

BALDOR • RELIANCE



AC Motors
6800 Frame
Horizontal Footless Mounting
Water Cooled Explosion Proof Mining Motor

Installation & Operating Manual

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Section 1 General Information

- Overview** This manual contains general procedures that apply to Baldor Motor products. Be sure to read and understand the Safety Notice statements in this manual. For your protection, do not install, operate or attempt to perform maintenance procedures until you understand the **Warning and Caution** statements. A **Warning** statement indicates a possible unsafe condition that can cause harm to personnel. A **Caution** statement indicates a condition that can cause damage to equipment.
- Baldor mining motors are sold to OEM (Original Equipment Manufacturers) companies who provide motors and equipment containing these motors as their product offerings. Be sure to consult the OEM documents for safety and regulatory information that is important to the application of these products.
- Important:** **This instruction manual is not intended to include a comprehensive listing of all details for all procedures required for installation, operation and maintenance. This manual describes general guidelines that apply to most of the motor products shipped by Baldor. If you have a question about a procedure or are uncertain about any detail, Do Not Proceed. Please contact your OEM for more information or clarification.**
- Before you install, operate or perform maintenance, become familiar with the following:
- IEC 34–1 Electrical and IEC72–1 Mechanical specifications.
- Safety Notice:** This equipment contains high voltage! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt installation, operation and maintenance of electrical equipment. Be sure that you are completely familiar with MSHA (Mine Safety and Health Administration), safety standards for selection, installation and use of electric motors and generators and local codes and practices. Unsafe installation or use can cause conditions that lead to serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.
- WARNING:** **Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.**
- WARNING:** **Disconnect all electrical power from the motor windings and accessory devices before disassembling of the motor. Electrical shock can cause serious or fatal injury.**
- WARNING:** **Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury.**
- WARNING:** **Avoid extended exposure to machinery with high noise levels. Be sure to wear ear protective devices to reduce harmful effects to your hearing.**
- WARNING:** **Surface temperatures of motor enclosures may reach temperatures which can cause discomfort or injury to personnel accidentally coming into contact with hot surfaces. When installing, protection should be provided by the user to protect against accidental contact with hot surfaces. Failure to observe this precaution could result in bodily injury.**
- WARNING:** **Guards must be installed for rotating parts to prevent accidental contact by personnel. Accidental contact with body parts or clothing can cause serious or fatal injury.**
- WARNING:** **This equipment may be connected to other machinery that has rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt to install operate or maintain this equipment.**
- WARNING:** **Do not by-pass or disable protective devices or safety guards. Safety features are designed to prevent damage to personnel or equipment. These devices can only provide protection if they remain operative.**
- WARNING:** **Be sure the load is properly coupled to the motor shaft before applying power. The shaft key must be fully captive by the load device. Improper coupling can cause harm to personnel or equipment if the load decouples from the shaft during operation.**
- WARNING:** **Use proper care and procedures that are safe during handling, lifting, installing, operating and maintaining operations. Improper methods may cause muscle strain or other harm.**
- WARNING:** **Pacemaker danger – Magnetic and electromagnetic fields in the vicinity of current carrying carrying conductors and permanent magnet motors can result result in a serious health hazard to persons with cardiac pacemakers, metal implants, and hearing aids. To avoid risk, stay way from the area surrounding a permanent magnet motor.**
- WARNING:** **Before performing any motor maintenance procedure, be sure that the equipment connected to the motor shaft cannot cause shaft rotation. If the load can cause shaft rotation, disconnect the load from the motor shaft before maintenance is performed. Unexpected mechanical rotation of the motor parts can cause injury or motor damage.**
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Safety Notice Continued

- WARNING:** Thermostat contacts automatically reset when the motor has slightly cooled down. To prevent injury or damage, the control circuit should be designed so that automatic starting of the motor is not possible when the thermostat resets.
- WARNING:** Use of an air jet may cause flying debris and generate particulate matter. Wear suitable skin, eye and respiratory protection. Failure to observe this precaution could result in bodily injury.
- Caution:** To avoid damage to the windings do not use air pressures greater than 30 psi (200 kPa). Avoid directing the air so dirt is blown into inner crevices.
- Caution:** To prevent premature equipment failure or damage, only qualified maintenance personnel should perform maintenance.
- Caution:** Do not use solvents containing trichloroethane to clean interior or exterior of motor. Damage may occur to paint and insulation systems.
- Caution:** To prevent damage, the motor shaft must be blocked to prevent axial movement whenever the motor is moved or relocated.
- Caution:** Do not over-lubricate motor as this may cause premature bearing failure.
- Caution:** Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load (gears, pumps, compressors, or other driven equipment) from the motor shaft before lifting the motor.
- Caution:** If eye bolts are used for lifting a motor, be sure they are securely tightened. The lifting direction should not exceed a 20° angle from the shank of the eye bolt or lifting lug. Excessive lifting angles can cause damage.
- Caution:** To prevent equipment damage, be sure that the electrical service is not capable of delivering more than the maximum motor rated amps listed on the rating plate.
- Caution:** If a Motor Insulation test (High Potential Insulation test) must be performed, disconnect the motor from any Speed Control or drive to avoid damage to connected equipment.
- Caution:** Some motors are designed for a single direction of rotation as indicated by nameplates. Running those units in the wrong direction will reduce airflow causing overheating. Check to see that both the motor and driven equipment are operating in the correct direction of rotation. If it is necessary to change rotation, disconnect and lockout all input power and interchange any two input power phases.

If you have any questions or are uncertain about any statement or procedure, or if you require additional information please contact your OEM.

Receiving

Each Baldor Electric Motor is thoroughly tested at the factory and carefully packaged for shipment. When you receive your motor, there are several things you should do immediately.

1. Observe the condition of the shipping container and report any damage immediately to the commercial carrier that delivered your motor.
2. Verify that the part number of the motor you received is the same as the part number listed on your purchase order.

- Caution:** Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load (gears, pumps, compressors, or other driven equipment) from the motor shaft before lifting the motor.

Handling

The motor should be lifted using the lifting lugs or eye bolts provided.

1. Use the lugs or eye bolts provided to lift the motor. Never attempt to lift the motor and additional equipment connected to the motor by this method. The lugs or eye bolts provided are designed to lift only the motor. Never lift the motor by the motor shaft or hood.
2. If the motor must be mounted to a plate with the driven equipment such as pump, compressor etc., it may not be possible to lift the motor alone. For this case, the assembly should be lifted by a sling around the mounting base. The entire assembly can be lifted as an assembly for installation. If the load is unbalanced (as with couplings or additional attachments) additional slings or other means must be used to prevent tipping. In any event, the load must be secure before lifting.

