



# Model RM-2000

## Remote Monitor for the 777 Series Electronic Overload Relays



UG-RM2000-C



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## **FEATURES**

The RM-2000 motor-monitoring device can be used to monitor and/or control SymCom's 777 Series via an RS-485 Modbus network. A second communication port allows monitoring and control of up to 99 RM-2000 devices from a personal computer (PC) with SymCom's Solutions software, or a PLC, DCS, or SCADA system. The RM-2000 is environmentally protected and can easily be mounted on the front of a panel or MCC.

The RM-2000 includes time logging and historical data tracking.

## **INFORMATION DISPLAYED**

The RM-2000 can display all of the information the 777 Series displays as well as information that the 777 Series maintains but does not display.

The RM-2000 displays the following real-time motor information:

- Line currents, average current and current unbalance
- Line-to-line voltages, average voltage and voltage unbalance
- Remaining restart delay times
- Current to ground
- Total motor run-time (reset capable)
- Energy consumption (KWhs) (reset capable)
- Total number of motor starts and trips (reset capable)
- Power factor
- Power draw (kW)
- KVARs
- Pending faults

The RM-2000 displays the following fault history information:

- Time and date of last four faults, with voltage and current at time of trip
- Time-stamped event log
- Minimum time between any two starts with time and date
- Run-time since last start (reset capable)
- Time of last motor start

## **INSTALLATION PROCEDURE**

**MOUNTING OPTIONS** (for flat surface mounting on NEMA 3R, and/or UL Type 12 enclosures)

- **Panel mounting:** a 777 Series is often mounted inside a motor control panel and its display is not visible. The RM-2000 can be mounted on the outside of the panel, allowing all of the information from the 777 Series to be displayed without opening the control panel.
- **Remote mounting:** the RM-2000 communicates with the 777 Series by an RS-485 cable which can be up to 4000 feet long. This allows the RM-2000 to remotely monitor a 777 Series.

## **INSTALLATION**

1. Attach the template drawing to the panel where the RM-2000 is to be mounted.
2. Take caution when drilling the holes to mount the RM-2000. Use an 11/64" drill bit for the four corner mounting screws. Create a hole for the center terminals by either using a 2" knock-out punch or by drilling a 1 15/16" – 2 3/16" hole. The center terminals should protrude through to the inside of the panel.
3. Verify the gasket is in place on the back of the RM-2000. Attach the RM-2000 to the panel using the four screws provided.
4. Run the appropriate wires to the back of the RM-2000 and terminate the wires in the provided screw-type, depluggable connectors; see the wiring diagram on the following page. This should include at least 115VAC control power, one set of communication wires to the 777 Series, and ground wire to case ground on the panel.
5. It is important to have the A phase of the breaker connected to L1 on the 777 Series, B phase to L2 and C to L3. Equally important, is to have the A phase conductor through the A phase hole, B through the B phase hole, and C through the C phase hole of the 777 Series for proper power calculations.
6. The 777 Series, when used with the RM-2000, should be connected according to the wiring diagrams found in the **Installation Instructions** for the appropriate 777 Series product..
7. A jumper or switch may be placed across K1 and K2 to enable programming lock.<sup>1</sup>

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<sup>1</sup> If desired, a key-switch can be installed in place of the jumper to allow only authorized personnel to make system/setting changes.

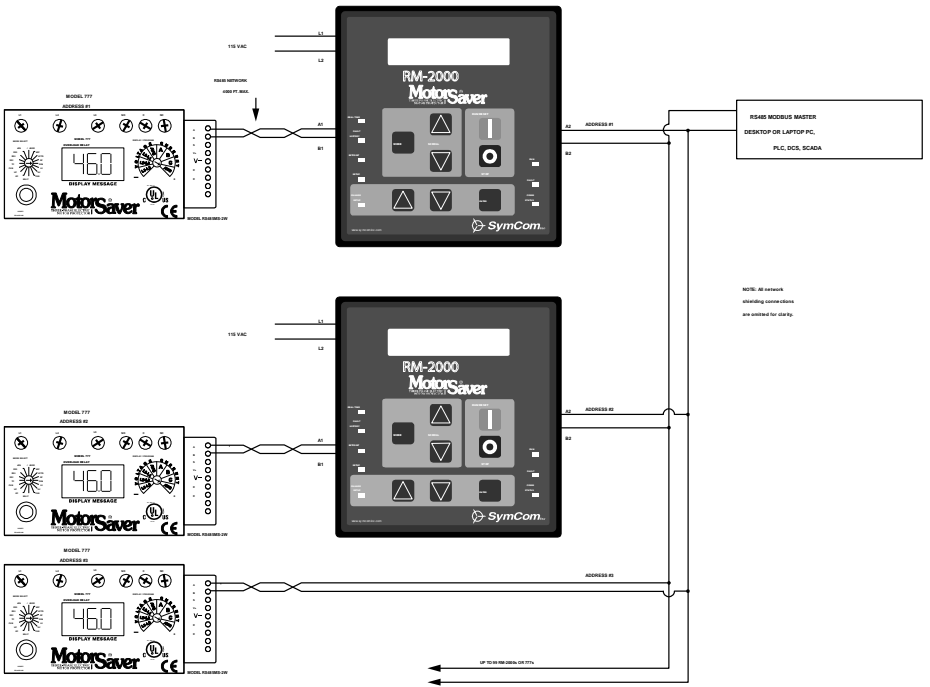


Figure 1: RM-2000 Wiring Diagram

## CONNECTIONS - NEW INSTALLATION

A SymCom Modbus communications module is required to connect the 777 Series to the RS-485 network. A shielded, twisted-pair cable connected to A and B of the RS485MS-2W must be connected to Comm Port 1 (A1 & B1) on the back of the RM-2000. Refer to the installation instructions or user's guide for the communications module in use.

