



Power Anytime, Anywhere

Tesla™ TI206 MPU-24

User Manual



Built Smart...Proven Tough

Tesla Industries, Inc.
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New Castle, DE 19720
(302) 324-8910 Phone
(302) 324-8912 Fax
www.teslaind.com
www.tesla1.com

NOTE: All users must read this entire manual prior to operating the TI206 MPU-24.

The TI206 MPU-24 is a limited maintenance-free and sealed unit. No repairs are authorized. Warranty will be voided if unit is tampered with in any way, or if unauthorized repairs are made. For technical support please contact:

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Improper use or failure to follow instructions in this user manual can result in unit damage and/or injury or death by electrical shock.

Any attempts to open or examine the inside of the unit via a tool or device (borescope, probe, etc.) can result in unit failure and/or injury by electrical shock. This MPU is maintenance free and should not be opened or disassembled for any reason.

Always protect the unit from short circuit.

Shipping Hazards: The unit contains sealed, dry cell rechargeable batteries that do not pose a shipping hazard.

All Ground Power Units, Micro Power Units (Aviation Batteries) and including, but not limited to, Battery Chargers/Conditioners, manufactured by Tesla™ Industries, Inc., are able to safely and effectively charge any AGM, Lead Acid battery.

The Tesla™ GPU's and chargers are voltage and current regulated to 0.01% (dual loop). The charging voltage is calibrated, by Tesla™, to 28.6 volts and is pure dc (no power line ripple).

Maximum Charge Voltage by Battery Type

| Type: | Charging Voltage / Cell | Charging Voltage / 12v | Charging Voltage / 24v |
|-------------------|-------------------------|------------------------|------------------------|
| SLI/Flooded | 2.366v to 2.416v | 14.2v to 14.5v | 28.4v to 29v |
| Lead Acid/Flooded | 2.366v to 2.416v | 14.2v to 14.5v | 28.4v to 29v |
| Sealed Lead Acid | 2.366v to 2.416v | 14.2v to 14.5v | 28.4v to 29v |
| VRLA | 2.366v to 2.416v | 14.2v to 14.5v | 28.4v to 29v |
| AGM | 2.433v to 2.466v | 14.6v to 14.8v | 29.2v to 29.6v |
| GEL | 2.350v to 2.400v | 14.1v to 14.4v | 28.2v to 28.8v |

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SAFETY DATA SHEET

Form #: SDS 853027
 Revised: AG
 Supersedes: AF
 ECO #: 1002195

| | |
|---|--|
| I. PRODUCT IDENTIFICATION | |
| Chemical Trade Name (as used on label): Tesla™ Industries, Inc. | Chemical Family/Classification: Sealed Lead Battery |
| Synonyms: Sealed Lead Acid Battery, VRLA Battery | Telephone: For information, contact Tesla™ Industries, Inc. Customer Service Department at 302-324-8910 |
| Manufacturer's Name/Address: Tesla™ Industries, Inc 101 Centerpoint Blvd. New Castle, DE 19720-4180 | 24-Hour Emergency Response Contact: CHEMTREC DOMESTIC: 800-424-9300 CHEMTREC INT'L: 703-527-3877 |

| | | |
|--|--------------------------------------|----------------------------------|
| II GHS HAZARDS IDENTIFICATION | | |
| HEALTH | ENVIRONMENTAL | PHYSICAL |
| Acute Toxicity (Oral/Dermal/Inhalation) Category 4 Skin Corrosion/Irritation Category 1A Eye Damage Category 1 Reproductive Category 1A Carcinogenicity (lead compounds) Category 1B Carcinogenicity (acid mist) Category 1A Specific Target Organ Toxicity (repeated exposure) Category 2 | Aquatic Chronic 1 Aquatic Acute 1 | Explosive Chemical, Division 1.3 |

| | | |
|-------------------|----------------------|-----------------|
| GHS LABEL: | | |
| HEALTH | ENVIRONMENTAL | PHYSICAL |
| | | |

| | |
|---|--|
| Hazard Statements DANGER! Causes severe skin burns and serious eye damage. May damage fertility or the unborn child if ingested or inhaled. May cause cancer if ingested or inhaled. Causes damage to central nervous system, blood and kidneys through prolonged or repeated exposure. May form explosive air/gas mixture during charging. Explosive, fire, blast, or projection hazard. May cause harm to breast-fed children Harmful if swallowed, inhaled, or contact with skin Causes skin irritation, serious eye damage. | Precautionary Statements Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Wear protective gloves/protective clothing, eye protection/face protection. Avoid breathing dust/fume/gas/mist/vapors/spray. Use only outdoors or in a well-ventilated area. Contact with internal components may cause irritation or severe burns. Avoid contact with internal acid. Irritating to eyes, respiratory system, and skin. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood Avoid contact during pregnancy/while nursing Keep away from heat/sparks/open flames/hot surfaces. No smoking |
|---|--|

| | | |
|--|-------------------|--------------------------------|
| III. COMPOSITION/INFORMATION ON INGREDIENTS | | |
| Components | CAS Number | Approximate % by Weight |
| Inorganic Lead Compound: | | |
| Lead | 7439-92-1 | 45 - 60 |
| Lead Dioxide | 1309-60-0 | 15 - 25 |
| Tin | 7440-31-5 | 0.1 - 0.2 |
| Sulfuric Acid Electrolyte (Sulfuric Acid/Water) | 7664-93-9 | 15 - 20 |
| Case Material: | | 5 - 10 |
| Polypropylene | 9003-07-0 | |
| Polystyrene | 9003-53-6 | |
| Styrene Acrylonitrile | 9003-54-7 | |
| Acrylonitrile Butadiene Styrene | 9003-56-9 | |
| Styrene Butadiene | 9003-55-8 | |
| Polyvinylchloride | 9002-86-2 | |
| Polycarbonate, Hard Rubber, Polyethylene | 9002-88-4 | |
| Polyphenylene Oxide | 25134-01-4 | |
| Polycarbonate/Polyester Alloy | -- | |
| Other: | | |
| Absorbent Glass Mat | -- | 1 - 2 |



SAFETY DATA SHEET

Form #: SDS 853027
Revised: AG
Supersedes: AF
ECO #: 1002195

Inorganic lead and sulfuric acid electrolyte are the primary components of every battery manufactured by Tesla™ Products.
There are no mercury or cadmium containing products present in batteries manufactured by Tesla™ Products.

IV. FIRST AID MEASURES

Inhalation:

Sulfuric Acid: Remove to fresh air immediately. If breathing is difficult, give oxygen. Consult a physician
Lead: Remove from exposure, gargle, wash nose and lips; consult physician.

Ingestion:

Sulfuric Acid: Give large quantities of water; do not induce vomiting or aspiration into the lungs may occur and can cause permanent injury or death; consult a physician
Lead: Consult physician immediately.

Skin:

Sulfuric Acid: Flush with large amounts of water for at least 15 minutes; remove contaminated clothing completely, including shoes. If symptoms persist, seek medical attention. Wash contaminated clothing before reuse. Discard contaminated shoes
Lead: Wash immediately with soap and water.

Eyes:

Sulfuric Acid and Lead: Flush immediately with large amounts of water for at least 15 minutes while lifting lids
Seek immediate medical attention if eyes have been exposed directly to acid.

V. FIRE FIGHTING MEASURES

Flash Point: N/A Flammable Limits: LEL = 4.1% (Hydrogen Gas) UEL = 74.2% (Hydrogen Gas)

Extinguishing Media: Carbon dioxide; foam; dry chemical. Avoid breathing vapors. Use appropriate media for surrounding fire.

Special Fire Fighting Procedures:

If batteries are on charge, shut off power. Use positive pressure, self-contained breathing apparatus. Water applied to electrolyte generates heat and causes it to spatter. Wear acid-resistant clothing, gloves, face and eye protection. Note that strings of series connected batteries may still pose risk of electric shock even when charging equipment is shut down.

Unusual Fire and Explosion Hazards:

Highly flammable hydrogen gas is generated during charging and operation of batteries. To avoid risk of fire or explosion, keep sparks or other sources of ignition away from batteries. Do not allow metallic materials to simultaneously contact negative and positive terminals of cells and batteries. Follow manufacturer's instructions for installation and service.

VI. ACCIDENTAL RELEASE MEASURES

Spill or Leak Procedures:

Stop flow of material, contain/absorb small spills with dry sand, earth, and vermiculite. Do not use combustible materials. If possible, carefully neutralize spilled electrolyte with soda ash, sodium bicarbonate, lime, etc. Wear acid-resistant clothing, boots, gloves, and face shield. Do not allow discharge of unneutralized acid to sewer. Acid must be managed in accordance with local, state, and federal requirements. Consult state environmental agency and/or federal EPA.

VII. HANDLING AND STORAGE

Handling:

Unless involved in recycling operations, do not breach the casing or empty the contents of the battery. There may be increasing risk of electric shock from strings of connected batteries. Keep containers tightly closed when not in use. If battery case is broken, avoid contact with internal components. Keep vent caps on and cover terminals to prevent short circuits. Place cardboard between layers of stacked automotive batteries to avoid damage and short circuits. Keep away from combustible materials, organic chemicals, reducing substances, metals, strong oxidizers and water. Use banding or stretch wrap to secure items for shipping.

Storage:

Store batteries in cool, dry, well-ventilated areas with impervious surfaces and adequate containment in the event of spills. Batteries should also be stored under roof for protection against adverse weather conditions. Separate from incompatible materials. Store and handle only in areas with adequate water supply and spill control. Avoid damage to containers. Keep away from fire, sparks and heat. Keep away from metallic objects which could bridge the terminals on a battery and create a dangerous short-circuit

Charging:

There is a possible risk of electric shock from charging equipment and from strings of series connected batteries, whether or not being charged. Shut-off power to chargers whenever not in use and before detachment of any circuit connections. Batteries being charged will generate and release flammable hydrogen gas. Charging space should be ventilated. Keep battery vent caps in position. Prohibit smoking and avoid creation of flames and sparks nearby. Wear face and eye protection when near batteries being charged.

VIII. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limits (mg/m3) Note: N.E.= Not Established

Table with 7 columns: INGREDIENTS (Chemical/Common Names), OSHA PEL, ACGIH, US NIOSH, Quebec PEV, Ontario OEL, EU OEL. Rows include Lead and Lead Compounds, Tin, Sulfuric Acid Electrolyte, Polypropylene, Polystyrene, Styrene Acrylonitrile, Acrylonitrile Butadiene, Styrene, Styrene Butadiene, Polyvinylchloride.

For expanded detailed info, download the PDF online at...
http://www.teslaind.com/PDF/chart/Tesla-Safety-Data-Sheet.pdf.

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Abbreviations and Symbols

Abbreviations that may be used within the text, headings and titles of this manual.

