

## Installation Manual and Operating Instructions

### Model TC230 DC/DC Power Converter



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Manual Number 9018670  
Rev C, October 7, 2016

## FOREWORD

This manual provides information intended for use by persons who, in accordance with current regulatory requirements, are qualified to install this equipment. If further information is required, please contact:

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## REVISION DETAIL

<b>Revision</b>	<b>Date</b>	<b>Approved</b>	<b>Detail</b>
A	08/31/16	SHO	Initial release.
B	09/28/16	BAW	Corrections. Updated sections.
C	10/07/16	ScH	Changed model number.

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## SECTION 1 GENERAL DESCRIPTION

### 1.1 INTRODUCTION

The model TC230 DC/DC Power Converter is a lightweight power converter that translates a direct current (DC) input of 14 volts to an output of 28 volts direct current (DC) output.

Converting an input operation voltage range of 10-18 VDC to 28VDC makes the TC230 suitable for power to a wide variety of general, business, or commercial aviation applications. The unit is rated for a nominal output of 230 watts to power avionics, instrumentation, lighting, and many other applications. The TC230 DC/DC Converter is FAA certified to TSO-C71 and tested to rigorous environmental standards and levels of RTCA DO-160G. The small size and light weight in conjunction with its installation flexibility (inside or outside the pressure vessel) make it an ideal choice for aircraft power needs while reducing the challenges associated with other similar products.

Highlighted features include short circuit protection, overload capability, low input voltage shut-down, temperature monitoring, reverse polarity protection, a self-resettable over-temperature disable and an optional remote enable (on/off) feature.

The TC230 DC/DC converter has a robust Military-rated circular connector and a rugged aluminum case which dissipates heat and provides excellent mechanical strength. It is engineered to require no external cooling and contains no internal fans or cooling methods, which saves energy, reduces weight and allows more flexible installation locations. At only 0.70 pounds, it is lighter and smaller than any other certified solution in the aviation market today.

### 1.2 TECHNICAL SPECIFICATIONS

<b>Electrical Attributes:</b>	<b>Model TC230</b>
Input Voltage:	Rated 14VDC nominal, Operating 10 - 18VDC.
Input Current (full load):	18 amps max at nominal input voltage
Output Voltage	28VDC $\pm$ 1%
Output Current	Continuous 8 A, Max 9 A for 2 hr.
Output Power:	230 watts
Efficiency:	90% nominal

**Table 1.1**

<b>Physical Attributes:</b>	<b>Model TC230</b>	
Weight:	0.70 lbs (0.32 kg)	
Dimensions: (not including connector mate)	2.75 inches long x 3.75 inches wide x 1.29 inches high (69.85 mm long x 95.25 mm wide x 32.77 mm high)	
Mating Connector (with cable clamp):	6430234-1	MCIA P/N 9018654
	6430234-2	MCIA P/N 9018655
Mounting:	Base mount – orientation not critical	

**Table 1.2**

<b>Qualifications:</b>	<b>Model TC230</b>
Certification:	FAA TSO-C71
Environmental Qualification:	RTCA DO-160G Environmental Category; See Section 5.2
Altitude:	-15,000 feet to +55,000 feet
Temperature:	-55°C to +70°C (-67°F to +158°F)

**Table 1.3**

## **SECTION 2 PRE-INSTALLATION CONSIDERATIONS**

### **2.1 COOLING**

The TC230 product does not require external cooling or contain internal active cooling. Cooling of the unit occurs exclusively through passive conduction through the base or radiated cooling across the metal case. Additional cooling can be realized through convection (exposure to free moving air) or conduction (mounting to a thermally conductive metal surface). These methods are not required to achieve rated performance but can help prevent potential overheating and extend life when the unit is operated at full power or during overload conditions. Specifically, mounting the unit to a metal surface is preferred, but not required.

### **2.2 EQUIPMENT LOCATION**

The TC230 is designed for mounting flexibility, allowing for installation inside or outside the pressure vessel with no requirement for temperature control. In addition to altitude and temperature resistance, the unit is also designed to withstand high levels of condensing humidity. However, installation locations where the unit could be subject to standing or direct water exposure should be avoided. The unit can be mounted in any orientation. Clearance should be provided for the mating connector and may require as much as five inches past the unit connector to allow for back shell access to the connector.

The rated output of eight (8) amps can be achieved with no special mounting considerations. Peak power up to 9 amps (~250W) can be delivered for up to two (2) hours. Additional power, up to 10 amps (280W) continuously, can be achieved when mounted to a metal surface.

