



Wilmore[®]
ELECTRONICS CO., INC.

USER MANUAL
Series 1721
DC-to-DC Converter

SERIES 1721 **Fault Tolerant 200-Watt** **DC-to-DC Converters**



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

1721-24-13-15
1721-24-24-8
1721-24-48-4
1721-48-13-15
1721-48-24-8

1721-48-48-4
1721-130-13-15
1721-130-24-8
1721-130-48-4



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CAUTION!**To avoid equipment damage during installation...**

- 1) Prior to installing the converter, verify that its front-panel input power switch (a "rocker-arm" circuit breaker) is in the OFF position, indicated by a wedge-shaped section of the rocker arm protruding from the front panel and exposing white plastic in the rocker assembly. If the converter does not appear to be turned off, push against the word "OFF" printed on the switch face to expose the white plastic indicator before making any connections to the converter.
- 2) Safe installation practice dictates that the DC input line connections should be de-energized at the DC source prior to connecting to the converter input. Verify that this is the case before making any connections to the converter. Once these input connections are made and the converter's input power switch has been verified to be in the OFF position, the DC input lines can be energized.

... do not "hot plug" or apply an energized connection to a "turned on" converter.

I. General Description

The Series 1721 dc-to-dc converter provides an isolated, regulated and fault-tolerant voltage output from station batteries or other widely-fluctuating voltage sources. Its internal dual/redundant design features two independent converter assemblies housed in a single 1.75"-high rack-mount enclosure, with integral output OR-ing diodes for each assembly to prevent faults in one converter from affecting the other. The input voltage range is shown in Table 1, and although this dual-converter unit can be operated from a single dc source, provision is also made for dual input feeds to allow users the flexibility to provide further redundancy through separate power feeds to the converter. The maximum rated output current is shown in Table 1 (continuous duty rating at 60°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 short circuits and converter-induced output overvoltages. Recovery to normal operating conditions is automatic upon removal of a short-circuit fault. Following an overvoltage shutdown, input power to the converter must be removed for approximately 30 seconds and then reapplied to resume converter operation. Protection against accidental reversal of the input-voltage polarity during installation is provided for each input by a shunt diode working in conjunction with its corresponding front-panel circuit breaker.

The operating efficiency of this converter exceeds 85% 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:*

$$\text{Input Current} = \frac{(\text{Output Voltage}) (\text{Output Current})}{(0.85) (\text{Input Voltage})}$$

Note that this converter is a constant-output-power device, 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 20% of maximum rated load current. For loads less than 20% of the maximum rating, linearly decrease the input current from its calculated value at 20% load to X milliamperes (in Table 1) at no load.

TABLE 1

MODEL	INPUT VOLTAGE RANGE (VDC)	OUTPUT VOLTAGE (VDC)	MAXIMUM OUTPUT CURRENT (A)	X (see paragraph above)
1721-24-13-15	21 - 29	13	15	300 mA
1721-24-24-8	21 - 29	24	8	300 mA
1721-24-48-4	21 - 29	48	4	150 mA
1721-48-13-15	42 - 58	13	15	200 mA
1721-48-24-8	42 - 58	24	8	200 mA
1721-48-48-4	42 - 58	48	4	200 mA
1721-130-13-15	105 - 145	13	15	100 mA
1721-130-24-8	105 - 145	24	8	100 mA
1721-130-48-4	105 - 145	48	4	100 mA

II. Installation and Operation

Connection and operation of Series 1721 converters are almost entirely self-explanatory from the front- and rear-panel markings on each unit (see Figures 1 & 2). All electrical connections to the converter are located on the rear panel.

Series 1721 converters can be operated from a single dc source or from two separate dc power feeds. It is recommended, in either case, that the user employ two pairs of input cables (one positive/negative pair for each input connector) to connect the input terminals to the dc source(s)*. **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. Both the input and the output of the converter are dc-isolated from the chassis and from each other. Suggested wire sizes for input and output cabling are shown in Table 2 on the next page and are listed by model number. 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. A #8-32 locking screw is provided for connection to chassis ground.

Two combination circuit breaker/ON-OFF switches are provided on the front panel, one for each internal converter. The rocker handles are flush with the front panel while in the ON position to guard against unintentionally turning the circuit breakers OFF through incidental contact. Similarly, two green LED's indicate the presence (ON) of proper output voltage for each of the converters.

