Wilmore® ELECTRONICS CO., INC.

USER MANUAL

Series 1605XT
DC-to-DC Converters

SERIES 1605XT
800-Watt
DC-to-DC Converters

This User's Information Manual is applicable for the following Models:

1605XT-130-48-16
1605XT-130-48-16-M3
1605XT-130-48-16-M5

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FOR MODEL 1605XT-130-48-16-M5 ONLY:

This User's Information manual provides general guidance regarding the installation and operation of this dc-to-dc converter, along with maintenance, warranty and contact information. It does not discuss features, programming and connectivity of the converter's Network Communications Interface. For complete information on the setup and use of this feature…

Please Download the **CONVERTER NETWORK COMMUNICATIONS INTERFACE User's Information Manual** at

https://wilmoreelectronics.com/support/#DOWNLOAD

I. General Description

This dc-to-dc power converter provides an isolated, regulated and adjustable 48-Vdc output from 130-Volt station batteries or other widely fluctuating 130-Vdc sources. The input voltage range is 90.0 to 160.0-Vdc, and the output voltage is adjustable ±4Vdc around its 48-Vdc nominal value. The maximum rated output current is 16 Amperes (continuous duty rating at 50°C ambient temperature and free air convection cooling). The converter output is galvanically isolated from the input source and chassis and, therefore, may be connected as either a positive or a negative output.

This converter is electronically protected against overloads, short circuits, and converter-induced output overvoltages. Recovery to normal operating conditions is automatic upon removal of an overload or short-circuit fault. Following an overvoltage shutdown, input power to the converter must be removed for approximately 10 seconds and then reapplied to resume converter operation. This should be accomplished by toggling the front panel breaker or the distribution breaker off for 10 seconds. **Do not "hot-plug" this unit.** Protection against accidental reversal of the input-voltage polarity during installation is provided by a shunt diode working in conjunction with the front-panel circuit breaker.

The operating efficiency of these converters exceeds 90% for most of the output load range. An approximation of input current for a specific input voltage and output load current can be determined as follows:*

$$\text{Input Current} = \frac{(\text{Output Voltage})\ (\text{Output Current})}{(0.90)\ (\text{Input Voltage})}$$

Note that these converters are constant-output-power devices, i.e., with a constant load, the input current and input voltage are inversely proportional. This means that the maximum input current is drawn at the minimum input voltage.

*This approximation applies for output load currents equal to or greater than 30% of maximum rated load current. For loads less than 30% of the maximum rating, linearly decrease input current from its calculated value at 30% load to 100 milliamperes at no load.

II. Installation and Operation

Note: If this converter is equipped with standard options as described in the subsequent section titled "Optional Features", please read the applicable portion of that section AND the following information before installing the converter.

Connection and operation of Model 1605XT converters are almost entirely self-explanatory from the front- and rear-panel markings on each unit. A combination circuit breaker and ON/OFF switch is provided on the front panel for input power. Its rocker handle is flush with the front panel while in the ON position to guard against unintentionally turning the circuit breaker OFF through incidental contact.

All electrical connections to the converter are located on the rear panel. The positive and negative terminals are clearly marked and deliberate caution should be exercised to avoid polarity mistakes. Both the input and the output of the converter are dc-isolated from the chassis and from each other. A connection to chassis ground is provided that accepts lugs for use with #8 hardware.

CAUTION: Always verify that the input power source has been turned OFF before inserting or removing input/output wiring or connectors.

Power connections are made via two-part (i.e. header and plug) connectors. Input and output cabling can be connected to the converter without separating the plug from the header. Alternately, the plug may be removed from the converter by disengaging its mounting-flange screws, and the cabling can be connected to the plug prior to re-engaging it with the header on the converter's rear panel (be sure to re-engage the mounting-flange screws as well). The positive and negative terminals on each power connector are clearly marked, and deliberate caution should be exercised to avoid polarity mistakes. To connect the power cables, simply strip 3/8" – 1/2" from one end of each cable and insert into the appropriate connector wire clamp. Tighten the wire-clamp screw securely and, if using stranded wire, check to make sure that all wire strands have been captured by the wire clamp.