The RM-2000 has a second RS-485 port allowing connection to a network host, such as a PLC, DCS, or SCADA system or a PC running Modbus master software such as SymCom's *Solutions*.

The network host is not required. If present, the network host must be connected to Comm Port 2 at the connections labeled **A2** and **B2**. The RM-2000 can be programmed as device address A01– A99 and up to 99 RM-2000s or 777 Series units can exist on the same network. The RM-2000's slave and master ports can be programmed for 300, 600, 1200, 2400, 9600, 14400, 19200 or 28800 baud. It can use even, odd or no parity and have 1 or 2 stop bits. The RM-2000 slave communication parameters must match the communication parameter of the attached overload. The network communication parameters of the RM-2000 must be the same for all devices connected to the upstream network.

### The RS-485 Network - Terminating Resistors

In Figure 1 there are three RS-485 networks. Each of the two RM-2000 devices with their slave 777 Series forms a separate, independent RS-485 network. The third network links the host PC to the two RM-2000 devices. Each independent network may require terminating resistors and may require a ground connection for the shield around the twisted pair cable.

If the length between the RM-2000 and the 777 Series exceeds 100 feet or if the twisted pair cable is in a noisy environment, 120Ω terminating resistors should be connected at both the RM-2000 (across A1 and B1) and also at the 777 Series (across A and B of the RS485MS-2W module). In addition, the shield of the twisted pair cable should be tied to the RM-2000's ground connection (labeled GND) with a single 100Ω resistor. If unsure, install the terminating resistors.

Unlike the port-powered RS-232 to RS-485 converter, the transceiver inside the RM-2000 is capable of supplying enough current to operate the RS-485 network, even with terminating resistors installed. The RM-2000 to host is a separate network and may require separate terminating resistors and ground connection.

## CONNECTIONS - EXISTING NETWORK INSTALLATIONS

If an RM-2000 is being added to a 777 Series in an existing network, the RM-2000 device's network address must be set to the existing 777 Series' address and the 777 Series' address must be set to match the overload address of the RM-2000.

The RM-2000 will pass read and write requests to the 777 Series, so the RM-2000 will respond just like the 777 Series as far as the Modbus Master software application is concerned except that a slightly longer time out delay may be required. Other than the time out delay, the Modbus Master software will not have to be reprogrammed to communicate with the RM-2000, unless the additional information from the RM-2000 is desired.

## **OPERATION**

RM-2000 information and functions are divided into five modes:

- REAL TIME
- FAULT HISTORY
- SETPOINT
- SETUP
- CHANGE SETUP (key switch or jumper required)

Press the [MODE] button to switch between these modes. An LED on the left side of the RM-2000 indicates which mode is selected.

Within any mode, the [SCROLL DOWN] and [SCROLL UP] buttons will change the information being displayed.

Only the SETPOINT and SETUP modes allow setting changes. The CHANGE SETUP LED is lit along with the SETPOINT or SETUP LED when a mode setting is ready to be changed. The [CHANGE SETUP DOWN] and the [CHANGE SETUP UP] buttons decrease and increase the value of a setup option. When the desired value is displayed, press [ENTER] to save the setting.

The [RUN/RESET] and [STOP] buttons will energize and de-energize the 777 Series' control relay provided the Start/Stop option is enabled in the SETUP mode ("EN.START/STOP: YES"). Set the option to "NO" to disable the [RUN/RESET] and [STOP] buttons.

**Note: whether the [RUN/RESET] and [STOP] buttons actually start and stop the motor is dependent on proper motor control connection of the 777 Series and the state of other auxiliary devices in the control circuit.**

## **MODES**

**REAL TIME:** displays all real-time information as well as calculated power factor, power consumption, and total number of starts and trips.

**FAULT HISTORY:** displays detailed information about the last 4 faults that caused the 777 Series to trip. It also displays the last 10 events (such as motor starts and motor stops); the length of time the motor has been running; and the date, time and length of the minimum time the motor was off.

**SETPOINT:** displays the parameters programmed into the 777 Series. Examples of these parameters would include the overcurrent (OC) limit and undercurrent (UC) limit, the current unbalance (CUB) limit, etc., programmed into the 777 Series.

**SETUP:** displays the parameters that affect the operation of the RM-2000, such as real-time clock settings (month, day, hour, etc.), the network host communications parameters, the voltage multiplier and others.

**CHANGE SETUP:** allows you to change the parameters that are displayed in the SETUP and SETPOINT modes. **A jumper connected between K1 and K2 on the back of the RM-2000 is required to enter this mode.** The CHANGE SETUP mode will be skipped when scrolling through the modes if the jumper is not in place.