LIST OF ABBREVIATIONS




Abbreviation **Definition**

| | |
|----------|---|
| ac | Alternating Current |
| AFT | Airflow Technology |
| AWG | American Wire Gauge |
| amp or A | Ampere |
| cont | Continuous |
| °C | Degree Celsius |
| °F | Degree Fahrenheit |
| dc | Direct Current |
| EFF | Efficiency |
| ft | Feet |
| FWD | Forward |
| GPU | Ground Power Unit |
| Hr | Hour |
| Hz | Hertz |
| kg | Kilograms |
| kHz | Kilohertz |
| kW | Kilowatts |
| LED | Light Emitting Diode |
| max | Maximum |
| MΩ | megaohm |
| min | Minimum |
| MPU | Micro Power Unit |
| NEMA | National Electrical Manufacturers Association |
| Ω | ohm |
| PF | power factor |
| PFC | power factor correction |
| rms | root-mean-square |
| THD | Total Harmonic Distortion |
| TMDE | Test, Measurement, & Diagnostic Equipment |
| UAV | Unmanned aerial vehicle |
| Vac | Volts, Alternating Current |
| Vdc | Volts, Direct Current |
| W | watts |

Section 1 – Safety Review

1.1 - Safety Notices

Safety notices appear throughout this manual to alert the user to important information regarding proper installation, operation, maintenance and storage of the unit. These notices, as illustrated below, contain a key word that indicates the level of hazard and a triangular icon that indicates the specific type of hazard.

| | |
|--|--|
|  WARNING | Indicates a condition, operating procedure or practice, which if not adhered to could result in serious injury or death. |
|  CAUTION | Indicates a condition or operating procedure, which if not strictly adhered to could result in damage or destruction of equipment. |
|  NOTE | Indicates a condition, operating procedure or practice, which is essential to highlight. |

1.2 - Symbols

The following symbols will appear within the warning triangles to alert the user to the specific type of danger or hazard.



Figure 1.2.1 – Different types of hazard and caution symbols

1.3 – Hazards



WARNING

Shock Hazard Potential

Severe injury or death from electrical shock may occur, if either user or the unit is wet, while the unit is connected to a power source. If the unit has come into contact with water, disconnect ac power from the ac source. If AC Input Circuit Breaker has tripped due to water infiltration, DO NOT try to reset it with the ac line voltage attached.



WARNING

Shock Hazard Potential

Severe injury or death from electrical shock can occur when damp electrical plugs are connected to the unit. Before making any connections, turn off unit. Failure to use proper grounding can cause potential shock hazard! In different countries, the power cord may require the use of a plug adapter to achieve plug style compatibility for operation. Use only adapters with proper grounding mechanism.

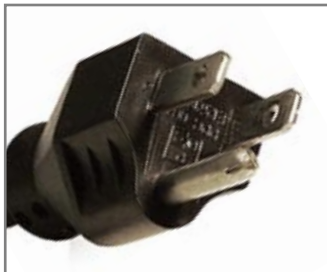


Figure 1.3.1 – Proper Ground Grounded Plug with Grounding Pin



Figure 1.3.2 – Proper Ground Adapter with Grounding Mechanism (Secured to Outlet)



Figure 1.3.3 – Improper Ground Plug with No Grounding Pin

1.4 – Important Safety Precautions



WARNING

Fire/Explosion Hazard Potential

Severe injury or death from fire or explosion can occur if electrical sparks are produced near fuel vapors. DO NOT CONNECT ac power supply WHILE FUELING. AC power functions of unit shall not be operated during any fuel handling operation. Power output is restricted to dc power only.

1.5 – Extreme Environments



CAUTION

Unit Damage Potential

The unit's charger temperature switch automatically disables the unit when the internal temperature exceeds 150°F (65°C). This protects the unit from overheating and damage. If the unit shuts down, move the unit into a cooler environment such as shade or air conditioning when possible. Perform a full function test, after the unit has been allowed to cool, prior to use.

Section 2 – Product Overview

1.1 – Introduction

This manual contains the complete operating instructions and procedures for the TI206 Micro Power Unit. The TI206 MPU-24 provides dc electrical ground power for aircraft flight line and maintenance ground support operations. The unit is designed to provide 24 volt dc electrical power output for aircraft engine starting and 24 or 28.5 volts dc electrical support for ground maintenance, avionics/electrical trouble shooting and testing. The observance of procedures, limitations and performance criteria ensures peak operating efficiency and maximizes operational capabilities and life of the TI206 Micro Power Unit.

The TI206's high capacity power cells and circuitry are encased in a rugged enclosure, and are designed to replace the original battery for the Bell 206 Helicopter. The internal circuitry incorporates an intelligent recharging system that allows the MPU to recharge from either the aircraft generator or from a standard 110 Vac or 220 Vac power source. The unit is also equipped with a built-in capacity meter that also serves as a recharge state indicator.



Figure 2.1.1 – TI206 MPU-24

2.2 – Indication of Terms Shall, Should and May

Within this technical manual the word “shall” is used to indicate a mandatory requirement for proper operation and warranty purposes. The word “should” is used to indicate a non-mandatory but preferred method of accomplishment. The word “may” is used to indicate an acceptable method of accomplishment.

2.3 – General Specifications

Electrical

DC Output:

- 1500 peak starting amps
- 10 amps continuous @ 28.5 Vdc (when plugged into ac power)
- 33 amp hours (797 watt hours) with ac power
- 23 amp hours (512 watt hours) of rechargeable battery power without ac

Recharge Rate From Full Discharge:

- 143 minutes @ 25° C

AC Input:

- Operates and charges from single phase 100-260 Vac 45-450 Hz
- 5.5 amps @ single phase 120 Vac
- 2.75 amps @ single phase 240 Vac

Physical Properties:

- Size: 13.3" L x 6.8" W x 9.9" H
- 337.8 mm x 172.7 mm x 251.5 mm
- Weight: 50.4 lbs (22.9 kg)

Operating Temperature:

- -40° C to +60° C (-40° F to 140° F) without ac power
- -40° C to +55° C (-40° F to 131° F) with ac power

Storage Temperature:

- -65° C to +105° C (-85° F to 221° F)

Cell Capacity:

- +40° C 110% ± 05%
- +25° C 100% ± 05%
- +00° C 80% ± 05%
- -20° C 65% ± 10%
- -40° C 50% ± 10%

2.4 – Physical Dimensions

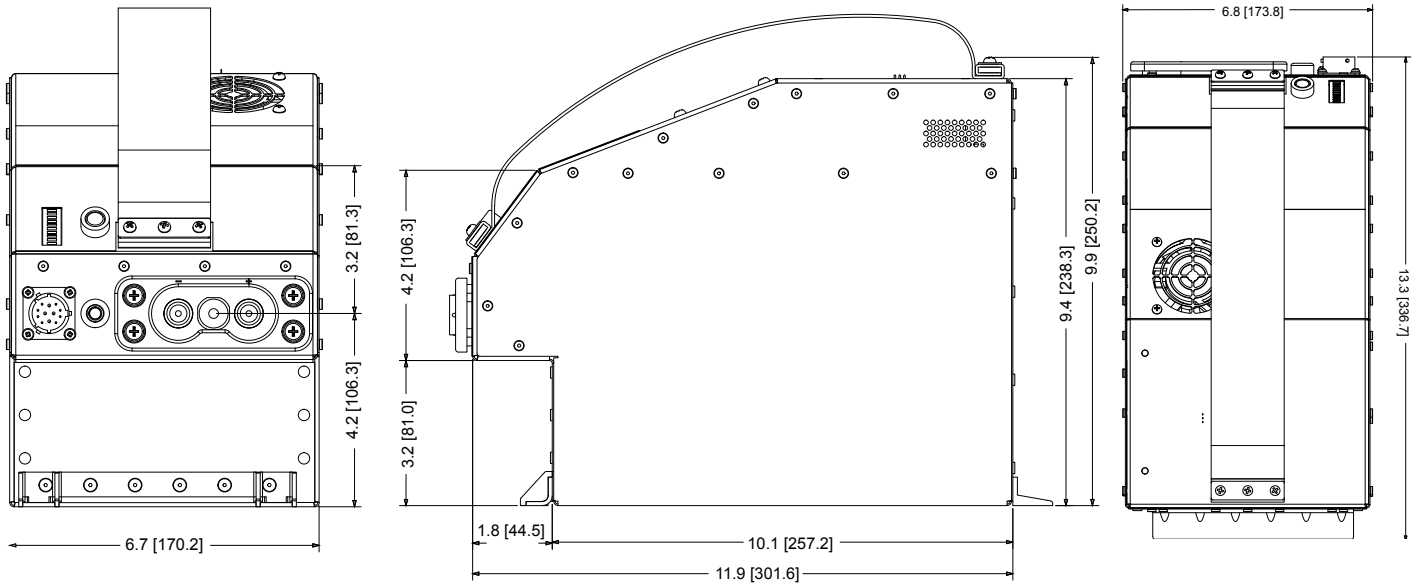



Figure 2.4.1 – TI206 MPU-24 physical dimensions

2.5 – Airflow Ports



CAUTION

Damage may occur if the TI206 MPU-24's air intake or outlet ports are obstructed. Ensure that ports are clear at all times.

The internal cooling system of the TI206 MPU-24 has been designed to efficiently regulate unit temperature regardless of load. At room temperature (+77 °F) the exhaust air will not exceed the ambient temperature by more than 5 °F. In more extreme temperatures (greater than 90 °F) the exhaust air will not exceed the ambient temperature by more than 10 °F.

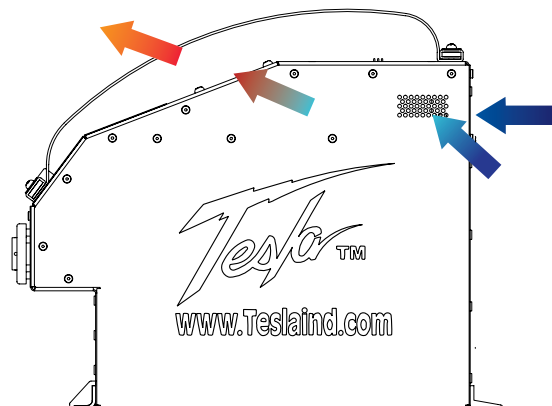
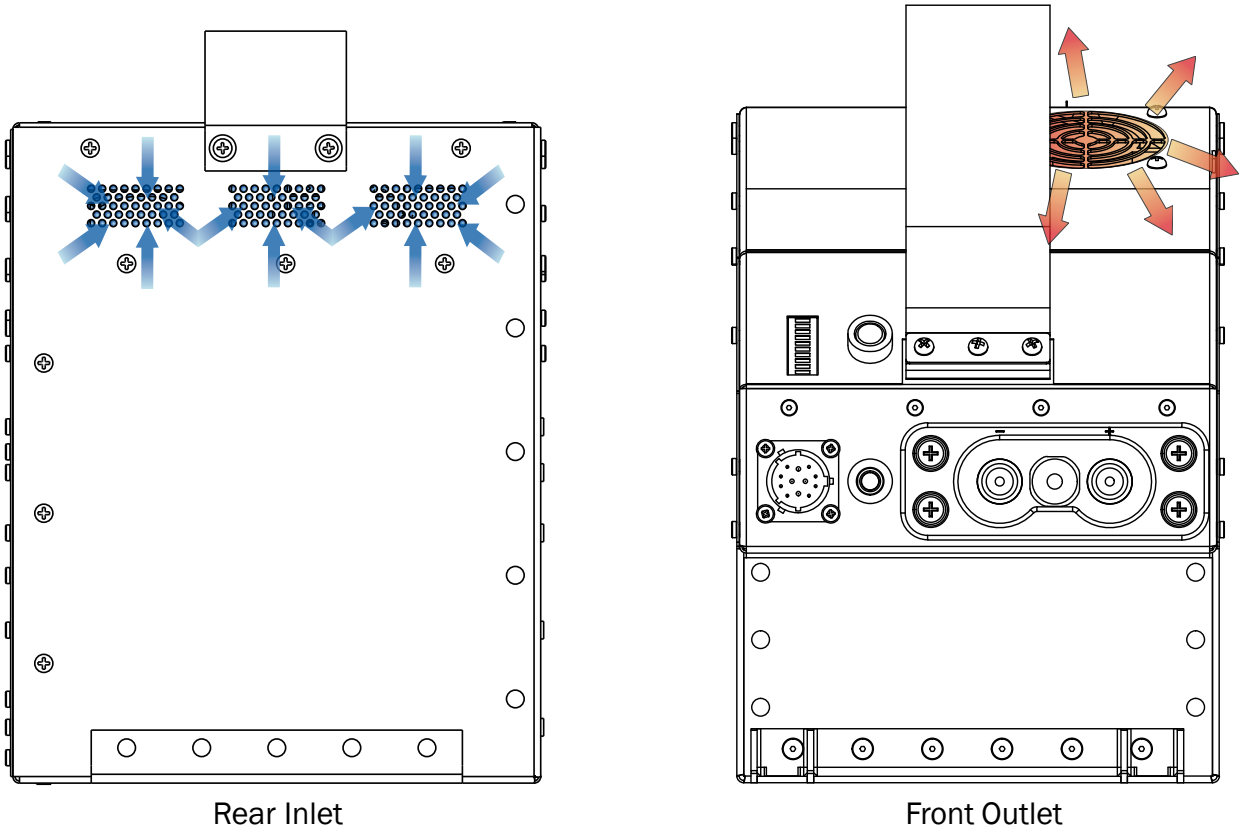


