



UFM-ST Noise Filter Module

HARDWARE MANUAL

Revision 2.00



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EU Declaration of Conformity

Manufacturer Aerotech, Inc.
Address 101 Zeta Drive
 Pittsburgh, PA 15238-2811
 USA
Product UFM-ST
Model/Types All



This is to certify that the aforementioned product is in accordance with the applicable requirements of the following directive(s):

2014/35/EU	Low Voltage Directive
EU 2015/863	Directive, Restricted Substances (RoHS 3)

and has been designed to be in conformity with the applicable requirements of the following standard(s) when installed and used in accordance with the manufacturer’s supplied installation instructions.

EN 61010-1:2010	Safety Requirements for Electrical Equipment
-----------------	--

Authorized Representative:

/ Norbert Ludwig

Managing Director
 Aerotech GmbH
 Gustav-Weißkopf-Str. 18
 90768 Fürth
 Germany

Engineer Verifying Compliance

/ Alex Weibel

Aerotech, Inc.
 101 Zeta Drive
 Pittsburgh, PA 15238-2811
 USA

Date

11/8/2023

UKCA Declaration of Conformity

Manufacturer Aerotech, Inc.
Address 101 Zeta Drive
Pittsburgh, PA 15238-2811
USA
Product UFM-ST
Model/Types All



To which this declaration relates, meets the essential health and safety requirements and is in conformity with the relevant UK Legislation listed below:

Electrical Equipment (Safety) Regulations 2016
Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

Using the relevant section of the following UK Designated Standards and other normative documents when installed in accordance with the installation instructions supplied by the manufacturer.

EN 61010-1:2010 Safety Requirements for Electrical Equipment

Authorized Representative:

A handwritten signature in black ink, appearing to read 'Simon Smith'.

/ Simon Smith

Managing Director
Aerotech Ltd
The Old Brick Kiln, Ramsdell, Tadley
Hampshire RG26 5PR
UK

Engineer Verifying Compliance

A handwritten signature in black ink, appearing to read 'Alex Weibel'.

/ Alex Weibel

Aerotech, Inc.
101 Zeta Drive
Pittsburgh, PA 15238-2811
USA
11/8/2023

Date

Agency Approvals

The UFM-ST filter modules have been tested by the following NRTL(s) and have been certified to the standards that follow:

Approval:	CUS NRTL
Approving Agency:	TUV SUD America Inc.
Certificate #:	U8V 13 12 68995 014
Standards:	CAN/CSA C22.2 No. 61010-1:2012 , UL 61010-1:2012

Visit <https://www.tuev-sued.de/product-testing/certificates> to view Aerotech's TÜV SÜD certificates. Type the certificate number listed above in the search bar or type "Aerotech" for a list of all Aerotech certificates.

Safety Procedures and Warnings

IMPORTANT: This manual tells you how to carefully and correctly use and operate the filter module.



- Read all parts of this manual before you install or operate the filter module or before you do maintenance to your system.
- To prevent injury to you and damage to the equipment, obey the precautions in this manual.
- All specifications and illustrations are for reference only and were complete and accurate as of the release of this manual. To find the newest information about this product, refer to www.aerotech.com.

If you do not understand the information in this manual, contact Aerotech Global Technical Support.

IMPORTANT: This product has been designed for light industrial manufacturing or laboratory environments. If the product is used in a manner not specified by the manufacturer:



- The protection provided by the equipment could be impaired.
- The life expectancy of the product could be decreased.

Safety notes and symbols are placed throughout this manual to warn you of the potential risks at the moment of the safety note or if you fail to obey the safety note.



The voltage can cause shock, burn, or death.



You are at risk of physical injury.
You could damage the filter module.



A surface can be hot enough to burn you.



Your actions, the temperature of the system, or the condition of the atmosphere that surround the system could start a fire.



Components are sensitive to electrostatic discharge.



Unsecured cables could cause you to:

- trip and fall
- drag the product off of its mounting location
- damage the cable connections.



A blue circle symbol is an action or tip that you should obey. Some examples include:



- General tip
- Read the manual/section
- Wear protective safety equipment (eye protection, ear protection, gloves)
- If applicable, do not lift unassisted



WARNING: Electrostatic Discharge (ESD) Sensitive Components!

You could damage the power supply or drives if you fail to observe the correct ESD practices.

Wear an ESD wrist strap when you handle, install, or do service to the PS2 assembly.