## LED STATUS INDICATION

Eight LEDs indicate the status of the RM-2000:

- Five red LEDs on the left side indicate the display mode.
- The green COMM STATUS LED on the lower right indicates the RM-2000 is communicating with the 777 Series.
- The green RUN LED on the upper right indicates the motor is drawing current.
- A solid red FAULT LED indicates the 777 Series has tripped on a fault and is either in manual reset mode or the 777 Series is going through restart delay RD2 or RD3. When a fault occurs, the RM-2000 automatically switches to the FAULT HISTORY mode and displays FAULT 1—the most recent fault. The RM-2000 will not switch to the FAULT HISTORY mode if it is currently in the CHANGE SETUP mode.
- A blinking red FAULT LED indicates the 777 Series has a pending fault. If the motor is not running, this may be a condition that is preventing the 777 Series from allowing the motor to start, such as high or low voltage. Look at the pending fault screen in the REAL TIME mode to view the fault condition.

## COMMUNICATION LOSS

If the RM-2000 loses communications with the 777 Series, the green COMM STATUS LED will not be lit and the REAL TIME mode screens will contain asterisks. For example, the screen showing 3-phase voltages and the average voltage will look like:

V	a	b	=					*		V	b	c	=					*
V	a	c	=					*		V	a	v	g	=				*

Things to look for:

- 1) Verify the 777 Series has power on lines L1 and L2.
- 2) Verify the 777 Series is programmed with the correct address. Refer to the installation instructions and programming guide for the particular model of relay or communications module for setup instructions.
- 3) Verify the RS-485 cable connects A1 of the RM-2000 to A of the communications module and B1 to B.
- 4) If using the older communications module, Model **RS485MS**, verify that a jumper is placed between A and Y and a second jumper is placed between B and Z.
- 5) Verify continuity of the RS-485 cable with an ohmmeter (**NOTE: test for continuity only when the RS-485 circuit is de-energized!**).



**NAVIGATION AND SCREEN MODES**

**REAL-TIME MODE**

The REAL TIME mode displays real-time information as well as calculated power factor and power consumption, and total number of starts and trips. By scrolling through the REAL TIME mode the following screens can be viewed:

**Current and Voltage Information**

Displays line-to-line voltages and phase currents.

I =			5	.	5	0				5	.	6	5					5	.	3	5		
V =						2	3	0						2	3	5					2	2	5

**Line Currents and Average Current**

Display individual phase currents and average current.

I a =			5	.	5	0				I b =			5	.	6	5
I c =			5	.	3	5				I a v g =			5	.	5	0

**Line-to-Line Voltages and Average Voltage**

If potential transformers (PTs) are used with the 777 Series, the voltage multiplier ("VOLTAGE MULT" in the SETUP menu) should be programmed with a voltage multiplier equal to the PT ratio. The voltage displayed on the RM-2000 will be higher than the voltage displayed on the 777, but will be consistent with the actual voltage.

V a b =						2	3	0								V b c =						2	3	5
V a c =						2	2	5								V a v g =						2	3	0

**Calculated Current and Voltage Unbalance**

Displays calculated current and voltage unbalance.

C	U	R	R	.	U	N	B	A	L	A	N	C	E	=								3	%
V	O	L	T	.	U	N	B	A	L	A	N	C	E	=								2	%

**Restart delays RD1, RD2 and RD3**

- RD1: power-up and rapid-cycle delay
- RD2: restart delay after all faults except undercurrent
- RD3: restart delay after an undercurrent fault

**NOTE: This screen displays the time remaining for each restart delay, not the setpoint value programmed into the 777 Series.**

R	E	S	.	D	E	L	A	Y	R	D	2	=										0	M	
R	D	1	=					0	S	R	D	3	=										0	M

**Ground Fault Current:**

For a motor, this value would likely represent the current leaking through the insulation of one or more phases.

G	R	O	U	N	D	F	A	U	L	T	C	U	R	R	E	N	T
						0	.	1	0	A	M	P	S				

### Accumulated Hours and Energy

The Accumulated Hours is the number of hours the 777 Series has detected current flow and the Energy-kWh (or Energy-MWh) is the calculated energy consumed during these hours. The information displayed is updated every minute.

The Accumulated information is stored in memory and will not be lost if the RM-2000 loses power. The values can be reset to zero with the CLEAR HISTORY option in the CHANGE SETUP mode.

A	C	C	.		H	O	U	R	S	=									0	.	1
E	N	E	R	G	Y	-	K	W	H	=									3	.	0

### Number of Starts and Trips

Values can be reset to zero by the CLEAR HISTORY option in the CHANGE SETUP mode.

N	O	.		S	T	A	R	T	S	=											5	
N	O	.		T	R	I	P	S	=													2

### Average Voltage, Current and Power Factor or Frequency and Power Factor

(777 Legacy) Average Voltage, Current and Power Factor

This screen is only displayed for the 777 Series (legacy), the 77C and the 777KWHP.