Figure 2.5.1 – Air intake and exhaust ports and internal air circulation

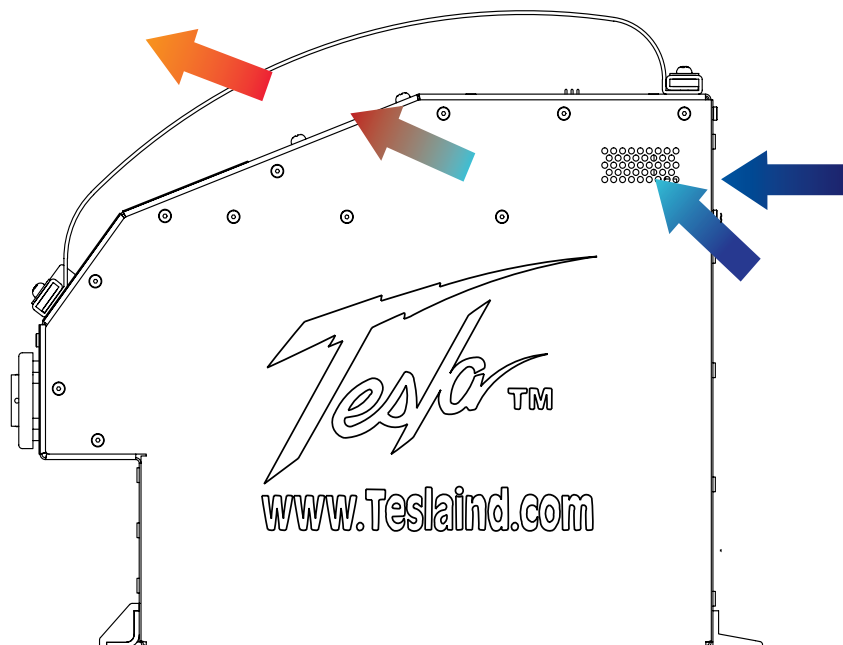
2.6 – Operating Position

The TI206 MPU-24 should be operated in the horizontal position as shown. Make sure that the airflow is not obstructed from air intake and outlet.



Rear Inlet


Front Outlet



2.7 – “Press for Capacity” Button and LED Status Indicator

The “Press for Capacity” button indicates the capacity of the power cells without applying ac input power. The status of the capacity lets the user know if there is enough power to perform another engine start. When the capacity is low the unit should be connected to ac power to allow it to recharge.

1. Make sure that you wait at least 2 minutes after ac power is applied, or dc power is extracted from the unit, before you press the “Press for Capacity” button. This ensures a correct reading.
2. Without ac power input or dc power output, simply press the “Push to Test” button on the faceplate and hold for approximately 2 to 3 seconds.
3. The LED bar graph should light up indicating the status of the power cells.
4. In addition, the fan(s) should start operating when the button is pressed. If you do not hear the fan(s) running, stop pressing the button and check for any obstructions.

| | |
|--|---|
|  CAUTION | Never press the “Press for Capacity” button while the unit is plugged into aircraft, vehicle or ac power. |
|--|---|


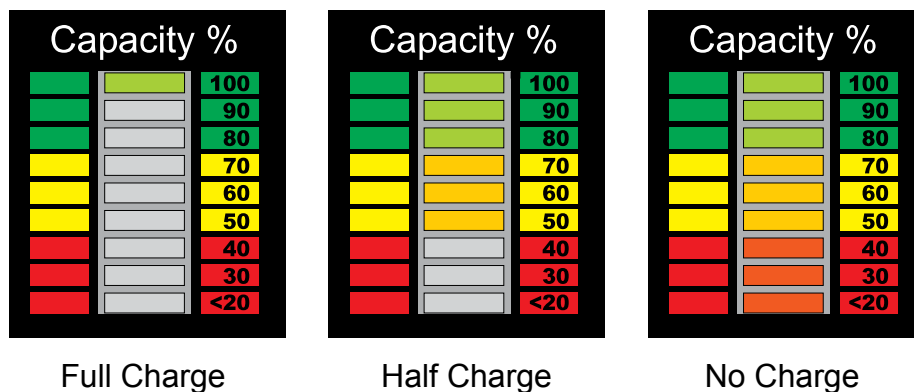
| | |
|--|--|
|  CAUTION | Never press the “Press for Capacity” button for more than 5 seconds. This may cause a temperature sensor to temporarily disrupt “Press for Capacity” function. (If this sensor is tripped, allow ten minutes for unit to cool before operating “Press for Capacity” button.) |
|--|--|



Figure 2.7.1 Pressing Button



2.8 – Maintenance Check

Check the unit for dents, punctures, case distortion or misalignment, and cracked or loose connectors. Check cables for cuts, chafing or evidence of crushing. Check connectors for cracks, cuts, distortion, excessive wear, broken or loose fasteners, and cables or strain relieves. If no external damage is evident, proceed to next step. Otherwise contact Tesla™ for further instructions.

2.9 – Pre-Installation Procedures

Removing Original Battery

Follow the aircraft's operator manual procedures to remove and dispose of the original aircraft battery properly and safely. Once the original battery has been removed from the battery compartment, proceed to the next step.

Check Unit Charge State

Before installing the unit into the aircraft, make sure the unit is fully charged. Remove the ac line cord from the ac input connector and wait two minutes. Then, push the "Press for Capacity" button to verify that the power cells are fully charged. Under a full charge the Capacity Meter will show a single green LED.



NOTE

If the unit is not fully charged after 143 minutes, the power cells may need to be replaced. Return the unit to Tesla™ Industries for evaluation and maintenance.

Section 3 – Operating Procedures

3.1 – Operating Procedures

This section concerns with normal procedures, and includes steps necessary to ensure safe and efficient operation of the TI206 MPU-24.



NOTE

When the TI206 MPU-24 is not in use, it should always remain plugged into a suitable ac power source to insure operational readiness at all times.



NOTE

If current demand exceeds 10 amps, converter output voltage will drop below 28.5 Vdc and two or more LED status indicator bars will illuminate. If all LED status indicator bars illuminate, both the converter and power cells are supplying 24 Vdc power output.

3.2 – General

Correct operation of the TI206 MPU-24 includes both pre-use and operational checks of the unit. Knowledge of the operating limits, restrictions, performance, unit capabilities and functions is fundamental to correct and safe operation. The operator shall ensure compliance with the instructions in this manual that affect operational safety and the warranty of the unit.

3.3 – Operating Limits and Restrictions


The minimum, maximum and normal operating ranges result from careful engineering and evaluation of test data. These limitations must be adhered to during all phases of operation.


3.4 – Performance

Refer to Section 7, PERFORMANCE DATA to determine the capability of the TI206 MPU-24. Consideration must be given to changes in performance resulting from variations in ambient temperature, mode of operation, state of charge (with or without 120 or 240 Vac power), and aircraft dc bus system inefficiency (voltage drops).

3.5 – Engine Starting Power

Operators should always ensure the unit is charged above 80% prior to ground support engine starting. However, circumstances may exist during use where unit recharge is not readily available and immediate external engine starting power is required. The following provides minimum states of charge necessary to provide ample power for an efficient engine start under specific current load demands.

| | |
|---|--|
|  NOTE | <p>The ambient temperature may cause the unit’s protective “over-temperature” sensors to shut down the 120-240 ac functions (converter and charger) until the unit cools to normal operating temperatures. If the unit shuts itself down, get the unit into a cooler environment such as shade or air conditioning (if possible). Perform a full function check prior to continued use once the unit is allowed to cool. For continued use in extremely hot environments, it is advised to send the unit back to Tesla™ for recalibration for use in these environments.</p> |
|---|--|

| | |
|---|---|
|  NOTE | <p>In the event that the temperature sensors do not shut the system down, extended use above specified limits may damage the unit. If the unit is operated when cold or heat soaked temperatures are exceeded, a full functional check should be accomplished prior to continued use.</p> |
|---|---|

| <u>ENGINE START PEAK CURRENT Requirements</u> | | <u>MINIMUM CHARGE</u> |
|---|--------------------|-----------------------|
| 600 | peak starting amps | 40% charged |
| 750 | peak starting amps | 50% charged |
| 900 | peak starting amps | 60% charged |
| 1050 | peak starting amps | 70% charged |
| 1200 | peak starting amps | 80% charged |
| 1350 | peak starting amps | 90% charged |
| 1500 | peak starting amps | 100% charged |

3.6 – Temperature Specifications

Cold/Hot Soaked Temperature

Exposing the unit for one (1) hour or more to the ambient temperature establishes the unit’s cold/hot soaked stabilization temperature. If the unit’s cold/hot soaked temperature is outside the normal operating temperature range, the unit must be stabilized prior to operation. For COLD SOAKED temperature stabilization, the unit must be placed in an environment with a temperature above +10°C (+41°F) for 3 hours or a temperature above +20°C (+68°F) for 2 hours. For HOT SOAKED temperature stabilization, the unit must be placed in an environment with a temperature below +38°C (+100°F) for 1 hour.