Storage

Storage requirements for motors and generators that will not be placed in service for at least six months from date of shipment.

Improper motor storage will result in seriously reduced reliability and failure. An electric motor that does not experience regular usage while being exposed to normally humid atmospheric conditions is likely to develop rust in the bearings or rust particles from surrounding surfaces may contaminate the bearings.

The electrical insulation may absorb an excessive amount of moisture leading to the motor winding failure.

A wooden crate “shell” should be constructed to secure the motor during storage. This is similar to an export box but the sides & top must be secured to the wooden base with lag bolts (not nailed as export boxes are) to allow opening and closing many times without damage to the “shell”.

Minimum resistance of motor winding insulation is 5 Meg ohms or the calculated minimum, whichever is greater. Minimum resistance is calculated as follows: $R_m = kV + 1$

where: (R_m is minimum resistance to ground in Meg-Ohms and
kV is rated nameplate voltage defined as Kilo-Volts.)

Example: For a 480VAC rated motor $R_m = 1.48$ meg-ohms (use $5 M\Omega$).
For a 4160VAC rated motor $R_m = 5.16$ meg-ohms.

Preparation for Storage

1. Some motors have a shipping brace attached to the shaft to prevent damage during transportation. The shipping brace, if provided, must be removed and stored for future use. The brace must be reinstalled to hold the shaft firmly in place against the bearing before the motor is moved.
2. Store in a clean, dry, protected warehouse where control is maintained as follows:
 - a. Shock or vibration must not exceed 2 mils maximum at 60 hertz, to prevent the bearings from brinelling. If shock or vibration exceeds this limit vibration isolation pads must be used.
 - b. Storage temperatures of 10°C (50°F) to 49°C (120°F) must be maintained.
 - c. Relative humidity must not exceed 60%.
 - d. Motor space heaters (when present) are to be connected and energized whenever there is a possibility that the storage ambient conditions will reach the dew point. Space heaters are optional.
Note: Remove motor from containers when heaters are energized, protect if necessary.
3. Measure and record the resistance of the winding insulation (dielectric withstand) every 30 days of storage.
 - a. If motor insulation resistance decreases below the minimum resistance, contact your OEM.
 - b. Place new desiccant inside the vapor bag and re-seal by taping it closed.
 - c. If a zipper-closing type bag is used instead of the heat-sealed type bag, zip the bag closed instead of taping it. Be sure to place new desiccant inside bag after each monthly inspection.
 - d. Place the shell over the motor and secure with lag bolts.
4. Where motors are mounted to machinery, the mounting must be such that the drains and breathers are fully operable and are at the lowest point of the motor. Vertical motors must be stored in the vertical position. Storage environment must be maintained as stated in step 2.
5. Motors with anti-friction bearings are to be greased at the time of going into extended storage with periodic service as follows:
 - a. Motors marked “Do Not Lubricate” on the nameplate do not need to be greased before or during storage.
 - b. Ball and roller bearing (anti-friction) motor shafts are to be rotated manually every 3 months and greased every 6 months in accordance with the Maintenance section of this manual.
 - c. Sleeve bearing (oil lube) motors are drained of oil prior to shipment. The oil reservoirs must be refilled to the indicated level with the specified lubricant, (see Maintenance). The shaft should be rotated monthly by hand at least 10 to 15 revolutions to distribute oil to bearing surfaces.
6. Coat all external machined surfaces with a rust preventing material. An acceptable product for this purpose is Exxon Rust Ban # 392.
7. Carbon brushes should be lifted and held in place in the holders, above the commutator, by the brush holder fingers. The commutator should be wrapped with a suitable material such as cardboard paper as a mechanical protection against damage.

Non-Regreaseable Motors

Non-regreaseable motors with “Do Not Lubricate” on the nameplate should have the motor shaft rotated 15 times to redistribute the grease within the bearing every 3 months or more often.

All Other Motor Types

Before storage, the following procedure must be performed.

1. Remove the grease drain plug, if supplied, (opposite the grease fitting) on the bottom of each bracket prior to lubricating the motor.
2. The motor with regreaseable bearing must be greased as instructed in Section 3 of this manual.
3. Replace the grease drain plug after greasing.
4. The motor shaft must be rotated a minimum of 15 times after greasing.

5. Motor Shafts are to be rotated at least 15 revolutions manually every 3 months and additional grease added every nine months (see Section 3) to each bearing.
6. Bearings are to be greased at the time of removal from storage.

Removal From Storage

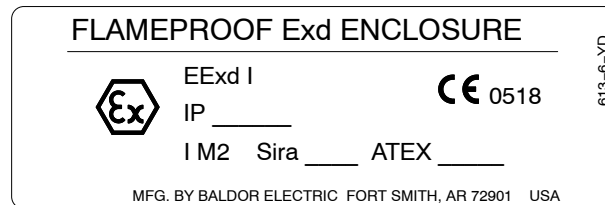
1. Remove all packing material.
2. Measure and record the electrical resistance of the winding insulation resistance meter at the time of removal from storage. The insulation resistance must not be less than 50% from the initial reading recorded when the motor was placed into storage. A decrease in resistance indicates moisture in the windings and necessitates electrical or mechanical drying before the motor can be placed into service. If resistance is low, contact your OEM.
3. Regrease the bearings as instructed in Section 3 of this manual.
4. Reinstall the original shipping brace if motor is to be moved. This will hold the shaft firmly against the bearing and prevent damage during movement.

EX Equipment Marking and Acceptance Instructions

ATEX:

If the motor is marked as shown in Figure 3-1, it is designed to comply with all European Directives in effect at the time of manufacture, including ATEX Directive 94/9/EC, Low Voltage Directive 73/23/EEC, and EMC Directive 89/336/EEC and designed considering the Machinery Directive 98/37/ EC. It is assumed that the installation of these motors by the OE Machinery manufacturer complies with this Directive and the standard EN 60204–1: Safety of Machinery – Electrical Equipment of Machines.

Figure 3-1 Typical AC and DC Mine Motor Markings



Any repairs by the end user, unless expressly approved by Baldor Electric Company, release Baldor Electric Company from responsibility to conformity. Authorized and qualified personnel only must perform repairs. These motors are designed in accordance with appropriate governmental regulatory agencies. They meet the technical requirements of the appropriate agencies at completion of manufacturing and have been issued approval numbers and nameplates. Any changes to these motors, may void these approvals and render these motors non-conforming and dangerous for use.

These motors are suitable for the ATEX Group and Category marked on the equipment nameplate. These motors are designed for normal mining applications and are in compliance with the above safety directives when operated within the parameters identified on the motor nameplate.