V	A	V	=		2	3	0		I	A	V	G	=		5	.	5	0
P	O	W	E	R		F	A	C	T	O	R	=		0	.	9	6	

(777-P2 Series and 601) Frequency and Power Factor

If connected to a 777-P2 Series or a Model 601, be sure to set the Model to 777-P2 or 601 in the CHANGE SETUP mode. This allows the Frequency information to be displayed on this screen instead of Average Voltage and Average Current.

F	R	E	Q	U	E	N	C	Y	(	H	Z	)	=		6	0	.	0
P	O	W	E	R		F	A	C	T	O	R	=		0	.	9	6	

### Power and KVARs

Displays consumed motor power in kW and reactive power in KVARs.

P	O	W	E	R	(	K	W	)	=												1	.	2	1	
K	V	A	R	S		=																0	.	6	4

### (777-Plus Series) Thermal Capacity and Time-To-Trip

For the 777-Plus Series, this screen shows the Thermal Capacity, expressed as a Percentage, based on Trip Class. The OC TimeToTrip is the estimated trip time assuming that the over current level remains constant.

T	H	E	R	M		C	A	P	A	C	I	T	Y	:											1	0	0
O	C		T	i	m	e	T	o	T	r	i	p	:														0

**(777-Plus Series) Status bits**

For the 777-Plus Series, this screen shows the 777 Status bits, expressed as a hexadecimal number. The second line is a brief interpretation of the bits.

S	T	A	T	U	S	B	I	T	S	:	0	x	8	0	0	0
R	I	y														

**(777-Plus Series) Trip Reason bits**

For the 777-Plus Series, this screen shows the 777 Trip Reason register, expressed as a hexadecimal number. The second line is a brief interpretation of the bits.

T	R	I	P	R	E	A	S	O	N	:	0	x	0	0	0	0
C	I	r														

**(777-Plus Series) Warning Status bits**

For the 777-Plus Series, this screen shows the 777 Warning Status register, expressed as a hexadecimal number. The second line is a brief interpretation of the bits.

See the 777-P2 programming guide for further information on the warning levels and trip delays.

W	A	R	N	I	N	G	S	T	A	T	:	0	x	0	0	0	0
C	I	r															

**(I/O Option) - Input Status Bits**

Displays the status of the RM-2000 input channels (if configured).

This screen is only visible if the I/O Screens are set to ON (CHANGE SETUP mode).

I	n	p	u	t	B	i	t	s	=	7	6	5	4	3	2	1	0	
					S	t	a	t	u	s	=	0	0	0	0	0	0	0

### Pending Fault Information

The Pending Fault screen will display up to three pending faults the 777 Series has sensed. The RM-2000's FAULT LED will blink anytime a pending fault condition exists. If the 777 Series is in a de-energized state, the pending fault identifies conditions that will prevent the 777 Series from allowing the motor to start. The RM-2000 uses the following codes to represent the faults:

<u>Fault Code</u>	<u>Fault Description</u>
OC	Overcurrent
I SP	Single-phase current
V SP	Single-phase voltage
CUB	Current unbalance
RP	Reverse phase
UC	Undercurrent
VUB	Voltage unbalance
HV	High voltage
LV	Low voltage
GF	Ground fault
HPr	High Power
LPr	Low Power

				P	E	N	D	I	N	G		F	A	U	L	T			
								N	O	N	E								

### FAULT HISTORY MODE

#### Fault Information

The RM-2000 will store detailed information about the last 4 faults. The fault information may be cleared by the CLEAR FAULTS option in the CHANGE SETUP mode.

**NOTE: When a fault occurs the RM-2000 will jump to the FAULT HISTORY mode and display the Fault 1 screen. To return to the previous mode, press ENTER.**

#### Fault Description, Date & Time

Displays faults. Fault #1 is the most recent, fault #4 is the oldest.

F	A	U	L	T		1		[	C	U	R	R		U	N	B	A	L	]
2	0	1	5	/	0	3	/	1	4	0	2	:	5	5	:	2	6	P	

#### Fault Currents

Displays phase current measurements just before the fault.

F	A	U	L	T		1			C	U	R	R	E	N	T	S	=		
		5	.	5	0			5	.	6	5			5	.	3	5		

#### Fault Voltages

Displays voltage measurements just before the fault.

F	A	U	L	T		1			V	O	L	T	A	G	E	S	=		
		2	3	0				2	3	5						2	2	5	

### Fault Current Unbalance and Average Current

Displays calculated unbalance and average current just before the fault.

F	A	U	L	T	1	C	.	U	N	B	A	L	=			3	%	
A	V	E	R	A	G	E	C	U	R	R	.	=			5	.	5	0

### Fault Voltage Unbalance and Average Voltage

Displays calculated unbalance and average voltage just before the fault.

F	A	U	L	T	1	V	.	U	N	B	A	L	=			3	%
A	V	E	R	A	G	E	V	O	L	T	.	=			2	3	0

### Fault Ground Fault Current

Displays fault description and Ground Fault current reported just before the fault.

F	A	U	L	T	1	[	C	U	R	R	U	N	B	A	L	]	
G	R	O	U	N	D	F	A	U	L	T	=			1	.	2	A

### Event Information

The RM-2000 will store the time of the last 10 events: motor starts, motor stops, RM-2000 power on, RM-2000 power loss, communication on, and communication loss. Event information can be cleared by the CLEAR EVENTS option in the CHANGE SETUP mode.

