INPUT	UINT	Bit 0: Single phase application Bit 1: Input1 is used as a PTC input. Bit 2: PTC trip is reset follows #RF. Bit 3: Input 4 is remote reset. Bit 4: Phase rotation is ABC. Bit 5: Reverse phase protection is enabled.
158	GET/SET	Thermal capacity restart level	UINT	25%

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Table 61: Control Supervisor Object—Class Code 0x29 *(continued)*

Attribute ID	Access Rule	Name	Data Type	Value
162	GET/SET	Configuration options	UINT	Bit 0: Reserved[1] Bit 1: Reserved[1] Bit 2: Ground fault inhibit is enabled. Bit 3: RD1 is only invoked on power up. Bit 6: Phase rotation monitoring is bypassed Bit 7: OutB WarnLinkMask enabled[2] Bit 8: Reserved[1]
169	GET	Motor run hours	UINT	0–65,000 hours
170	GET	RD1 timer	UINT	0–500 seconds
171	GET	RD2 timer	UINT	2–500 minutes
172	GET	RD3 timer	UINT	2–500 minutes
173	GET/SET	RD1 setting	UINT	0–500 seconds
174	GET/SET	RD2 setting	UINT	2–500 minutes
175	GET/SET	RD3 setting	UINT	2–500 minutes
176	GET/SET	#RU setting	UINT	0 = manual 1 = 1 auto reset 2 = 2 auto resets 3 = 3 auto resets 4 = 4 auto resets 5 = auto reset
177	GET/SET	#RF setting	UINT	0 = manual 1 = manual 2 = 1 auto reset 3 = oc1 4 = 2 auto resets 5 = oc2 6 = 3 auto resets 7 = oc3 8 = 4 auto resets 9 = oc4 10 = auto reset 11 = ocA
181	GET/SET	UC warning level SP2B6 SP2C6 SP216 SP226 SP236 SP246 SP256 SP266	INT	 .12–3 Amps .5–12 Amps 1.5–34 Amps 2.5–58 Amps 5–118 Amps 15–180 Amps 30–360 Amps 60–720 Amps

[1] Do not write to reserved bits.

[2] See Attribute 0x29, 187.

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Table 61: Control Supervisor Object—Class Code 0x29 *(continued)*

Attribute ID	Access Rule	Name	Data Type	Value
182	GET/SET	OC warning level SP2B6 SP2C6 SP216 SP226 SP236 SP246 SP256 SP266	INT	 .25–3 Amps 1–12 Amps 3–35 Amps 5–60 Amps 10–120 Amps 15–225 Amps 30–450 Amps 60–900 Amps
183	GET/SET	GF warning level	INT	1–12 x MULT
184	GET/SET	CUB warning level	INT	2–200%
187	GET/SET	WarnLinkMask	UINT	Bit 0: UC warning enabled Bit 1: OC warning enabled Bit 2: GF warning enabled Bit 3: CUB warning enabled
188	GET	WarnLinkMask	UINT	Bit 0: UC warning enabled Bit 1: OC warning enabled Bit 2: GF warning enabled Bit 3: CUB warning enabled

[1] Do not write to reserved bits.

Table 62: Acknowledge Handler Object—Class 0x2B

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	Revision	UINT	1

Table 63: Acknowledge Handler Object—Class 0x2B, Instance 1

Attribute ID	Access Rule	Name	Data Type	Value
1	GET/SET	Acknowledge timer	UINT	in milliseconds
2	GET/SET	Retry limit	USINT	0 or 1
3	GET	COS producing conn instance	UINT	[1]

[1] Value changes in real time.