### **2.3 ROUTING OF CABLES**

The wires and cable bundle associated with the unit are heavy gauge wire and carry significant power. Be aware of routing cables near other electronics or with other wire bundles that may be susceptible to high energy flow.

Avoid sharp bends in cabling and routing near aircraft control cables. Also avoid proximity and contact with aircraft structures, avionics equipment, or other obstructions that could chafe wires during flight and cause undesirable effects.

### **2.4 LIMITATIONS**

The conditions and tests for TSO approval of this article are minimum performance standards. Those installing this article, on or in a specific type or class of aircraft, must determine that the aircraft installation conditions are within the TSO standards. TSO articles must receive additional installation approval prior to being operated on each aircraft. The article may be installed only according to 14 CFR Part 43 or the applicable airworthiness requirements.

The TC230 is designed to operate at full rated load throughout the specified environmental temperature range (per section 5.2). Note that when operating at full power, the unit case can be hot to the touch. Heat dissipation can be improved, resulting in a cooler external temperature, when mounted to a metal surface.

## SECTION 3 INSTALLATION PROCEDURES

### 3.1 GENERAL INFORMATION

This section contains interconnect diagrams, mounting dimensions and other information pertaining to the installation of the TC230 DC/DC Converter. After installation of cabling and before installation of the equipment, ensure that power is applied only to the pins specified in the interconnect diagram.

The following two versions of the unit are available. See section 4.2.1 for additional details of the remote enable (on/off) feature and installation details within section 3.

Part Number	Remote On/Off
6430234-1	No (output always enabled)
6430234-2	Yes (enable signal required)

### 3.2 UNPACKING AND INSPECTING EQUIPMENT

When unpacking this equipment, make a visual inspection for evidence of any damage that may have been incurred during shipment. The following parts should be included:

- |                                     |                      |
|-------------------------------------|----------------------|
| a. DC/DC Converter                  | MCIA P/N 6430234-( ) |
| b. Mating Connector (& cable clamp) |                      |
| a. 6430234-1                        | MCIA P/N 9018654     |
| b. 6430234-2                        | MCIA P/N 9018655     |
| c. Installation Manual              | MCIA P/N 9018670     |

Equipment not provided:

- |                       |   |
|-----------------------|---|
| a. Mounting Hardware  | 6-32 pan head screws (qty 4 required)<br>#6 lock washers (optional) |
| b. Cable Harness Wire | See Section 3.3 for specifications                                  |

### 3.3 CABLE HARNESS

Construct the cable harness with regards to the instructions below, and using Figures 3.1 – 3.6, and Wiring Diagram of Table 3.3 and 3.4.

Refer to Section 2: Pre-Installation Considerations in regards to routing precautions.

#### 3.3.1 Wire Gauge Selection

Use of PTFE, ETFE, TFE, Teflon, or Tefzel insulated wire is recommended for aircraft use. The following wire gauges are recommended for each of the pins in the connector:

- Pin A – 14AWG stranded or solid
- Pins B and C – 14 AWG or 16 AWG stranded or solid
- Pin D – 24 AWG stranded or solid

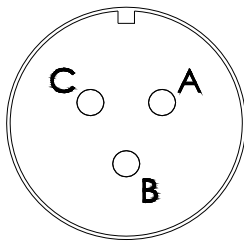
### 3.3.2 Pin Assignment Information

**Positive DC input** – (11 -18 VDC). Connect pin A to aircraft positive 14 VDC bus.  
 (25 Amp circuit breaker recommended)

**DC Output** – Connect pin C as the positive 28V DC output voltage.

**DC Return** – Connect pin B to input power return or aircraft ground.

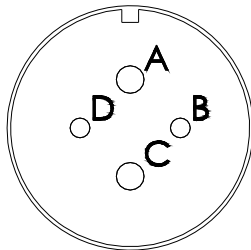
**Enable** – 6430234-1: Not available  
 6430234-2: Pin D to be grounded to enable power output  
 (via switch or other means. See section 4.2.1 and figure 3.6 for related details)



Connector Pinout	
<b>A</b>	<b>DC Power Input</b>
<b>B</b>	<b>DC Power Return</b>
<b>C</b>	<b>DC Power Output</b>

**Figure 3.3**  
**Pinout View of 6430234-1 Unit Connector**

**Table 3.3**  
**6430234-1 Connector Pinout**



Connector Pinout	
<b>A</b>	<b>DC Power Input</b>
<b>B</b>	<b>DC Power Return</b>
<b>C</b>	<b>DC Power Output</b>
<b>D</b>	<b>Remote ON/OFF</b>

**Figure 3.4**  
**Pinout View of 6430234-2 Unit Connector**

**Table 3.4**  
**6430234-2 Connector Pinout**

### 3.3.3 Harness Verification

With the TC230 Static Converter disconnected, activate the aircraft power bus that supplies the unit and use a multi-meter to verify that aircraft power and ground with appropriate voltage is on the pins within the mating harness.



