

MINUTE MAN[®]

UNINTERRUPTIBLE POWER SUPPLIES

PM SERIES

MODELS DESCRIBED IN THIS MANUAL:

PM600
PM900
PM1250

PM600/2
PM900/2
PM1250/2

OWNER'S MANUAL



TABLE OF CONTENTS

	<u>PAGE</u>
1. INTRODUCTION.....	1
2. RECEIVING INSTRUCTIONS.....	1
3. WARRANTY REGISTRATION.....	1
4. IMPORTANT SAFETY INSTRUCTIONS.....	1
5. SELECTION OF UPS LOCATION.....	2
6. PRODUCT DESCRIPTION.....	3
7. PRODUCT SPECIFICATIONS.....	5
8. BATTERY BACK-UP TIME.....	7
9. INSTALLATION AND TEST.....	7
10. OPERATION.....	8
11. SYSTEM BATTERIES.....	8
12. BATTERY/SYSTEM CHECKOUT.....	9
13. UPS MONITORING CONFIGURATIONS.....	9
14. UPS DIRECT INTERFACE CONFIGURATIONS.....	9
15. UPS DB9 PIN OUT.....	10
16. SERVICE.....	10
17. UPS PROBLEM CHART.....	11

INTRODUCTION

The MINUTEMAN Power Master "PM" Series is an advanced, true sinewave standby Uninterruptible Power Supply designed to provide superior, total power protection for computer networks, telephone systems and other sensitive or critical electronic equipment against all commercial power anomalies. These models provide light and audible alarm indications, so the user will know the status of both commercial power and the MINUTEMAN "PM" power supply at all times. Each unit is designed to be maintenance free and to provide years of excellent service. Unit features include:

- Light weight and small footprint.
- Low voltage boost to facilitate low commercial voltage operation without battery utilization.
- Automatic frequency selection 50HZ or 60HZ.
- Excellent non-linear current capability (crest ratio -- 3:1).
- LAN communications port.
- Automatic unit test at turn on.
- Low, weak or bad battery indication.

RECEIVING INSPECTION

Remove and inspect the unit for shipping damage. If damage is found, immediately notify the carrier and your dealer. If no damage is found save both the shipping container and the packing foam in case the unit may later need to be returned to the factory or shipped to another location.

WARRANTY REGISTRATION

Complete the warranty registration card located in the back of this manual and mail it within ten days of product receipt to register your warranty. Failure to register your warranty renders it non-valid.

IMPORTANT SAFETY INSTRUCTIONS (SAVE THESE INSTRUCTIONS)

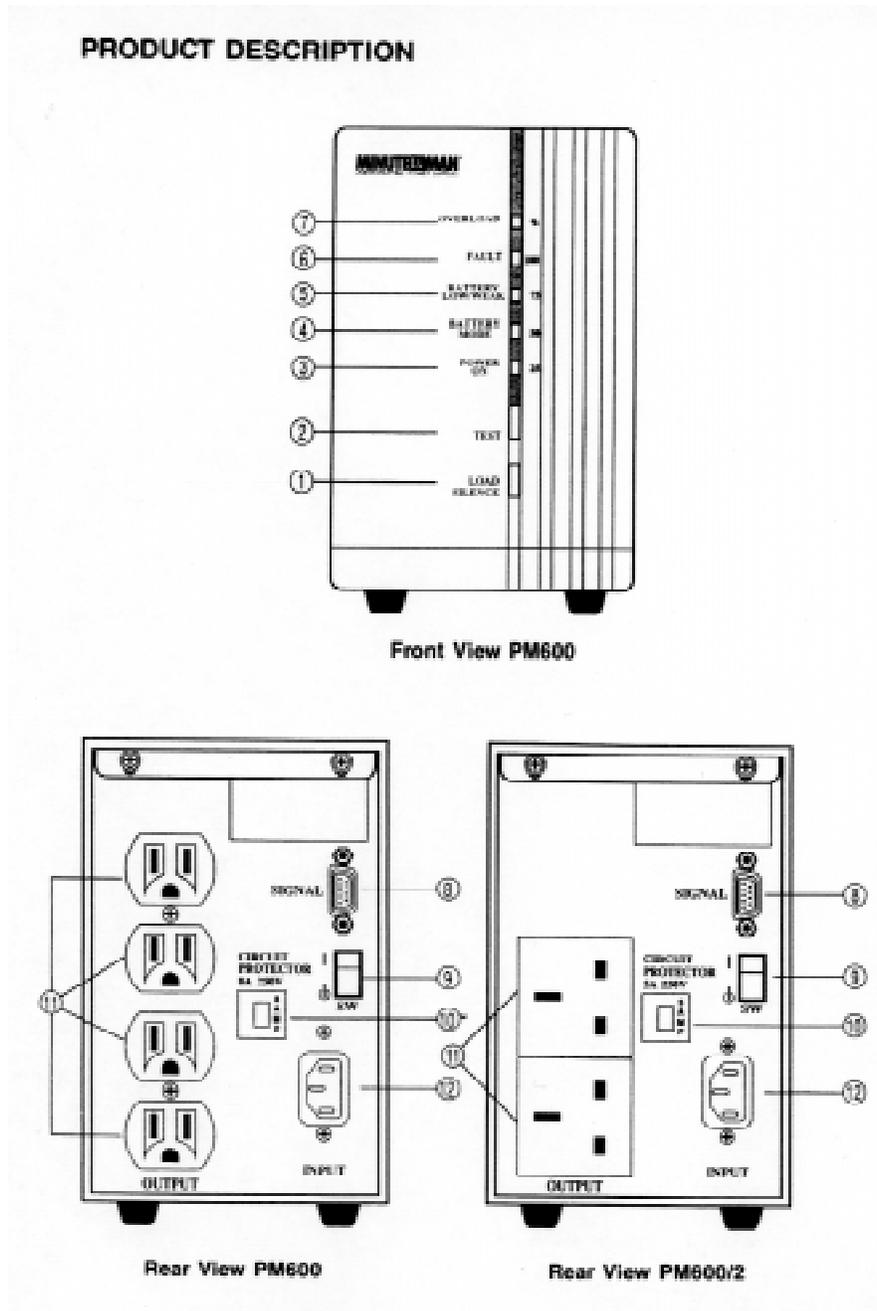
- Read all instructions carefully before operating the UPS. All operating instructions should be followed and all cautions must be adhered to.
- These UPS units are intended for use in a temperature controlled, indoor area free of conductive contaminants.
- **CAUTION** -- UPS units use batteries for generation of AC voltages, so output receptacles may be electrically hot even when the unit is not connected to commercial power. Trained service personnel should perform all repairs, since an electrical shock hazard exists.

- **CAUTION** -- Do not remove the cover, there are no user serviceable parts inside.
- **CAUTION** -- The 3-wire plug supplied with the unit provides earth ground for the UPS unit chassis to prevent electrical shock. Plug the UPS unit into a 3-wire grounding type, commercial receptacle with grounding conductor connected to earth ground at the service equipment. Removal of the ground pin from the plug or use of a 3-wire-to-2-wire adapter will defeat this safety feature and may result in a shock hazard. Additionally, if the plug is removed to simulate a power failure (not recommended), do not touch the plug conductors or the chassis while the plug is removed.
- **CAUTION** -- Do not allow water or any foreign object to enter the UPS. In case this occurs, immediately turn the unit power switch off and unplug the MINUTEMAN from the commercial receptacle.
- Servicing of batteries should be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from the batteries.
- When replacing UPS batteries, use the same number of sealed lead-calcium rechargeable batteries with the same voltage and ampere-hour rating as those contained in the units. These batteries have pressure operated safety vents.
- **CAUTION** --
 1. Do not dispose of batteries in a fire. They may explode.
 2. Do not open or mutilate batteries. Released electrolyte is harmful to the skin and eyes and may be toxic.
 3. Battery systems present a risk of very high short circuit current. The current capability of each battery system is sufficient to burn large wire or tools very rapidly, producing molten metal. The following precautions should be observed when working on batteries:
 - a. Turn the UPS off and disconnect it from the commercial receptacle prior to connecting or disconnecting battery terminals.
 - b. Remove watches, rings or other metal objects.
 - c. Use tools with insulated handles.
 - d. Do not lay tools or any metal parts on top of batteries.
 - e. Wear protective gloves and eye ware.

SELECTION OF UPS LOCATION

- Select a location that will provide good air circulation for the UPS. Do not cover the unit air vent holes or restrict airflow in any way. The unit must have good air circulation at all times.
- Avoid locations near heating devices.
- Avoid locations near water or excessive humidity.

- Avoid locations where the unit is exposed to direct sunlight.
- Route unit power cord so it can not be walked on or damaged.



1. **Load/Silence Switch:** Momentary Switch. Depressing this switch silences the audible alarm in normal inverter mode only. Depressing this switch in the AC normal mode provides a load measurement as a percentage of a full load.
2. **Test Switch:** Momentary Switch. Depressing this switch causes the unit to switch to the inverter mode for test.
3. **Power On/25% LED (Green):** During normal unit function LED is on when commercial power is present and in an acceptable range, off otherwise. When the load switch is depressed this LED indicates that load is greater than 25% of full load.
4. **Battery Mode/50% LED (Green):** During normal unit function LED is on when unit goes to the inverter mode, off otherwise. When the load switch is depressed this LED indicates that load is greater than 50% of full load.
5. **Battery Low/Weak/75% LED (Amber):** During normal unit function this LED provides indications of both low battery warning (LED comes on steady while unit is running in inverter mode) and battery low, weak or bad (LED blinks twice each second for approximately 4 second and then flashes every 4 seconds until a subsequent successful inverter function -- test or actual -- proves that battery function is now proper). When the load switch is depressed this LED indicates that load is greater than 75%.
6. **Fault/100% LED (Red):** During normal unit function this LED comes on when the unit has an internal problem. This condition can only be cleared by turning the unit power switch off and back on. When the load switch is depressed this LED indicates that load is greater than 100%.
7. **Overload LED (Red):** This LED comes on when the unit is overloaded. Reducing the load will extinguish the LED.
8. **LAN Interface Port (DB9 Female connector):** UPS monitoring interface -- see description under "UPS Monitoring Configurations".
9. **Main Power Switch:** Brings on all the unit functions, except internal battery charger. Charger comes on when unit is connected to commercial power.
10. **Input Circuit Breaker or Fuse**
11. **Output Receptacles:** 120VAC, 60Hz models use standard NEMA 5-15R receptacles and 220VAC, 50Hz models uses British receptacles (standard). Other international receptacle options are available by special order.
12. **Input Receptacle (IEC 320):** An IEC 320 power cord is supplied with each unit. The plug on the other end of the power cord matches unit output receptacles above.
13. **Audible Alarm (Internal):** During normal inverter mode the alarm sounds once every 4 seconds, changing to once each second at low battery warning. The alarm also sounds twice each second for 4 seconds when the battery is low, weak or bad. The alarm comes on steady during both fault and overload conditions. Decreasing the load will clear the overload alarm.
14. **Cooling Fan:** All PM Series units except PM600. PM600 is convection cooled.

PRODUCT SPECIFICATIONS

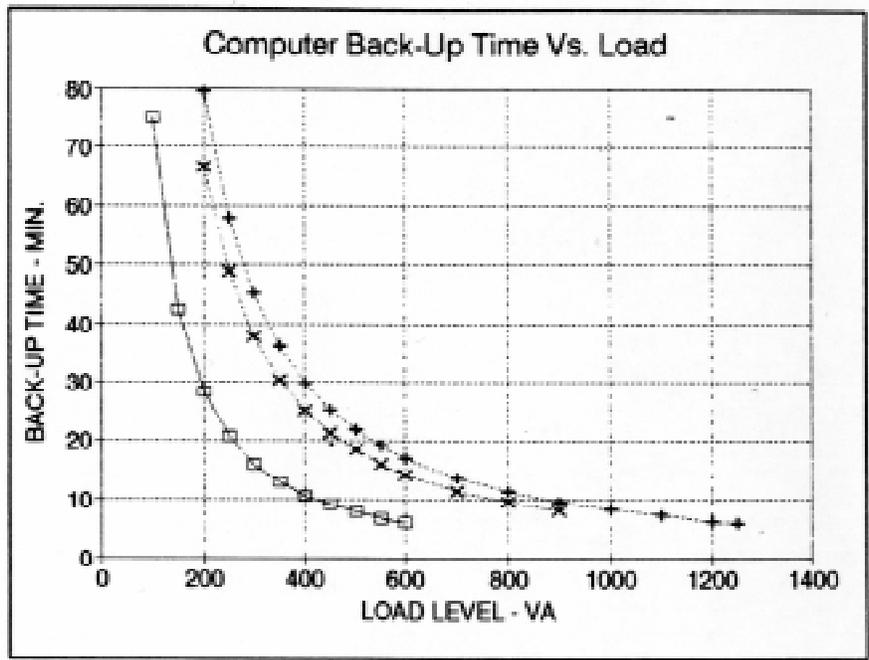
ELECTRICAL							
Model #	Rated Output (VA/Watts)	Freq. * (HZ)	Input * (VAC/A)	Output * (VAC/A)	Battery (VDC)	Max. Heat Dissipation (BTU/HR) Inverter Mode	AC Mode
PM600	600/400	50/60	120/5.5	120/5.0	24	150	60
PM600/2	600/400	50/60	220/3	220/2.7	24	150	60
PM900	900/630	50/60	120/8.7	120/7.5	48	235	120
PM900/2	900/630	50/60	220/4.8	220/4.1	48	235	120
PM1250	1250/900	50/60	120/12.0	120/10.4	48	335	120
PM1250/2	1250/900	50/60	220/6.6	220/5.7	48	335	120