#### Event Description Date & Time –

Displays the event number, description and time stamp. Event #1 is the most recent, event #10 is the oldest.

E	V	E	N	T		1	:	M	T	R	S	T	A	R	T			
2	0	1	5	/	0	3	/	1	5	0	7	:	5	7	:	2	3	P

### Last Start

Displays date and time of the last motor start.

L	A	S	T	S	T	A	R	T	:									
2	0	1	5	/	0	3	/	1	5	0	7	:	5	7	:	2	3	P

### Run Time

If the motor is running, this displays the length of time since the last motor start.

If the motor is not running, this displays the time between the last start and the last stop.

R	U	N	T	I	M	E	:							1	D	A
2	0	H	R	S	2	8	M	I	N	5	4	S	E	C		

### Date of Minimum Off Time

Displays the date and time of the start following the Minimum Off Time.

D	A	T	E	O	F	M	I	N	O	F	T	I	M	E				
2	0	1	5	/	0	3	/	1	1	1	0	:	2	5	:	5	3	P

### Minimum Off Time

Displays the minimum length of time the motor was off.

Very short times may signify a motor was not allowed to cool down before restarting indicating a programming error or operator override.

**NOTE: The Last Start, Run Time, Date of Minimum Off Time and Minimum Off time screens can be cleared by the CLEAR MIN OFF option in the CHANGE SETUP mode.**

M	I	N		O	F	F		T	I	M	E	:							
								1	M	I	N			2	S	E	C		

### CHANGE SETUP MODE

The CHANGE SETUP<sup>2</sup> mode allows changes to be made to the SETPOINT and SETUP information. To change SETPOINT parameters, press the MODE button until both SETPOINT and CHANGE SETUP LEDs illuminate. To change SETUP parameters, press the MODE button until SETUP and CHANGE SETUP LEDs illuminate.

In the CHANGE SETUP mode, a ">" and "<" will indicate the selected parameter. Use the [SCROLL UP] and [SCROLL DOWN] buttons to move through the parameters. To change the value or a parameter, press the CHANGE SETUP [UP] and [DOWN] buttons. When a value is changed, an asterisk will appear. To save the displayed value, press [ENTER].

### SETPOINT MODE

The SETPOINT mode displays the parameters that are programmed into the 777 Series. Each setting can be viewed and changed using the RM-2000, without interrupting the 777 Series' control relay.

### Current Limits

Used to view or set the overload (OC) limit and underload (UC) limit.

O	V	E	R		C	U	R	R	.	:			1	6	.	0			
U	N	D	E	R		C	U	R	R	.	:			1	0	.	0		

### Voltage Limits

Used to view or set HV and LV settings.

O	V	E	R		V	O	L	T	.	:				2	7	2			
U	N	D	E	R		V	O	L	T	.	:				2	0	7		

### Unbalance Limits

Used to view or set CUB and VUB settings.

C	U	R	R	.	U	N	B	A	L	:					7	%			
V	O	L	T	.	U	N	B	A	L	:					5	%			

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<sup>2</sup> K1 and K2 must be shorted.

### Current Multiplier and Ground Fault Limit

Used to view or set MULT and GF settings.

For the 777-Plus Series, the CURR MULT will be displayed, but it cannot be changed using this screen. See the 777P Multiplier and 777P Divisor screen

C	U	R	R	.	M	U	L	T	:										5
G	R	N	D		F	A	U	L	T	:	1	.	2	0					A

### Restart Delays<sup>3</sup>

Used to view or set RD1, RD2, RD3 settings.

RD1: rapid-cycle delay

RD2: restart delay after all faults except undercurrent

RD3: restart delay after an undercurrent fault

R	E	S		D	E	L	A	Y		R	D	2	:						3	0	M	
R	D	1	:							R	D	3	:							2	0	M

### Trip Class and Under Current Trip Delay

Used to view or set TC and UCTD settings.

T	R	I	P		C	L	A	S	S	:											1	0	
U	C		T	R	I	P		D	E	L	A	Y	:									5	S

### Number of Restart Attempts after an Undercurrent Fault

Used to view or set #RU setting.

N	U	M	B	E	R		O	F		R	E	S	T	A	R	T	S						
O	N		U	N	D	E	R		C	U	R	R	:	A	A	U	T	O					

### Number of Restart Attempts after any other Fault

Used to view or set #RF setting.

N	U	M	B	E	R		O	F		R	E	S	T	A	R	T	S							
O	T	H	E	R		F	A	U	L	T	S	:										o	c	A

### Power Limits

Used to view or set high and low kW settings.

H	I	G	H		K	W	:															1	.	2	0	
L	O	W		K	W	:																	0	.	4	0

### (777 P series) OC Linear

Used to view or set Overcurrent Linear trip time setting.

O	C		L	i	n	e	a	r	:																	O	F	F

<sup>3</sup> This screen shows the setpoint for each restart delay, not the time remaining.





## Message Builder

The message builder screen allows you to read and write 777 Series information<sup>5</sup>. Values are displayed in both hexadecimal and decimal numbers. Value and address will be separated into high byte and low byte. In most applications only the low byte will need to be changed.