DANGER: Risk of Electric Shock!

- Before you install or do maintenance to the system, disconnect the electrical power. Ensure that an inadvertent circuit connection is not possible.
- Wait at least one (1) minute after you remove the power supply before you touch any part of the system.
- Do not connect or disconnect electrical components and cables while the system is connected to a power source.
- Do not connect primary and secondary sides of the power supply together.
- Do not remove the case of the power supply.
- Do not exceed the rated specifications of the output current or output wattage.
- Make sure that all components are grounded correctly and that they obey the local electrical safety requirements.
- Supply operators with the necessary precautions and protection from live electrical circuits.



DANGER: Risk of Fire and Short Circuit!

- Protect the power supply openings from foreign objects and liquids.
- Replace fuses only with a fuse of the same type and fuse rating.
- Do not install the system near water or in an environment with high moisture.
- Do not install the system in an environment with a high ambient temperature or near a fire source.



IMPORTANT: The power supply FG (⊕) must be connect to PE (Protective Earth).



WARNING: To prevent damage to the equipment and decrease the risk of electrical shock and injury, obey the precautions that follow.

1. Make sure that all system cables are correctly attached and positioned.
2. Do not use the cables or the connectors to lift or move this product.
3. Use this product only in environments and operating conditions that are approved in this manual.
4. Only trained operators should operate this equipment.

Handling and Storage

Unpacking the filter module



IMPORTANT: All electronic equipment and instrumentation is wrapped in antistatic material and packaged with desiccant. Ensure that the antistatic material is not damaged during unpacking.

Inspect the shipping container for any evidence of shipping damage. If any damage exists, notify the shipping carrier immediately.

Remove the packing list from the shipping container. Make sure that all the items specified on the packing list are contained within the package.

The documentation for the filter module is on the included installation device. The documents include manuals, interconnection drawings, and other documentation pertaining to the system. Save this information for future reference. Additional information about the system is provided on the Serial and Power labels that are placed on the chassis.

The system serial number label contains important information such as the:

- Customer order number (please provide this number when requesting product support)
- Drawing number
- System part number

Handling



IMPORTANT: It is the responsibility of the customer to safely and carefully lift and move the filter module.

- Be careful when you move or transport the filter module.
- Refer to [Section 1.2. Mechanical Specifications](#) for dimensions and weight specifications.
- Retain the shipping materials for future use.
- Transport or store the filter module in its protective packaging.



WARNING: Electrostatic Discharge (ESD) Sensitive Components!

You could damage the power supply or drives if you fail to observe the correct ESD practices.

Wear an ESD wrist strap when you handle, install, or do service to the system assembly.

Storage

Store the filter module in the original shipping container. If the original packaging included ESD protective packaging, make sure to store the filter module in it. The storage location must be dry, free of dust, free of vibrations, and flat.

Refer to [Section 1.3. Environmental Specifications](#).

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Chapter 1: UFM-ST Overview

Use the Universal Filter Module (UFM-ST) to reduce conducted line noise generated by switching servo amplifiers. The UFM-ST is for customers requiring compliance with the CE EMC directives and provides RFI filtering and surge suppression. See the Declaration of Conformity within the individual products hardware manual for applicability.

Figure 1-1: UFM-ST



1.1. Electrical Specifications

Table 1-1: Filter Specifications

Description	Specification
Input Voltage Range	0-240 VAC
Output Voltage Range	0-240 VAC
Maximum Continuous Current	8 A _{rms} with convection cooling 10 A _{rms} with forced air cooling
Frequency	50/60 Hz
Phases	Single Phase
Leakage Current	1.1 mA (max)
Fuse Protection	Internal 10 A fuses on AC1 and AC2 inputs