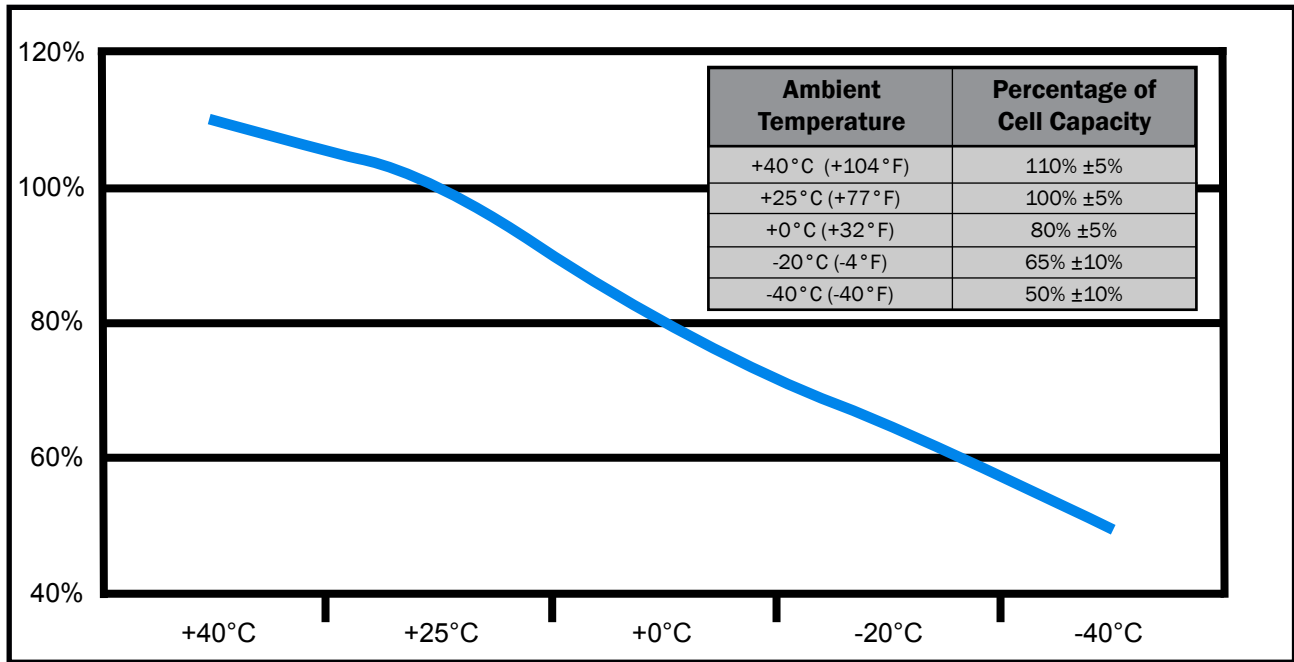


Figure 3.6.1 – Output power capability versus ambient temperature

Hot Soaked or Cold Soaked Definition

Simple terms: When a material is exposed to a change in temperature, its temperature will also change. Some material changes temperature quickly, others slowly. If the ambient temperature changes and is then held constant, the materials temperature will also change until its temperature stabilizes. Once the material temperature has stabilized, it is considered “soaked”.

Example: A unit is moved from the cool shade into the hot sun. That unit’s temperature will increase until it stabilizes. Once stabilized, the unit would be considered “hot soaked”.

NOTE

The unit’s temperature switch automatically disables ac power functions when the internal temperature is above 150°F (65°C). This protects the unit from overheating and damage. If the unit shuts down, move the unit into a cooler climate, such as shade or air conditioning when possible. Perform a full function test prior to use after the unit has been allowed to cool.

3.7 – Environmental



WARNING

Operating any electrical equipment in the presence of moisture creates possible safety hazards and/or potential for equipment damage. Every effort has been made, within the scope of existing technology to prevent foreseeable safety hazards and make the unit moisture resistant to prevent damage or failure.

If the unit is exposed to significant moisture, preventive measures and precautions shall be taken to:

- A. Prevent accumulation of moisture on ac and dc connectors/receptacles
- B. Minimize moisture entering forward inlet and outlet cooling fan vent ports

When not in use, unit inlet and outlet vent ports shall be covered from exposure. Unit shall be kept horizontal.

3.8 – Transporting Unit

The TI206 has a rugged nylon carrying strap permanently attached to the top of the unit to provide easy transport and placement into the aircraft. Be sure to check for frays prior to moving unit.



Figure 3.8.1 Nylon Carrying Strap

3.9 – Normal Function Test Procedures

This section involves “normal function” test procedures, and includes steps necessary to ensure that the TI206 MPU-24 is operating within specified parameters prior to use. A digital multimeter (an example is shown in Figure 3.9.1) capable of measuring dc and ac voltage and resistance will be required to perform some of the tests. These functional test procedures should become routine.



Figure 3.9.1 – Digital Multimeter

Check Unit for Evidence of Damage

Check for dents, punctures, case distortion or misalignment, and cracked or loose connectors. If no damage is evident, proceed to the next step. If damage is evident, contact Tesla™ Industries, Inc.

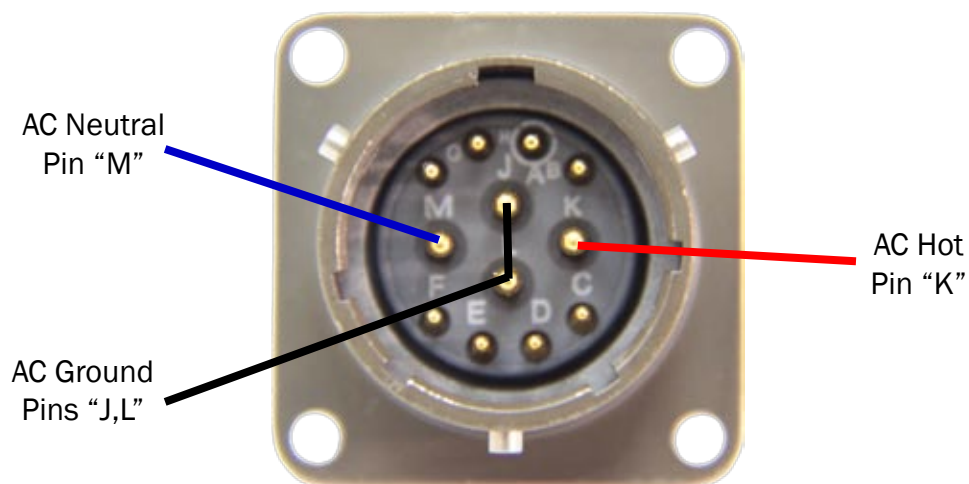


Figure 3.9.2 – AC Input Connector wiring diagram

Check Unit Internal Resistance (Test for Shorts)

It is essential to test for shorts to detect any problems with the unit. First, set the multimeter to the “resistance”. Next, test to see if both terminals are isolated from the chassis ground and the line ground using the steps below. In steps 2, 3, 5 and 6, a reading of greater than 10 MΩ assures no shorts exist. In steps 1 and 4, the multimeter should read less then 1Ω.



1. Place the negative probe on the ac ground probe (J or L) and the positive probe on an exposed part of the metal case.



2. Move the positive probe to the dc positive post on the dc output connector.



3. Move the positive probe to the dc negative post on the dc output connector.



4. Move the positive probe to one of the four screws securing the dc output connector to the unit casing.



5. Move the negative probe to the dc negative post on the dc output connector.



6. Move the negative probe to the dc positive post on the dc output connector.

Check DC Voltage Reading at DC Receptacle Terminals

To verify that the power cells are fully charged, set the digital multimeter to measure dc voltage. Place the positive probe (red) on the positive post of the dc output connector, as shown in Figure 3.9.3. Next, place the negative probe on the negative post. The multimeter display should read approximately 28.5 Vdc (± 0.5 Vdc) when power cells are fully charged and the unit is plugged into an ac power source. When the unit is not plugged into an ac power source, the multimeter display should read 25.5 Vdc.



Figure 3.9.3 – Testing DC Receptacle

3.10 – Regulated 28.5 VDC Ground Power

Connecting DC Power Cable To Unit

Ensure dc power cable plug is fully seated into the MPU's DC Battery Receptacle. Attaching a dc plug is quick and easy. Line up the plug with the receptacle. Push forward while rotating the T-handle one full turn clockwise. The unit is now ready to safely transfer power.



Figure 3.10.1 Attaching dc power cable to TI206 MPU-24

3.11 – Regulated AC Power

Plugging in with AC Power

When the unit is plugged into ac power, the output is 28.5 volts. This voltage allows the system to recondition and recharge the aircraft's battery(ies). It is also an optimum voltage for powering avionics and lighting on most aircraft. The MPU's ac to dc converter produces continuous amps of dc power depending on the size of the system.

Ensure 120 or 240 Vac power cord is properly connected to an approved ac power supply. After approximately 5-8 seconds, unit's LED status indicator will illuminate indicating power cell state of charge. Cooling fan will operate. Ensure LED status indicator and cooling fan is operational prior to continuing.



Figure 3.11.1 Connecting TI206 to ac power supply

Connect DC Power To Aircraft (Low Power Demand)

Low power demand is defined by a requirement of 10 amps or less. Connect dc power to aircraft ground power receptacle. DC bus power should come on and aircraft voltmeter should indicate 28.5 Vdc to 27 Vdc (26.5 Vdc minimum). If aircraft power demand is less than 5 amps converter output will remain at 28.5 Vdc (only one GREEN LED status indicator bar will illuminate). If aircraft power demand exceeds 10 amps converter voltage output will decrease and two or more LED status indicator bars will illuminate.

Connect DC Power To Aircraft (High Power Demand)

High power demand is defined by a requirement of greater than 10 amps. Connect to aircraft ground power receptacle. DC bus power should come on and aircraft voltmeter should indicate 28.5 Vdc to 23.5 Vdc (23 VDC minimum). If current demand is greater than 10 amps, converter output voltage will drop below 28.0 Vdc and LED status indicator lights will illuminate indicating current is being drawn from the power cells. The greater the current draw, the quicker the LED status indicator will approach red. Note the LED status indicator shows the status of the power cells.



NOTE

When all LED status indicator bars illuminate, both the converter and power cells are supplying 24 Vdc power output for current demands above 10 amps.

Engine Starting

UNPLUG AC POWER CORD BEFORE STARTING ENGINE WITH TI206 MPU-24

Prior to engine start, ensure power cell charge is sufficient to provide an efficient engine start. Users should follow ground power engine starting procedures as specified in the aircraft's operator manual.

3.12 – Charging Unit

Attaching AC Input Power

Before plugging the line cord into an ac outlet, attach and lock the mating plug to the ac input connector. Once accomplished, the unit can be plugged into an electrical outlet to begin charging. The Capacity Meter will immediately show the current charge state of the power cells. Make sure there is at least 2 to 3 inches of clearance in the front of the Air Exhaust Fan to provide for sufficient ventilation. If the unit is completely discharged, a minimum of 143 minutes will be required to fully recharge the unit.

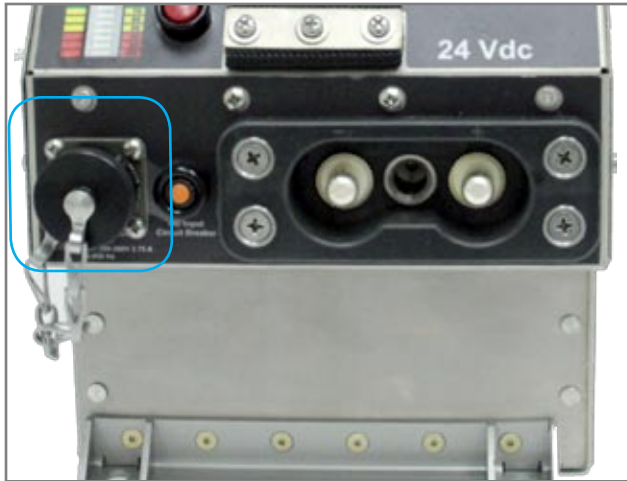


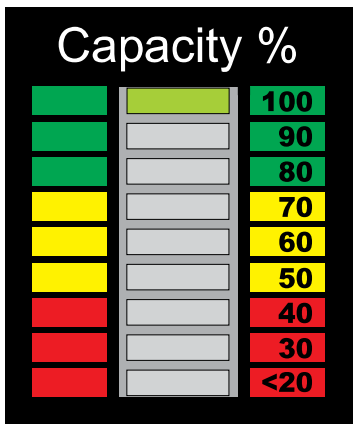
Figure 3.12.1 AC Input Connector (outlined in blue)



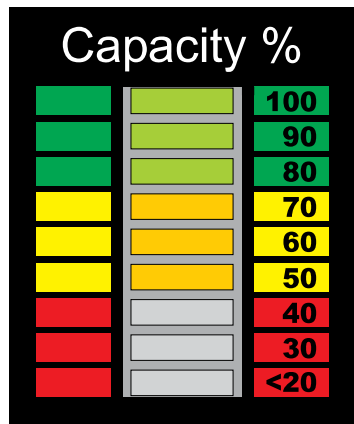
Figure 3.12.2 Attaching AC Line Cord

LED and Fan Activity

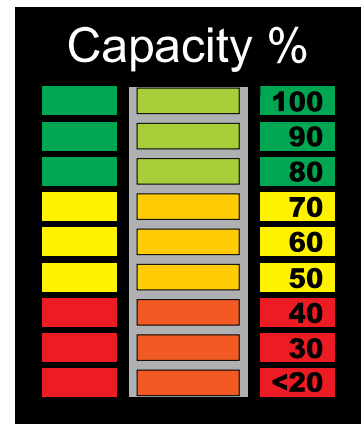
Initially, several LEDs will be illuminated on the Capacity Meter. As the unit charges, the LEDs will go out one by one. Under full charge, the Meter will show either a single solid or pulsating green LED. In addition, the fan will be running at reduced RPM. This indicates that the unit is in standby mode and ready for use.