**Reading:** Select the desired address in the 'Addr' field. Press Enter to get to the command field ('SKIP'). Use change arrows to change the command to READ\* and press ENTER. The unit displays COMMAND ACKNOWLEDGED before returning to the message builder screen and displaying the value just read as both hexadecimal and decimal.

**Writing:** Set the desired value to write in the 'Value' field. Select the desired address in the 'Addr' field. Use change arrows to change the command field to WRITE\* and press ENTER. The unit will ask you to confirm the Write operation. Use the Change setup up arrow to change >NO< to YES\* and press enter. If the write was successful, the unit displays COMMAND ACKNOWLEDGED before returning to the message builder screen and showing the new value for the selected address.

V	a	l	u	e	=	0	0	0	0	h	=					F	F
A	d	d	r	=		0	0	6	5	H		S	K	I	P		

## Command Line

The command line allows you to do several things:

- Turn off/on slave communication watchdog
- Send an off or reset command to the 777 Series
- Lock/unlock network programming—prevents/allows 777 parameter setting changes
- Clear run hours
- Clear last fault

S	e	n	d		c	o	m	M	a	n	d	:					
F	A	U	L	T		R	E	L	A	Y					O	F	F

## Model and Software

For a 777-P2 series, the Model field on this screen will be listed as 777 if the RM-2000 has the SETUP Model configured as 777. If the SETUP Model is configured as 777-P2, the Model field on this screen will show 778. The 778 signifies that the additional Setpoint and Real Time screens for a 777-P2 will be displayed.

M	o	d	e	l	:											7	7	8
S	o	f	t	w	a	r	e		R	e	v	:	3	3	.	0	4	

<sup>5</sup> Please refer to SymCom's 777 Programming Guide for more information.

## SETUP MODE

The SETUP mode displays parameters that affect the operation of the RM-2000.

### Real Time Clock

#### Clock Date Settings

Used to view or set the real-time clock date settings.

C	L	O	C	K			Y	E	A	R	:	2	0	1	5		
M	O	N	T	H	:	0	3			D	A	Y	:	1	4		

#### Clock Time Settings

Used to view or set the real-time clock time settings.

The time can be displayed in 24 hour values by changing (AM/PM) to (24HR).

H	O	U	R	:	0	1	P			(	A	M	/	P	M	)	
M	I	N	U	T	E	:	5	9		S	E	C	:	2	6		

### 777 Series Comm Port (Port 1, A1 & B1)

#### 777 Series (Port 1) Modbus Address

The OVRLD ADDR must match the modbus address programmed into the 777 Series.

O	V	E	R	L	O	A	D		(	P	O	R	T		1	)	
O	V	R	L	D		A	D	D	R	:				A	0	0	1

#### 777 Series (Port 1) Communication Parameters

The RM-2000 supports multiple communication settings for use with different SymCom power monitors and overload relays as well as different communications modules. The RM-2000 must be set to match the 777 Series or communications module installed. Please review the appropriate documentation.

O	V	R	L	O	A	D		B	A	U	D	:		9	6	0	0
P	A	R	I	T	Y	:	E			S	T	O	P	:		1	

### Network Comm Port (Port 2, A2 & B2)

#### Network (Port 2) Modbus Address

The host network allows communication between an RM-2000 and a PC with SymCom's *Solutions* software, or a PLC, DCS, or SCADA system. Up to 99 RM-2000s can exist on this network; thus, the network address can be set from A001–A099.

		N	E	T	W	O	R	K		(	P	O	R	T		2	)		
		N	E	T	W	O	R	K		A	D	D	R	:		A	0	2	6

#### Network (Port 2) Communication Parameters

The RM-2000 can communicate on a host network using 300, 600, 1200, 2400, 9600, 14400, 19200 or 28800 baud; even, odd or no parity; and 0, 1 or 2 stop bits.

		N	E	T	W	O	R	K		B	A	U	D	:		9	6	0	0
		P	A	R	I	T	Y	:	N			S	T	O	P	:		1	

## Network Watchdog

An upstream communication watchdog occurs when no upstream messages are received for 10 seconds. Another watchdog will not occur, and no watchdog actions will be taken again until communication is re-established and then lost again for 10 seconds. The network watchdog can be set to:

**DISABLED** – no action will be taken if a network watchdog occurs.

Or a combination of:

**RLY (Relay)** – when an upstream communication watchdog occurs, the RM-2000 will turn off its relays (if the RM-2000 is configured with relays).

**Send OFF** – when an upstream communication watchdog occurs, the RM-2000 will send an OFF command to the 777 Series overload, de-energizing its output relay. Use the Send OFF feature if you want the overload fault relay to open when the RM-2000 loses communications with the network host.

**Send RHWD (Remote Host Watchdog)** – (If the 777 Series supports this feature) When an upstream communication watchdog occurs, the RM-2000 will send a remote host watchdog command to the overload., The overload will immediately perform its configured watchdog action (The standard 777 does not support this feature).