*Each model has an output frequency of either 50Hz or 60Hz, internally selected by unit microprocessor from input frequency measurement. Models are available with other input/output voltage options -- 110VAC, 230VAC and 240VAC.

	120VAC MODELS	220VAC MODELS
Input Voltage (AC Mode Function)	92 VAC - 132 VAC	170 VAC - 264 VAC
Boost Capability (AC Mode Function)	+ 12%	+ 12%
Transfer to Battery Mode	<92VAC, >132VAC	<170 VAC, >264 VAC
Return to AC Mode	>98 VAC, <126VAC	>176 VAC, <258 VAC
Transfer Time	2 MSEC typical	
Inverter (Battery) Mode Function:		
Waveform	True Sinewave	
Output Voltage Regulation	± 5%	
Frequency Regulation	± 0.1 Hz	
Efficiency	75%	
Load Crest Ratio	3:1	
Overload Capacity	110% for 22 seconds	
Acoustic Noise	40dBA at 3'	
Battery Back Up Time	See Typical Battery Backup Time	
Overload/Shorted Load Protection	Electronic and Fuse	
Recharge Time w/Discharged Batteries	8 hours to 90% of full charge	
EMI/RMI Protection	Meets VDE Class B EMI/RFI	
Noise Attenuation	66dB normal, 42dB common at 1MHZ	
Surge Suppression	Meets IEEE 587	

PHYSICAL			
MODEL	NET Wt. (lbs.)	Shipping Wt. (lbs.)	Dimensions (L x W x H) (")
PM600	31.1	34	15.8 x 4.8 x 7.8
PM900	49.5	53	18.3 x 6.5 x 9.6
PM1250	49.5	53	18.3 x 6.5 x 9.6

ENVIRONMENTAL	
Operating Temperature	0°C to 40°C
Relative Humidity	95% maximum, non-condensing
Storage Temperature	-15°C to 40°C



TYPICAL BATTERY BACK-UP TIME			
COMPUTER LOAD	PM600	PM900	PM1250
200VA	28 min.	67 min.	80 min.
300VA	16 min.	38 min.	45 min.
400VA	11 min.	25min.	30 min.
500VA	8 min.	18 min.	22 min.
600VA	6 min.	14 min.	17 min.
700VA	---	11 min.	14 min.
800VA	---	9 min.	11 min.
900VA	---	8 min.	10 min.
1000VA	---	---	8 min.
1100VA	---	---	7 min.
1200VA	---	---	6 min.
1250VA	---	---	6 min.

INSTALLATION AND TEST

- Ensure that the UPS main power switch is off ("⏻" position) and plug the power cord into the UPS input receptacle. Then plug the other end of the power cord into a commercial power receptacle, supplying the proper voltage per UPS model. Ensure that the commercial receptacle has a grounding conductor connected to earth ground at the service equipment.
- Leave the UPS in this condition for a minimum of four hours to permit the internal batteries to charge (charger runs when unit is plugged in with power switch off).
- Turn on the UPS main power switch ("I" position). If commercial power is available and the commercial voltage is in range, the UPS will go through a diagnostic, after a short delay, at turn on. All LED's will illuminate and the alarm will sound for approximately 1 second and then turn off. Then the "power on" LED will come on and output power will be supplied to the load.
- After approximately 4 seconds the UPS will go through an automatic inverter test for approximately 2 seconds. "Power On" and "Battery Mode" lights will be on during this test. At the end of the test the "Battery Mode" LED will turn off. If any other indications are observed during the turn on procedure refer to the "UPS Problem Chart".
- Depress the test switch and verify that the unit goes through the inverter test as described above.
- Depress the load/silence switch and the LED's will provide an indication of the percentage of full load actually being supplied using four LED's as described previously.
- If all indications described above are proper, the UPS is ready for operation. The UPS main power switch can be used to turn your loads on and off each day, if desired. The charger will continue to charge the internal batteries with the UPS main power switch off.