Specific motor type, frame designation, model number, date code, electrical specifications, and serial number are marked on a separate nameplate.

Special Conditions are indicated on the motor nameplate as a suffix "X" on the certificate number. Details of this condition can be found on the motor approval certificate.

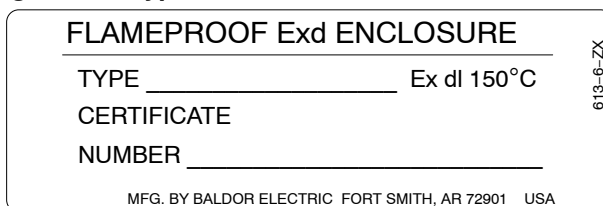
IEC, IECEX, ANZEX CERTIFICATION:

If the motors are marked as Indicated below, the motors are certified to IEC60079–0 and IEC60079–1 standard series. It is assumed that the installation of these motors by the OE Machinery manufacturer will be carried out in accordance with any national requirements for the intended market. Any Repairs by the end user, unless expressly approved by Baldor Electric Company, release Baldor Electric Company from responsibility to conformity. Authorized and qualified personnel only must perform repairs.

These motors are designed in accordance with appropriate governmental regulatory agencies. They meet the technical requirements of the appropriate agencies at completion of manufacturing and have been issued approval numbers and nameplates. Any changes to these motors, without the consent of Baldor Electric Company and the regulatory agencies may void these approvals and render these motors non-conforming and dangerous for use.

These motors are suitable for Group I with a maximum surface temperature of 150°C. Typical motor marking is shown in Figure 3-2.

Figure 3-2 Typical AC and DC Mine Motor Markings



Specific motor type, frame designation, model number, date code electrical specifications, and serial number are marked on a separate nameplate. The certificate number provides additional information for example certificate numbers such as IECEx are in the form IECExCCC.YY.nnnnX”, where CCC is the Certification Body, YY the year the certificate is issued, nnnn the certificate number and “X” is present if there are special conditions. For the ANZEx scheme, a similar convention exists and the numbers are in the form of “ANZEx YY.nnnnX” The certificate number is assigned to the various Australian certification bodies. Refer to the certificate for details on marking code and conditions of certification.

Specific Conditions of Use:

If the motor certificate number is followed by the symbol “X”, this indicates that the motor has specific conditions of use which are indicated on the certificate. It is necessary to review the product certification certificate in conjunction with this instruction manual.

Operation On Frequency Converters:

If the motor is evaluated for operation with an adjustable speed drive, the type of converter (for example PWM for Pulse Width Modulated) and safe speed ranges (for example 0–120Hz) will be specified in the certification documents or on motor nameplates. It is necessary to consult the adjustable speed drive manual for proper set up.

Acceptance Inspection

All motors should be inspected for damage prior to connecting the motor to an electrical supply. All covers should be in place and access cover bolts torqued to their proper levels. On motors received with the shaft blocked by the factory, remove blocking before operating the motor. If motor is to be reshipped, alone or installed to another piece of equipment, the shaft must again be blocked against axial movement to prevent brinelling of the bearings during shipment.



Section 2 Installation & Operation

- WARNING:** Electrostatic discharge from belts and pulleys must be eliminated prior to operation in areas subject to the risk of explosion. Explosion may result in severe injury or death.
- Caution:** Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load (gears, pumps, compressors, or other driven equipment) from the motor shaft before lifting the motor.
- Overview** Strict compliance with all local and national laws, regulations, and practices regarding the safe operation and maintenance of underground mining equipment is necessary to assure the personal safety of those working on, or around this equipment.
- The motor must be located in an environment that satisfies local codes and National Board of Fire and Underwriter's regulations. The following additional considerations should also govern its location.
- Caution:** If eye bolts are used for lifting a motor, be sure they are securely tightened. The lifting direction should not exceed a 20° angle from the shank of the eye bolt or lifting lug. Excessive lifting angles can cause damage.
- Caution:** To prevent damage, the motor shaft must be blocked to prevent axial movement whenever the motor is moved or relocated.
- Installation** Should additional handling or shipment of motors be required, be certain to block the shaft as it was blocked at the factory. Blocking the shaft limits the rotor movement both axially and radially which prevents bearing damage. When a common base is used to mount the motor and driven equipment, do not use the lifting means provided on the motor. The assembly should be lifted by a sling around the base or by other lifting means provided on the base. Assure lifting in the direction intended in the design of the lifting means.
- Eye bolts, lifting lugs or lifting openings when provided on the motor, are intended only for lifting the motor and standard motor mounted accessories not exceeding, in total, 30% of the motor weight. These lifting provisions should never be used when lifting or handling the motor and other equipment (i.e., gears, pumps or other driven equipment) as single unit.
- When the motor is an integral part of the mining machine, it should be mounted as prescribed by the OEM manufacturer.
- Where motors are separately mounted, a foundation sufficiently rigid to prevent excessive vibration should be used.
- Alignment** Accurate alignment of the motor with the driven equipment is extremely important. Forcibly driving the coupling or load onto the motor shaft will damage the bearings.
- After careful alignment, bolt motor securely in place. Use shims to fill any unevenness in the foundation. All motor feet should sit solidly on foundation before mounting bolts are tightened.
- The OEM must specify motor starter and overcurrent protection suitable for this motor and its application. Consult motor starter application data as well as applicable national and local codes.
- Coupling**
1. In preparation for making the coupling alignment, wash off the rust-protective coating on the motor shaft with solvent. Any factory-installed couplings should also be cleaned with solvent prior to installation on the shaft.
 2. Cylindrical bore couplings should be heated for proper mounting. Do not press or drive this type of coupling onto the shaft. Tapered bored couplings should be installed per the coupling manufacturer's recommendations.
- COUPLING ALIGNMENT**
- There are a number of different procedures in alignment of the motor to the driven equipment. The end result depends upon the accuracy of the parts in roundness, flatness, runout of the reference surfaces, rigidity of the mounting platform, and the skill of the set-up-person. The motor mounting surface must be flat and perpendicular to the shaft axis.
- COUPLING ALIGNMENT PROCEDURE**
- Refer to accepted procedures for coupling alignment such as double-dial indicator or laser alignment. Coupling alignment shall be within the following limits:
- Maximum Permissible Angular Misalignment = .001 inch per inch of coupling hub diameter.
Maximum Permissible Parallel Misalignment = .002 inch TIR (Total Indicated Runout).
The motor mounting bolts should be SAE Grade #8, 1.00 inch (ISO Class 8.8, M24) torqued to 125 +25/-00 lb-ft (170 +34/-00 Nm).

WARNING: Guards must be installed for rotating parts to prevent accidental contact by personnel. Accidental contact with body parts or clothing can cause serious or fatal injury.

Guarding Guards must be installed for rotating parts. This is particularly important where the parts have surface irregularities or hot surface temperatures.

Power Connection Motor and control wiring, overload protection, disconnects, accessories and grounding must conform to applicable national and local codes. The motor is provided with a quick disconnect socket or other suitable means for connection to the power source. Typically the customer provides the mating plug or approved packing gland parts. The customer side power and ground cable should be sized in accordance with the given countries applicable electrical and mine authorities electric code.

A main terminal box may be provided for power lines to the stator. Other terminal boxes for all other electrical connections may be provided.

Frames and accessories of motors must be earth bonded in accordance with recommended national and local codes. Motors must be properly grounded to earth by the OE mining equipment manufacturer and by qualified electricians during the field installation of replacement motors.

Connect the motor to the power supply of identical characteristics, according to the connection diagram on the motor nameplate.

This motor must be properly grounded to earth prior to operation. The motor earthing connection cable or facility is located adjacent to the motor power terminals in the motor conduit box or lead connection area. The earthing connection must be securely tightened to prevent loosening.

The machine cable providing power to the motor must incorporate an earthing conductor with a minimum cross-sectional area corresponding with the table below.

Grounding In the USA consult MSHA requirements for information on grounding of motors. In making the ground connection, the installer should make certain that there is a solid and permanent metallic connection between the ground point, the motor or generator terminal housing, and the motor or generator frame. In non-USA locations consult the appropriate applicable national and local codes.

Motors with resilient cushion rings usually must be provided with a bonding conductor across the resilient member. Some motors are supplied with the bonding conductor on the concealed side of the cushion ring to protect the bond from damage. Motors with bonded cushion rings should usually be grounded at the time of installation in accordance with the above recommendations for making ground connections. When motors with bonded cushion rings are used in multimotor installations employing group fusing or group protection, the bonding of the cushion ring should be checked to determine that it is adequate for the rating of the branch circuit over current protective device being used.

There are applications where grounding the exterior parts of a motor or generator may result in greater hazard by increasing the possibility of a person in the area simultaneously contacting ground and some other nearby live electrical parts of other ungrounded electrical equipment. In portable equipment it is difficult to be sure that a positive ground connection is maintained as the equipment is moved, and providing a grounding conductor may lead to a false sense of security.

Select a motor starter and over current protection suitable for this motor and its application. Consult motor starter application data as well as the National Electric Code and/or other applicable local codes.

For motors installed in compliance with IEC requirements, the following minimum cross sectional area of the protective conductors should be used:

Cross-sectional area of phase conductors, S mm ²	Minimum cross-sectional area of the corresponding protective conductor, S_p mm ²
$S < 16$	S
$16 < S \leq 35$	16
$S > 35$	$0,5 S$

Equipotential bonding connection shall made using a conductor with a cross-sectional area of at least 4 mm².

Conduit Box For ease of making connections, an oversize conduit box may be provided. Some conduit boxes can be rotated 360° in 90° increments. Auxiliary conduit boxes are provided on some motors for accessories such as space heaters, RTD's etc.

AC Power Motors with flying lead construction must be properly terminated and insulated. Connect the motor leads as shown on the connection diagram located on the name plate or inside the cover on the conduit box. Be sure the following guidelines are met:

1. AC power is within $\pm 10\%$ of rated voltage with rated frequency. (See motor name plate for ratings).
OR
2. AC power is within $\pm 5\%$ of rated frequency with rated voltage.
OR
3. A combined variation in voltage and frequency of $\pm 10\%$ (sum of absolute values) of rated values, provided the frequency variation does not exceed $\pm 5\%$ of rated frequency.

Caution: **Some motors are designed for a single direction of rotation as indicated by nameplates. Running those units in the wrong direction will reduce airflow causing overheating. Check to see that both the motor and driven equipment are operating in the correct direction of rotation. If it is necessary to change rotation, disconnect and lockout all input power and interchange any two input power phases. If you have any questions or are uncertain about any statement or procedure, or if you require additional information please contact your OEM.**

Rotation Check the nameplate to see if rotation is one direction only. All three phase motors are reversible. To reverse the direction of rotation, disconnect and lock out power and interchange any two of the three line leads for three phase motors.

Adjustable Frequency Power Inverters used to supply adjustable frequency power to induction motors produce wave forms with lower order harmonics with voltage spikes superimposed. Turn-to-turn, phase-to-phase, and ground insulation of stator windings are subject to the resulting dielectric stresses. Suitable precautions should be taken in the design of these drive systems to minimize the magnitude of these voltage spikes. Consult the OEM instructions for maximum acceptable motor lead lengths, and proper grounding.

Start Up Considerations AC Mine Motors are designed to operate in a normal mining environment. Loading and operation of motors should be in accordance with the nameplate data. The motor has been designed based on rating information, application data, and duty cycle analysis provided by the OEM. Proper motor cooling is required for normal operation of the motor.

Operation in excess of nameplate parameters is not recommended and may result in damage to the equipment and potential injury to operators and persons near the equipment. Safety related switching used by the OEM must actuate the relevant control devices without intermediate software command.

WARNING: **These motors are designed to operate at or below the maximum surface temperature stated in the ATEX directive in a normal mining application. Operation of these motors in excess of the nameplate parameters may cause the maximum allowable surface temperature to be exceeded, resulting in a risk of explosion.**

Temperature detection devices may be provided in these motors. The OEM determines the control setup to ensure operation within the thermal limit characteristics of the motor.

The following conditions are examples of improper motor operation:

1. Load imposed on the motor exceeds its nameplate value or motor power rating.
2. Ambient temperatures that exceed the nameplate temperature value.
3. Voltages $\pm 10\%$ above or below the voltage(s) specified on the motor nameplate.
4. Voltage unbalanced conditions.
5. Insufficient or loss of coolant flow.
6. Adjustable frequency operation for motors designed for sine wave power only.
7. Altitude above 3000 ft (1000m).
8. Severe duty cycles and/or repeated starts.
9. Motor stall.
10. Motor reversing
11. Poly phase motors being operated in single phase condition

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12. Operating motors on variable frequency drives with operating parameters other than those specified on the motor certification drawings
 13. Improper alignment of motor mounting.

First Time Start Up Be sure that all power to motor and accessories is off. Be sure the motor shaft is disconnected from the load and will not cause mechanical rotation of the motor shaft.