N	e	T	w	o	r	k		W	a	t	c	h	d	o	G				
R	L	Y	,		S	e	n	d		O	F	F							

## Model and Voltage Multiplier

### Model Number

The Model Number setting should match the model number of the 777 monitored by the RM-2000. Valid choices are:

<u>(Legacy)</u>	<u>(777 Plus Series)</u>
777	777 -P
777 LR	777 P1
777 MV	777 P2
777 KW	
77C	
601	

**NOTE: When using any of the 777-P2 series, select Model “777 P2”.**

### Voltage Multiplier

Voltage Multiplier should be set to 1 unless the 777 Series is powered by potential transformers (PTs). This multiplier is used to scale the voltage readings up to the actual line voltages being monitored.

M	O	D	E	L	:														7	7	7	
V	O	L	T	A	G	E		M	U	L	T	:										1

## 777-MV Power Factor Correction

If a legacy 777-MV (Medium Voltage) is installed with only ONE potential transformer (PT), set this function to YES—the RM-2000 will adjust the power factor to correct the Power, kVARs, and Energy Usage values. Be sure to check the 777-MV installation instructions to keep the proper relationship between PT and CT connections.

M	O	D	E	L		7	7	7	M	V		W	I	T	H						
O	N	L	Y		1		P	.	P	.	?	:								N	O

## LCD Control and UC Alarm Control

### LCD Control

If the Auto LCD Dim option is set to NO, the backlighting of the LCD will remain on all the time. If the option is set to YES, the backlighting will automatically turn off 2 minutes after the last button is pressed. The backlight will come on again once a button is pressed.

### UC Alarm Control

This setting is commonly used in pumping applications. If a well runs dry, the 777 Series will shut down the motor because of an undercurrent condition. Since this may occur frequently in pumping applications, the undercurrent faults can fill up the last four faults of the RM-2000. If you do not want the fault screen to pop up on the RM-2000 when an undercurrent fault is detected, set this field to "NO". This allows the last four faults to keep track of other, unexpected faults.

A	A	U	T	O		L	C	D		D	I	M		:		Y	E	S	
A	L	A	R	M		O	N		U	/	C			:		Y	E	S	

### Starting with Voltage Errors

This setting controls how a [RUN/RESET] button is handled when the 777 Series is trying to start, but voltage errors are present.

If a motor has been shut down and the 777 Series detects a voltage error—overvoltage, undervoltage, reverse phase, or voltage unbalance—the 777 Series will not close its control relay until the voltage fault is no longer present. Options are:

- 1) **SEND OFF** — if the [RUN/RESET] button is pressed while the voltage faults are present the RM-2000 will send an OFF command instead of a START command. This prevents the 777 Series from starting, even after the voltage fault goes away. The RM-2000 displays a message to report this change for about two seconds. The [RUN/RESET] button must be pressed again after the voltage faults are cleared to make the motor start.
- 2) **SEND ON** — if the [RUN/RESET] button is pressed while voltage faults are present a START command will be sent to the 777 Series. When the 777 Series receives a START command, it will restart the control contacts as soon as the voltage fault goes away.
- 3) **DSP WARN** — if the [RUN/RESET] button is pressed while voltage faults are present a warning message will pop up for 2 seconds letting you know the Reset was not successful.

I	F		S	T	A	R	T	I	N	G		W	/	V	O	L	T	.	
E	R	R	O	R	S	:					S	E	N	D		O	F	F	

### Type of Events toTrack

The RM-2000 will track up to 10 events with the date and time of each event. Specify YES or NO for each of the events according to your system preferences.

L	O	G		M	T	R		S	T	A	R	T	S	:		Y	E	S	
				M	T	R		S	T	O	P	S	:		Y	E	S		

L	O	G		R	M		P	W	R		O	N	:		N	O			
				R	M		P	W	R		L	O	S	:		N	O		

L	O	G		C	O	M	M		O	N			:		N	O			
				C	O	M	M		L	O	S	S	:		N	O			



## **777-PLUS SERIES SUPPORT**

The RM-2000 supports the following features of the 777-Plus Series overload relay/power monitor:

- Voltage and Current reading
- Ground current fault readings
- Setpoint changes
- Power and Power factor readings
- Pending fault status
- Logging of faults codes

The RM-2000 has the following limitations in support of 777-Plus Series units.