Figure 1-2: AC Line Filter Functional Diagram

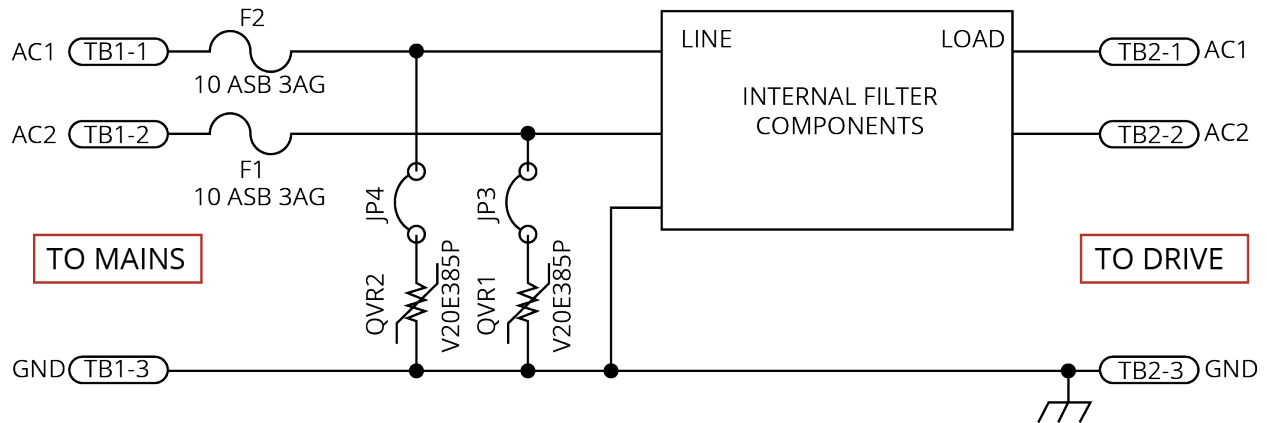


Table 1-2: TB1 and TB2 Mating Connector Ratings

Specification		Description
Type		3-Pin Terminal Block
Part Numbers		Aerotech: ECK00213 Phoenix: 1754465
Conductor Cross Section	One conductor, stranded with ferrule and plastic sleeve	14...22 AWG (0.25...2.5 mm ²)
	Two conductors (same cross-section), stranded, twin ferrule with plastic sleeve	16...20 AWG (0.5...1.5 mm ²)
Tightening Torque		0.5...0.6 N·m
Conductor Insulation Strip Length		7 mm (0.25 in)
(1) Refer to the manufacturer website for additional information.		

1.2. Mechanical Specifications

Line filters should be located as close to the drive as possible with the case connected through a low impedance connection to earth ground for maximum effectiveness. The unit should be mounted to earth ground, where possible, with M4 (#8) mounting hardware.