1. Be sure the electrical power to the motor is OFF and Locked and Tagged Out of service.
2. If motor has been in storage or idle for some time, check winding insulation integrity (see Section 1).
3. If motor has been in storage or idle for some time, check winding insulation integrity (see Section 1).
4. Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity.
5. Be sure all shipping materials and braces (if used) are removed from motor shaft.
6. Manually rotate the motor shaft to ensure that it rotates freely.
7. Replace all panels and covers that were removed during installation, tighten hardware.
8. Check the incoming power to be sure that line voltage, frequency and phase are correct for the motor (refer to the motor nameplate).
9. Momentarily apply power and check the direction of rotation of the motor shaft.

Caution: **Some motors are designed for a single direction of rotation as indicated by nameplates. Running those units in the wrong direction will reduce airflow causing overheating. Check to see that both the motor and driven equipment are operating in the correct direction of rotation. If it is necessary to change rotation, disconnect and lockout all input power and interchange any two input power phases. If you have any questions or are uncertain about any statement or procedure, or if you require additional information please contact your OEM.**

10. If motor rotation is wrong, be sure power is off and change the motor lead connections unless nameplate indicates single direction of rotation. Verify rotation direction before you continue.
11. Start the motor and ensure operation is smooth without excessive vibration or noise. If so, run the motor for 1 hour with no load connected.
12. If bearing temperature detectors are provided, check the temperatures frequently during the initial hour of operation. At initial start, the bearing temperature rate of rise will be high. This rate of rise should decrease within 30 minutes. If this rate of rise does not decrease or the temperature exceeds 130°C, stop the motor.
13. Run the motor for an additional 1 hour of operation and verify no problems are encountered.
14. If motor is totally enclosed fan-cooled or non-ventilated it is recommended that condensation drain plugs, if present, be removed. These are located in the lower portion of the end-shields. Totally enclosed fan-cooled "XT" motors are normally equipped with automatic drains which may be left in place as received.

Initial Lubrication Baldor motors are shipped from the factory with the bearings properly packed with grease and ready to operate. Where the unit has been subjected to extended storage (6 months or more) the bearings should be relubricated (regreaseable type) prior to starting. When motors are equipped for oil mist lubrication refer to the instruction manual for installation, operation, and maintenance of oil mist lubrication systems.

Test for General Condition

If the motor has been in storage for an extensive period or has been subjected to adverse moisture conditions, it is best to check the insulation resistance of the stator winding with a meg ohm meter. If the resistance is less than 5 meg ohms, the windings should be dried. Contact your OEM.

Coupled Start Up This procedure assumes the first time start up procedure was successful.

1. Be sure the electrical power to the motor is OFF and Locked and Tagged Out of service.
2. Assemble and lubricate the coupling with the manufacturer's recommended lubricant.
3. Couple the motor shaft to the load.
4. Perform Coupling Alignment in Section 2 of this manual. Ensure that the coupling is not binding.
5. Check the coupling and ensure that all guards and protective devices are installed.
6. Check that the coupling is properly aligned and not binding.
7. The first coupled start up should be with no load. Apply power and verify that the load is not transmitting excessive vibration back to the motor through the coupling or the foundation. Vibration should be at an acceptable level.
8. Run for approximately 1 hour with the driven equipment in an unloaded condition.

The equipment can now be loaded and operated within specified limits. Do not exceed the name plate ratings for amperes for steady continuous loads.

VIBRATION LIMITS The vibration levels listed above are only guidelines.

Condition	Amplitude On Bracket
	Amplitude on Bracket in/sec
Warning	.2
Shutdown	.3

TEMPERATURE LIMITS The temperature levels listed above are only guidelines.

Condition	Bearing RTD °C	Winding RTD °C
	Warning	120
Shutdown	130	145

Jogging and Repeated Starts Repeated starts and/or jogs of induction motors generally reduce the life of the motor winding insulation. A much greater amount of heat is produced by each acceleration or jog than by the same motor under full load. If it is necessary to repeatedly start or jog the motor, it is advisable to check the application with your OEM or your Baldor District Office.

From ambient temperature, the motor is normally capable of making two starts in succession while coasting to rest between these starts. The motor is also normally capable of making one start from its rated load operation temperature.

If more starts or less time between starts than defined above are attempted, severe damage to the motor electrical windings and rotor may result.

These starting conditions apply only if the inertia of the connected load, the load torque during acceleration, the applied voltage, and the starting method are those for which the motor was designed. For starting situations not covered here, consult your Baldor District Office. Refer also to the motor nameplate which may list starting conditions.

Heating

Duty rating and maximum ambient temperature are stated on the motor name plate.

Do not exceed these values. If there is any question regarding safe operation, contact your OEM.

Hazardous Locations

Hazardous locations are those where there is a risk of ignition or explosion due to the presence of combustible gases, vapors, dust, fibers or flyings.

Selection Facilities requiring special equipment for hazardous locations are typically classified in accordance with local requirements. This classification process lets the installer know what equipment is suitable for installation in that environment, and identifies what the maximum safe temperature or temperature class is required. It is the customer or users responsibility to determine the area classification and select proper equipment.

Protection Concepts

Zone 1 [Equipment Group I (mining) or Equipment Protection Level (EPL) Gb, Mb]

Baldor•Reliance offers a range of motors suitable for installation in a mining environment. These motors are known as explosion proof or flameproof. Motors that are explosion proof or flameproof use specially machined flameproof joints between the end bell or bracket and the frame, as well as along the rotating shaft and at connection box covers and entries. The fit of these flameproof joints are designed to contain the combustion or quench the flame of an explosive gas atmosphere prior to it exiting the motor. These flameproof joints have lengths and widths selected and tested based on the gas group present in the atmosphere.

These motors are not gas tight. To the contrary, this protection concept assumes that due to the normal heating and cooling cycle of motor operation that any gas present will be drawn into the motor. Since flameproof or explosion proof motors are designed to contain the combustion and extinguish any flame transmission, for this protection concept, only external surface temperatures are of concern. Thermal limiting devices such as thermostats, thermistors or RTDs may be provided on these motors to limit the external surface temperature during overload conditions.

If thermostats are provided as a condition of certification, it is the installer's responsibility to make sure that these devices are properly connected to a suitable switching device. Flameproof motors are internationally referred to as Ex d. Representative motors are laboratory tested to verify that a flame is not transmitted outside the motor enclosure and to determine the maximum internal pressure encountered.

Sine Wave Power Operation for Hazardous Locations.

These motors are designed to operate at or below the maximum surface temperature (or T-Code) stated on the nameplate. Failure to operate the motor properly can cause this maximum surface temperature to be exceeded. If applied in a mining environment, this excessive temperature may cause ignition of hazardous materials. Operating the motor at any of the following conditions can cause the marked surface temperature to be exceeded.