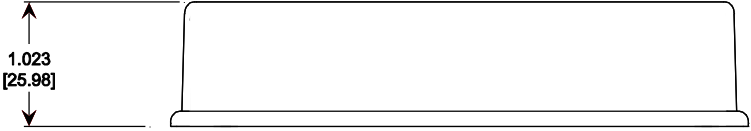
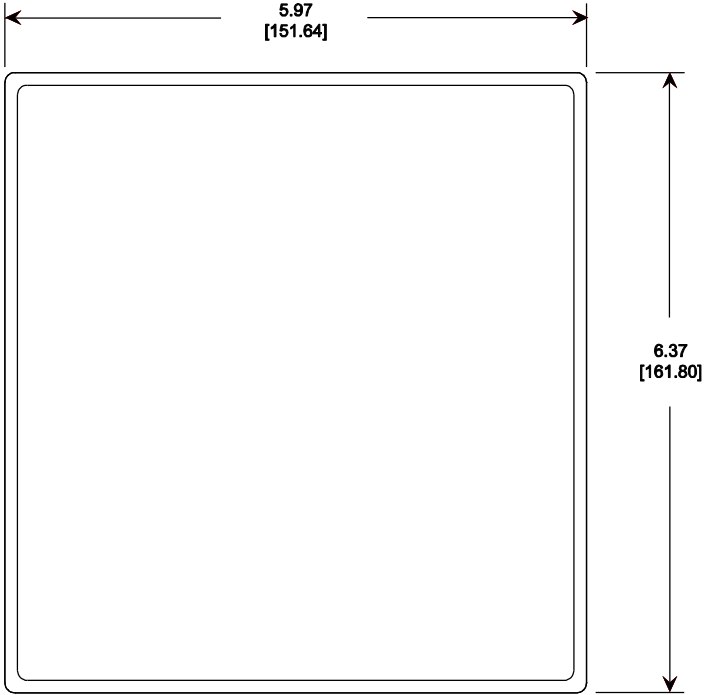
- Ground fault current will be logged with the fault data, but will max out if the current is above 2.52 Amps for a 777-LR-P and 25.2 Amps for a 777-P; however, the ground fault will still display correctly on the real-time screen.
- When reading 777-P2 ground fault currents over the network with the legacy memory map, the ground fault current will max out if above 2.52 Amps for a 777-LR-P and 25.2 Amps for a 777-P2, however, the ground fault will still read correctly from the 777-P2 memory map.

The 777-P2 uses a 16 bit memory map, where all setpoints and real-time values will be read and written as 2-byte numbers. The 777-P2 also supports the legacy memory map that contains both 16 bit and 8 bit parameters.

Because of this difference when reading OC, UC, GF setpoint from the legacy memory map, in some cases the values will not match the front panel display. This is caused by mathematical rounding that occurs when converting from an 8 bit memory map to a 16 bit memory map. All trip conditions are based on what is displayed on the front panel of the 777-P2 or 777-LR-P2.

See PG-RM-2000 for more information about network programming of the RM-2000.

**DIMENSIONS**



**inches[millimeters]**

**RM-2000 SPECIFICATIONS**

<b>Functional Characteristics</b>													
<b>Control Voltage</b>	115VAC ±10%, 50/60Hz												
<b>Transient Protection</b>	2500V for 10ms												
<b>Communications</b>	<table border="1"> <thead> <tr> <th><b>Overload Comm. Settings</b></th> <th><b>PC, PLC, etc.</b></th> </tr> </thead> <tbody> <tr> <td>Baud Rate</td> <td>300-28800</td> </tr> <tr> <td>Setup</td> <td>None, Odd, or Even Parity, 1 or 2 Stop Bits</td> </tr> <tr> <td>Protocol</td> <td>Modbus RTU</td> </tr> <tr> <td>Serial Interface</td> <td>RS485MS-2W</td> </tr> <tr> <td>Available Addresses</td> <td>A001-A099</td> </tr> </tbody> </table>	<b>Overload Comm. Settings</b>	<b>PC, PLC, etc.</b>	Baud Rate	300-28800	Setup	None, Odd, or Even Parity, 1 or 2 Stop Bits	Protocol	Modbus RTU	Serial Interface	RS485MS-2W	Available Addresses	A001-A099
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Setup	None, Odd, or Even Parity, 1 or 2 Stop Bits												
Protocol	Modbus RTU												
Serial Interface	RS485MS-2W												
Available Addresses	A001-A099												
<b>Real-Time Clock</b>	10 years @ 25°C without external power												
Battery Back-up Life	Stores up to 4 faults with time and date stamp, includes voltages and currents at time of trip												
Last Fault Memory													
<b>General Characteristics</b>													
<b>Maximum Input Power</b>	3W												
<b>Terminal</b>	Depluggable terminal block												
Torque	3 in.-lbs. max.												
<b>Display</b>	Liquid crystal with extended temperature range												
Size	2 rows x 20 characters												
Lighting	LED backlight												
<b>Keypad</b>	Eight 0.5" stainless steel dome buttons for tactile feedback												
Mechanical Life	50,000 actuations												
Overlay Material	Polyester												
UV Exposure w/out Degradation	2000 hrs.												
<b>Electrical Noise Immunity</b>													
Electrostatic discharge	IEC 61000-4-2, Level 3 (6kV contact, 8kV air discharge)												
Electrostatic field	IEC 61000-4-3, Level 3 (10V/m)												
Fast transient burst	IEC 61000-4-4, Level 4+, 4kV power supply port and 2kV inputs/output ports												
Surge	IEC 61000-4-5, 24V supply, Level 1 (±500V) RS-485 & Reset Lines, Level 2 (±1kV)												
Conducted RF	IEC 61000-4-6, Level 3+ (30V <sub>rms</sub> )												
<b>Environment</b>													
Class of Protection	NEMA 3R / UL Type 12												
Ambient Operating Temperature	-20° to 70°C												
Ambient Storage Temperature	-4° to 158°F												
Humidity	-30° to 70°C												
<b>Enclosure</b>	-22° to 158°F												
Dimensions	Up to 85%, non-condensing												
Weight	6.1" L x 6.5" W x 1.1" D (154.94 x 165.1 x 27.94 mm)												
Material	1.2 lbs. (544.3 g) Polycarbonate												



**NOTES**

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