Table 64: Overload Object—Class 0x2C

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	Revision	UINT	1

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Table 65: Overload Object—Class Code 0x2C, Instance 1

Attribute ID	Access Rule	Name	Data Type	Value
3	GET/SET	Trip FLA setting	INT	—
4	GET/SET	Trip class	UINT	5, 10, 15, 20, 30
5	GET	Avg current	UINT	—
6	GET	%Phlmbal	UINT	—
7	GET	%Thermal cap utilized	UINT	0–99%
8	GET	L1 current	INT	—
9	GET	L2 current	INT	—
10	GET	L3 current	INT	—
11	GET	GF current x Attr 100	INT	—
100	GET/SET	Current multiplier	USINT	—
101	GET	L1 current	UINT	—
102	GET	L2 current	UINT	—
103	GET	L3 current	UINT	—
104	GET	Avg current	UINT	—
105	GET	L1%FLA	UINT	—
106	GET	L2%FLA	UINT	—
107	GET	L3%FLA	UINT	—
108	GET	Average%FLA	UINT	—
109	GET	% Thermal cap utilized	UINT	0–99%
110	GET	CUB measured	INT	—
113	GET	OL time to reset	UINT	—
129	GET/SET	Trip class	INT	5, 10, 15, 20, 30
130	GET/SET	Jam protection	USINT	1 = Jam enabled
137	GET/SET	GF trip level	INT	—
146	GET/SET	UC trip delay	USINT	2–60 seconds
147	GET/SET	UC trip level	UINT	[1]
151	GET/SET	CUB trip level	USINT	2–25%
177	GET/SET	CT ratio[2]	USINT	—

[1] Refer to Table 23 on page 51 for current limits by SSOLR model number.

[2] Sizes 4, 5, and 6.

Table 66: DeviceNet Interface Object—Class 0xB4

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	Revision	UINT	1

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Table 67: DeviceNet Interface Object—Class 0xB4, Instance 1

Attribute ID	Access Rule	Name	Data Type	Value
7	GET/SET	Assembly 100, Word 1	UINT	—
8	GET/SET	Assembly 100, Word 2	UINT	—
9	GET/SET	Assembly 100, Word 3	UINT	—
10	GET/SET	Assembly 100, Word 4	UINT	—
16	GET/SET	Polled Output Assembly Instance	UINT	0, 2, 101, 103, 104, 105
17	GET/SET	Polled Input Assembly	UINT	0, 100, 150
20	GET/SET	Control Supervisor Model Type	UINT	—
25	GET/SET	Assembly 150, Word 1	UINT	—
26	GET/SET	Assembly 150, Word 2	UINT	—
27	GET/SET	Assembly 150, Word 3	UINT	—
28	GET/SET	Assembly 150, Word 4	UINT	—
29	GET/SET	Assembly 150, Word 5	UINT	—
30	GET/SET	Assembly 150, Word 6	UINT	—
31	GET/SET	Assembly 150, Word 7	UINT	—
32	GET/SET	Assembly 150, Word 8	UINT	—
33	GET/SET	Assembly 150, Word 9	UINT	—
34	GET/SET	Assembly 150, Word 10	UINT	—
35	GET/SET	Assembly 150, Word 11	UINT	—
36	GET/SET	Assembly 150, Word 12	UINT	—
37	GET/SET	Assembly 150, Word 13	UINT	—
38	GET/SET	Assembly 150, Word 14	UINT	—
39	GET/SET	Assembly 150, Word 15	UINT	—
40	GET/SET	Assembly 150, Word 16	UINT	—
41	GET/SET	Assembly 150, Word 17	UINT	—
42	GET/SET	Assembly 150, Word 18	UINT	—
43	GET/SET	Assembly 150, Word 19	UINT	—
44	GET/SET	Assembly 150, Word 20	UINT	—
45	GET/SET	Assembly 150, Word 21	UINT	—
46	GET/SET	Assembly 150, Word 22	UINT	—
47	GET/SET	Assembly 150, Word 23	UINT	—
48	GET/SET	Assembly 150, Word 24	UINT	—
49	GET/SET	Assembly 150, Word 25	UINT	—
50	GET/SET	Assembly 150, Word 26	UINT	—
51	GET/SET	Assembly 150, Word 27	UINT	—
52	GET/SET	Assembly 150, Word 28	UINT	—
53	GET/SET	Assembly 150, Word 29	UINT	—

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Table 67: DeviceNet Interface Object—Class 0xB4, Instance 1 *(continued)*