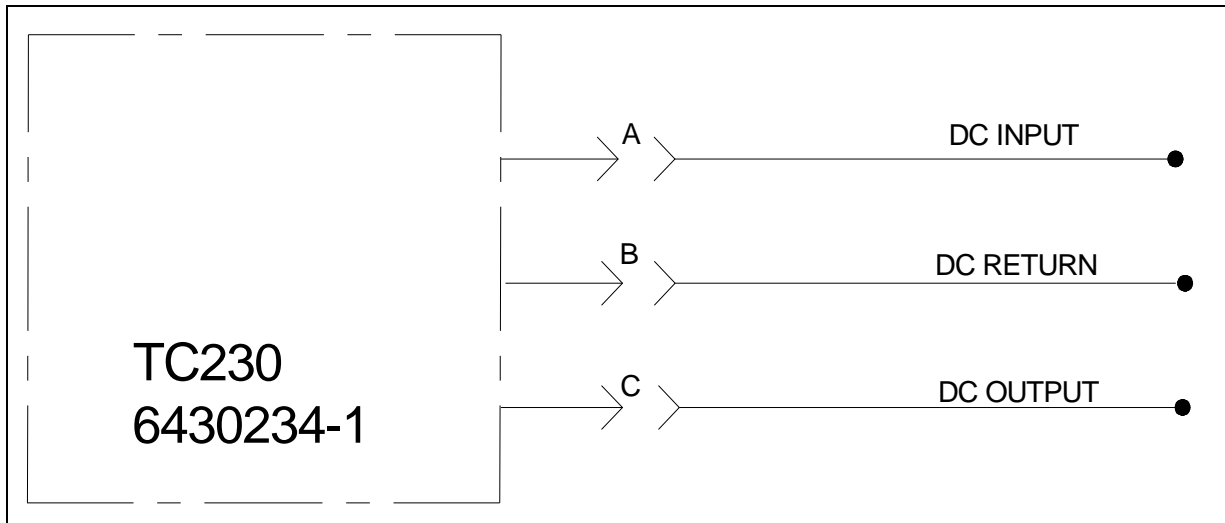


Figure 3.5: Typical 6430234-1 Aircraft Wiring Installation – Constant On

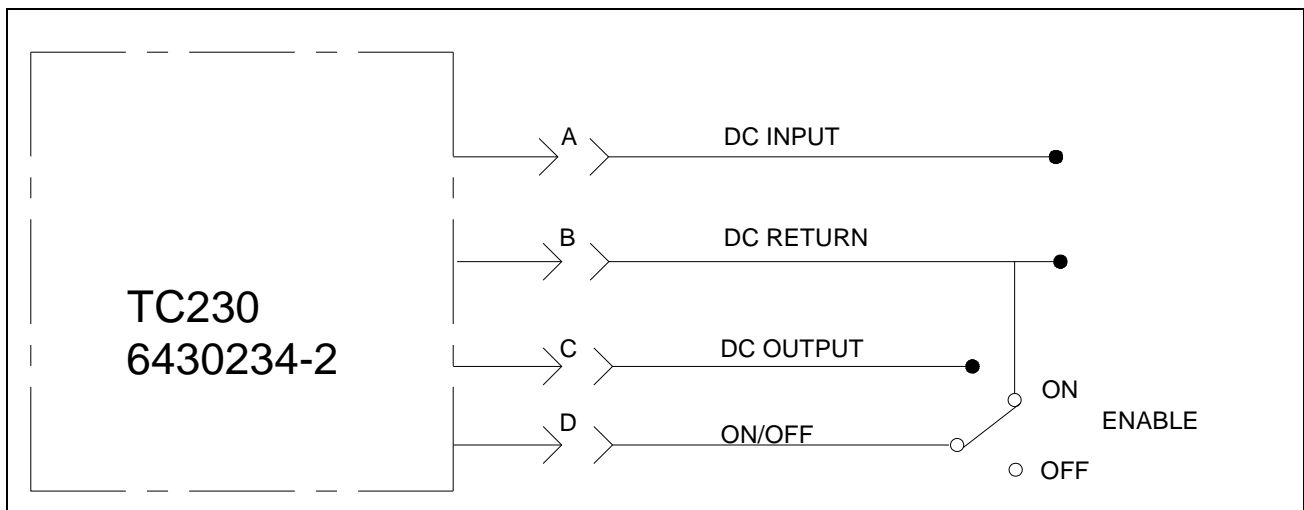
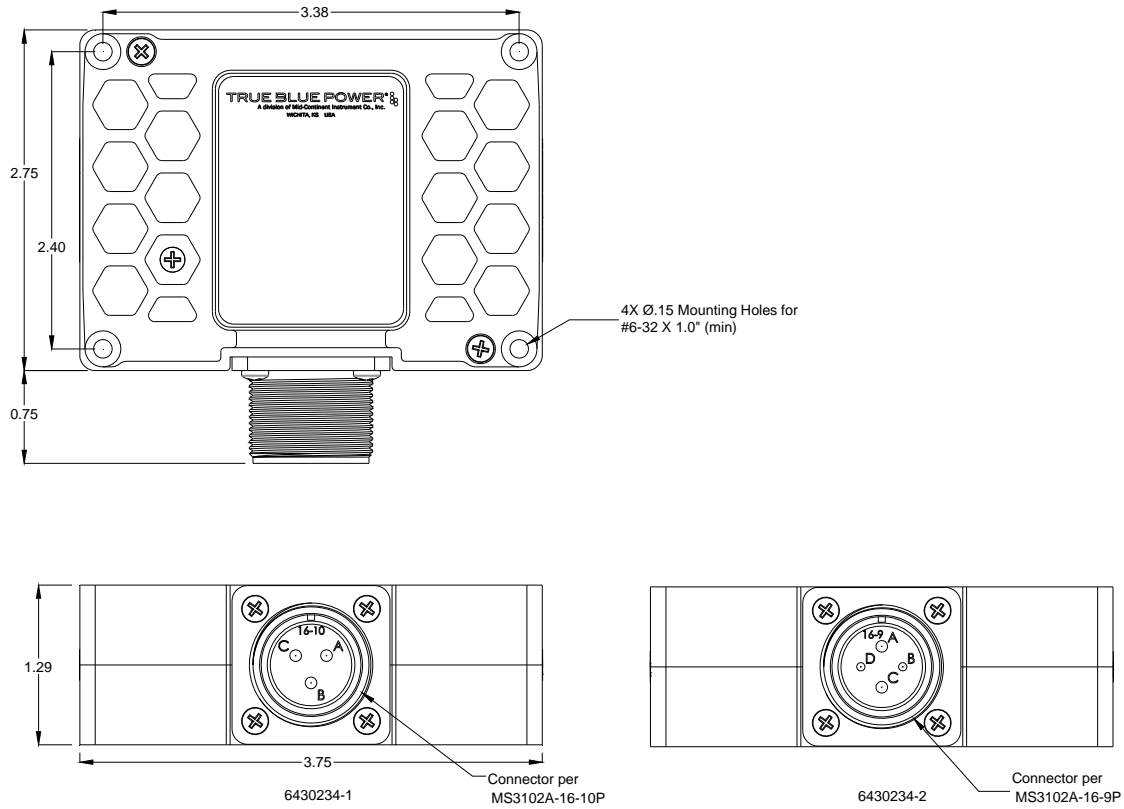


Figure 3.6: Typical 6430234-2 Aircraft Wiring Installation – Remote On/Off

### 3.4 MOUNTING

Refer to Section 2: Pre-Installation Considerations in regards to equipment location.

The TC230 DC/DC Converter is designed for base mounting only. Four 6-32 mounting holes should be provided in the aircraft in accordance with Figure 3.7. Secure the unit with four 6-32 pan head screws, or equivalent. A lock washer under the head of each screw is recommended.



**Figure 3.7**  
**TC230 DC/DC Converter Outline Drawing**

### 3.5 INSTALLATION CAUTION

Under no circumstances should the output of the Converter to be connected to another power output source or damage will occur to the unit or the connected power source.

