ELECTRIC MOTOR

Owner's Manual

WARNING: Read carefully and understand all ASSEMBLY AND OPERATION INSTRUCTIONS before operating. Failure to follow the safety rules and other basic safety precautions may result in serious personal injury.

Item #51820, #51821, #51822, #51823

SAVE THESE INSTRUCTIONS

Thank you very much for choosing an Ironton® product!

For future reference, please complete the owner's record below:

Serial Number/Lot Date Code: _____

Purchase Date: _____

Save the receipt, warranty, and this manual. It is important that you read the entire manual to become familiar with this product before you begin using it.

This Electric Motor is designed for certain applications only. Northern Tool & Equipment is not responsible for issues arising from modification or improper use of this product such as an application for which it was not designed. We strongly recommend that this product not be modified and/or used for any application other than that for which it was designed.

For technical questions, please call **1-800-222-5381**.

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Intended Use

Motor models #51820, #51821, and #51822 are designed for air compressor duty applications, which require a high breakdown torque and may be suitable for other applications having similar loads.

Motor model #51823 is designed for industrial duty air fan motors for air circulators, which may be suitable for other applications such as compressors, pumps, conveyors, blowers, and fans having similar loads.

Technical Specifications

Specifications	#51820	#51821	#51822	#51823
Motor HP	2SPL	3	5SPL	1/2
Rated Speed	3450	3450	3450	1725
Volts	115/230	208-230	208-230	115/208-230
Amps	15.0/7.5	13.1-12.3	15	9.0/4.0-4.5
Hertz	60	60	60	60
Motor Phase	1	1	1	1
Shaft Diameter (in)	5/8	5/8	5/8	5/8
Shaft length (in)	1 7/8	1 7/8	1 7/8	1 7/8
Frame Type	M56	M56	P56	J56
Rotation Direction	Clockwise, not reversible	Counter clockwise, can be reversed	Clockwise, not reversible	Counter clockwise, can be reversed
Housing Type	Open Drip Proof	Open Drip Proof	Open Drip Proof	Open Drip Proof
Capacitor	Cap Start & Cap Run	Cap Start & Cap Run	Cap Start & Cap Run	Cap Start
Protector	Thermally Protected	Thermally Protected	Thermally Protected	Thermally Protected
Manual Overload Protection	Yes	Yes	Yes	Yes
Service Factor	1.0	1.0	1.0	1.25
Ambient Temperature	40°C	40°C	40°C	40°C

Important Safety Information

⚠WARNING

- Read and understand all instructions. Failure to follow all instructions may result in serious injury or property damage.
- The warnings, cautions, and instructions in this manual cannot cover all possible conditions or situations that could occur. Exercise common sense and caution when using this motor. Always be aware of the environment and ensure that the motor is used in a safe and responsible manner.
- Do not allow persons to operate or assemble the motor until they have read this manual and have developed a thorough understanding of how it works.

- Do not modify this motor in any way. Unauthorized modification may impair the function and/or safety and could affect the life of the motor. There are specific applications for which the motor was designed.
- Use the right tool for the job. DO NOT attempt to force small equipment to do the work of larger industrial equipment. There are certain applications for which this motor was designed. It will be a safer experience and the tool will do a better job at the capacity for which it was intended. DO NOT use this motor for a purpose for which it was not intended.
- Industrial or commercial applications must follow OSHA requirements.

⚠WARNING

WORK AREA SAFETY

- Inspect the work area before each use. Keep work area clean, dry, free of clutter, and well lit. Cluttered, wet, or dark work areas can result in injury.
- Do not use the motor where there is risk of fire or explosion; e.g., in the presence of flammable liquids, gases, or dust. The product can create sparks, which may ignite the flammable liquids, gases, or dust.
- Keep children and bystanders away from the work area while operating the motor. Do not allow children to handle the motor.
- Be aware of all power lines, electrical circuits, water pipes, and other mechanical hazards in your work area. Some of these hazards may be hidden from your view and may cause personal injury and/or property damage if contacted.