Attribute ID	Access Rule	Name	Data Type	Value
54	GET/SET	Assembly 150, Word 30	UINT	—
55	GET/SET	Assembly 150, Word 31	UINT	—
56	GET/SET	Assembly 150, Word 32	UINT	—
57	GET/SET	Assembly 150, Word 33	UINT	—
58	GET/SET	Assembly 150, Word 34	UINT	—
59	GET/SET	Assembly 150, Word 35	UINT	—
60	GET/SET	Assembly 150, Word 36	UINT	—
61	GET/SET	Assembly 150, Word 37	UINT	—
62	GET/SET	Assembly 150, Word 38	UINT	—
63	GET/SET	Assembly 150, Word 39	UINT	—
64	GET/SET	Assembly 150, Word 40	UINT	—
65	GET/SET	Assembly 150, Word 41	UINT	—
66	GET/SET	Assembly 150, Word 42	UINT	—
67	GET/SET	Assembly 150, Word 43	UINT	—
68	GET/SET	Assembly 150, Word 44	UINT	—
69	GET/SET	Assembly 150, Word 45	UINT	—
70	GET/SET	Assembly 150, Word 46	UINT	—
71	GET/SET	Assembly 150, Word 47	UINT	—
72	GET/SET	Assembly 150, Word 48	UINT	—
73	GET/SET	Assembly 150, Word 49	UINT	—
74	GET/SET	Assembly 150, Word 50	UINT	—

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Automatic Reset on Faults

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

- If A1, A2 power is present and automatic restart is selected, the motor will start running after the thermal reset timing period.
- Equipment operation must conform to national and local safety regulations and codes.

Failure to follow these instructions will result in death or serious injury.

Automatic Restart after Power Loss

On power restoration the output relays on the MLPII SSOLR can go back to their “Last State” before the power loss. This is a handy feature for automatically restarting motors or processes after a power outage or dip.

Table 68: Automatic Restart after Power Loss Features

Name	Object	Instance	Attribute	Access Rule	Type	Options
NETWKSTAT	0x29, Control Supervisor	1	147	Get	UINT	Bit 15 1 = On

Voltage Sag Ride Thru Time	0 – 10000 ms, 10 ms increments
Enhanced AutoRestart for Power Loss Time (PLT)	0 – 14400 sec
Restart after Power Loss Delay Timer (RD0)	0 – 500 sec

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APPENDIX A—8-BIT AND 16-BIT ADDRESS CROSS REFERENCE

The 8-bit memory addresses are provided solely for legacy installations currently using a Motor Logic Plus SSOLR. Modbus commands to the MLPII SSOLR should be sent to the 16-bit memory addresses.

The following table provides a cross-reference between the 8-bit and 16-bit memory addresses. The 8-bit memory addresses increment the address for each byte used. Therefore, 2 byte location addresses increment by 2 rather than 1. A Modbus command can request data starting anywhere in the 8-bit space, allowing the low and high bytes of neighboring locations to be combined in a message.

Table 69: 8-Bit and 16-Bit Address Cross Reference

8-Bit Memory		16-Bit Memory		Code
Hex	Decimal	Hex	Decimal	
84	40133	192	40403	WARNSTAT
86	40135	193	40404	MLP2STAT2
88	40137	194	40405	INFOPWRUP
8A	40139	195	40406	INSTFLT
8C	40141	196	40407	PENDFLT
8E	40143	197	40408	FAULTST
90	40145	198	40409	PTCOHMS
92	40147	199	40410	HOLDOFF
94	40149	19A	40411	MANRESET
96	40151	19B	40412	NETWKSTAT
98	40153	19C	40413	MLP2CMDSTAT
9A	40155	19D	40414	MLP2OPRSTAT
9C	40157	19E	40415	MMSCMDSTAT
9E	40159	19F	40416	MMSOPRSTAT
A2	40163	1A1	40418	IAVE
A6	40167	1A3	40420	CUB
AA	40171	1A5	40422	THERM CAP
AC	40173	1A6	40423	GF
AE	40175	1A7	40424	TRIPRN/ ERCODE
B0	40177	1A8	40425	FH
B2	40179	1A9	40426	PID

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Table 69: 8-Bit and 16-Bit Address Cross Reference *(continued)*