OPERATION

When a minor brownout or low voltage condition occurs the unit will switch to inverter mode function momentarily, switch to the voltage boost mode and return to AC mode function. In this mode batteries are not being utilized. When commercial voltage increases to nominal, the UPS will again switch to inverter mode function momentarily, switch out of the voltage boost mode and return to AC mode function.

If a very low voltage condition, over-voltage, power interruption or power outage occurs the UPS will switch to inverter mode function and supply a well regulated, sinewave output to protected loads. The audible alarm will sound every 4 seconds, the "power on" LED will extinguish and the "inverter mode" LED will illuminate. This is the normal inverter mode function. In this mode the audible alarm can be silenced by depressing the "load/silence" switch. The alarm will automatically reset upon return to the AC mode. For long duration power outages or problems the unit will provide a low battery warning a minimum of 2 minutes prior to low battery shutdown. At low battery warning the alarm will sound once each second and the "battery low/weak" LED will illuminate. The audible alarm can not be silenced in this mode. At low battery shutdown the UPS will shut off automatically to protect its internal batteries from excessive discharge. All LED's the audible alarm and power out will turn off. When commercial power returns, the UPS will return to the AC normal mode.

The UPS goes through automatic inverter test at each turn on and upon return to AC mode from low battery cut-off. If the battery is found to be very low during this test the unit will return to the AC mode, the "battery low/weak" LED will blink and the audible alarm will sound twice each second for approximately 4 seconds. The audible alarm will stop, but the LED will continue to blink at a slower rate. The unit will continue in this mode until the battery recovers sufficiently to run the load in the inverter mode and a successful inverter run occurs. Should this happen the user is encouraged to turn off the UPS main power switch and allow the UPS batteries to charge for 2 hours. Then turn the UPS main power switch back on. If UPS start up is now normal, the batteries have recharged sufficiently for inverter run. If the "battery low/weak" signal occurs again at start up, the batteries should be replaced.

During normal AC mode operation, the unit will quietly protect the protected load from power surges, voltage spikes and noise interference. No alarm will sound unless the surges or spikes are long enough duration to cause the UPS to switch to the inverter mode.

SYSTEM BATTERIES

The batteries used internally in the MINUTEMAN "PM" Series units are sealed, maintenance free, lead-acid batteries with electrolyte totally absorbed in the plates and separator material. For maximum battery life batteries should be maintained at as cool a temperature as is practical indoors at proper trickle charge voltage. The most effective charging temperature range is 41°F to 95°F. However, batteries can be charged within the range of 32°F to 104°F (0°C to 40°C) without any detrimental effects. Expected float life of the batteries is 3 to 6 years at 85°F. We recommend replacement after 3 years of use. Replacement batteries can be purchased from Para Systems, Inc. or from your local distributor or dealer. If the UPS must be stored, leave it plugged in with commercial power applied for 24 hours prior to storage. Store the unit in a cool, dry location. For extended storage the unit must be removed from storage and recharged as above every 4 months.

If batteries are replaced the used batteries should be provided to a recycling center for reclamation of the lead.

BATTERY/SYSTEM CHECKOUT

To verify proper system function and battery condition, the user is encouraged to engage the test switch periodically. Normal indications as specified should be observed. If the system goes immediately to the low battery warning mode, the batteries should be replaced.

UPS MONITORING CONFIGURATIONS

The PM Series models provide an UPS monitoring capability which will allow direct interface with many different computer operating systems. This capability permits an unattended, orderly shut down of the computer system when commercial power is lost for a long period. Some configurations also provide for a shut down of the UPS after the computer has been shut down, thereby conserving UPS battery capability. Following is a partial list of systems with which the direct monitoring capability exists. Contact Para Systems sales department for a more complete, up to date list.