1. Motor load exceeding service factor nameplate value
2. Ambient temperatures above nameplate value
3. Voltages above or below nameplate value
4. Unbalanced voltages
5. Loss of proper ventilation
6. Altitude above 3300 feet / 1000 meters
7. Severe duty cycles of repeated starts
8. Motor stall
9. Motor reversing
10. Single phase operation of poly phase equipment
11. Variable frequency operation

Variable Frequency Power Operation for Hazardous Locations (motors with maximum surface temperature listed on the nameplate).

Only motors with nameplates marked for use on inverter (variable frequency) power, and labeled for specific hazardous areas may be used in those hazardous areas on inverter power. The motor is designed to operate at or below the maximum surface temperature (150°C) stated on the nameplate. Failure to operate the motor properly can cause this maximum surface temperature to be exceeded. If applied in a mining environment, this excessive temperature may cause ignition of hazardous materials. Operating the motor at any of the following conditions can cause the marked surface temperature to be exceeded.

1. Motor load exceeding service factor nameplate value
2. Ambient temperature above nameplate value
3. Voltage (at each operating frequency) above or below rated nameplate value
4. Unbalanced voltages
5. Loss of proper ventilation
6. Operation outside of the nameplate speed / frequency range
7. Altitudes above 3300 feet / 1000 meters
8. Single phase operation of poly phase equipment
9. Unstable current wave forms
10. Lower than name plate minimum carrier frequency

Thermal Limiting

Thermal limiting devices are temperature sensing control components installed inside the motor to limit the internal temperature of the motor frame by interrupting the circuit of the holding coil of the magnetic switch or contactor. They are required for most Division 1 and Zone 1 applications. For Division 2 or Zone 2 applications, motors should be selected that preclude running temperatures from exceeding the ignition temperatures for the designated hazardous material. In Division 2 or Zone 2 classified locations, thermal limiting devices should only be used for winding protection and not considered for limiting all internal motor temperatures to specific ignition temperatures.

Equipotential Bonding and Shaft Current Reduction

Larger motors (ie WP construction) may require proper bonding between motor enclosures and covers to avoid the risk of stray currents during start up. Fastening methods and bonding straps must not be modified. Bearing currents can exist in some motors for both line-fed and inverter-fed applications. Larger line-fed motors may require at least one insulated bearing to prevent a flow of current through the bearings. Do not defeat such insulation whether the motor is line-fed or inverter-fed applications. Inverter-fed motors may require additional bearing insulation or even a shaft brush. Do not defeat such features. When the motor and the coupled load are not on a common conductive base plate, it may also be necessary to electrically bond together the stationary parts of the motor and the coupled equipment.

Repair of Motors used in Hazardous Locations

Repair of hazardous certified motors requires additional information, skill, and care. It is the customer's responsibility to select service shops with proper qualifications to repair hazardous location motors. Contact the manufacture for additional repair details. Use only original manufacturer's parts.

Repair of Explosion Proof or Flame Proof Motors

In the international markets using IEC based requirements, repair should be undertaken only after consulting IEC60079-19 Explosive Atmospheres-Part 19 Equipment repair, overhaul and reclamation. If use of a certified repair facility is desired, consult the IECEx Repair Scheme at

http://www.iecex.com/service_facilities.htm

Explosion proof and flameproof motors achieve their safety based on the mechanical construction – flameproof joints and bearing clearance, and the electrical design including any thermal limiting devices. If it is necessary to repair a flameproof or explosion proof motor, it is critical that the mechanical flameproof joints be maintained. Consult OEM. Because this protection method also relies on temperature being maintained, make sure that any rewinding uses the original electrical designs, including any thermal protection that may be present.

Section 3

Maintenance & Troubleshooting

General Inspection Baldor 6800 Frame motors, when properly applied, require minimal routine maintenance. Since clearances and fits are precisely machined, no periodic mechanical adjustments are required. Like any precision machine, periodic inspection and simple routine maintenance will prolong your motor's life and help detect potentially damaging conditions. The minimal time spent performing the simple cleaning and maintenance procedures will have great payback.

WARNING: **Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.**

WARNING: **Surface temperatures of motor enclosures may reach temperatures which can cause discomfort or injury to personnel accidentally coming into contact with hot surfaces. When installing, protection should be provided by the user to protect against accidental contact with hot surfaces. Failure to observe this precaution could result in bodily injury.**

Caution: **Do not use solvents containing trichloroethane to clean interior or exterior of motor. Damage may occur to paint and insulation systems.**

Every 3 months or 500 operating hours, whichever comes first:

- 1 Listen for any abnormal noises and check cause immediately.
- 2 Check that the motor is clean. Check that the exterior surfaces are free from dirt and debris. If the motor is not properly ventilated, overheating and early failure can occur.
- 3 Check for excessive vibration.
- 4 Check to see that all covers are in place and secure.
- 5 Check for proper lubrication.
- 6 Check bearing temperature rise.
- 7 Check voltage and frequency variations. Unbalanced voltage or single-phase operation of poly phase motors will cause excessive heating and ultimately failure. Only a slight unbalance of voltage applied to a poly phase motor will cause large unbalance currents and result in overheating. Check power supply total harmonic distortion to avoid overheating. Periodic checks of phase, voltage, frequency, and power consumption of an operating motor are recommended.

These checks can also provide an excellent indication of the load from the driven equipment.

Comparisons of this data with previous no load and full load power demands will give an indication of the performance of the driven machine.

Relubrication & Bearings Bearing grease will lose its lubricating ability over time, not suddenly. The lubricating ability of a grease (over time) depends primarily on the type of grease, the size of the bearing, the speed at which the bearing operates and the severity of the operating conditions. Good results can be obtained if the following recommendations are used in your maintenance program.

This motor is equipped with anti-friction bearings and the Positive Lubrication System which routes new grease directly into the bearing.

Cleanliness is important in lubrication. Any grease used to lubricate anti-friction bearings should be fresh and free from contamination. Similarly, care should be taken to properly clean the grease inlet areas of the motor prior to lubricating to prevent grease contamination.

Type of Grease A high grade ball or roller bearing grease should be used. Use only OEM recommended grease. Do not mix greases unless compatibility has been checked and verified.

Relubrication Intervals Recommended relubrication intervals are shown in Table 3-2. It is important to realize that the recommended intervals of Table 3-2 are based on average use.

Refer to additional information contained in Tables 3-3 and 3-1.