⚠WARNING

PERSONAL SAFETY

- Stay alert, watch what you are doing, and use common sense when operating the motor. Do not use the motor while you are tired or under the influence of drugs, alcohol, or medication. A moment of inattention while operating the motor may result in a serious personal injury.
- Dress properly. Do not wear loose clothing, dangling objects, or jewelry. Keep your hair, clothing, and gloves away from moving parts. Loose clothes, jewelry, or long hair can be caught in moving parts. Air vents on the motor often cover moving parts and should be avoided.
- Wear the proper personal protective equipment when necessary. Use ANSI Z87.1 compliant safety goggles (not safety glasses) with side shields, or when needed, a face shield. Use a dust mask in dusty work conditions. Also use non-skid safety shoes, hardhat, gloves, dust collection systems, and hearing protection when appropriate. This applies to all persons in the work area.
- Do not overreach. Keep proper footing and balance at all times.
- Before plugging in the motor, ensure the power switch is off.
- Remove keys or wrenches before connecting the motor to a power supply or turning it on. A wrench or key that is left attached to a rotating part of the tool may cause personal injury.
- When practical, secure the work with clamps or a vise instead of your hand. This safety precaution allows for proper motor operation using both hands.

⚠WARNING

ELECTRICAL SAFETY

- Always check to ensure the power supply corresponds to the voltage on the rating nameplate.
- Motors should be installed, protected, and fused in accordance with the latest issue of National Electrical Code, NEMA Standard Publication No MG 2, and local codes.
- Motors with automatic thermal protectors will automatically restart when the protector temperature drops sufficiently. Do not use motors with automatic thermal protectors in applications where an automatic restart will be hazardous to personal equipment.
- Motors with manual thermal protectors may start unexpectedly after protector trips. If manual protector trips, disconnect motor from power line. After protector cools (five minutes or more) it can be reset and power may be applied to motor.
- Discharge all capacitors before servicing motor.
- Electrical repairs should be performed by trained and qualified personnel only.
- Grounded tools must be plugged into an outlet, properly installed, and grounded in accordance with all codes and ordinances. Never remove the grounding prong or modify the plug in any way. Do not use any adapter plugs. Check with a qualified electrician if you are in doubt as to whether the outlet is properly grounded. If the motor should electrically malfunction or break down, grounding provides a low resistance path to carry electricity away from the user.
- Double insulated tools are equipped with a polarized plug (one blade is wider than the other). This plug will fit in a polarized outlet only one way. If the plug does not fully fit into the outlet, reverse the plug. If it still does not fit, contact a qualified electrician to install a polarized outlet. Do not change the plug in any way. Double insulation eliminates the need for the three wire grounded power cord and grounded power supply system.
- Avoid body contact with grounded surfaces such as pipes, radiators, ranges, and refrigerators. There is an increased risk of electric shock if your body is grounded.
- Do not expose motors to rain or wet conditions. Water entering an electric motor will increase the risk of electric shock.
- Do not abuse the power cord. Never use the power cord to carry the motor or pull the plug from an outlet. Keep the power cord away from heat, oil, sharp edges, or moving parts. Replace damaged power cords immediately. Damaged power cords increase the risk of electric shock.
- When operating a motor outside, use an outdoor extension cord marked ‘W-A’ or ‘W’. These extension cords are rated for outdoor use and reduce the risk of electric shock.

⚠CAUTION

MOTOR USE AND CARE

- Motors should be installed, protected, and fused in accordance with the latest issue of National Electrical Code, NEMA Standard Publication No. MG 2, and local codes.
- Frames and accessories of motors should be grounded in accordance with the National Electrical Code (NEC) Article 430. For general information on grounding, refer to NEC Article 250.
- Rotating parts such as pulleys, couplings, external fans, and shaft extensions should be permanently guarded.
- Check for damaged parts before each use. Carefully check that the motor will operate properly and perform its intended function. Replace damaged or worn parts immediately. Never operate the motor with a damaged part.
- Disconnect the power before working on motors or driven equipment.
- Motors with automatic thermal protectors will automatically restart when the protector temperature drops sufficiently. Do not use motors with automatic thermal protectors in applications where automatic restart will be hazardous to personnel or equipment.

- Motors with manual thermal protectors may start unexpectedly after protector trips. If a manual protector trips, disconnect the motor from the power line. After the protector cools (five minutes or more) it can be reset and the power may be applied to the motor.
- Discharge all capacitors before servicing the motor.
- Always keep hands and clothing away from moving parts.
- Never attempt to measure the temperature rise of a motor by touch. The temperature rise must be measured by a resistance thermometer, an imbedded detector, or a thermocouple.
- Electrical repairs should be performed by trained and qualified personnel ONLY.
- Failure to follow instructions and safe electrical procedures could result in serious injury or death.
- If safety guards are required, be sure the guards are in use.
- All wiring, fusing, and grounding must comply with National Electrical Codes and local codes. To determine proper wiring, rotation, and voltage connections, refer to the information and diagram on the nameplate, separate connection plate, or decal. If the plate or decal has been removed, contact the manufacturer for assistance.
- Use the proper size of line current protection and motor controls as required by the National Electrical Code and local codes. Recommended use is 125% of full load amps as shown on the nameplate for motors with 40°C ambient and a service factor of over 1.0. Recommended use is 115% of full load amps, as shown on the nameplate for all other motors. Do not use protection with larger capacities than recommended.

Operation

⚠WARNING

Disconnect and lock out before working on motors or driven equipment.

Motors are all fully factory-tested and inspected before shipping. Damage during shipment and storage can occur. Motors not correctly matched to the power supply and/or the load will not operate properly. These instructions are intended as a guide to identify and eliminate these problems before they are overlooked or cause further damage.

Storage

A. Keep the motor clean.
    a. Store it indoors.
    b. Keep the motor covered to eliminate airborne dust and dirt. Keep both the interior and exterior of the motor free from dirt, water, oil, and grease.
B. Keep the motor dry.
    a. Store the motor in a dry area indoors.
    b. Temperature swings should be minimal to prevent condensation.
    c. Space heaters are recommended to prevent condensation.
    d. Treat unpainted flanges, shafts, and fittings with a rust inhibitor.
    e. Check the insulation resistance before putting the motor into service.
C. Keep the bearings lubricated.
    a. Once a month, rotate the shaft several turns to distribute the grease in the bearings.

Before Initial Starting

- After uncrating, check for any damage which may have been incurred in handling. The motor shaft should turn freely by hand. Repair or replace any loose or broken parts before attempting to use the motor.
- Check to be sure that the motor has not been exposed to dirt, grit, or excessive moisture in shipment or storage before installation.
- Measure the insulation resistance. (See the Operation section.) Clean and dry the windings as required.
- Never start a wet motor without thoroughly drying it.

Location

- In selecting a location for the motor, consideration should be given to the environment and ventilation. A motor with the proper enclosure for the expected operating condition should be selected.
- The ambient temperature of the air surrounding the motor should not exceed 40°C (104°F) unless the motor has been especially designed for high ambient temperature applications. The free flow of air around the motor should not be obstructed.
- The motor should NEVER be placed in a room with a hazardous process, or where flammable gases or combustible material may be present, unless it is specifically designed for this type of service.
  - Drip proof (open) motors are intended for use indoors where the atmosphere is relatively clean, dry, and non-corrosive.
  - Totally enclosed motors may be installed where dirt, moisture, and corrosion are present, or in outdoor locations.
  - Explosion proof motors are built for use in hazardous locations as indicated by the Underwriters' label on the motor. Consult the UL, NEC, and local codes for guidance.
- Refer to the manufacturer for application assistance.

Motor Mounting

Motors should be provided with a firm, rigid foundation with the plane of four mounting pads flat within .010" for 56 to 210 frames and .015" for 250 to 500 frames. This may be accomplished by shims under the motor feet. For special isolation mounting, contact the manufacturer for assistance.