8-Bit Memory		16-Bit Memory		Code
Hex	Decimal	Hex	Decimal	
BA	40187	1AD	40430	IC
BC	40189	1AE	40431	IB
BE	40191	1AF	40432	IA
C0	40193	1B0	40433	RD1
C2	40195	1B1	40434	RD2
C4	40197	1B2	40435	RD3
C6	40199	1B3	40436	COM-LINE
C8	40201	1B4	40437	Scale
D0	40209	1B8	40441	MULT
D2	40211	1B9	40442	OC
D4	40213	1BA	40443	UC
D6	40215	1BB	40444	CUB
D8	40217	1BC	40445	TC
DA	40219	1BD	40446	RD1
DC	40221	1BE	40447	RD2
DE	40223	1BF	40448	RD3
E0	40225	1C0	40449	#RU
E2	40227	1C1	40450	#RF
E4	40229	1C2	40451	UCTD
E6	40231	1C3	40452	GF
E8	40233	1C4	40453	MBAddress
EA	40235	1C5	40454	MTIM
EC	40237	1C6	40455	MLP2COMS
EE	40239	1C7	40456	MLP2INPUT
		257	40600	DnADDR
		258	40601	DnBaudRt
		259	40602	ThermCapAvail
		263	40612	WarnUC
		264	40613	WarnOC
		265	40614	WarnGF
		266	40615	WarnCUB
		267	40616	MBAssembly103
		269	40618	WarnEnableMask

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APPENDIX B— MOTOR MANAGEMENT SYSTEM DISPLAY (9999MMS) MEMORY MAP

This memory map applies to the Motor Management System Display (9999MMS) beginning with revision 3.11.

Operation: MMSCMDSTAT and the Setup Parameters for the MMS can be read and written; all other registers are Read Only. All registers are 16-bit words.

Address: Relative ONLY (addresses increment by 1 for each 16-bit word).

Table 70: Relative Address:

(HEX)	(Dec)	Code	Description	Size (words)
19EH	40415	MMSCMDSTAT	Command State/Status (bits)	(1)
19FH	40416	MMSOPRSTAT	Operating Status (bits)	(1)
	...			
400H	41025	PRODID	Product Identifier	(1)
401H	41026	SFTREV	Software Revision (Major * 100 + Minor	(1)
402H	41027	PWRFCTR	Power Factor * 256 (0–256)	(1)
403H	41028	POWRKW	Power * 256 (KW)	(2)
405H	41030	KVARS	KVA reactive * 256	(2)
407H	41032	ENRGUSE	Energy Usage (KWH * 10)	(2)
409H	41034	NSTARTS	Number of Starts	(1)
40AH	41035	NTRIPS	Number of Trips (Fault trips)	(1)
40BH	41036	DTLSTART	Date/Time of Last Start	(4)
40FH	41040	DTLOFF	Date/Time of Last Off	(4)
413H	41044	DTMINOFF	Date/Time of Minimum Off Time	(2)
417H	41048	MINOFF	Minimum Off Time (Seconds)	(2)
419H	41050	RTC	Real Time Clock - current reading	(4)
41DH	41054	WRNGSTAT	Warning Status (bits)	(1)
41EH	41055	LSTFLT1	Most Recent Fault	(1)
41FH	41056	LSTFLT2	2nd Most Recent Fault	(1)
420H	41057	LSTFLT3	3rd Most Recent Fault	(1)
421H	41058	LSTFLT4	4th Most Recent Fault	(1)
	...			
422H			(Reserved for future Use)	
	...			

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Table 70: Relative Address:

(HEX)	(Dec)	Code	Description	Size (words)
430H	41073	FLTCNT	Number of Faults (0–6)	(1)
431H	41074	FLTPTR	Pointer to Most Recent Fault (0–5)	(1)
432H	41075	FLTDATA0	Data for Fault in Position 0	(12)
43EH	41087	FLTDATA1	Data for Fault in Position 1	(12)
44AH	41099	FLTDATA2	Data for Fault in Position 2	(12)
456H	41111	FLTDATA3	Data for Fault in Position 3	(12)
462H	41123	FLTDATA4	Data for Fault in Position 4	(12)
46EH	41135	FLTDATA5	Data for Fault in Position 5	(12)
47AH	41147	EVTCNT	Number of Events	(1)
47BH	41148	EVTPTR	Pointer to Most Recent Event (0–31)	(1)
47CH	41149	EVTDATA0	Date/Time & Code for Event in Position 1	(4)
480H	41153	EVTDATA1	Date/Time & Code for Event in Position 2	(4)
...				...
4F4H	41269	EVTDATA30	Date/Time & Code for Event Position 30	(4)
4F8H	41273	EVTDATA31	Date/Time & Code for Event Position 30	(4)
...				...
		SETUP PARAMETERS FOR MMS		
5C0H	41473	SLVCOMS	Comm Setting	(1)
5C1H	41474	SLVBAUD	Baud Rate	(1)
5C2H	41475	SLVPAR	Parity bits	(1)
5C3H	41476	SLVSTP	Stop bits	(1)
5C4H	41477	MMSADDR	Network Address of MMS	(1)
5C5H	41478	MMSCOMS	Comm Setting for MMS (1–6)	(1)
5C6H	41479	MMSBAUD	Baud Rate for MMS	(1)
5C7H	41480	MMSPAR	Parity bits for MMS	(1)
5C8H	41481	MMSSTP	Stop bits for MMS	(1)
5C9H	41482	PCFGOPT	Configuration Options	(1)
5CAH	41483	EVTSLOG	Type of Events to Log	(1)
5CBH	41484	LOCLRMT	Local/Remote Control	(1)
5CCH	41485	STRTOPT	Startup Option	(1)

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MMS Command State / Status Word

The MMSCMDSTAT register contains 16 bits that control the MMS. The bits are numbered from 15 (most significant bit) to 0 (least significant bit).

MMSCMDSTAT

Bit 0	1 = MMS - Forward Run	Activates the Foward Run relay
Bit 1	1 = MMS - Reverse Run	Activates the Reverse Run relay
Bit 2	1 = MMS - Stop	Deactivates both Fwd & Rev Run relays
Bit 3	1 = MMS - Clear History Data	
Bit 4	1 = MMS - Clear Last Start Data	
Bit 5	1 = MMS - Clear Fault Data	
Bit 6	1 = MMS - Clear Event Data	
Bit 7	---	
Bit 8	1 = Start / Reset	(See Command 1)[1]
Bit 9	1 = Stop / Off	(See Command 2)[1]
Bit 10	1 = Display Lock 0 = Display Unlock	(See Command 3)[1] (See Command 4)[1]
Bit 11	1 = Network Program Disable 0 = Network Program Enable	(See Command 6)[1] (See Command 5)[1]
Bit 12	1 = Network Watch Dog Enable 0 = Network Watch Dog Disable	(See Command 7)[1] (See Command 8)[1]
Bit 13	1 = Clear Run Time Hours	(See Command 9)[1]
Bit 14	1 = Clear Last Fault	(See Command 10)[1]
Bit 15	1 = MMS - ShutDown State to Hold Last Values 0 = MMS - ShutDown State to Manual Restart	(Auto Restart)

[1] See SSOLR Comman Processing section on page 122.

Writing a 1 to bits 3–9 and bits 13–14 will not latch a 1 value, but it will cause an action; then the bit will revert to 0. Bits 0–2 will be changed depending on the state of the Forward and Reverse Control relays. Bit 15 will be changed to reflect any change in the ShutDown state due to operator change at the MMS keypad.

Bits 10–12 will not accurately reflect the operating state of the SSOLR until the states are changed. In other words, for a newly installed SSOLR, the controller may need to send all three bits as 1's (ones), then send all three bits as 0's (zeroes), and finally, send the desired operating state for each bit.

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MMS Operating Status Format

The MMSOPRSTAT register contains 16 bits that describe the Operating Status of the MMS. The bits are numbered from 15 (most significant bit) to 0 (least significant bit).