It is suggested that No. 12 AWG or larger cables be used to connect the converter to its 130-Volt source. It is desirable that these cables be kept as short as possible, and, if their length must exceed 10 feet, it may be desirable to use larger wire.

For the output connections between the converter and its load, No. 10 AWG or larger cables should be used, subject to the same comments as above regarding the desirability of minimum length.

An internal circuit that monitors the converter's output preceding the isolating diode (diode only installed in M3 and M5 versions) and indicates output status via a single-pole, double-throw "Form C" contact arrangement brought out to a connector on the rear panel. This is a two-part (i.e. header and plug) connector and, as with the power connectors described previously in Section II, wiring connections can be made without separating the plug from the header. Alternately, the plug may be removed from the converter, and the cabling can be connected to the plug prior to re-engaging it with the header. This plug is held in place by a friction lock – to remove it from the header, grasp the plug firmly and pull it straight out from the rear panel. To connect signal wires to this connector, simply strip approximately ¼" from one end of each wire and insert into the appropriate connector wire clamp. Tighten the wire-clamp screw securely and, if using stranded wire, check to make sure that all wire strands have been captured by the wire clamp. For system wiring flexibility, access to both normally-open and normally-closed contacts is provided (see Figure 2). "Normal" condition means that the converter is ON and proper output voltage is present.

Input Protection

Good installation practice for power conversion equipment dictates that an input fuse or circuit breaker should be located at the power-source end of the cables feeding the equipment. The type and rating of such devices are largely dependent on local and/or national codes and installation variables such as cable routing and wire gauge. Wilmore cannot anticipate these variables and consequently does not recommend specific fuse or circuit breaker values. However, it is important to note a few operating characteristics of this unit that may affect an installer's choice of protection devices.

1) As mentioned previously, this unit is a constant-power device; that is, it draws its maximum input current at its minimum input voltage.

2) As with essentially all electronic equipment with significant input capacitance, the unit will draw an initial peak current many times its normal operating current for a very brief period (a few milliseconds or so) when power is initially applied. **Consequently, instantaneous-trip circuit breakers or non-time-delay fuses may be activated by normal power-up events and are not recommended.**

3) Following the brief capacitor-charging current described above, the unit will exhibit a "soft-start" characteristic that limits its input current to approximately that of its full load current (see Section I for specific load current information) as the circuit reaches its normal operating mode. Consequently, and even though the user's application may only require a fraction of the unit's power rating, the input circuit breaker or fuse must be sized to accommodate the full-load input current to avoid nuisance tripping.

III. Optional Features

Model 1605XT dc-to-dc power converters can be provided as a standard unit, or with several factory-installed options. The presence of one or more of these options is indicated by a suffix in the converter model number, which is silk-screened on the rear panel. The options are available in two modified configurations, designated M3 or M5. If a designation other than M3 or M5 appears as part of the model number, this indicates a non-standard factory modification to the converter - please consult the factory. A brief description of these standard option configurations follows.

M3: Paralleling Diode and Proportional Load Sharing

This configuration is for applications in which converters are paralleled for additional load current and/or redundancy. The converters will proportionally share the load current (after following the Set-Up Procedure below). A power diode is internally wired in series with the converter's positive (+) output terminal.

In the case of an application requiring additional output current, the outputs of two converters may be paralleled to provide up to 32 amperes of output power if the load requires it. Similarly, three converters may be paralleled to provide up to 48 amperes, etc.

In the case of an application requiring redundancy, in the event of a loss of output from one converter, the remaining converter(s) continues to power the load without potential adverse effects from the diode-isolated nonfunctioning converter. For example, three M3-type converters can be paralleled to power a load capable of being powered by only two converters. The three converters will proportionally share the load current, and if any one converter becomes inoperable, the two remaining converters will power the load.

The following initial Set-Up Procedure should be used when installing converters with the M3 configuration:

1. After connecting converter power cables and auxiliary alarm circuits, turn any one converter ON with no load on its output.

2. Load converter to approximately 50% of its rating, and let it warm up for five minutes. Using a digital Voltmeter with 3-digit or better accuracy, measure the output voltage and adjust the front-panel potentiometer to the desired output voltage.

3. Turn the converter OFF.

4. Repeat steps 1 through 3 with each individual converter, applying an identical output load and setting each one's output voltage alike.

Converters with the M3 configuration, adjusted in this manner, will proportionally share the system load current and provide redundancy when properly sized for the system load current. A slight degradation in output-voltage regulation with respect to variations in load current may occur.

M5: Paralleling Diode, Proportional Load Sharing and Ethernet Connectivity

This configuration provides a paralleling diode, balanced load sharing, and Ethernet connectivity.

The following initial Set-Up Procedure should be used when installing converters with the M5 configuration:

1. After connecting converter power cables and auxiliary alarm circuits, turn any one converter ON with no load on its output.

2. Load converter to approximately 50% of its rating, and let it warm up for five minutes. Using a digital Voltmeter with 3-digit or better accuracy, measure the output voltage and adjust the front-panel potentiometer to the desired output voltage.

3. Turn the converter OFF.

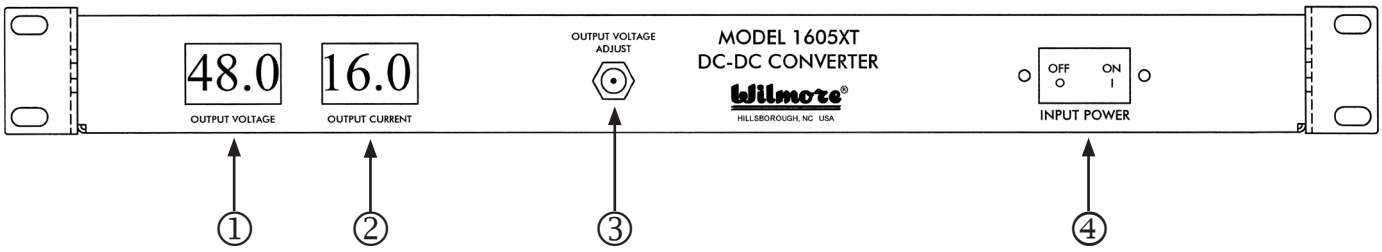
4. Repeat steps 1 through 3 with each individual converter, applying an identical output load and setting each one's output voltage alike.

Converters with the M5 configuration, adjusted in this manner, will proportionally share the system load current and provide redundancy when properly sized for the system load current. A slight degradation in output-voltage regulation with respect to variations in load current may occur.

For complete information on the setup and use of the Ethernet connectivity feature, please download the **CONVERTER NETWORK COMMUNICATIONS INTERFACE User's Information Manual** at

https://wilmoreelectronics.com/support/#DOWNLOAD

Figure 1. Front Panel



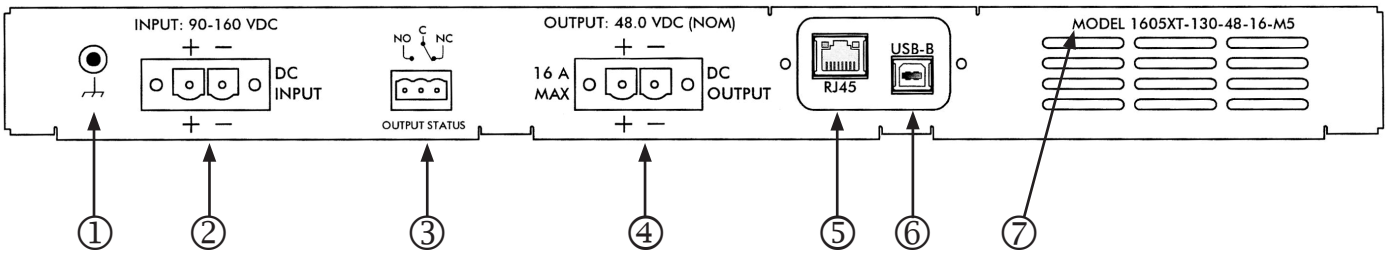
① **OUTPUT VOLTAGE METER:** Displays the voltage in Volts (±3% meter accuracy) appearing at the output terminals *unless* the unit is equipped with an integral output paralleling diode (see Section III. OPTIONAL FEATURES), in which case this meter displays the voltage on the "converter side" of the diode, not the "load side" appearing at the output terminals.

② **OUTPUT CURRENT METER:** Displays the current in Amperes (±3% meter accuracy) being drawn by the load

③ **OUTPUT VOLTAGE ADJUSTMENT:** Adjusts the output voltage over the range of 44Vdc to 52Vdc.

④ **DC INPUT CIRCUIT BREAKER:** This is a combination DC input switch and circuit breaker, provided in the positive (+) input line.

Figure 2. Rear Panel (shown without plugs)



① **CHASSIS GROUND TERMINAL:** Connection to chassis ground is provided for use with #8 hardware.

② **DC INPUT CONNECTOR**: Connections for DC input power are provided via a two-part (plug and header) connector.

③ **OUTPUT STATUS CONNECTOR:** This three-position connector provides access to a set of Form C relay contacts. These contacts are provided for remote indication of an improper output (often referred to as a "converter fail alarm"). The maximum DC voltage and power ratings for these contacts are 125Vdc and 30 Watts, respectively.

④ **DC OUTPUT CONNECTOR:** Connections for DC output power are provided via a two-part (plug and header) connector.

⑤ **RJ45 ETHERNET PORT (M5 version only):** Used for network connectivity. A properly configured IPv4 Ethernet connection is required to access the web interface, monitor via SNMP (Simple Network Management Protocol), or query the web service API (Application Programming Interface). For additional information, see separate Converter Network Communications Interface User's Information Manual, available from Wilmore's website as a download.

⑥ **USB 2.0 TYPE B PORT (M5 version only):** Used for initial setup and configuration of the communications interface (requires Wilmore's configuration application). Also allows you to query specific information via the serial terminal console. See separate Converter Network Communications Interface User's Information Manual, available from Wilmore's website as a download.

⑦ **MODEL NUMBER:** This is the complete model number of the converter, including standard or special factory-assigned modification codes.

IV. Maintenance Information

Other than preventing dust accumulation on internal components and external surfaces of the converter, no periodic maintenance should be required.

A damaged or malfunctioning unit should be returned to Wilmore for repair. Multiple-component cascade failures in power conversion circuitry can greatly complicate trouble-shooting procedures, and factory technicians familiar with the circuitry can locate the problem quickly, explore adjacent circuitry for stressed or damaged components, and subject the converter to a thorough retest.

Wilmore maintains a **Return Material Authorization** system in order to efficiently track your inbound shipment and expedite its repair and return to you. Before shipping material for repair to Wilmore, please call (919) 732-9351 or email *info@wilmoreelectronics.com* and request a **RMA Number** for your shipment. If possible, please provide the complete model number of the equipment, its serial number, and a brief description of the problem. Place this **RMA Number** on the outside of the package and ship prepaid to:

WILMORE ELECTRONICS CO., INC.
607 U.S. 70A East
P.O. Box 1329
Hillsborough, NC 27278

V. Limited Warranty

Wilmore Electronics Company, Inc. warrants this product to be free from defects in material and workmanship for one (1) year after delivery to the original purchaser. During this period, a defective product for which an authorization to return the product has been given, shall be returned to Wilmore freight prepaid. The products will be repaired, replaced, or credit allowed only if the defect, after examination by Wilmore, is determined to be a defect in material or workmanship. If this returned product is determined by Wilmore to have suffered from user misuse or abuse or to have been opened or modified without written instructions from Wilmore, or if the date of receipt of a request for return authorization exceeds the 1-year warranty period, the warranty is null and void. In such cases, Wilmore will determine the cost of repair, quote this price to the purchaser, and continue as advised by the purchaser.

The sole obligation of Wilmore and the purchaser's exclusive remedy under this or any other warranty, expressed or implied, is the repair or replacement of a defective product as provided above, or the issuance of credit in an amount not to exceed the contract price for the product deemed to be defective. Wilmore makes no warranty of merchantability or fitness for a particular use. Wilmore shall not be responsible for incidental or consequential damage, whether or not foreseeable, caused by defects in this product. There are no other warranties which shall extend the description above.