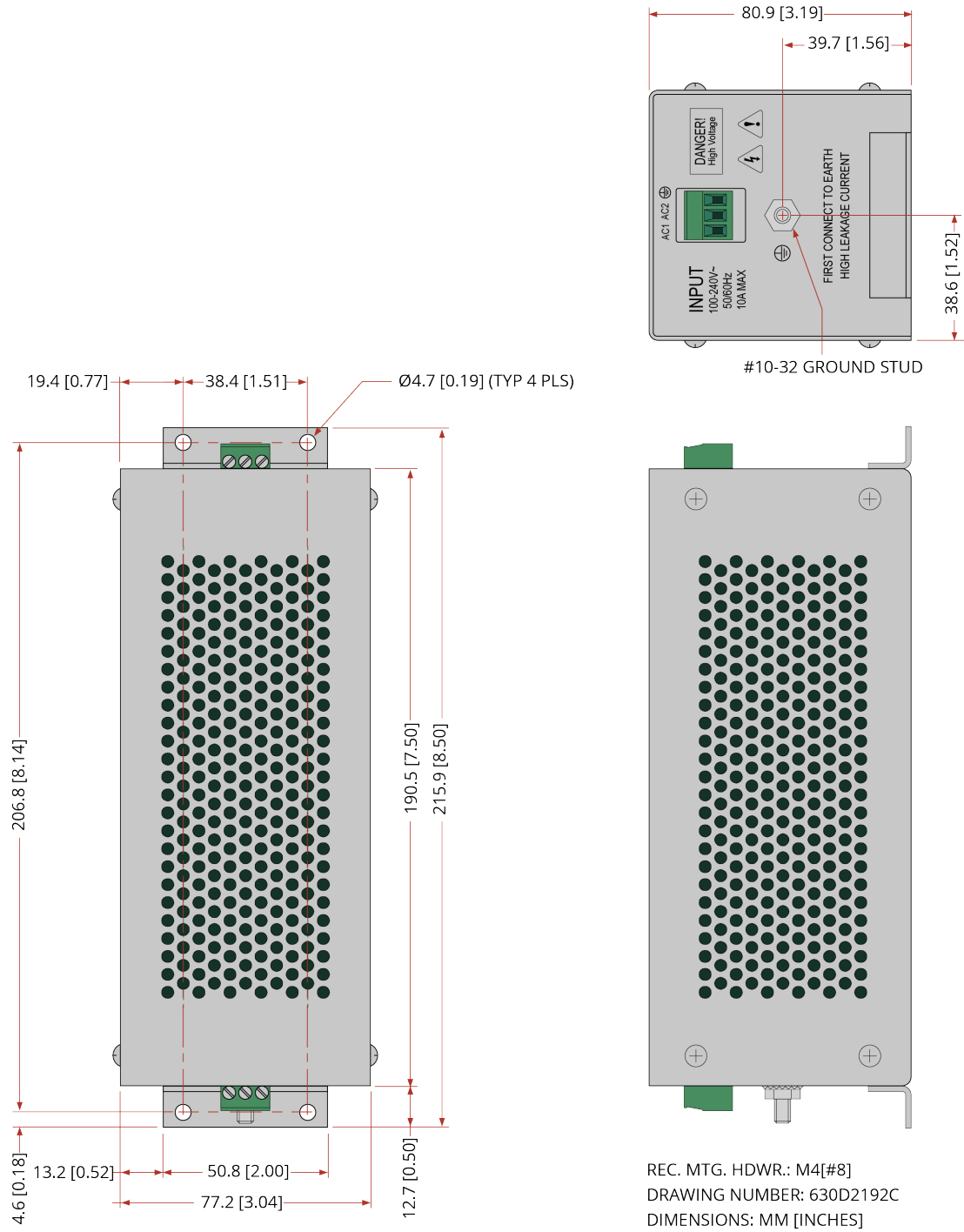
1.2.1. Mounting and Cooling

Table 1-3: Mounting Specifications

		UFM-ST
Customer-Supplied Enclosure		IP54 Compliant
Weight		1.13 kg (2.5 lbs)
Mounting Hardware		M4 [#8] screws (four locations, not included)
Dimensions		Refer to Section 1.2.2.
Minimum Clearance	Airflow	~25 mm
	Connectors	~100 mm
Operating Temperature		Refer to Section 1.3.

1.2.2. Dimensions

Figure 1-3: UFM-ST Dimensions



1.3. Environmental Specifications

The environmental specifications are listed below.

Table 1-4: Environmental Specifications

Ambient Temperature	Operating: 5 °C to 40 °C (41 °F to 104 °F)
	Storage: -20 °C to 70 °C (-4 °F to 158 °F)
Convection Cooling	Convection cooling can be used for operating currents up to 8 A _{rms} .
Forced-Air Cooling	Forced-air cooling of 50 LFM at 10 CFM is required for operating currents above 8 A _{rms} .
Humidity Non-condensing	The maximum relative humidity is 80% for temperatures that are less than 31 °C and decreases linearly to 50% relative humidity at 40 °C.
Operating Altitude	0 m to 2,000 m (0 ft to 6,562 ft) above sea level.
Pollution	Pollution Degree 2
	Typically only nonconductive pollution occurs.
Operation	Use only indoors
Environment	Indoor, Light Industrial Manufacturing, Laboratory

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Chapter 2: Installation and Configuration

This section provides information concerning the installation and wiring of the UFM-ST filter. Wiring information includes wire size and insulation requirements. Refer to other product documentation for additional installation requirements

2.1. AC Power Connections

The UFM-ST has two AC connectors; an Input connector (AC Mains) and an Output connector (Load). Each of these connectors also has a ground terminal.



WARNING: The System Integrator or end user is responsible for determining and meeting all safety and compliance requirements necessary to integrate the UFM-ST into the final application.