MMSOPRSTAT:

Bit 0	1 = MMS Forward Run Relay is On or Closed	
Bit 1	1 = MMS Reverse Run Relay is On or Closed	
Bit 2	1 = Motor is drawing current	
Bit 3	---	
Bit 4	1 = SSOLR is not in communication with the MMS display	(1 = Data Fault)
Bit 5	1 = Fault Condition	(RD2 or RD3 is not zero)
Bit 6	1 = ROM checksum failure	
Bit 7	1 = Power Problem or Voltage Error HoldOff	
Bit 8	1 = MMS is in Local Mode	
Bit 9	1 = MMS is in Full Remote mode	
Bit 10	1 = MMS is in Semi-Remote mode	
Bit 11	1 = EEPROM checksum failure	
Bit 12	1 = Input1 is high. See PCFGOPT, bit 7 for definition	
Bit 13	1 = Input2 is high. See PCFGOPT, bit 7 for defintion	
Bit 14	---	
Bit 15	1 = MMS ShutDown State is in Hold Last Value (Auto Restart) 0 = MMS All Relays Off	(Manual Restart)

Format of PWRFCTR variable

The power factor variable at location 41027 is the cosine of the power factor angle (at location 40421). The power factor is multiplied by 256. If PWRFCTR reads 181, the power factor is 181 / 256 or 0.707, which corresponds to the power factor for a 45 degree power factor angle. If the power factor variable reads 256, the power factor is 256 / 256 or 1.00, which corresponds to a power factor angle of 0 degrees.

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Warning Status

The WRNGSTAT register at location 41054 contains 16 bits that describe the Instantaneous Warning Status of the SSOLR. The bits are numbered from 15 (Most Significant bit) to 0 (Least Significant bit).

WRNGSTAT

Bit 0	1 = Pending Trip Condition	(OC, UC, CUB, GF, Current SP
Bit 1	1 = Voltage Error Detected	If not drawing current, indicates HOLDOFF (VHI, VLO, VUB, VSP, RP)

Date Formats

Date and Time information is stored in the following format:

1st word	Century 256	+	Year
2nd word	Month 256	+	Day
3rd word	Hour 256	+	Minute
4th word	Second 256	+	(Optional Code)

Fault Data

The 12 words of data for each fault are stored in the following format:

1st word	Line Voltage A–C
2nd word	Line Voltage B–C
3rd word	Line Voltage A–B
4th word	Current in Phase C
5th word	Current in Phase B
6th word	Current in Phase A
7th word	Ground Fault Current
8th word	PID (for scale factor for currents

9th–12th words contain Date and Time information and Fault Code			
9th word	Century 256	+	Year
10th word	Month 256	+	Day
11th word	Hour 256	+	Minute
12th word	Second 256	+	Fault Code

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Fault Codes

The Fault Codes stored in the 12th word of the Fault Data Block are the same as the SSOLR units:

4	Contactor Failure
6	Single Phase
7	Ground Fault
8	Unbalance
10	Overcurrent
11	Undercurrent

Event Data

The 4 words of data for each fault are stored in the following format:

1st word	Century 256	+	Year
2nd word	Month 256	+	Day
3rd word	Hour 256	+	Minute
4th word	Second 256	+	Event Code

Event Codes

The EVENT CODE data is stored in the low byte of the 4th word:

1	Motor Start
2	Motor Stop
3	9999MMS Power on
4	9999MMS Power loss
5	Communications with SSOLR unit established
6	Communcations with SSOLR unit lost

Processing Fault and Event Data

The MMS uses ring buffers for the fault data and the event data. The EVTPTR and the FLTPTR always point to the next free data block. If the EVTCNT or the FLTCNT is less than the maximum, the oldest data will be in data block 0. Once the counters are set to their maximum values, the oldest data is the block where the pointer is currently pointing.

In order to calculate the starting address of a block of fault data, multiply the block number by 12, and add the starting address of

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block 0 (41075 or 432 hexadecimal). For example, with FLTPTR set to 3, the starting address of the most recent fault data will be ((3 - 1) * 12) + (41075); or 41099 (44A hexadecimal).

In order to calculate the starting address of a block of Event data, multiply the block number by 4, and add the starting address of block 0 (41149 or 47C hexadecimal). For example, with EVTPTR set to 8, the starting address of the most recent event data will be ((8 - 1) * 4) + (41149); or 4177 (498hex).

Example of Reading Event Data

As a concrete example, assume there have been 40 motor starts and stops recorded as events since the Event data was cleared. The Event buffer will only store the last 32 events. The first step is to read 2 words starting at location 41147 (47Ahex). The value of EVTCNT will be 32. The value of EVTPTR will be 8. This means that the most recent event is 1 less than the value of the EVTPTR, or position 7.