Full Charge



Half Charge



No Charge

Section 4 – Post Operation

4.1 – General

Although the TI206 MPU-24 has been ruggedized and made weather resistant within the scope of unit's intended use, it is essential that good general care be taken to maintain unit in good operating condition and to maximize unit's operational life.

4.2 – After Use

Unit should be protected from environmental elements and man made hazards. Ideally unit should be secured in a building or shed. Most importantly, unit shall be fully covered if stored while exposed to environmental elements.

4.3 – Power Cell Recharge

When Installed in an operating aircraft, the TI206 MPU-24 will back-charge from the aircraft's dc power. Otherwise, the TI206 MPU-24 has an intelligent recharging system that will enable it to rapidly recharge when connected to an ac power source. If the unit's power cells become fully discharged, the unit should be recharged within 24 hours to ensure maximum life and performance. Under normal circumstances a minimum of 143 minutes will be required to fully recharge the unit.



NOTE

Plug the TI206 MPU-24 into ac power to keep the cells charged whenever it is not in use, even if it is at Full Charge. The unit will not overcharge or overheat.

Connect AC Power Cord to Unit

Ensure 120 or 240 Vac power cord is properly connected to an approved ac power supply. After approximately 5-8 seconds, ensure unit's LED status indicator illuminates indicating power cell state of charge and cooling fan is operating.



Figure 6.3.1 Connecting TI206 MPU-24 to AC Power Supply

**CAUTION****Guard From Incorrect Power Source**

The TI206 MPU-24's power cells may be damaged if recharged by NiCad or Lead Acid-type battery chargers. Power cells should only be charged by either the TI206 MPU-24's internal charger and the AC power cord furnished with the equipment, or when connected to aircraft's external DC power receptacle.



Figure 6.3.3 Proper and Improper Charging Methods

Section 5 – Unit Care and Maintenance



DANGER

Severe injury or death from electrical shock will occur if either the user or the unit is wet while operating the unit with an ac power source attached.



CAUTION

Damage may occur if an unapproved or modified ac line cable or input plug is attached to the MPU. Do not use any type of ac voltage converter.

5.1 - Unit Care

Avoid Prolonged Exposure to Extremely Damp Environments

Be sure to disconnect ac power from the ac source if the TI206 MPU-24 has come into contact with water. If the AC Input Circuit Breaker has tripped due to water infiltration, allow the unit to dry out before attempting to reset circuit breaker. Cover the unit to prevent water seepage. If the unit is operated in extremely damp conditions, it should be stored in an environmentally controlled building when not in use. Wipe unit clean periodically with a soft cloth to remove dust, dirt, etc.



Protect Cables from Damage

Do not cut, crush, or drag the input or output power cables when handling the TI206 MPU-24. Always inspect cables prior to use. If no damage is evident, proceed to the next step. If damage is evident, contact Tesla™ Customer Service. Do not attempt to use any other type of power cables other than the Tesla™ cables included with the TI206 MPU-24.



Figure 5.1.1 – Damaged cable

5.2– Unit Servicing

This unit is a maintenance-free, sealed unit. No repairs outside of Tesla™ are authorized. Warranty will be voided if unit is tampered with in any way including any damage to the WARRANTY VOID stickers located on the case (see Figure 5.2.1 below). If the unit requires maintenance, please contact Tesla™ Customer Service at (302) 324-8910. A Repair Request Form can be found in the back of this manual.

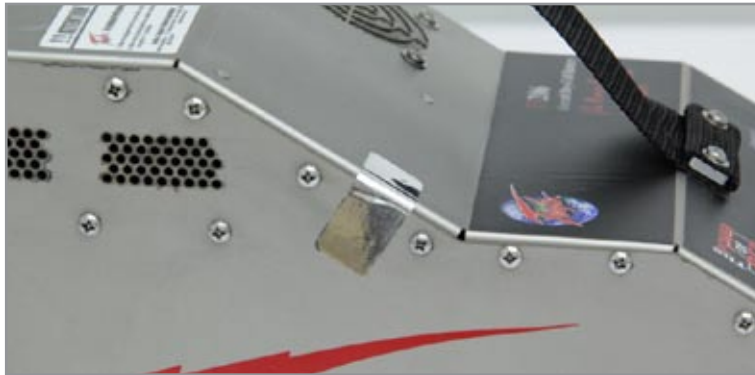


Figure 5.2.1 – Warranty Void stickers Front and Back on the unit

5.3 – Packaging and Shipping

Ensure proper packaging when returning the unit. Transport the unit only in a sturdy shipping crate or Tesla™ Shipping Case. It is important to enclose the Repair Request Form. Seal the crate on all sides and return it to Tesla™ at the address listed below. Please contact Tesla™ Customer Service at (302) 324-8910 with any questions or concerns.

TESLA™ INDUSTRIES, INCORPORATED
101 CENTERPOINT BLVD.
CENTERPOINT INDUSTRIAL PARK
NEW CASTLE, DELAWARE 19720
PHONE: (302) 324-8910 FAX: (302) 324-8912
Website: www.teslaind.com Email: Tesla1@teslaind.com

Section 6 – Frequently Asked Questions

1. Why should I buy a Tesla TI206 MPU-24?

A Tesla MPU has dramatic advantages over standard aircraft batteries. The advantages include power, durability, and longevity. A Tesla MPU will provide more power for testing avionics and starting than comparable competitors. The dry cells are more resistant to heat and vibration. A Tesla MPU does not experience thermal runaway. A Tesla MPU is equipped with a built in intelligent charger. To keep a Tesla MPU in perfect condition, plug it into a standard wall socket.

2. Do the cells have memory?

The cells have no memory. The user can plug the TI206 MPU-24 into ac for charging regardless of the unit's current state of charge. The intelligent charger will keep a fully charged battery by trickle charging. Keeping a fully charged TI206 MPU-24 plugged into AC when not in use will prolong the life of the batteries.

3. How are Micro Power Units used in Aviation Support?

There are many ways a MPU will benefit your operation. By using it for pre-flight testing, you will avoid depleting the aircraft's battery. You can start the aircraft's engine with the MPU as well. In the hangar, when connected to ac power, the MPU will provide 28.5 Vdc for avionics testing and will also recondition and recharge the aircraft's battery.

4. How much power will my TI206 MPU-24 provide?

Depending on the system, the MPU will provide up to 10 continuous amps with ac line voltage and 750 peak starting amps directly from the internal cells.

5. Will a Tesla Turbo Start spool up a turbine engine?

Nothing will start a turbine engine faster or safer than the right Tesla™ Turbo Start™. Not only will it eliminate hot starts, but it will extend the life of your starter, your engine and your battery while reducing maintenance. The Turbo Start senses the impedance from the starter/generator. It then provides the exact power required throughout the start-up curve.

6. How many engine starts will my MPU provide until it is depleted?

The MPU back-charges, almost instantly, once the aircraft is started and the generator is on line. This "power flywheel" feature enables the Turbo Start to recharge itself right from the aircraft it started in less than 30 seconds.

7. How do you prolong the life of the TI206 MPU-24's cells?

All you need to do is plug the unit in to the appropriate AC power outlet the system requires. AC power will recharge the system and keep the cells healthy. Users who regularly plug the system in can expect to get 5-7 years from their cells before they need to be replaced. Tesla cells do not have a memory like cell phone batteries. There is no need to fully discharge them. The recharging system will not overcharge the unit or produce excess heat.

8. Is it waterproof?

Water-resistant but not waterproof. See Section 3.7 for further information.

9. Why does the cooling fan run continuously when the MPU is plugged into ac power? Why does the cooling fan slow down?

The cooling fan speed varies to regulate the temperature of the internal circuitry when plugged into an ac power source.

10. Can one person transport it?

Micro Power Units are designed to be handled by one person. The TI206 MPU-24 provides a rugged nylon strap attached to the top of the unit that helps easily transport and place into aircrafts. See Section 5.6 for more information.

11. Is the TI206 MPU-24 in the government purchasing system?

Yes. Tesla Industries is an approved vendor/supplier – our cage code is OVWE2. Most Tesla™ products are class IX, have a NSN (National Stock Number) designation and can be acquired through the DLA (Defense Logistics Agency).

12. How long does this unit stay charged?

Unit should never be allowed to discharge fully. In-field use, it receives a dc back charge directly from a running engine. When not in use, unit should be plugged into ac power (outlet) all the time. Tesla systems will retain 80% of their capacity after one year of storage.

13. How do I get my TI206 MPU-24 serviced?

Contact Tesla™. We can be reached at (302) 324-8910. Ask for customer service. You can also email us at tesla1@teslaind.com. Once we receive the unit at our facility, we will examine it. Systems that are protected under warranty will be repaired at no charge. If the warranty has expired, you will receive a quote for necessary repairs prior to work being done. Our turnaround time is 48 hours once repairs are authorized.

14. Can I make my own repairs to unit?

During the warranty period, the unit can only be repaired by Tesla™ Industries for the warranty to remain in effect. Regardless, we strongly recommend allowing Tesla™ to repair any unit as we will analyze the complete system and re-calibrate it.

15. What type of maintenance does the TI206 MPU-24 require?

Although the systems are maintenance free, please keep units plugged in while not in use. This will greatly extend the life of the cells. Also, keep the vent areas clean and free of debris. Keep units in a well ventilated area while charging. Keep the unit in a protected environment when not in use (maintenance facility, shed).

16. What is included with my TI206 MPU-24?

Customers receive an ac line cord for their home country and a full three year warranty.

17. Are there any HAZMAT issues or disposability problems?

There are none. Tesla will reclaim all battery cells for disposability purposes. Contact Tesla™ if you have questions.

6.2 - Basic Usage/Operation Questions

1. What's the best position to place the unit for use?

The only position for the MPU is the upright position for stability and airflow considerations.

2. Does the unit have to be plugged in all the time?

No, but for maximum performance and cell longevity, keep the unit plugged in while not in use.

3. What happens if I don't keep it plugged in?

Unit will eventually lose its charge and cell life is shortened.

4. How do I check the status of the charge?

Press the "Push to Test" LED bar indicator on the unit's faceplate. A fully charged unit will have one green LED light showing.

5. Why is the cooling fan always running when I am plugged into AC power?

Constant cooling fan operation ensures proper and consistent ventilation of the unit.

6. Why does the cooling fan slow down?

Cooling fan rpm varies for better temperature regulation.