Table 3-1 Service Conditions

Severity of Service	Description
Standard	Eight hours per day, normal or light loading, clean ambient air at -32° F (-18° C) to 104° F (40° C)
Severe	Twenty four hours per day operation or shock loading, vibration, ambient air containing dirt or dust at 100–120° F (40–50° C) .
Extreme	Heavy shock or vibration, ambient air containing dirt, dust or high humidity and temperatures in excess of 104° F (40° C)

Table 3-2 Relubrication Intervals

Anti Friction Bearings			
Rated RPM	Standard	Severe	Extreme
≥ 3000	6 months	3 months	2 months
< 3000	6 months	3 months	3 months
Roller Bearings			
< 3000	4 months	2 months	1.5 months

Table 3-3 Relubrication Volume

Drive Method	3000 & 3600 RPM	< 3000RPM
Coupled Duty	1.5 in ³	3.0 in ³
Belted Duty		4.0 in ³
Data on a lubrication nameplate on the motor takes precedent over this Table.		

1. Select the Service Conditions from Table 3-1.
2. Select Lubrication Frequency from Table 3-2.
3. Select Lubrication Volume from Table 3-3.

Caution: To avoid damage to motor bearings, grease must be kept free of dirt. For an extremely dirty environment, contact your OEM for additional information.

Caution: Do not over-lubricate motor as this may cause premature bearing failure.

Caution: Over-lubricating can cause excessive bearing temperatures, premature lubrication breakdown and bearing failure.

Relubrication Procedure Be sure that the grease you are adding to the motor is compatible with the grease already in the motor. Consult local Baldor District office if a grease other than the nameplate recommended type is to be used.

Anti-friction bearings may be lubricated with the motor running or stationary. (Stationary with the motor warm is recommended.)

1. Relubrication with the shaft stationary and a warm motor is recommended.
If lubrication must be done with motor running, stay clear of rotating parts and electrical circuits.
2. Locate the grease inlet, clean the area and replace the pipe plug with a grease fitting, if the motor is not equipped with grease fittings. There is one grease inlet per bearing.
3. Remove relief plug. If grease is caked around the plug, clean with a wooden stick or suitable tool, if severe caking appears at the plug, run the motor until the bearing housing is warm, permitting a free flow of grease through the housing.
4. Locate the motor nameplate. Find the lubricant recommended type and volume.
5. Add the recommended volume of the recommended lubricant using a hand operated grease gun.
6. Run the motor for several minutes with relief plug removed.

7. Replace the pipe plugs and wipe off excess grease.

Anti Friction Bearing Replacement

1. For anti-friction bearing motors the inner cap bolts must be removed before removing the motor bracket.
2. Remove all bolts that secure the bracket to the frame.
3. Using a hoist, support the bracket.
4. Jacking holes have been provided in the bracket mounting lugs to facilitate the removal of the bracket from the frame rabbet fit. Tighten the jack bolts evenly to avoid mis-alignment of the bracket during removal.
5. At this stage, the bearing is still seated in the bracket bearing bore. Remove the bracket from the bearing by rocking the bracket from side-to-side while applying an axial force on the bracket. After the bracket has cleared the bearing, use the hoist to move the bracket off of the shaft and away from the motor.
6. The bearing can now be removed by using a conventional bearing puller. Locate the puller arms behind the bearing outer race for ball bearings and behind the bearing inner race for roller bearings. Protect the shaft center by using a spacer block of brass or some other soft material between the shaft and bearing puller. Remove the bearing by applying axial force with the bearing puller.
7. With roller bearings, the bearing rolling elements and outer race are contained within the bearing bracket bore. This bearing assembly can be removed from the bracket bearing bore by pulling on the rolling elements or by tapping on the outer race through the shaft bore in the bracket.
8. Clean and inspect all parts. Remove all old grease from the inner caps, brackets, grease inlet and drain piping and shaft. Replace all shaft and cap seals.
9. All shaft bearing shoulders and journals should be free of nicks before replacing bearing. Dress shaft with emery cloth or stone as necessary. Assemble the bearing inner caps onto the shaft.
10. Heat bearing to 250° F (120° C) for at least 30 minutes.
11. Place bearing onto shaft. Make certain that the bearing is contacting the locating shoulder on shaft.
DO NOT use impact force on bearing.
12. Let the bearing cool. Protect the bearing from contamination. Fill the outboard side cavity of the bearing, cage and rolling element area of the bearing, 100% with grease. Fill the bearing inner cap cavities and bracket bearing housing cavity with grease to 60% full. Fill the grease inlet pipe 100% with grease.
13. Assemble the brackets in reverse order of Steps 1 through 6. Torque bolts per table NO TAG.

Rotor and Stator Removal

Contact Baldor District Office for proper removal procedures.

- WARNING:** Use of an air jet may cause flying debris and generate particulate matter. Wear suitable skin, eye and respiratory protection. Failure to observe this precaution could result in bodily injury.
- Caution:** Do not use solvents containing trichloroethane to clean interior or exterior of motor. Damage may occur to paint and insulation systems.
- Caution:** To avoid damage to the windings do not use air pressures greater than 30 psi (200 kPa). Avoid directing the air so dirt is blown into inner crevices.

Winding Maintenance

De-energize motor by opening manual disconnect and locking out. To inspect the ends and outside surface of the windings, remove the brackets from the motor. Inspection of these portions of the windings will provide a good indication of their general condition. To thoroughly inspect and clean the windings it may be necessary to remove the rotor.

There are numerous methods for cleanings windings. The following methods are most commonly used, in order of preference.

Note: Before cleaning the windings check for loose blocking, evidence of damage to insulation, distortion or movement of coils, etc. If any of these conditions exist, contact your local Baldor District Office for recommendations.

Dry Wiping

This method is satisfactory when the surfaces to be cleaned are accessible and when only dry dirt is to be removed. Use a clean dry, lint-free cloth. The lint will adhere to the insulation and increase dirt collection. Lint is particularly objectionable on high voltage insulation systems as it tends to concentrate corona discharge.

Brushing and Suction Cleaning

Remove the dry dust and dirt by brushing with a bristle brush, followed by a vacuum suction cleaning. **Do not use wire brushes.**

Blowing

Dry dirt and dust can be removed from inaccessible crevices by using a jet of low pressure, oil free compressed dry air.

Cleaning with Water and Detergent

Windings can be cleaned by hose washing or by pressure spray from a low pressure steam generator or shop steam line.

Oil, grease, tar and wax can be removed by adding a non-conductive detergent to the wash water. After washing, it is necessary to dry the windings in an oven. Bake in an oven (preferably a circulating air oven) at a temperature not over 90°C until insulation resistance remains constant.

After cleaning, measure the insulation resistance as given in Section 1 of this manual. Bake in oven until acceptable resistance is measured. For motors in good condition, insulation resistance readings of 10 to 100 times RM stated in Section 1 are common.