To read the most recent event, read 4 words starting at location (41149 + 7*4) or location 41177 (498hex).

For this example, assume that the most recent event was a motor stop on February 17, 2003, at 5:10:25pm. A motor stop is Event Code 2. The data returned from the Modbus READ command will be:

Register 1:	5123	Century & Yr	(20 * 256 + 03)
Register 2:	529	Month & Day	(2 * 256 + 17)
Register 3:	4362	Hour & Minute	(17 ^ 256 + 10)
Register 4:	6402	Second & Evt. Code	(25 * 256 + 2)

The 2nd most recent event data is at position 6 or starting at location (41149 + 6*4) or locatin 41173 (494hex). The 8th most recent event is at position 0, and the 9th most recent event will wrap back around to position 31. The 10th most recent event is at position 30.

Normally, the MMS can supply 40 words of data in a single 03 (Read) command, but in order to read the 10 most recent events, it will be necessary to do two separate reads. The first read will be 32 words starting at location 41149 (47Chex). This would read the 8th most recent event data through the most recent event data. The second read will be be 8 words starting at locatin 41269 (4F4hex). This would read the 10th and 9th most recent events.

In the above example, the value of EVTCNT is at its maximum (32). This means that the oldest event, which is the 32nd oldest event data,

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will be at the current value of EVTPTR or position 8. If EVTCNT were less than its maximum, the oldest event data would be at data block 0.

Clearing Events or Fault History

Clearing the events or clearing the fault history only resets the pointers and counters to zero. The FLTCNT or EVTCNT values will only be zero after clearing the Fault History or Event History.

SSOLR Command Processing

For the normal SSOLR unit, RAM location C6 (or relative location 1B3) is the command line code (COMLINE). The MMS will pass all of the commands down to the SSOLR unit.

01H	Start / Reset (SSOLR)
02H	Stop / OFF (SSOLR)
03H	Display Lock
04H	Display Unlock
05H	Network Program Enable
06H	Network Program Disable
07H	Enable network comm. loss watchdog timer
08H	Disable network comm loss watchdog timer
09H	Clear Run Time Hours
0AH	Clear Last Fault
25H	Enable Network WD
26H	Disable Network WD

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MMS Configuration Options

The PCFGOPT register at location 41482 contains 6 bits that enable or disable several features of the MMS. The bits are numbered from 15 (Most Significant bit) to 0 (Least Significant bit).

PCFGOPT:

Bit 0	RESERVED
Bit 1	1 = Display time as AM/PM 0 = Display time in 24 hour format
Bit 2	1 = Automatically dim LCD backlighting after 2 minutes of no key press
Bit 3	RESERVED
Bit 4	1 = Treat Under Current as Fault and record conditions at time of trip
Bit 5	1 = Enable Modbus host watchdog timer
Bit 6	1 = Enable Contactor Proof Relay Follower option
Bit 7	1 = Report Input Status (bits 12 and 13 in MMSOPRSTAT) as 1 when connections are open 0 = Report as 1 when connections are shorted

Events to Log

The EVTSLOG register at location 41483 controls which events will be logged.

EVTSLOG

Bit 0	1 = Log motor starts
Bit 1	1 = Log motor stops
Bit 2	1 = Log MMS power on
Bit 3	1 = Log MMS power loss
Bit 4	1 = Log MMS-to-Slave communications established
Bit 5	1 = Log MMS-to-Slave communications loss

Local or Remote Control of MMS Relays

The LOCLRMT register at location 41484 determines how the output relays of the MMS are controlled. Local control means the RUN buttons on the MMS can be usd to turn on the control relays. Remote control means that only a PLC is allowed to control the relays. In all cases, the STOP / RESET button is active.

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LOCLRMT:

0 = Semi-Remote control (Both Local and Network control are permitted)
1 = Local control only (Network control is not permitted)
2 = Full remote control only (Local control is not permitted)

Startup Control of MMS Relays

Register STRTOPT at location 41485 determines whether or not the relays automatically restart.

STRTOPT:

Bit 0	1 = Hold last state of relays 0 = Manual start

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