Direct Connected Drive

Flexible or solid shaft couplings must be properly aligned for satisfactory operation. On flexible couplings, the clearance between the ends of the shafts should be in accordance with the coupling manufacturer's recommendations or the NEMA standards for end play and limited travel in coupling.

Misalignment and Run-Out

Misalignment and run-out between direct connected shafts will cause increased bearing loads and vibration even when the connection is made by means of a flexible coupling. Excessive misalignment will decrease bearing life. Proper alignment, per the specifications of the coupling being used, is critical.

V-Belt Drive

1. Select the proper type and number of belts and sheaves. An excessive belt load will damage bearings. Sheaves should be in accordance to the NEMA Spec. MG-1 or as approved by the manufacturer for a specific application.

2. Align the sheaves carefully to avoid axial thrust on the motor bearing. The drive sheave on the motor should be positioned toward the motor so it is as close as possible to the bearing.
3. When adjusting the belt tension, make sure the motor is secured by all mounting bolts before tightening the belts.
4. Adjust the belt tension to the manufacturer's recommendations. Excessive tension will decrease bearing life.

Thermal Protector Information

The nameplate will indicate one of the following:

- The motor is thermally protected
- The motor is not thermally protected
- The motor is provided with a protective overheating device

Examples:

1. Motors equipped with built-in thermal protection have THERMALLY PROTECTED stamped on the nameplate. Thermal protectors open the motor circuit electrically when the motor overheats or is overloaded.
2. The protector cannot be reset until the motor cools. If the protector is automatic, it will reset itself. If the protector is manual, you will need to press the red button to reset.
3. Motors without thermal protection do not have a label on the nameplate.
4. Motors that are provided with an overheat protective device that does not open the motor circuit directly will be indicated with an 'Overheat Protective Device' label. See the motor connection diagram for details.
   a. Motors with this type of overheat protective device have protector leads brought out in the motor conduit box marked P1 and P2. These leads are intended for connection in series with the stop button of the 3-wire pilot circuit for the magnetic starter which controls the motor. See Figure 1A.
   b. The circuit controlled by the above overheat protective device must be limited to a maximum of 600 volts and 360 volt-amps.

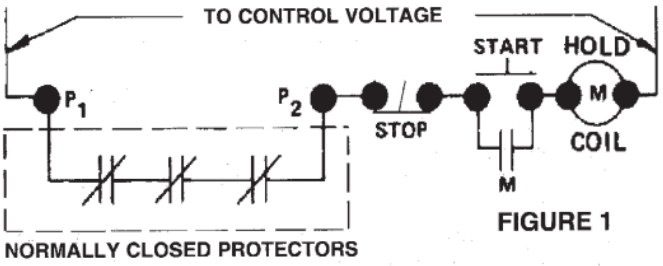
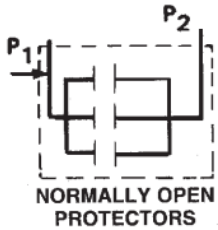


FIGURE 1



Normally Open (N/O) Motor Thermostats may be used in conjunction with controls installed by Original Equipment Manufacturers.

FIGURE 1A

Changing Rotation

- Keep hands and clothing away from rotating parts.
- Before the motor is coupled to the load, determine the proper rotation.
- Check the rotation by jogging or bumping. Apply power to the motor leads for a short period of time, just until the motor shaft rotates a slight amount and you can observe the shaft's rotating direction.
- Single Phase Motors - Reconnect as shown in the connection diagram on the motor.

Recommended Maintenance

⚠WARNING

Disconnect the power before servicing the motor or driven equipment. Motors with automatic thermal protectors will automatically restart when the protector temperature drops sufficiently. Do not use motors with automatic thermal protectors in applications where automatic restart will be hazardous to persons or equipment.

Motors are properly lubricated at the time of manufacture. It is not necessary to lubricate at the time of installation unless the motor has been in storage for a period of 12 months or longer. (Refer to the lubrication procedure that follows.)

