Allen-Bradley

Application Note

Using the Auxiliary +5v Logic Supply Feature of the Ultra3000

Introduction

This application note provides guidelines for using the auxiliary +5v logic supply feature of the Ultra3000™ drive.

Affected Models:

- 2098-DSD-005x-xx
- 2098-DSD-010x-xx
- 2098-DSD-020x-xx

These guidelines include power supply recommendations and a procedure for voltage adjustment. The 500W, 1kW, and 2kW models of the Ultra3000 family support a feature allowing the user to power the control board independently with an external +5v power supply. This enables you to remove the main AC power supply to the drive and still keep the position monitoring function of the drive working, thus avoiding re-homing the system when the main AC is brought back on line. This feature is also used with SERCOS interface™ or DeviceNet™ models of the drive to maintain drive communications with a master.

Power Supply Requirements

The control board on the Ultra3000 is specified to operate with a DC power supply of 5.10 - 5.25v at 1.5A. Although the drive typically draws less than 1.0A of current, under worst case conditions the usage can approach 1.5A.

The unusual tolerance on the voltage, 5.10 - 5.25v, is required in order to properly supply the motor encoder with 5v power. The encoders used with the Ultra3000 typically require at least 4.75v, so supplying the drive with a minimum of 5.10v allows up to 0.35v of drop in the cabling to the motor encoder. The motor encoder cables associated with the Ultra3000 were designed to produce less than 0.35v of voltage drop even at their maximum length. The 5.25v maximum is required because of limitations of the integrated circuits on the control board.

Note: The external power supply must *not* be connected to chassis ground. Because the logic common of the drive is connected to chassis ground, if this signal is also connected to chassis ground, disruptive ground currents could flow because of the ground loop. This is exactly the situation if a single +5v power supply is used to power multiple drives, since each drive has its logic common connected to chassis ground.

While applications have used a single power supply with multiple drives without ground loop problems, because of the problems that could be encountered, it is not recommended that a single +5v power supply be used to power multiple drives.

Power Supply Selection

Other than output voltage and current, several factors are critical in selecting a +5v power supply for use with the Ultra3000.

Adjustable Output

The external power supply must have an adjustable voltage output to allow for voltage drops in the cabling and meet the unusual voltage requirement of 5.10 - 5.25v. Typically, the power supply will need to be adjusted +/-10%.

Linear vs. Switching

The tradeoffs between linear power supplies and switching power supplies is well known, however a brief mention is still warranted. Both types of power supplies are suitable for use with the Ultra3000 so the choice of these power supplies will be application dependent. The table below summarizes the advantages of the two architectures. Generally speaking, linear power supplies present the lowest risk solution due to their inherent lower noise levels.

Type	Advantages
Linear	◆ Low Cost ◆ Low Output Voltage Ripple ◆ Less EMI
Switching	◆ Small Size ◆ Universal Input

Recommended Models

The power supply models listed below meet the requirements of the drive and have been evaluated for functional performance and CE compliance when used with the Ultra3000.

Manufacturer	Model	Dimensions (h x w x d, inches)	Notes
Power-One 1-800-678-9445 *www.power-one.com*	HB5-3/OVP-A	4.9 x 2.1 x 4.0	▪ Open Frame ▪ Solder Terminals ▪ Jumper-Selectable Input Voltage, 100-240V AC
Condor 1-800-235-5929 *www.condorpower.com*	HB5-3/OV-A+	4.9 x 2.1 x 4.0	▪ Open Frame ