

Installation Manual and Operating Instructions

Model TC120 DC/DC Power Converter



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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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We welcome your comments concerning this manual. Although every effort has been made to keep it free of errors, some may occur. When reporting a specific problem, please describe it briefly and include the manual part number, the paragraph/figure/table reference and the page number. Send your comments to:

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REVISION DETAIL

Revision	Date	Approved	Detail
A	02/10/16	SHO	Initial release
B	03/04/16	BAW	Updated EQF in Section 5, corrected input voltage range, added note to Section 2.4

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SECTION 1 GENERAL DESCRIPTION

1.1 INTRODUCTION

The model TC120 DC/DC Power Converter is a lightweight power converter that translates a direct current (DC) input of 28 volts to 5 - 18V adjustable direct current (DC) output.

The input operating voltage (24–32V) makes the TC120 suitable for nearly any common business or commercial aircraft and provides an adjustable DC output voltage (5–18V). The output of 9 amps at 13.75 VDC produces 120 watts of power to supply avionics, instrumentation, personal charging, lighting, and many other applications. The TC120 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 a remote on/off function. The TC120 DC/DC converter has a robust Military-rated circular connector and a rugged aluminum case dissipates heat and provides excellent mechanical strength. It is engineered to run cooler and requires no external cooling and contains no internal fans or cooling methods, which saves energy, reduces weight and allows more flexible installation locations. At only 0.6 pounds, it is lighter and smaller than any other certified solution in the aviation market today.

1.2 TECHNICAL SPECIFICATIONS

Electrical Attributes:	
Input Voltage:	Rated 28VDC nominal, Operating 24 – 32VDC.
Input Current (full load):	5 amps max (at 28V)
Output Voltage	5 – 18VDC adjustable
Output Power:	120 watts nominal
Efficiency:	90% nominal

Table 1.1

Physical Attributes:	
Weight:	0.60 lbs (0.27 kg)
Dimensions: (not including connector mate)	2.75 inches long x 3.75 inches wide x 1.20 inches high (69.85 mm long x 95.25 mm wide x 30.48 mm high)
Mating Connector (and cable clamp):	MS3106A14S-5S
Mounting:	Base mount – orientation not critical

Table 1.2

Qualifications:	
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 TC120 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 TC120 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.

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 TC120 is designed to operate at full rated load (per Figure 4.1) 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. Reference the following examples of selected conditions when operating at *maximum* rated load of 120 watts (stabilized after 20 minutes):

- At an ambient test temperature of +23°C when not mounted to a metal surface, the maximum case temperature can reach +62°C.
- At an ambient test temperature of +23°C when mounted to a metal surface, the maximum case temperature can reach +42°C.
- At an ambient test temperature of +70°C when not mounted to a metal surface, the maximum case temperature can reach +87°C.

Caution and consideration should be taken with respect to aircraft installation and operation.

SECTION 3 INSTALLATION PROCEDURES

3.1 GENERAL INFORMATION

This section contains interconnect diagrams, mounting dimensions and other information pertaining to the installation of the TC120 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.

3.2 UNPACKING AND INSPECTING EQUIPMENT

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

- | | |
|-------------------------------------|-------------------|
| a. DC/DC Converter | P/N 6430120-() |
| b. Mating Connector (& cable clamp) | P/N MS3106A14S-5S |
| c. Installation Manual | P/N 9018558 |

Equipment not provided:

- | | |
|-----------------------|---|
| a. Mounting Hardware | four 6-32 pan head screws
#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 3.3 – 3.5, and Wiring Diagram of Table 3.3.

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. Use the following wire gauges for each of the pins in the connector:

- Pins A and B – 18 or 16 AWG stranded or solid
- Pins C and D – 16 AWG stranded or solid
- Pins E – 24 AWG stranded or solid

3.3.2 **Pin Assignment Information**

DC Input – (24-32 VDC). Connect pin A to the aircraft positive 28 VDC bus using a 7.5 amp circuit breaker.

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

DC Output – Connect pin C as the positive output voltage (adjustable).

DC Return – Connect pin D to output return or aircraft ground. Equivalent to pin B.

Enable – Connect pin E to either return (pins B or D) directly or through a switch to enable the DC output of the converter. See section 4.2.1 for related detail.

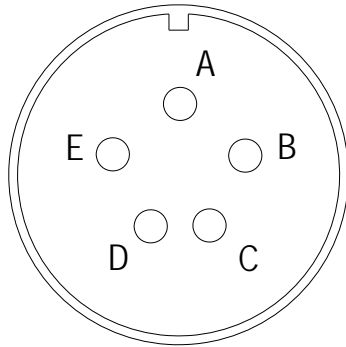


Figure 3.1
Pinout View of Unit Connector

Connector Pinout	
A	DC Input
B	DC Return
C	DC Output
D	DC Return
E	Enable

Table 3.1
Connector Pinout

3.3.3 Harness Verification

With the TC120 DC/DC Power Converter disconnected, activate the aircraft power bus that supplies the unit and use a multi-meter to measure and verify the power, ground, and enable voltages on the appropriate pins within the mating harness.

3.3.4 Output Voltage Adjustment

The output voltage may be adjusted while the TC120 DC/DC Power Converter is connected to the mating harness and aircraft power, but disconnected from the output load. Use a multi-meter at the load end of the harness to measure output voltage.

The adjustment trimmer may be accessed by removing the 4-40 screw near the label as shown in Figure 3.4. After removing the screw, a flat screwdriver (2mm) will fit into the hole and the trimmer. Turn the trimmer carefully either clockwise to increase voltage or counter-clockwise to decrease voltage. Replace the 4-40 screw after adjustment is complete.

The output voltage can be set to any value between 5 and 18VDC. Note that the default output voltage is initially set to approximately 13.8V at the factory.