NOTE: Motors without relubrication fittings are lubricated for the life of the motor and no lubrication is needed.

Troubleshooting

⚠WARNING

Disconnect the power before working on motors or driven equipment. Allow the motor to come to a complete stop. Discharge capacitors, if any, to prevent electric shock.

If trouble is experienced in the operation of the motor, make sure that:

1. The bearings are in good condition and operating properly.
2. There is no mechanical obstruction to prevent rotation in the motor or in the driven load.
3. The air gap is uniform. (Consult the manufacturer for specifications.)
4. All bolts and nuts are tightened securely.
5. Proper connection to the drive machine or load has been made.

In checking for electrical troubles, be sure that:

1. The line voltage and the frequency correspond to the voltage and frequency stamped on the nameplate of the motor.
2. The voltage is actually available at motor terminals.
3. The fuses and other protective devices are in proper condition.
4. All connections and contacts in the circuits, between the control apparatus and motor, are properly made.

These instructions do not cover all details or variations in equipment, nor do they provide for every possible condition to be met in connection with installation, operation, or maintenance. Should additional information be desired for the purchaser's purposes, refer to the manufacturer for more detail.

RECOMMENDED COPPER WIRE GUAGE & TRANSFORMER SIZE

SINGLE PHASE MOTORS - 230 VOLTS						
H.P.	TRANSFORMER KVA	DISTANCE - MOTOR TO TRANSF. IN FT.				
		100	150	200	300	500
1 1/2	3	10	8	8	6	4
2	3	10	8	8	6	4
3	5	8	8	6	4	2
5	7 1/2	6	4	4	2	0
7 1/2	10	6	4	3	1	0

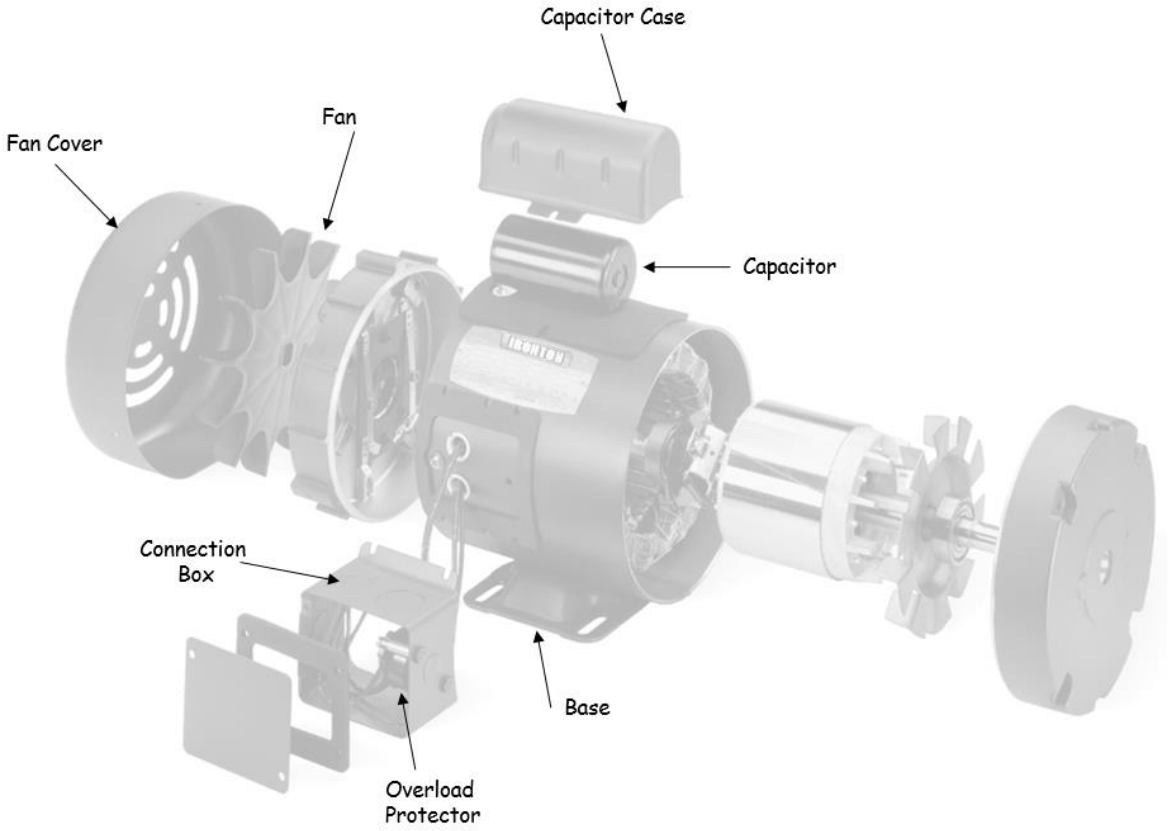
Motor Trouble Shooting Chart

Your motor service and any trouble shooting must be handled by qualified persons who have proper tools and equipment.

TROUBLE	CAUSE	WHAT TO DO
Motor fails to start	Blown fuses	Replace fuses with the proper type and rating.
	Overload trips	Check and reset the overload in the starter.
	Improper power supply	Check to see that the power supply agrees with the motor nameplate and load factor.
	Improper line connections	Check the connection diagram (on the nameplate) supplied with each motor.
	Open circuit in winding or control switch	Indicated by the humming sound when the switch is closed. Check for loose connections. Also see that all control contacts are closing.
	Mechanical failure	Check to see if the motor and drive turn freely. Check the bearings and lubrication.
	Short circuited stator	Indicated by blown fuses. The motor must be rewound.
	Poor stator coil connection	Remove the end bells and locate with a test lamp.
	Rotor defective	Look for broken bars or end rings.
	Motor may be overloaded	Reduce the load.
Motor stalls	One phase may be open	Check the lines for an open phase.
	Wrong application	Change the type or size. Consult the manufacturer.
	Overload	Reduce the load.
	Low voltage	See that nameplate voltage is maintained. Check connection.
	Open circuit	Fuses blown, check overload relay, stator and pushbuttons.
Motor runs and then dies down	Power failure	Check for loose connections to line, to fuses and to control.
Motor does not come up to speed	Not applied properly	Consult the supplier for the proper type.
	Voltage too low at motor terminals because of line drop.	Use a higher voltage on transformer terminals or reduce the load. Check the connections. Check the conductors for proper size.
	Starting load too high	Check the load that the motor is supposed to carry at the start.
	Broken rotor bars or loose rotor	Look for cracks near the rings. A new rotor may be required as repairs are usually temporary.
	Open primary circuit	Locate fault with a testing device and repair.

TROUBLE	CAUSE	WHAT TO DO
Motor takes too long to accelerate and/or draws high amp	Excessive load	Reduce the load.
	Low voltage during start	Check for high resistance. Ensure adequate wire size is being used.
	Defective squirrel cage rotor	Replace with new rotor.
	Applied voltage too low	Have the power company increase the power tap.
Wrong rotation	Wrong sequence of phases	Reverse the connections at the motor or at the switchboard.
Motor overheats while running under load	Overload	Reduce the load.
	Frame or bracket vents may be clogged with dirt and prevent proper ventilation of motor.	Open vent holes and check for a continuous stream of air from the motor.
	Motor may have one phase open	Check to make sure that all leads are well connected.
	Grounded coil	Locate and repair.
	Unbalanced terminal voltage	Check for faulty leads, connections, and transformers.
Motor vibrates	Motor misaligned	Realign.
	Weak support	Strengthen the base
	Coupling out of balance	Balance the coupling.
	Driven equipment unbalanced	Rebalance the driven equipment.
	Defective bearings	Replace the bearing.
Motor vibrates Unbalanced line current on three phase motors during normal operation Scraping noise	Bearings not in line	Line up properly.
	Balancing weights shifted	Rebalance the motor.
	Three phase motor running single phase	Check for an open circuit.
	Excessive end play	Adjust the bearing or add a shim.
	Unequal terminal volts	Check leads and connections.
	Single phase operation	Check for open contacts.
	Unbalanced voltage	Correct unbalanced power supply.
	Fan rubbing air shield	Remove interference.
	Fan striking insulation	Clear the fan.
Unbalanced line current on three phase motors during normal operation Noisy operation	Loose on bedplate	Tighten the holding bolts.
	Air gap not uniform	Check and correct the bracket fits or bearing.
	Rotor unbalance	Rebalance.
Hot bearings general	Bent or sprung shaft	Straighten or replace the shaft.
	Excessive belt pull	Decrease belt tension.
	Pulley is too far away	Move pulley closer to motor bearing.
Noisy operation	Pulley diameter too small	Use larger pulleys.
	Misalignment	Realign the drive.
Hot bearings ball	Insufficient grease	Maintain proper quantity of grease in bearing.
	Deterioration of grease or lubricant contaminated	Remove old grease, wash bearings thoroughly in kerosene, and replace with new grease.