7. Why does my LED flicker when the unit is plugged in?

Older Turbo Starts™ indicated a full charge with a flickering LED readout. Newer models feature the illumination of one green bar on the LED readout when the unit is fully charged.

8. What do I do if a circuit breaker trips?

The AC input circuit breaker is located above the AC Input Connector. When the circuit breaker has been tripped, either of the red buttons will pop out. In the event that the breaker trips:

1. Disconnect the ac and dc connectors. (Unplug ac line cord on unit.)
2. Wait for a minimum of 60 seconds.
3. Reset breaker by pressing red button.
4. Reconnect ac and dc connections to the unit. (Plug in ac line cord on unit.)

The unit should power up automatically. If the breaker continues to trip, return the unit to Tesla™ Industries for repair.

Section 7 – Performance Data

7.1 – Purpose

This section provides performance data for the T1206 MPU-24. Continual reference to this information will enable the user to obtain maximum performance, utilization and service life from the MPU. Although maximum performance is not always required, regular referral to this section is recommended for the following reasons:

- A.** To generate knowledge of unit's performance margins to enable the operator to make sound judgment when unexpected conditions or alternate operational requirements are encountered.
- B.** To enable the user to readily recognize situations requiring maximum performance.
- C.** To gain experience in accurately estimating the effects of variables for which data is not presented.
- D.** To help the operator determine if an aircraft system malfunction exists by comparing actual performance with expected performance.



NOTE

The information provided in this section is primarily intended for operational planning and is most useful when planning operations under unfamiliar conditions or environmental extremes. The data may also be used to establish local operating procedures and to ensure unit's operational life is maximized.

7.2 – General

The data presented covers the maximum range of conditions and performance that can reasonably be expected. In each area of performance, the effects of temperature and dc electrical load demand relating to the ground power support requirements are presented. Wherever practical, data is presented conservatively. However, **NO GENERAL CONSERVATISM HAS BEEN APPLIED**. All performance data presented is within the applicable limits of the MPU.

7.3 – Data Basis

The type of data used is indicated at the bottom of each performance chart under DATA BASIS. The applicable report and date of the data are also given. The data provided generally are based on one of three categories:

- A.** Derived From Actual Controlled Testing: Controlled test data obtained on a similar unit type.
- B.** Calculated Data: Data based on tests, but not on a similar unit type placed under a controlled test.
- C.** Estimated Data: Data based on estimates using rules of physics, mathematics, and electrical engineering principles and concepts, but not verified by tests.

7.4 – Specific Conditions

The data presented are accurate only for specific conditions listed under the title of each chart or graph. Variables for which data are not presented, but which may affect that phase of performance, are discussed in associated text. Where data is available or reasonable estimates can be made the amount that each variable affect performance will be given.

7.5 – General Conditions

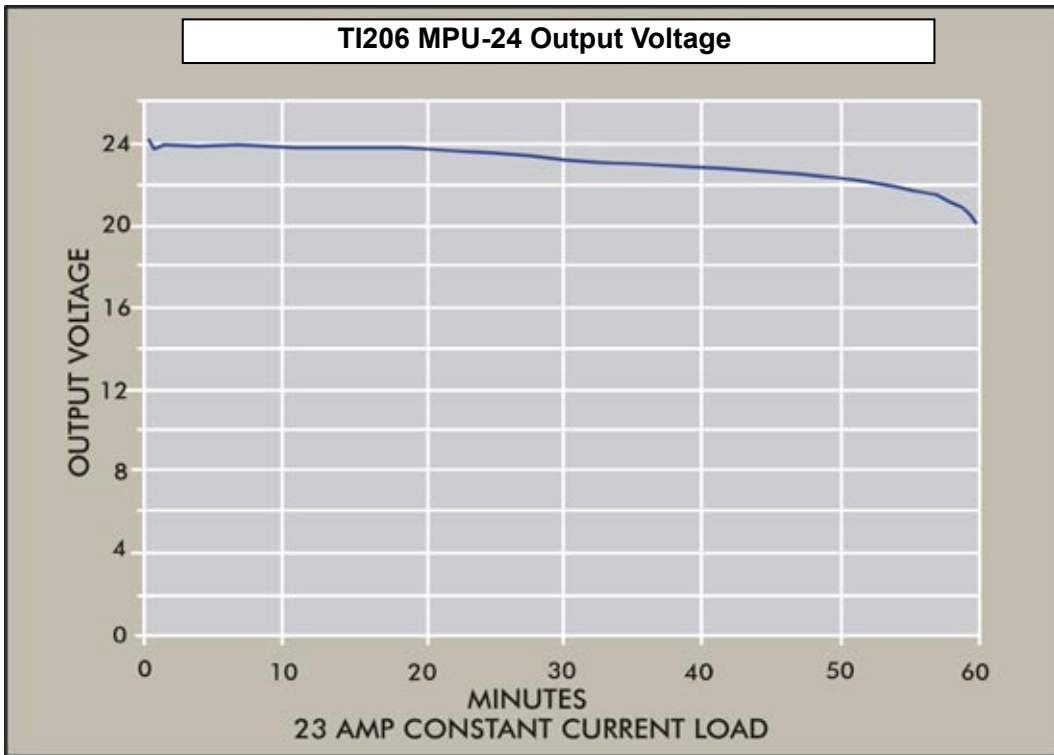
In addition to the specific conditions, the following general conditions are applicable to the performance data.

- A.** Variation in Aircraft: Power demand differences between individual aircraft of the same make and model are known to exist due to variations in DC electrical system efficiency. These differences, however, are considered insignificant and are not individually accounted for.
- B.** Ground Support and Aircraft Instrument Variations: The data shown in the performance charts do not account for instrument tolerance differences or inaccuracies.

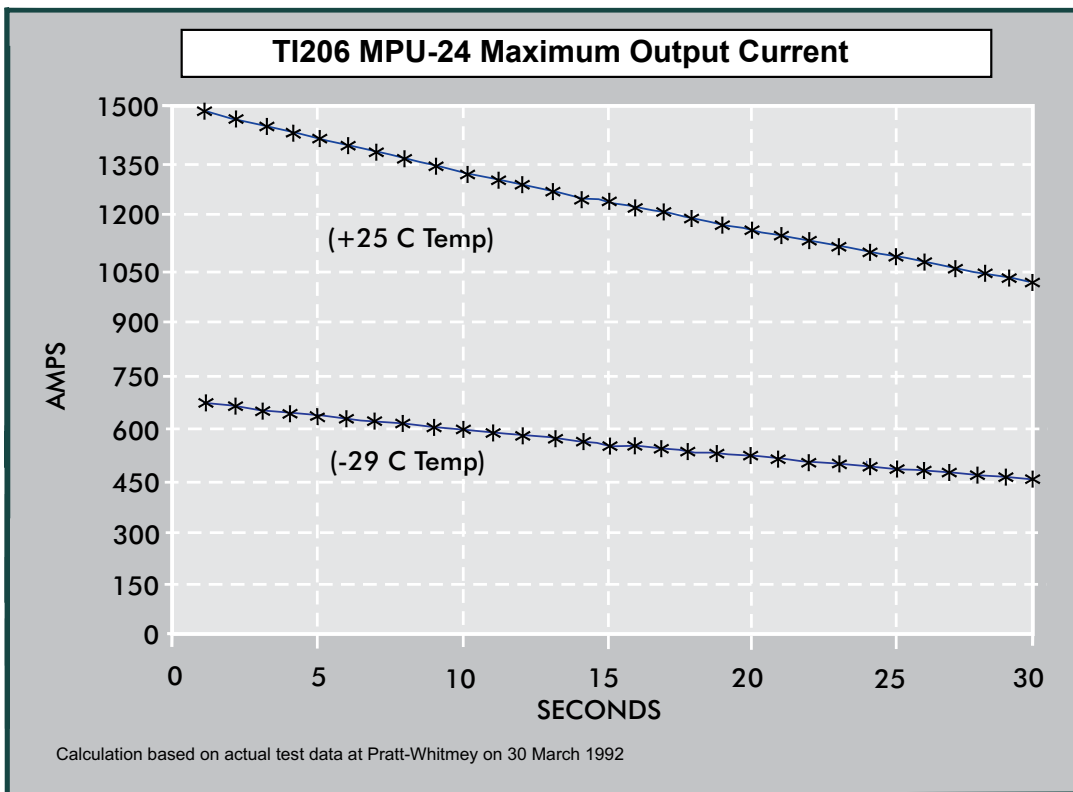
7.6 – Temperature Conversion Chart

| °C | °F | °C | °F | °C | °F | °C | °F |
|-------|-------|-------|-------|------|-------|------|-------|
| -60.0 | -76.0 | -27.0 | -16.6 | 6.0 | 42.8 | 39.0 | 102.2 |
| -59.0 | -74.2 | -26.0 | -14.8 | 7.0 | 44.6 | 40.0 | 104.0 |
| -58.0 | -72.4 | -25.0 | -13.0 | 8.0 | 46.4 | 41.0 | 105.8 |
| -57.0 | -70.6 | -24.0 | -11.2 | 9.0 | 48.2 | 42.0 | 107.6 |
| -56.0 | -68.8 | -23.0 | -9.4 | 10.0 | 50.0 | 43.0 | 109.4 |
| -55.0 | -67.0 | -22.0 | -7.6 | 11.0 | 51.8 | 44.0 | 111.2 |
| -54.0 | -65.2 | -21.0 | -5.8 | 12.0 | 53.6 | 45.0 | 113.0 |
| -53.0 | -63.4 | -20.0 | -4.0 | 13.0 | 55.4 | 46.0 | 114.8 |
| -52.0 | -61.6 | -19.0 | -2.2 | 14.0 | 57.2 | 47.0 | 116.6 |
| -51.0 | -59.8 | -18.0 | -0.4 | 15.0 | 59.0 | 48.0 | 118.4 |
| -50.0 | -58.0 | -17.0 | 1.4 | 16.0 | 60.8 | 49.0 | 120.2 |
| -49.0 | -56.2 | -16.0 | 3.2 | 17.0 | 62.6 | 50.0 | 122.0 |
| -48.0 | -54.4 | -15.0 | 5.0 | 18.0 | 64.4 | 51.0 | 123.8 |
| -47.0 | -52.6 | -14.0 | 6.8 | 19.0 | 66.2 | 52.0 | 125.6 |
| -46.0 | -50.8 | -13.0 | 8.6 | 20.0 | 68.0 | 53.0 | 127.4 |
| -45.0 | -49.0 | -12.0 | 10.4 | 21.0 | 69.8 | 54.0 | 129.2 |
| -44.0 | -47.2 | -11.0 | 12.2 | 22.0 | 71.6 | 55.0 | 131.0 |
| -43.0 | -45.4 | -10.0 | 14.0 | 23.0 | 73.4 | 56.0 | 132.8 |
| -42.0 | -43.6 | -9.0 | 15.8 | 24.0 | 75.2 | 57.0 | 134.6 |
| -41.0 | -41.8 | -8.0 | 17.6 | 25.0 | 77.0 | 58.0 | 136.4 |
| -40.0 | -40.0 | -7.0 | 19.4 | 26.0 | 78.8 | 59.0 | 138.2 |
| -39.0 | -38.2 | -6.0 | 21.2 | 27.0 | 80.6 | 60.0 | 140.0 |
| -38.0 | -36.4 | -5.0 | 23.0 | 28.0 | 82.4 | 61.0 | 141.8 |
| -37.0 | -34.6 | -4.0 | 24.8 | 29.0 | 84.2 | 62.0 | 143.6 |
| -36.0 | -32.8 | -3.0 | 26.6 | 30.0 | 86.0 | 63.0 | 145.4 |
| -35.0 | -31.0 | -2.0 | 28.4 | 31.0 | 87.8 | 64.0 | 147.2 |
| -34.0 | -29.2 | -1.0 | 30.2 | 32.0 | 89.6 | 65.0 | 149.0 |
| -33.0 | -27.4 | 0.0 | 32.0 | 33.0 | 91.4 | 66.0 | 150.8 |
| -32.0 | -25.6 | 1.0 | 33.8 | 34.0 | 93.2 | 67.0 | 152.6 |
| -31.0 | -23.8 | 2.0 | 35.6 | 35.0 | 95.0 | 68.0 | 154.4 |
| -30.0 | -22.0 | 3.0 | 37.4 | 36.0 | 96.8 | 69.0 | 156.2 |
| -29.0 | -20.2 | 4.0 | 39.2 | 37.0 | 98.6 | 70.0 | 158.0 |
| -28.0 | -18.4 | 5.0 | 41.0 | 38.0 | 100.4 | 71.0 | 159.8 |

7.7 – Output Voltage



7.8 – Maximum Output Current



Section 8 – Optional Accessories

8.1 – Tesla™ AC Line Cords

AC line cords come in several lengths or can be custom-ordered to fit your needs. Tesla™ specializes in outfitting cables with a variety of connectors and junction boxes. Contact Tesla™ customer service to find out more about our selection of cords.

