


AUTOTRANSLINEATOR™


AUTOTRANSFORMER AND UNIVERSAL HARMONIC FILTER



IMPORTANT SAFETY INSTRUCTION

SAVE THESE INSTRUCTIONS - This manual contains important instructions for the AutoTransLineator™ that must be followed during installation, operation, and maintenance of the AutoTransLineator™ and its auxiliary equipment.

	<p style="text-align: center;">WARNING</p> <p style="text-align: center;">OPENING ENCLOSURES EXPOSES HAZARDOUS VOLTAGES. ALWAYS REFER SERVICE TO QUALIFIED PERSONNEL ONLY.</p>
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	<p style="text-align: center;">WARNING</p> <p>As standards, specifications, and designs are subject to change, please ask for confirmation of the information given in this publication.</p> <p>This manual is a controlled document; pages should not individually be removed from this document.</p>
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AUTOTRANSLINEATOR™

INSTALLATION, OPERATION AND MAINTENANCE GUIDE

ATL-M001-A2
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Warranty and Performance Guarantee

1. **Warranty:** MIRUS International Inc. ("MIRUS") warrants to the end-user (the "Customer") of the AUTOTRANSLINEATOR™ Harmonic Filter ("ATL") as follows:
 - (a) The AUTOTRANSLINEATOR™ ATL will be free from defects in materials and workmanship under normal use and service for a period of 3 years from the date of shipment; and
 - (b) The AUTOTRANSLINEATOR™ ATL will perform as advertised to reduce harmonic distortion caused by AC Variable Speed Drives and other non-linear loads equipped with 3-phase, 6-pulse, diode bridge rectifiers. A properly selected and installed AUTOTRANSLINEATOR™ will:
 - (i) Reduce Current Total Harmonic Distortion (ITHD), measured at the AUTOTRANSLINEATOR™ input terminals at full load, to:
 - < 8% when background voltage distortion is < 5% and voltage imbalance is < 3%
 - < 5% when short circuit ratio (Isc/IL), as defined by IEEE Std 519, is < 20 and when background voltage distortion is < 0.5% and voltage imbalance is < 1%
 - (ii) Reduce Current Total Demand Distortion (ITDD), measured at the AUTOTRANSLINEATOR™ input terminals over its entire operating range, to levels defined in Item 1 above. ITDD is defined as the measured ITHD multiplied by the ratio of measured RMS current to full load current (peak demand current) of the AUTOTRANSLINEATOR™.
 - (iii) Minimize the contribution to Voltage Harmonic Distortion of all VSD's equipped with the AUTOTRANSLINEATOR™ to < 5% total and < 3% for individual harmonics, as defined by IEEE Std 519-1992.
 - (iv) NOT become overloaded by other upstream harmonic sources.
 - (v) NOT resonate with other power system components.
 - (vi) NOT have compatibility problems with engine generator sets properly sized for the load.
2. **Limitation:** Limitation: The foregoing warranties shall not apply and shall be void if the AUTOTRANSLINEATOR™ ATL has been subject to misuse, abuse, accident, disaster, or has been operated contrary to MIRUS' instructions relating to installation, maintenance, use or operation.
3. **Exclusive Remedy:** If the AUTOTRANSLINEATOR™ ATL does not conform with the warranties set out above, the Customer must notify MIRUS of the defective unit within the applicable warranty period and obtain a written return material authorization (an "RMA") from MIRUS. The Customer must return the defective unit to MIRUS, freight prepaid, within sixty (60) days of receipt of the RMA and must include a copy of MIRUS' paid invoice for the defective unit and a description of the defective unit's failure to conform. If MIRUS agrees that the returned unit is defective, MIRUS' entire obligation and liability shall be, in MIRUS' sole discretion, to repair or replace the defective unit or give a full refund of the purchase price to the Customer.

THE FOREGOING IS THE CUSTOMER'S SOLE AND EXCLUSIVE REMEDY FOR BREACH OF WARRANTY BY MIRUS WITH RESPECT TO THE AUTOTRANSLINEATOR™ ATL.
4. **Replacement or Repaired Product Warranty:** Any repaired or replaced AUTOTRANSLINEATOR™ ATL shall be warranted as set forth herein for the remainder of the applicable warranty period of the original unit or for three (3) months, whichever is greater.

Service and Factory Repair - Call 1 - 888 - TO - MIRUS (1 - 888 - 866 - 4787)

Direct questions about the operation, repair, or servicing of this equipment to MIRUS International Inc. Customer Support Services. Include the part number, assembly number, and serial number of the unit in any correspondence. Should you require factory service for your equipment, contact MIRUS International Inc. Customer Support Services and obtain a Return Materials Authorization (RMA) prior to shipping your unit. Never ship equipment to MIRUS International Inc. without first obtaining an RMA.

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Revision History

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1.0 Installation

	<p>WARNING</p> <p><i>Danger! There is the potential of electric shock whenever working in or around electrical equipment such as transformers. Power must be shut off before any work is conducted on a transformer.</i></p>
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1.1 Location

Location of the AUTOTRANSLINEATOR™ should be made with consideration given to accessibility, ventilation and atmospheric conditions. Sufficient clearances from walls and other obstructions should be provided to permit unrestricted opening of hinged and removable doors, covers and panels for the purpose of wiring terminations, inspection, maintenance and testing. Also, **proper ventilation requires at least 6 in. (155mm) clearance** at all ventilation openings. In enclosed rooms, minimum air circulation of 100 ft³/min per kilowatt of transformer loss should be provided.