Parts Diagram



Replacement Parts

- For replacement parts and technical questions, please call Customer Service at **1-800-222-5381**.
- Not all product components are available for replacement. The illustrations provided are a convenient reference to the location and position of parts in the assembly sequence.
- When ordering parts, the following will be required: Item Model Number, Item Serial Number/Item Lot Date Code, Item Description, and the Item Reference.
- The distributor reserves the rights to make design changes and or improvements to product lines and manuals without notice.

Limited Warranty

Northern Tool and Equipment Company, Inc. ("We" or "'Us") warrants to the original purchaser only ("You" or “Your”) that the Ironton product purchased will be free from material defects in both materials and workmanship, normal wear and tear excepted, for a period of one year from date of purchase. The foregoing warranty is valid only if the installation and use of the product is strictly in accordance with product instructions. There are no other warranties, express or implied, including the warranty of merchantability or fitness for a particular purpose. If the product does not comply with this limited warranty, Your sole and exclusive remedy is that We will, at our sole option and within a commercially reasonable time, either replace the product or product component without charge to You or refund the purchase price (less shipping). This limited warranty is not transferable.

Limitations on the Warranty

This limited warranty does not cover: (a) normal wear and tear; (b) damage through abuse, neglect, misuse, or as a result of any accident or in any other manner; (c) damage from misapplication, overloading, or improper installation; (d) improper maintenance and repair; and (e) product alteration in any manner by anyone other than Us, with the sole exception of alterations made pursuant to product instructions and in a workmanlike manner.

Obligations of Purchaser

You must retain Your product purchase receipt to verify date of purchase and that You are the original purchaser. To make a warranty claim, contact Us at 1-800-222-5381, identify the product by make and model number, and follow the claim instructions that will be provided. The product and the purchase receipt must be provided to Us in order to process Your warranty claim. Any returned product that is replaced or refunded by Us becomes our property. You will be responsible for return shipping costs or costs related to Your return visit to a retail store.

Remedy Limits

Product replacement or a refund of the purchase price is Your sole remedy under this limited warranty or any other warranty related to the product. We shall not be liable for: service or labor charges or damage to Your property incurred in removing or replacing the product; any damages, including, without limitation, damages to tangible personal property or personal injury, related to Your improper use, installation, or maintenance of the product or product component; or any indirect, incidental or consequential damages of any kind for any reason.

Assumption of Risk

You acknowledge and agree that any use of the product for any purpose other than the specified use(s) stated in the product instructions is at Your own risk.

Governing Law

This limited warranty gives You specific legal rights, and You also may have other rights which vary from state to state. Some states do not allow limitations or exclusions on implied warranties or incidental or consequential damages, so the above limitations may not apply to You. This limited warranty is governed by the laws of the State of Minnesota, without regard to rules pertaining to conflicts of law. The state courts located in Dakota County, Minnesota shall have exclusive jurisdiction for any disputes relating to this warranty.

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