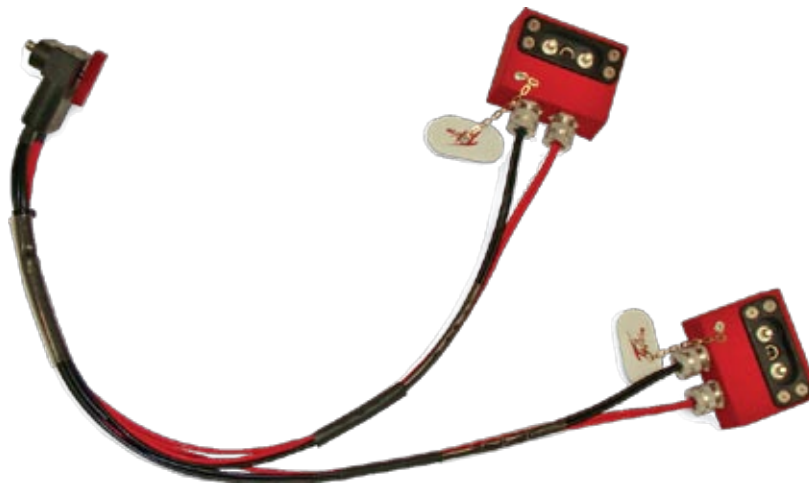
Universal Line Cords

| | |
|-------------|--|
| TI25000-111 | North American Line Cord 105-125 Vac 60 Hz 6.50 amps max NSN: 5935-01-576-4422 (CL IX) |
| TI25000-112 | Italian Line Cord 10A/250V |
| TI25000-113 | European Line Cord 10A/250V-210-250 Vac 50/60 Hz 3.25 amps max |
| TI25000-114 | Old British Line Cord 210-250 Vac 50/60 Hz 3.25 amps max |
| TI25000-115 | England Line Cord 10A/250- 210/250 Vac 50/60 Hz 3.25 amps max |
| TI25000-120 | Israel Line Cord 6/10A/250V |



8.2 - TI2006-903 Y-Cable

Using the optional TI2006-903 Y-Cable, the TI206 MPU-24 is capable of providing power to two M134 Dillon Miniguns simultaneously.



APPENDIX A

OPTIONAL LINE CORDS FOR WORLDWIDE OPERATIONS

| <u>COUNTRY</u> | <u>VOLTS</u> | <u>HZ</u> | <u>TESLA™ PART #</u> |
|------------------------------|--------------|-----------|--|
| Afghanistan | 220 | 50 | TI25000-004 Old British Line Cord |
| Algeria | 220 | 50 | TI25000-004 Old British Line Cord |
| American Samoa | 240 | 60 | TI25000-011 Australian Line Cord |
| Angola | 220 | 50 | TI25000-003 Continental European Line Cord |
| Anguilla (U.K.) | 240 | 50 | TI25000-005 United Kingdom Line Cord |
| Antigua | 230 | 60 | TI25000-005 United Kingdom Line Cord |
| Argentina | 220 | 50 | TI25000-011 Australian Line Cord |
| Aruba | 115 | 60 | TI25000-001 North American Line Cord |
| Australia | 240 | 50 | TI25000-011 Australian Line Cord |
| Austria | 220 | 50 | TI25000-003 Continental European Line Cord |
| Azores (Portugal) | 220 | 50 | TI25000-004 Old British Line Cord |
| Bahamas | 120 | 60 | TI25000-001 North American Line Cord |
| Bahrain | 220 | 50 | TI25000-005 United Kingdom Line Cord |
| Bangladesh | 220 | 50 | TI25000-004 Old British Line Cord |
| Barbados | 115 | 50 | TI25000-001 North American Line Cord |
| Belgium | 220 | 50 | TI25000-003 Continental European Line Cord |
| Belize (Br. Hond.) | 110 | 60 | TI25000-001 North American Line Cord |
| Benin | 220 | 50 | TI25000-004 Old British Line Cord |
| Bermuda | 120 | 60 | TI25000-005 United Kingdom Line Cord |
| Bolivia | 220 | 50 | TI25000-003 Continental European Line Cord |
| Botswana | 220 | 50 | TI25000-005 United Kingdom Line Cord |
| Brazil | 110 | 60 | TI25000-001 North American Line Cord |
| Bulgaria | 220 | 50 | TI25000-003 Continental European Line Cord |
| Burkina Faso | 220 | 50 | TI25000-003 Continental European Line Cord |
| Burma (Now Myanmar) | 230 | 50 | TI25000-005 United Kingdom Line Cord |
| Burundi | 220 | 50 | TI25000-003 Continental European Line Cord |
| Cambodia | 220 | 50 | TI25000-003 Continental European Line Cord |
| Cameroon | 230 | 50 | TI25000-003 Continental European Line Cord |
| Canada | 120 | 60 | TI25000-001 North American Line Cord |
| Canary Islands (Spain) | 220 | 50 | TI25000-003 Continental European Line Cord |
| Cape Verde, Rep. of | 220 | 50 | TI25000-003 Continental European Line Cord |
| Cayman Islands | 120 | 60 | TI25000-001 North American Line Cord |
| Central African Republic | 220 | 50 | TI25000-003 Continental European Line Cord |
| Chad | 220 | 50 | TI25000-003 Continental European Line Cord |
| Channel Islands | 240 | 50 | TI25000-005 United Kingdom Line Cord |
| Chile | 220 | 50 | TI25000-002 Italian Line Cord |
| China, Peoples Republic of | 220 | 50 | TI25000-011 Australian Line Cord |
| Christmas Island (Australia) | 240 | 50 | TI25000-011 Australian Line Cord |
| Cocos Islands (Australia) | 240 | 50 | TI25000-011 Australian Line Cord |
| Columbia | 220 | 60 | TI25000-003 Continental European Line Cord |
| Congo, Republic of | 220 | 50 | TI25000-003 Continental European Line Cord |
| Cook Island (New Zealand) | 240 | 50 | TI25000-011 Australian Line Cord |
| Costa Rica | 120 | 60 | TI25000-001 North American Line Cord |
| Curacao Islands | 110 | 60 | TI25000-001 North American Line Cord |
| Cyprus | 240 | 50 | TI25000-005 United Kingdom Line Cord |
| Czech, Republic of | 220 | 50 | TI25000-003 Continental European Line Cord |
| Denmark | 220 | 50 | TI25000-300 Denmark Line Cord |
| Djibouti, Republic of | 220 | 50 | TI25000-003 Continental European Line Cord |
| Dominica | 230 | 50 | TI25000-005 United Kingdom Line Cord |
| Dominican Republic | 110 | 60 | TI25000-001 North American Line Cord |

APPENDIX A (Cont.)

OPTIONAL LINE CORDS FOR WORLDWIDE OPERATIONS

| <u>COUNTRY</u> | <u>VOLTS</u> | <u>HZ</u> | <u>TESLA™ PART #</u> |
|----------------------|--------------|-----------|--|
| Ecuador | 120 | 60 | TI25000-001 North American Line Cord |
| Egypt | 220 | 50 | TI25000-003 Continental European Line Cord |
| El Salvador | 115 | 60 | TI25000-001 North American Line Cord |
| England | 240 | 50 | TI25000-005 United Kingdom Line Cord |
| Equatorial Guinea | 220 | 50 | TI25000-003 Continental European Line Cord |
| Estonia | 220 | 50 | TI25000-003 Continental European Line Cord |
| Ethiopia | 220 | 50 | TI25000-003 003 Continental European Line Cord |
| Fiji | 240 | 50 | TI25000-011 Australian Line Cord |
| Finland | 220 | 50 | TI25000-003 Continental European Line Cord |
| France | 220 | 50 | TI25000-003 Continental European Line Cord |
| French Guiana | 220 | 50 | TI25000-003 Continental European Line Cord |
| Gabon | 220 | 50 | TI25000-003 Continental European Line Cord |
| Gambia | 220 | 50 | TI25000-005 United Kingdom Line Cord |
| Georgia | 220 | 50 | TI25000-003 Continental European Line Cord |
| Germany | 220 | 50 | TI25000-003 Continental European Line Cord |
| Ghana | 220 | 50 | TI25000-005 United Kingdom Line Cord |
| Gibraltar | 240 | 50 | TI25000-005 United Kingdom Line Cord |
| Greece | 220 | 50 | TI25000-003 Continental European Line Cord |
| Greenland (Denmark) | 220 | 50 | TI25000-300 Denmark Line Cord |
| Grenada | 230 | 50 | TI25000-005 United Kingdom Line Cord |
| Guadeloupe | 220 | 50 | TI25000-003 Continental European Line Cord |
| Guam | 110-120 | 60 | TI25000-001 North American Line Cord |
| Guatemala | 120 | 60 | TI25000-001 North American Line Cord |
| Guinea | 220 | 50 | TI25000-003 Continental European Line Cord |
| Guinea-Bissau | 220 | 50 | TI25000-003 Continental European Line Cord |
| Guyana | 110 | 50/60 | TI25000-001 North American Line Cord |
| Haiti | 110-120 | 50-60 | TI25000-001 North American Line Cord |
| Honduras | 110 | 60 | TI25000-001 North American Line Cord |
| Hong Kong | 220 | 50 | TI25000-005 United Kingdom Line Cord |
| Hungary | 220 | 50 | TI25000-003 Continental European Line Cord |
| Iceland | 220 | 50 | TI25000-003 Continental European Line Cord |
| India | 220-250 | 50 | TI25000-004 Old British Line Cord |
| Indonesia | 220 | 50 | TI25000-003 Continental European Line Cord |
| Iran | 220 | 50 | TI25000-003 Continental European Line Cord |
| Iraq | 220 | 50 | TI25000-005 United Kingdom Line Cord |
| Ireland, Republic of | 220 | 50 | TI25000-005 United Kingdom Line Cord |
| Isle of Man | 240 | 50 | TI25000-005 United Kingdom Line Cord |
| Israel | 230 | 50 | TI25000-200 Israel Line Cord |
| Italy | 220 | 50 | TI25000-002 Italian Line Cord |
| Ivory Coast | 220 | 50 | TI25000-003 Continental European Line Cord |
| Jamaica | 110 | 50 | TI25000-001 North American Line Cord |
| Japan | 110 | 50/60 | TI25000-001 North American Line Cord |
| Jordan | 220 | 50 | TI25000-005 United Kingdom Line Cord |
| Kenya | 240 | 50 | TI25000-005 United Kingdom Line Cord |
| Korea, South | 220 | 60 | TI25000-003 Continental European Line Cord |
| Kuwait | 240 | 50 | TI25000-005 United Kingdom Line Cord |

APPENDIX A (Cont.)