2.1.1. AC Input Power Wiring

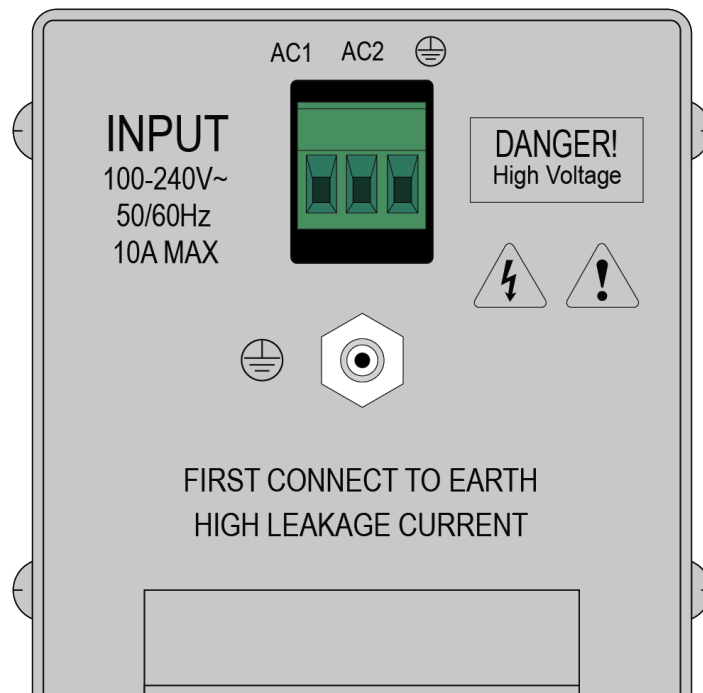
The UFM-ST three-terminal input connector is the AC power (Mains) connector. The AC1 and AC2 terminals are the AC power lines (Internally fused at 10 Amps). The Ground terminal is connected internally to the external Ground Stud and must be connected to Ground.

Wiring to the UFM-ST filter must use #16 AWG wires or larger and have an insulation rating of at least 300 V.



DANGER: Ground connection must be connected to ground to minimize possibility of electrical shock hazard.

Figure 2-1: AC Input Connections

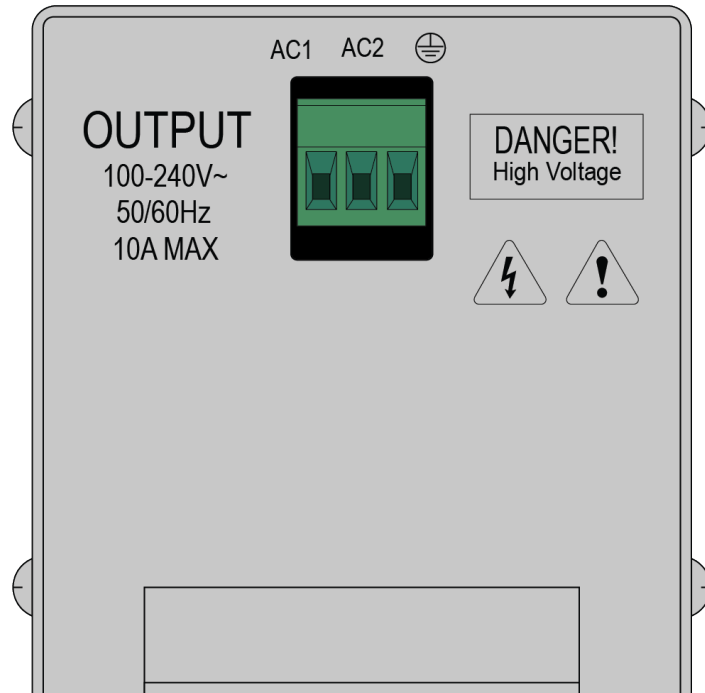


2.1.2. Amplifier Fault Inputs

The UFM-ST three-terminal output connector is the filter AC output (load) connector. Terminals AC1 and AC2 are the AC power connections and are wired to the equipment being filtered. The Ground terminal (connected internally to the Input ground and the external Ground Stud) and is typically connected to the ground of the equipment being supplied by this filter.

Wiring to the UFM-ST filter must use #16 AWG wires or larger and have an insulation rating of at least 300 V.

Figure 2-2: AC Output Connections



2.2. Forced-Air Cooling

The UFM-ST filter requires additional cooling for operation above 8 A_{rms}. Air flow must be directed into the ventilation holes on the UFM-ST filter case. Sufficient cooling is being provided if the UFM-ST case temperature is less than 45°C during all operation conditions.

Chapter 3: Maintenance



IMPORTANT: For your own safety and for the safety of the equipment:

- Do not remove the cover of the UFM-ST.
- Do not attempt to access the internal components.



DANGER: If you must remove the cover and access any internal components be aware of the risk of electric shock.

1. Disconnect the Mains power connection.
2. Wait at least one (1) minute after removing the power supply before doing maintenance or an inspection. Otherwise, there is the danger of electric shock.
3. All tests must be done by an approved service technician. Voltages inside the controller and at the input and output power connections can kill you.

Table 3-1: Troubleshooting

Symptom	Possible Cause and Solution
No voltage output	<ol style="list-style-type: none"> 1. Verify AC input voltage is present at AC1 & AC2. 2. Check for blown fuse inside UFM-ST filter. Fuse can be checked by making continuity check between Input & Output connectors. Resistance between AC inputs and outputs is less than 1 OHM. There should be no continuity between AC1, AC2, and Ground.
UFM-ST filter blows fuses	<ol style="list-style-type: none"> 1. Check UFM-ST output wiring for shorts. 2. Verify that UFM-ST load is not exceeding 10 Amps.
Fails Hi-pot test	The UFM-ST filter contains MOV's that will cause a Hi-pot failure and could be damaged by Hi-pot testing. Contact Aerotech concerning Hi-pot testing the UFM-ST filter.

3.1. Preventative Maintenance

While the UFM-ST filter normally does not require any maintenance it is recommended that the filter and associated wiring be inspected at least once a year. [Table 3-2](#) lists some recommended checks that should be made during these inspections.

Table 3-2: Preventative Maintenance

Check	Action to be Taken
Visually check filter for loose or damaged parts / hardware. Note: Internal inspection is not required unless internal contamination or damage is suspected.	Parts and hardware should be repaired or replaced.
Check for fluids or electrically conductive material on or around filter.	Remove and cleanup any fluids or conductive Material from filter. Fluids and conductive material must not be allowed to enter filter.
Visually inspect all wires and connectors.	Tighten or re-secure any loose connections. Replace or repair damaged or frayed wires.

Cleaning



DANGER: Before you clean the UFM-ST, disconnect the electrical power from the drive.

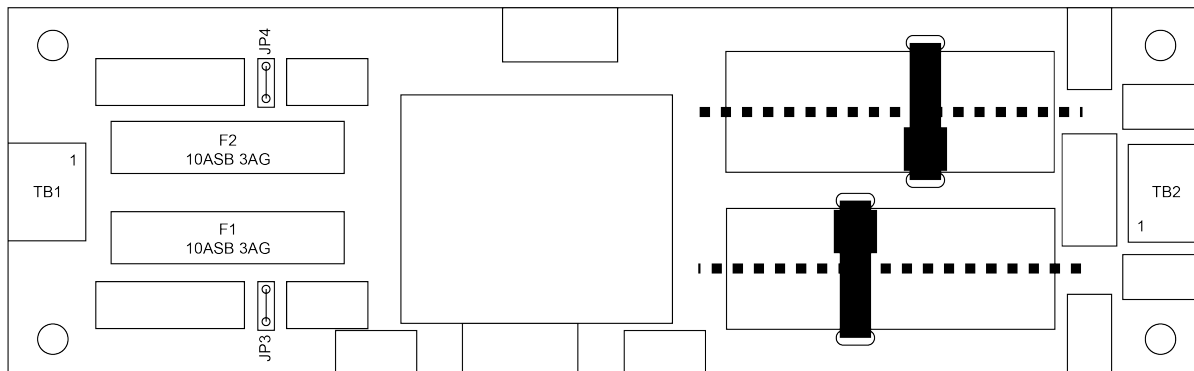
Use a clean, dry, soft cloth to clean the UFM-ST. If necessary, use a cloth that is moist with water or isopropyl alcohol. If you use a moist cloth, make sure that moisture does not go into the filter module. Also make sure that it does not go onto the outer connectors and components. Internal contamination from the cleaning solution can cause corrosion and electrical short circuits.

Do not clean the labels with a cleaning solution because it might remove the label information.

3.2. AC Line Filter PCB

The UFM-ST Filter contains the Aerotech AC Line Filter PCB. The AC Line Filter PCB contains various filter components, transient suppressors, and the 10 A AC line fuses (F1 & F2) on the standard version of the UFM-ST filter.

Figure 3-1: AC Line Filter PCB Assembly



3.3. Fuse Specifications



WARNING: Replace fuses only with the same type and value.

Table 3-3: Fuse Replacement Specifications

Function/Location	Fuse Rating	Aerotech P/N	Third Party P/N
AC Input (AC1 & AC2) / F1 & F2 on AC Line Filter PCB	10 A, 250 V (Standard)	EIF00117	Littelfuse, 326010P or Bussmann, MDA-10-R

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Appendix A: Warranty and Field Service

Aerotech, Inc. warrants its products to be free from harmful defects caused by faulty materials or poor workmanship for a minimum period of one year from date of shipment from Aerotech. Aerotech's liability is limited to replacing, repairing or issuing credit, at its option, for any products that are returned by the original purchaser during the warranty period. Aerotech makes no warranty that its products are fit for the use or purpose to which they may be put by the buyer, whether or not such use or purpose has been disclosed to Aerotech in specifications or drawings previously or subsequently provided, or whether or not Aerotech's products are specifically designed and/or manufactured for buyer's use or purpose. Aerotech's liability on any claim for loss or damage arising out of the sale, resale, or use of any of its products shall in no event exceed the selling price of the unit.