Table 3-4 Troubleshooting Chart

Symptom	Possible Causes	Possible Solutions
Motor will not start	Usually caused by line trouble, such as, single phasing at the starter.	Check source of power. Check overloads, fuses, controls, etc.
Excessive humming	High Voltage.	Check input line connections.
	Eccentric air gap.	Have motor serviced at local Baldor service center.
Motor Over Heating	Overload. Compare actual amps (measured) with nameplate rating.	Locate and remove source of excessive friction in motor or load. Reduce load or replace with motor of greater capacity.
	Single Phasing.	Check current at all phases (should be approximately equal) to isolate and correct the problem.
	Improper ventilation.	Check external cooling fan to be sure air is moving properly across cooling fins. Excessive dirt build-up on motor. Clean motor.
	Unbalanced voltage.	Check voltage at all phases (should be approximately equal) to isolate and correct the problem.
	Rotor rubbing on stator.	Check air gap clearance and bearings. Tighten "Thru Bolts".
	Over voltage or under voltage.	Check input voltage at each phase to motor.
	Open stator winding.	Check stator resistance at all three phases for balance.
	Grounded winding.	Perform dielectric test and repair as required.
	Improper connections.	Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity. Refer to motor lead connection diagram.
	Bearing Over Heating	Misalignment.
Excessive belt tension.		Reduce belt tension to proper point for load.
Excessive end thrust.		Reduce the end thrust from driven machine.
Excessive grease in bearing.		Remove grease until cavity is approximately $\frac{3}{4}$ filled.
Insufficient grease in bearing.		Add grease until cavity is approximately $\frac{3}{4}$ filled.
Dirt in bearing.		Clean bearing cavity and bearing. Repack with correct grease until cavity is approximately $\frac{3}{4}$ filled.
Vibration	Misalignment.	Check and align motor and driven equipment.
	Rubbing between rotating parts and stationary parts.	Isolate and eliminate cause of rubbing.
	Rotor out of balance.	Have rotor balance checked and repaired at your Baldor Service Center.
	Resonance.	Tune system or contact your Baldor Service Center for assistance.
Noise	Foreign material in air gap or ventilation openings.	Remove rotor and foreign material. Reinstall rotor. Check insulation integrity. Clean ventilation openings.
Growling or whining	Bad bearing.	Replace bearing. Clean all grease from cavity and new bearing. Repack with correct grease until cavity is approximately $\frac{3}{4}$ filled.

ICDS SYSTEM SNAPSHOT

The ICDS motor is a 1250 HP, 1.15 SF, 4160 volt three phase induction motor with on board temperature monitoring and real time power measurement. The motor has sensors and electronics located in the main conduit box as well as four other small X/P boxes located on top of the motor. The main conduit box is located on the drive end divided into three compartments. One compartment for electronics, a center compartment for the main power leads and current transformer, and a third compartment for the potential transformers .

ACCESSIBLE MOTOR SENSORS

- Potential Transformers
35:1 ratio PT (2 total)
- Current Transformer
300:5 ratio CT
- Water In Temperature 100 ohm RTD
- Water Out Temperature 100 ohm RTD
- XP Enclosure Temperature 100 ohm RTD
- DE Vibration Probe 0-25mm/sec probe
- ODE Vibration Probe 0-25mm/sec probe

ACCESSIBLE ELECTRONICS

- Power Monitor 3000
- CompactLogix Controller
- 1606 XLP Power supply
- 12 volt DC supply
- DBT UOI Isolator

INTERNAL MOTOR SENSORS

- Winding Temperatures (one per phase) 100 ohm RTD's (3 total)
- Bearing Temperatures (one per bearing) 100 ohm RTD's (2 total)

BASIC TROUBLESHOOTING

Note: The troubleshooting tips below require the explosion proof covers be removed to access devices inside the conduit boxes. Refer to proper mine site and MSHA regulations for proper servicing of devices inside an XP conduit box.

RTD's

1. If values displayed are exceptionally high (greater than 185 C winding or 145 C water and bearing temperatures) a loose wire could be the culprit. All RTD's terminate on one of two modules on the CompactLogix rack. Confirm placement and secure leads. **No external surface temperature readings (water RTD's) should ever exceed 145 C or motor must be de-energized and allowed to cool. Confirm proper water flow is going through motor.**
2. Numbers greater than 800 C indicate an RTD that has been disconnected, broken wires or the temperature element has failed.
3. Disconnect RTD from CompactLogix module and check resistance with an ohmmeter. Values of the RTD should be less than 250 oh ms. If resistance values show infinity then the RTD has failed or the wires between the element and terminals are broken. Replace wires or RTD if possible. If resistance values show close to zero or less than 100 ohms then check the leads you are measuring. Measure between the red and white leads (or black and white leads on water RTD's). Check wiring harness on water RTD's for proper continuity and signs of any damage. If measurements with an ohmmeter are correct confirm proper color placement on terminal strip and tighten leads. Confirm that no external motor surface temperatures ever exceeds 145C.

VIBRATION MONITORS

If problems exist with the vibration probe readings the following should be checked.

1. Check +24 volts output from PLC terminal.
2. Check 1 amp fuses for continuity with an ohmmeter.
3. Check wiring harness for continuity with an ohmmeter on each of the three leads.
4. Check remaining wiring between PLC, analog module, and probes.
5. If only one probe is not functioning, swap the working probe with the non working probe to eliminate the probe as the possible cause of problem. If probe still does not operate then replace probe.

POWER MONITOR

If problems exists with the readings on either voltage, current, real power out put, or reactive power output then the Power Monitor 3000 should be checked for problems

1. Check the configuration of the Power Monitor with the external display unit. These values are:
 - a. Confirm that configuration is set for "Open Delta 3 CT".
 - b. Confirm that the potential transformer ratio is set for "4160" primary and "120" secondary.
 - c. Confirm the current transformer ratio is set for "3 00" primary and "5" secondary.
 - d. Confirm that the neutral current I4 CT is set for "5" primary and "5" secondary.
2. Check for proper wiring from the Ct's and Pt's to the Power Monitor. Review against wiring diagram.

COMPACTLOGIX PLC

If no data is being received from the PLC confirm the problems.

1. Confirm all the proper lights are on the Power Monitor, each PLC module, and the PLC itself. The "activity" light of the Power monitor and the PLC should be continuously blinking.
2. Confirm that the receive and transmit lights on the DBT UOI are blinking.
3. Confirm the DBT PMC-D and PMC-V are operating properly.
Reload the program from compact flash if no activity lights are blinking. Insert compact flash card in appropriate slot and cycle 120 volt power on the PLC.

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