Installation locations should be free of contaminants including dust, fertilizer, excessive moisture, corrosive gases, flammable materials or chemical fumes. Filtered air may be considered to reduce maintenance where air born contaminants are a problem.

Enclosures are designed in accordance with NEMA and UL standards and can allow for installation in various environments. Standard enclosures for the AUTOTRANSLINEATOR™ are NEMA3R and NEMA3R Enhanced.

Where AUTOTRANSLINEATOR™ are connected to lines subject to lightning exposure or other voltage surges, careful coordination of BIL levels and protective surge arresters must be made. For derating factors which apply to installation at high altitudes, refer to ANSI C57.12.01-1989.

1.2 Inspection

Upon receipt of shipment the AUTOTRANSLINEATOR™ should be inspected for any damage incurred during shipment. Before energization an internal inspection should be conducted with emphasis on loose or broken connections, damaged or displaced parts, cracked insulators, dirt or foreign material, or evidence of moisture.

1.3 Handling

The AUTOTRANSLINEATOR™ should be thoroughly protected against the entrance of dust, rain or snow when handled outdoors.

When lifting the AUTOTRANSLINEATOR™, the lifting cables should be held apart by a spreader to avoid bending the lifting lugs or other parts of the structure. The AUTOTRANSLINEATOR™ may be skidded or moved on rollers but care must be taken not to damage the base or tip it over. When rollers are used under larger units, skids must be used to distribute the stress over the base.

After the AUTOTRANSLINEATOR™ is placed in permanent position, shipping braces should be removed and shipping bolts, if present, should be loosened. **Where isolation pads have been included, the bolt should be loosened until the spring washer has been relaxed before putting into service.** This will reduce noise resulting from the AUTOTRANSLINEATOR'S™ natural vibration.


1.4 Grounding

Consideration must be given to equipment grounding (case and core) and must be made in accordance with all applicable electrical codes.

2.0 Storage

Condensation and moisture absorption must be prevented during storage. The AUTOTRANSLINEATOR™ must be stored in a warm, dry location. Ventilation openings should be covered to keep out dust. If outdoor storage cannot be avoided, the AUTOTRANSLINEATOR™ must be protected to prevent entrance of water, moisture and foreign material.

3.0 Maintenance

	<p>WARNING</p> <p><i>Internal maintenance must be performed with a transformer de-energized, isolated and with the terminals grounded.</i></p>
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3.1 Periodic Inspection and Maintenance


The AUTOTRANSLINEATOR™ has no moving or active parts and therefore requires only minimal periodic maintenance when installed in a clean and well ventilated environment. This should include:

- 3.1.1 Visual inspection for evidence of loose connections, dirt, moisture, rusting, corrosion, and deterioration of the insulation, varnish or paint. Observations should be made for signs of overheating and overvoltage creeping. Corrective measures should be taken as necessary.
- 3.1.2 For early detection of any developing hotspots, an infrared scan can be performed while the AUTOTRANSLINEATOR™ is operating under its heaviest load condition.
- 3.1.3 Measuring the current in each of the 3 phases of the capacitor circuit can be a quick and easy method of determining the condition of the capacitors. The capacitors can be assumed to be in good operating condition when all 3 phases carry approximately the same amount of load current. Measurements should be taken at the input to the capacitor fuse block and can be done at any loading condition. If the phase currents are found to be substantially different, the unit should be taken offline and serviced by a qualified technician. This test should be conducted annually or whenever the unit seems to be operating in an abnormal manner.

3.2 Cleaning

Excessive accumulations of dirt on the transformer windings or insulators and capacitor terminals should be removed to permit free circulation of air and to guard against the possibility of insulation breakdown. Particular attention should be given to cleaning the top and bottom ends of the winding assemblies and to cleaning out ventilating ducts. Windings should be lightly cleaned by the use of a vacuum cleaner. If necessary a blower or compressed air may be used but pressure should not exceed 25 psi. Lead supports, tap changers and terminal boards, bushings, and other major insulating surfaces should be brushed or wiped with a dry cloth. The use of liquid cleaners is not recommended due to deteriorating effects on most insulating materials.

3.3 Drying of Core and Coil Assembly


	<p>CAUTION</p> <p><i>Constant attention during the drying process is recommended.</i></p>
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When it is necessary to dry a AUTOTRANSLINEATOR™ transformer before installation or after an extended shutdown under relatively high humidity conditions, internal and/or external heating methods can be used. (See ANSI/IEEE C57.94-1982 for a description of these methods).

It is important that most of the heated air pass through the winding ducts and not around the sides. Good ventilation is essential in order that condensation not take place in the reactor itself or inside the case. A sufficient quantity of air should be used to assure approximately equal inlet and outlet temperatures.

Air temperature should not exceed 70°C.

4.0 Operation

	<p style="text-align: center;">WARNING</p> <p><i>Internal maintenance must be performed with a transformer de-energized, isolated and with the terminals grounded.</i></p>
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Caution: Do not remove covers, panels, or any enclosure parts while the AUTOTRANSLINEATOR™ is energized.

4.1 Effect of Humidity

While the AUTOTRANSLINEATOR™ is energized, humidity conditions are generally not important since the heat from the reactor will prevent condensation. If a shutdown exceeding 24 hours occurs during a period of high humidity that could cause condensation within the transformer, precautions should be taken. Small strip heaters may be energized in the bottom of the unit to maintain the temperature of the unit a few degrees above that of the outside air. If such precautions are not taken the unit should be inspected for evidence of moisture and insulation resistance checked. If necessary, dry as described in Maintenance section above.

4.2 Loading

A AUTOTRANSLINEATOR™ should only be loaded in accordance with its nameplate rating.



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