THE EXPRESS WARRANTY SET FORTH HEREIN IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, BY OPERATION OF LAW OR OTHERWISE. IN NO EVENT SHALL AEROTECH BE LIABLE FOR CONSEQUENTIAL OR SPECIAL DAMAGES.

Return Products Procedure

Claims for shipment damage (evident or concealed) must be filed with the carrier by the buyer. Aerotech must be notified within thirty (30) days of shipment of incorrect material. No product may be returned, whether in warranty or out of warranty, without first obtaining approval from Aerotech. No credit will be given nor repairs made for products returned without such approval. A "Return Materials Authorization (RMA)" number must accompany any returned product(s). The RMA number may be obtained by calling an Aerotech service center or by submitting the appropriate request available on our website (www.aerotech.com). Products must be returned, prepaid, to an Aerotech service center (no C.O.D. or Collect Freight accepted). The status of any product returned later than thirty (30) days after the issuance of a return authorization number will be subject to review.

Visit [Global Technical Support Portal](#) for the location of your nearest Aerotech Service center.

Returned Product Warranty Determination

After Aerotech's examination, warranty or out-of-warranty status will be determined. If upon Aerotech's examination a warranted defect exists, then the product(s) will be repaired at no charge and shipped, prepaid, back to the buyer. If the buyer desires an expedited method of return, the product(s) will be shipped collect. Warranty repairs do not extend the original warranty period.

Fixed Fee Repairs - Products having fixed-fee pricing will require a valid purchase order or credit card particulars before any service work can begin.

All Other Repairs - After Aerotech's evaluation, the buyer shall be notified of the repair cost. At such time the buyer must issue a valid purchase order to cover the cost of the repair and freight, or authorize the product(s) to be shipped back as is, at the buyer's expense. Failure to obtain a purchase order number or approval within thirty (30) days of notification will result in the product(s) being returned as is, at the buyer's expense.

Repair work is warranted for ninety (90) days from date of shipment. Replacement components are warranted for one year from date of shipment.

Rush Service

At times, the buyer may desire to expedite a repair. Regardless of warranty or out-of-warranty status, the buyer must issue a valid purchase order to cover the added rush service cost. Rush service is subject to Aerotech's approval.

On-site Warranty Repair

If an Aerotech product cannot be made functional by telephone assistance or by sending and having the customer install replacement parts, and cannot be returned to the Aerotech service center for repair, and if Aerotech determines the problem could be warranty-related, then the following policy applies:

Aerotech will provide an on-site Field Service Representative in a reasonable amount of time, provided that the customer issues a valid purchase order to Aerotech covering all transportation and subsistence costs. For warranty field repairs, the customer will not be charged for the cost of labor and material. If service is rendered at times other than normal work periods, then special rates apply.

If during the on-site repair it is determined the problem is not warranty related, then the terms and conditions stated in the following "On-Site Non-Warranty Repair" section apply.

On-site Non-Warranty Repair

If any Aerotech product cannot be made functional by telephone assistance or purchased replacement parts, and cannot be returned to the Aerotech service center for repair, then the following field service policy applies:

Aerotech will provide an on-site Field Service Representative in a reasonable amount of time, provided that the customer issues a valid purchase order to Aerotech covering all transportation and subsistence costs and the prevailing labor cost, including travel time, necessary to complete the repair.

Service Locations

<https://www.aerotech.com/contact-sales.aspx?mapState=showMap>

USA, CANADA, MEXICO

Aerotech, Inc.
Global Headquarters

CHINA

Aerotech China
Full-Service Subsidiary

GERMANY

Aerotech Germany
Full-Service Subsidiary

TAIWAN

Aerotech Taiwan
Full-Service Subsidiary

UNITED KINGDOM

Aerotech United Kingdom
Full-Service Subsidiary

Appendix B: Revision History

Revision	Description
2.00	General Update
1.03	Revision changes have been archived. If you need a copy of this revision, contact AerotechGlobal Technical Support.
1.02	
1.01	
1.00	

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Warranty and Field Service

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