### 3.6 INSTALLATION COMPLETION

Prior to operating the unit in the aircraft, it is recommended to verify the output and functionality of the unit. In order to prevent accidental damage to other systems, it is best not to attach the output to other equipment or power busses prior to verification. Verify the output of the unit at the terminating end of the cable with a multi-meter to ensure proper voltage and polarity. Once verified, installation can be completed and functionality of the remote on/off feature (if used) should be checked.

## **SECTION 4 OPERATION**

### **4.1 ELECTRICAL PERFORMANCE**

The TC230 is designed as a non-isolated, boost topology, solid-state switch-mode power supply. The unit converts a direct current voltage (10-18VDC) input to a regulated 28 VDC output. It is capable of providing up to 230 watts of power to a variety of aircraft accessories including lights and onboard systems. The rated output of eight (8) amps can be achieved with no special mounting considerations. Peak power up to 9 amps (~250W) can be delivered for up to two (2) hours. Additional power, up to 10 amps (280W) continuously, can be achieved when mounted to a metal surface.

### **4.2 PROTECTIVE FEATURES**

#### **4.2.1 Remote On/Off**

The TC230 DC/DC Converter (6430234-2 only) incorporates a remote on/off feature that allows the user to enable or disable the output of the unit. By providing a ground on the appropriate pin, the user, via a remote mounted switch, can enable the output of the unit. (See Figure 3.6)

#### **4.2.2 Input Under Voltage Limit**

If the input voltage drops below 11 VDC the unit senses an under-voltage condition and disables the output.

#### **4.2.3 Over-Temperature**

The TC230 DC/DC Converter incorporates an internal temperature sensing device that continually provides monitoring and feedback to the control circuits. When the unit senses an internal condition that exceeds maximum temperature ratings, the output is disabled. The Converter will continue to remain shut-down until the temperature returns to within acceptable limits. This over-temperature reset occurs automatically without external intervention required.

#### **4.2.4 Short Circuit And Over-Current**

The TC230 DC/DC Converter is capable of surviving a short circuit or over-current event without permanent damage or effect to long-term reliability. The unit can provide over its rated power output up to 252 watts for over 120 minutes (until over-temperature shutdown occurs).

The Converter monitors the DC output on a pulse-by-pulse scenario to determine a short - circuit or over-current situation. If detected, the output is limited by limiting the current output to less than 10A. The short-circuit condition is latched until power is cycled off and back on.

**SECTION 5 CONFORMANCE**

**5.1 INSTRUCTIONS FOR CONTINUED AIRWORTHINESS**

No periodic scheduled maintenance or calibration is necessary for continued airworthiness of the TC230 DC/DC Converter. If the unit fails to perform to specifications, the unit must be removed and serviced by Mid-Continent Instruments and Avionics or their authorized designee.

**5.2 ENVIRONMENTAL QUALIFICATION STATEMENT**

**PART NUMBER** : 6430234  
**MODEL NUMBER** : TC230  
**NOMENCLATURE** : DC/DC Converter  
**TSO NUMBER** : C71  
**MANUFACTURERS SPECIFICATIONS:** Test Specification (TS) 700-(P), Test Data Sheet (TDS) 700-(P)  
**QUALIFICATION STANDARD** : RTCA DO-160G

CONDITIONS	SECTION	DESCRIPTION OF TEST
Temperature and Altitude	4	Category F2
Low Temperature	4.5.1	Operating Low Temp = -55C
High Temperature	4.5.3	Operating High Temp = +70C
	4.6.1	Altitude = +55,000 ft.
Decompression	4.6.2	+8,000 to +55,000 ft.
Overpressure	4.6.3	-15,000 ft.
Temperature Variation	5	Category S2
Humidity	6	Category B
Operational Shock and Crash Safety	7	Category B
Vibration	8	Category R; Curve C, C1 [(RCC1)]
Explosion	9	Category X
Waterproofness	10	Category X
Fluids	11	Category X
Sand and Dust	12	Category X
Fungus	13	Category F
Salt Spray	14	Category X
Magnetic Effect	15	Category Z
Power Input	16	Category B(XX)
Voltage Spike	17	Category B
Audio Frequency Conducted Susceptibility	18	Category R
Induced Signal Susceptibility	19	Category X
Radio Frequency Susceptibility	20	Category X
Emission of Radio Freq Energy	21	Category M
Lightning Induced Transient Susceptibility	22	Category X
Lightning Direct Effects	23	Category X
Icing	24	Category X
ESD	25	Category A
Flammability	26	Category X