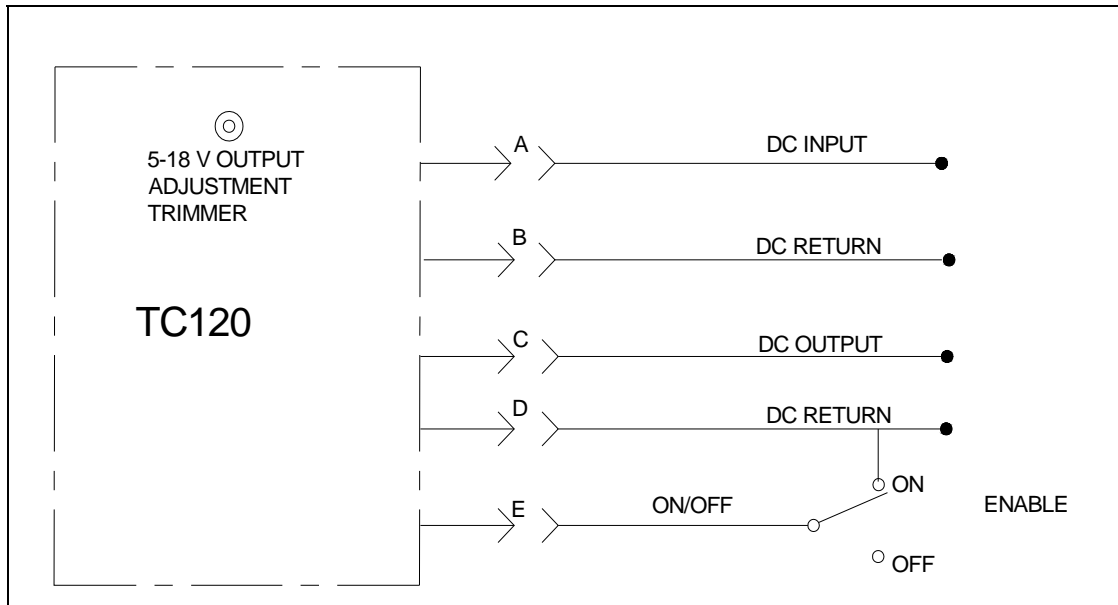


Figure 3.2: Typical TC120 Aircraft Wiring Installation – Remote On/Off

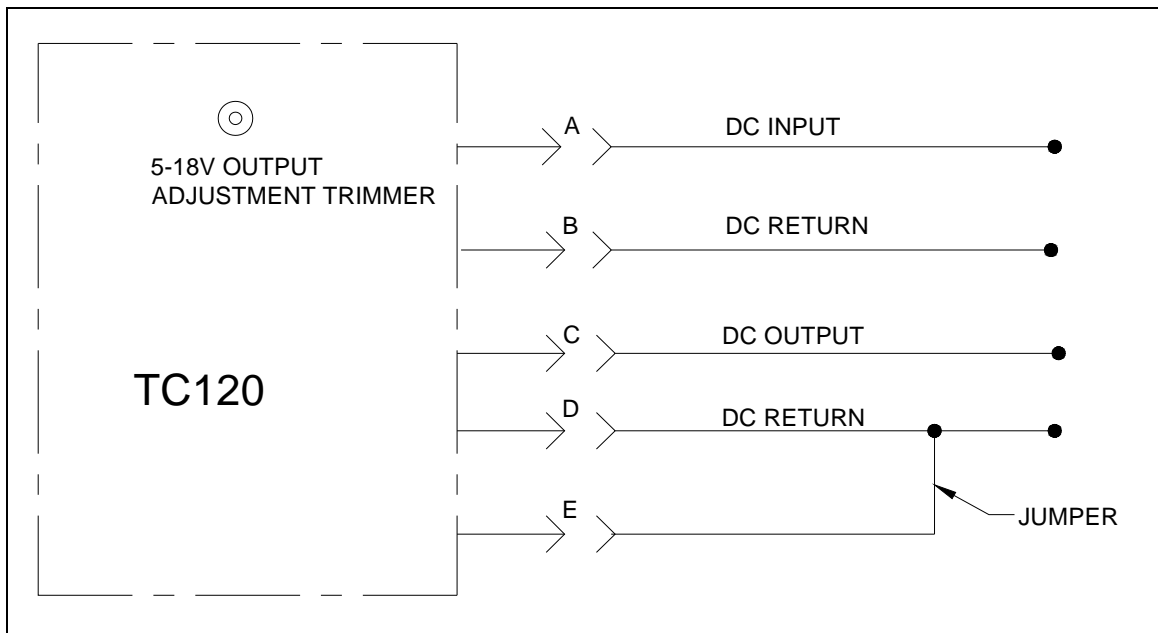


Figure 3.3: Typical TC120 Aircraft Wiring Installation – Constant On

3.4 MOUNTING

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

The TC120 DC/DC Converter is designed for base mounting only. Four 6-32 mounting holes should be provided in the aircraft in accordance with Figure 3.6. Secure the unit with four 6-32 pan head screws, or equivalent. A lock washer under the head of each screw is recommended.