TABLE 2

MODEL	INPUT CABLE (AWG)* 2 PAIRS/4 CABLES	OUTPUT CABLE (AWG) 1 PAIR/ 2 CABLES
1721-24-13-15	12	10
1721-24-24-8	12	14
1721-24-48-4	12	16
1721-48-13-15	14	10
1721-48-24-8	14	14
1721-48-48-4	14	16
1721-130-13-15	18	10
1721-130-24-8	18	14
1721-130-48-4	18	16

*If necessary, a single pair of larger input cables may be used, and the two input connectors can be wired in parallel locally at the converter's rear panel. Please contact Wilmore for recommended cable sizes and connections.

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.

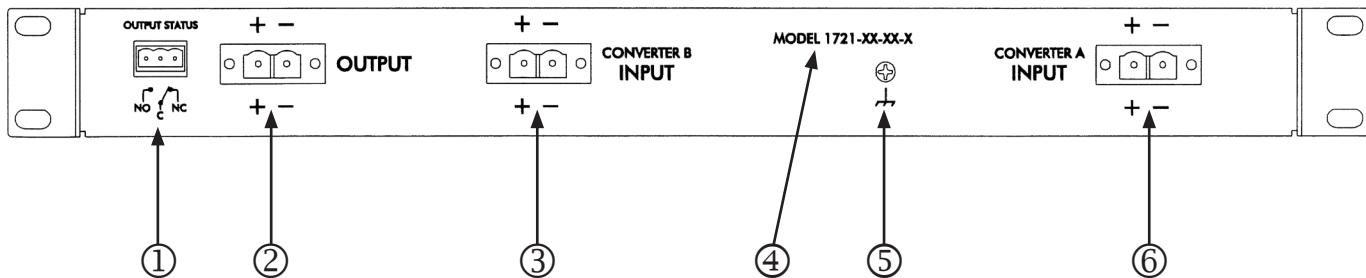
Series 1721 dc-to-dc power converters are provided with factory-installed paralleling diodes (also known as OR-ing diodes). These integral power diodes are wired in series with each internal converter's output. In the event of a loss of output from either of the internal converters, the remaining converter continues to power the load without potential adverse effects from the diode-isolated nonfunctioning converter. An internal circuit monitors each converter's output preceding the paralleling diode and indicates output status via the corresponding front-panel LED. In addition, this status information is available for remote monitoring via a single-pole, double-throw ("Form C") contact arrangement brought out to a three-position 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 $\frac{1}{4}$ " 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). The "normal" condition means that the converter is ON, with proper output voltage present and auxiliary relay coil energized.

FIGURE 1. FRONT PANEL (shown without mounting brackets)



- ① **"CONVERTER A" OUTPUT POWER INDICATOR:** This green LED indicates the presence (ON) or absence (OFF) of proper output voltage for "Converter A".
- ② **"CONVERTER A" DC INPUT CIRCUIT BREAKER:** This is a combination DC input switch and circuit breaker, provided in the positive (+) input line for "Converter A".
- ③ **"CONVERTER B" OUTPUT POWER INDICATOR:** This green LED indicates the presence (ON) or absence (OFF) of proper output voltage for "Converter B".
- ④ **"CONVERTER B" DC INPUT CIRCUIT BREAKER:** This is a combination DC input switch and circuit breaker, provided in the positive (+) input line for "Converter B".

FIGURE 2. REAR PANEL
 (shown with mounting brackets and without plugs attached)



- ① **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 from either (or both) internal converters (often referred to as a "converter fail alarm"). The maximum DC voltage and power ratings for these contacts are 125Vdc and 30 watts, respectively.
- ② **DC OUTPUT CONNECTOR:** Connections for DC output power are provided via a two-part (plug and header) connector.
- ③ **"CONVERTER B" DC INPUT CONNECTOR:** Connections for DC input power are provided via a two-part (plug and header) connector.
- ④ **MODEL NUMBER:** This is the complete model number of the inverter, including any standard or special factory-assigned modification codes.
- ⑤ **CHASSIS GROUND:** Connection to chassis ground is provided by a #8-32 locking screw.
- ⑥ **"CONVERTER A" DC INPUT CONNECTOR:** Connections for DC input power are provided via a two-part (plug & header) connector.

III. Maintenance Information

Other than preventing dust and debris 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 an **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

IV. 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.