Para Systems also offers its own software package "Network Manager" which functions with Novell, OS2, Unix and Macintosh operating systems. This system offers many advantages over most existing UPS monitoring packages.

Finally, for systems which do not have UPS interface capability, user software can be written to read UPS status and provide for system shut down. Software specialists should contact Para Systems, Inc. for more information. The standard UPS DB9 PIN out is provided below for your information.

UPS DIRECT INTERFACE CONFIGURATIONS

- *Novell for AT compatible computers
- Novell for PS/2 computers with mouse port connector
- Altos Unix/Pick/Xenix with 1/4" stereo jack
- Same except for low battery warning response
- DTS Servers running Banyon Vines
- Servers running Banyon Vines/286, Vines/386
- Prime 2350/2450
- Convergent/Unisys
- Microsoft LAN Manager
- Convergent Might Frame/Miniframe
- LANtastic

*This interface configuration functions with existing Novell UPS monitoring board, SS Keycard or Disk Coprocessor Board. Para Systems Monitoring Board (MB1) is available for new installations which do not already have an add-on monitoring board.

UPS DB9 PIN OUT

PIN 1 UPS sends a RS232 high level (+12VDC) within 1 second after UPS goes to inverter mode (commercial power fails or voltage is out of range). Pin 1 is normally at RS232 low level (-12VDC).

PIN 2 UPS simulates a relay closing between Pins 2 and 4 when it switches to inverter mode.

PIN 3 UPS simulates a relay opening between Pins 3 and 4 when it switches to inverter mode.

PIN 4 Common for Pins 2, 3 and 5.

PIN 5 UPS simulates a relay closing between Pins 5 and 4 at low battery warning.

PIN 6 User sends a RS232 high level (+5 to + 12VDC) for > 1 msec. This signal will turn off the UPS during inverter mode function. The UPS will return to AC mode when commercial power is restored.

PIN 7 Common return for Pins 6, 8 and Pin 9.

PIN 8 +24VDC protected internally by a 10K OHM resistor.

PIN 9 User sends a RS232 low level ($\leq 0V$) for > 1 second to turn off output instantly in either AC or inverter mode. The UPS will be turned back on when the low-level signal is removed.

SERVICE

If any problems are observed with your MINUTEMAN "PM" Series UPS, contact your supplier or Para Systems, Inc. customer service department. Prior to calling for service, please write down and be prepared to discuss all unit light and audible indications in each mode (AC and Inverter) and whether or not the unit supplies power in either mode. Below is a guide to assist you in locating some common problems.

Do not remove the unit cover or attempt to service this unit. There are no user serviceable components inside. Unauthorized service will void the warranty.

UPS PROBLEM CHART		
PROBLEM	POSSIBLE CAUSE	ACTION TO TAKE
UPS does not come on when main power switch is turned on.	Rear panel circuit breaker tripped.	Reduce load and push to reset breaker.
	No commercial power available at wall receptacle.	Verify power is available at commercial receptacle.
UPS does not come on when main power switch is turned on and alarm sounds continuously.	Input voltage too low (<85VAC) or too high (>132VAC)	Measure voltage at commercial receptacle.
	Input frequency too low or too high.	Check frequency at commercial receptacle.
"Battery Mode" LED illuminates and audible alarm sounds every 4 seconds (inverter mode function) when commercial power is thought to be proper.	Rear panel circuit breaker tripped.	Reduce load and push to reset breaker.
	Commercial power is off or voltage is too low (<98VAC) or too high (>126VAC).	Measure voltage at commercial receptacle.
"Fault" LED illuminates and audible alarm sounds continuously.	UPS failure.	Turn off main power switch and turn back on, allowing UPS to go through power up and initialization routine. If fault still exists, call for service.
"Overload" LED illuminates and audible alarm sounds continuously.	UPS is overloaded.	Remove the least critical load.
"Battery Low/Weak" LED is flashing.	Low, weak or bad battery.	Turn off main power switch and allow UPS batteries to charge for 4 hours. If problem does not clear when main power is turned back on, call for service.
Back-up time is considerably less than expected and battery charge condition is unknown.	Load is greater than estimated.	Verify Load.
	Batteries are not fully charged or weak.	Recharge batteries for 8 hours and repeat backup test.
Back-up time is considerably less than expected at the end of a battery recharge cycle (8 hours) and load is verified.	Charger failure or batteries are bad.	Call for service.