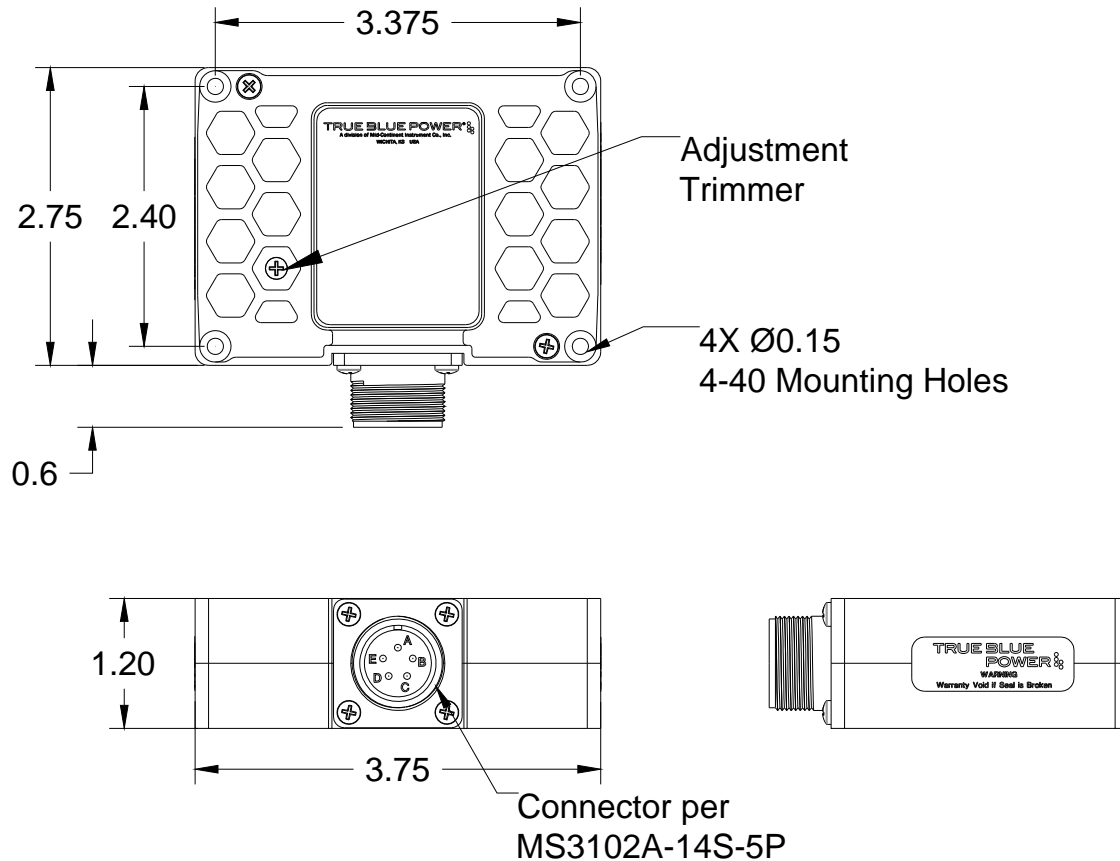


Figure 3.4
TC120 DC/DC Converter Outline Drawing

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 TC120 is designed as a non-isolated, buck topology, solid-state switch-mode power supply. The unit converts a direct current voltage (VDC) input to a regulated 5-18 VDC output. It is capable of providing up to 120 watts of power to a variety of aircraft accessories including lights and onboard systems or portable consumer product power. Rated output current, and thus power, is a function of the user-selected output voltage. See Figure 4.1 for maximum current vs. voltage.

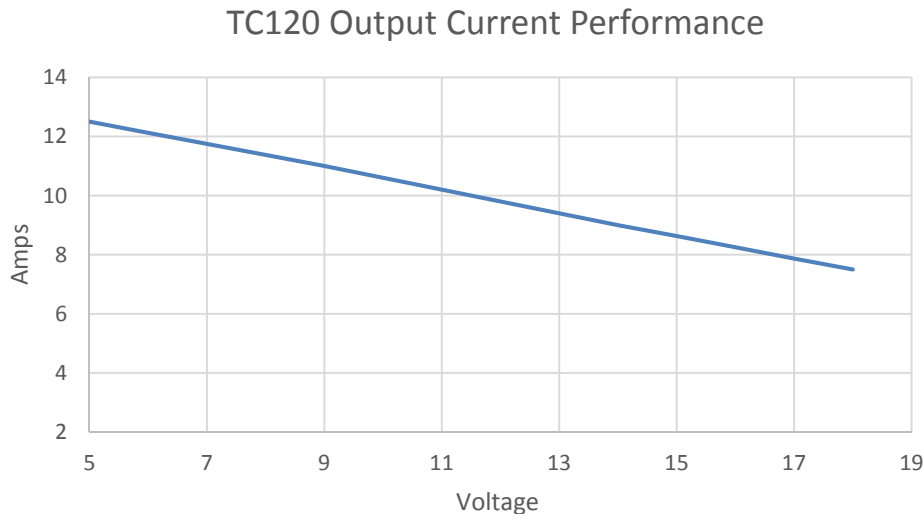


Figure 4.1
TC120 Output Current Performance

4.2 PROTECTIVE FEATURES

4.2.1 Remote On/Off

The TC120 DC/DC Converter 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 3.2) The unit can be similarly disabled by removing the ground signal (open circuit) to the same pin.

4.2.2 Input Voltage Limit

If the input voltage exceeds 34VDC the unit senses an over-voltage condition and disables the output.

4.2.3 Over-Temperature

The TC120 C/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 TC120 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 132 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 11 A. If the short-circuit or over-current situation is removed, the unit will return to normal operation.

SECTION 5 CONFORMANCE

5.1 INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

No periodic scheduled maintenance or calibration is necessary for continued airworthiness of the TC120 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: 6430120 Series **MODEL NUMBER:** TC120
NOMENCLATURE: DC/DC Converter **TSO NUMBER:** C71
MANUFACTURERS SPECIFICATIONS: Test Specification (TS) 627, Test Data Sheet (TDS) 627
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 X
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