OPTIONAL LINE CORDS FOR WORLDWIDE OPERATIONS

| <u>COUNTRY</u> | <u>VOLTS</u> | <u>HZ</u> | <u>TESLA™ PART #</u> |
|------------------------------|--------------|-----------|--|
| Laos | 220 | 50 | TI25000-001 North American Line Cord |
| Latvia | 220 | 50 | TI25000-003 Continental European Line Cord |
| Lebanon | 220 | 50 | TI25000-003 Continental European Line Cord |
| Lesotho | 240 | 50 | TI25000-004 Old British Line Cord |
| Liberia | 120 | 60 | TI25000-005 United Kingdom Line Cord |
| Liechtenstein | 220 | 50 | TI25000-006 Switzerland Line Cord |
| Lithuania | 220 | 50 | TI25000-003 Continental European Line Cord |
| Luxembourg | 220 | 50 | TI25000-003 Continental European Line Cord |
| Libya | 230 | 50 | TI25000-002 Italian Line Cord |
| Macao | 220 | 50 | TI25000-004 Old British Line Cord |
| Madagascar | 220 | 50 | TI25000-003 Continental European Line Cord |
| Maderia (Portugal) | 220 | 50 | TI25000-004 Old British Line Cord |
| Majorca | 220 | 50 | TI25000-003 Continental European Line Cord |
| Malawi | 230 | 50 | TI25000-005 United Kingdom Line Cord |
| Malaysia | 240 | 50 | TI25000-005 United Kingdom Line Cord |
| Maldives | 230 | 50 | TI25000-004 Old British Line Cord |
| Mali, Republic of | 220 | 50 | TI25000-003 Continental European Line Cord |
| Malta | 240 | 50 | TI25000-005 United Kingdom Line Cord |
| Martinique | 220 | 50 | TI25000-003 Continental European Line Cord |
| Mauritania | 220 | 50 | TI25000-003 Continental European Line Cord |
| Mauritius | 230 | 50 | TI25000-005 United Kingdom Line Cord |
| Mexico | 127 | 60 | TI25000-001 North American Line Cord |
| Monaco | 220 | 50 | TI25000-003 Continental European Line Cord |
| Mongolia | 220 | 50 | TI25000-003 Continental European Line Cord |
| Montseurrat | 230 | 60 | TI25000-005 United Kingdom Line Cord |
| Morocco | 220 | 50 | TI25000-003 Continental European Line Cord |
| Mozambique | 220 | 50 | TI25000-003 Continental European Line Cord |
| Namibia (W.S. Africa) | 220-250 | 50 | TI25000-004 Old British Line Cord |
| Nepal | 220 | 50 | TI25000-004 Old British Line Cord |
| Neth. Antilles | 220 | 50/60 | TI25000-003 Continental European Line Cord |
| Netherlands | 220 | 50 | TI25000-003 Continental European Line Cord |
| New Caledonia | 220 | 50 | TI25000-003 Continental European Line Cord |
| New Zealand | 230 | 50 | TI25000-011 Australian Line Cord |
| Nicaragua | 120 | 60 | TI25000-001 North American Line Cord |
| Niger | 220 | 50 | TI25000-003 Continental European Line Cord |
| Nigeria | 230 | 50 | TI25000-005 United Kingdom Line Cord |
| Norfolk Islands (Australia) | 240 | 50 | TI25000-011 Australian Line Cord |
| North Ireland | 220 | 50 | TI25000-005 United Kingdom Line Cord |
| North Mariana Islands (U.S.) | 115 | 60 | TI25000-001 North American Line Cord |
| Norway | 220 | 50 | TI25000-003 Continental European Line Cord |
| Okinawa | 100-120 | 60 | TI25000-001 North American Line Cord |
| Oman | 240 | 50 | TI25000-005 United Kingdom Line Cord |
| Pakistan | 230 | 50 | TI25000-004 Old British Line Cord |
| Panama | 110 | 60 | TI25000-001 North American Line Cord |
| Papua New Guinea | 240 | 50 | TI25000-011 Australian Line Cord |
| Paraguay | 220 | 50 | TI25000-003 Continental European Line Cord |
| Peru | 110 | 50/60 | TI25000-001 North American Line Cord |
| Philippines | 115 | 60 | TI25000-001 North American Line Cord |
| Piccairn Islands (U.K.) | 240 | 50 | TI25000-004 Old British Line Cord |
| Poland | 220 | 50 | TI25000-003 Continental European Line Cord |
| Portugal | 220 | 50 | TI25000-003 Continental European Line Cord |
| Puerto Rico | 120 | 60 | TI25000-001 North American Line Cord |

APPENDIX A (Cont.)

OPTIONAL LINE CORDS FOR WORLDWIDE OPERATIONS

| <u>COUNTRY</u> | <u>VOLTS</u> | <u>HZ</u> | <u>TESLA™ PART #</u> |
|--------------------------------|--------------|-----------|--|
| Romania | 220 | 50 | TI25000-003 Continental European Line Cord |
| Russia | 220 | 50 | TI25000-003 Continental European Line Cord |
| Rwanda | 220 | 50 | TI25000-003 Continental European Line Cord |
| Saudi Arabia | 220 | 50/60 | TI25000-003 Continental European Line Cord |
| Scotland | 220 | 50 | TI25000-005 United Kingdom Line Cord |
| Senegal | 220 | 50 | TI25000-003 Continental European Line Cord |
| Seychelles | 240 | 50 | TI25000-005 United Kingdom Line Cord |
| Sierra Leone | 230 | 50 | TI25000-005 United Kingdom Line Cord |
| Singapore | 230 | 50 | TI25000-005 United Kingdom Line Cord |
| Slovakia | 220 | 50 | TI25000-003 Continental European Line Cord |
| Somalia | 220 | 50 | TI25000-003 Continental European Line Cord |
| South Africa | 220-250 | 50 | TI25000-004 Old British Line Cord |
| Spain | 220 | 50 | TI25000-003 Continental European Line Cord |
| Sri Lanka | 230 | 50 | TI25000-004 Old British Line Cord |
| St. Pierre & Miquelon (France) | 115 | 60 | TI25000-001 North American Line Cord |
| St. Kitts & Nevis | 230 | 60 | TI25000-005 United Kingdom Line Cord |
| St. Lucia | 240 | 50 | TI25000-005 United Kingdom Line Cord |
| St. Vincent | 230 | 50 | TI25000-005 United Kingdom Line Cord |
| Sudan | 240 | 50 | TI25000-005 United Kingdom Line Cord |
| Surinam | 115 | 60 | TI25000-003 Continental European Line Cord |
| Svalbard (Norway) | 220 | 50 | TI25000-003 Continental European Line Cord |
| Swaziland | 230 | 50 | TI25000-004 Old British Line Cord |
| Sweden | 220 | 50 | TI25000-003 Continental European Line Cord |
| Switzerland | 220 | 50 | TI25000-006 Switzerland Line Cord |
| Syria | 220 | 50 | TI25000-003 Continental European Line Cord |
| Tahiti | 220 | 50 | TI25000-003 Continental European Line Cord |
| Taiwan | 110 | 60 | TI25000-001 North American Line Cord |
| Tanzania | 230 | 50 | TI25000-005 United Kingdom Line Cord |
| Thailand | 220 | 50 | TI25000-003 Continental European Line Cord |
| Togo | 220 | 50 | TI25000-003 Continental European Line Cord |
| Tonga | 115 | 60 | TI25000-004 Old British Line Cord |
| Trinidad & Tobago | 230 | 60 | TI25000-005 United Kingdom Line Cord |
| Tunisia | 220 | 50 | TI25000-003 Continental European Line Cord |
| Turkey | 220 | 50 | TI25000-003 Continental European Line Cord |
| Uganda | 220 | 50 | TI25000-004 Old British Line Cord |
| United Arab Emir. | 220 | 50 | TI25000-005 United Kingdom Line Cord |
| United Kingdom & Ireland | 240 | 50 | TI25000-005 United Kingdom Line Cord |
| United States | 120 | 60 | TI25000-001 North American Line Cord |
| Uruguay | 220 | 50 | TI25000-011 Australian Line Cord |
| Venezuela | 120 | 60 | TI25000-001 North American Line Cord |
| Vietnam | 220 | 50 | TI25000-003 Continental European Line Cord |
| Virgin Islands | 120 | 60 | TI25000-001 North American Line Cord |
| Wales | 220 | 50 | TI25000-005 United Kingdom Line Cord |
| Western Samoa | 230 | 50 | TI25000-005 United Kingdom Line Cord |
| Yemen | 220 | 50 | TI25000-005 United Kingdom Line Cord |
| Yugoslavia | 220 | 50 | TI25000-003 Continental European Line Cord |
| Zaire, Republic of | 220 | 50 | TI25000-003 Continental European Line Cord |
| Zambia | 220 | 50 | TI25000-005 United Kingdom Line Cord |
| Zimbabwe | 220 | 50 | TI25000-005 United Kingdom Line Cord |

APPENDIX A (Cont.)

UNIVERSAL LINE CORD KIT FOR WORLDWIDE OPERATIONS

NOTE: TESLA™ UNIVERSAL AC LINE CORD KIT, P/N: **TI25000-U00**, IS FOR UNITS ORIGINALLY BUILT WITH THE UNIVERSAL AC LINE CORD OPTION ONLY.
THE AC ADAPTER OPTION IS TESLA™ P/N **TI16000-19** AND MUST BE ORDERED WITH THE ORIGINAL PROCUREMENT OF UNIT(S). UNIT(S) MAY BE RETURNED TO TESLA™ INDUSTRIES, FOR A NOMINAL COST, AND MODIFIED TO ALLOW OPERATION WITH THE UNIVERSAL AC LINE CORD KIT.

TESLA™ UNIVERSAL AC LINE CORD KIT, P/N: **TI25000-U00**, IS COMPRISED OF THE FOLLOWING FIVE PART NUMBERS:

| | |
|-------------|--------------------------|
| TI25000-111 | NORTH AMERICAN LINE CORD |
| TI25000-113 | EUROPEAN 10A/250V |
| TI25000-114 | OLD BRITISH LINE CORD |
| TI25000-115 | ENGLAND 10A/250V |
| TI7000-131 | LINE CORD POUCH |

Repair Request Form

Please complete the information below to ensure prompt and accurate service. Include this form with the unit you are returning. Thank you.

Date of return: _____

Company name & _____

Billing address: _____

Contact person: _____

Phone #: _____ Fax #: _____

Email: _____

Purchase Order #: _____

Model #: _____ Serial #: _____

Model #: _____ Serial #: _____

Shipping method to Tesla™: _____

Description of shipping package: _____

Description of problem: _____

Return to Tesla™

101 Centerpoint Boulevard, New Castle, DE 19720 Attention: Repair Department



WE GET THE MILITARY STARTED!

Tesla™

101 Centerpoint Blvd.
New Castle, DE 19720 USA
Tel: 302-324-8910
Fax: 302-324-8912

9475 Double R Blvd., Suite 2
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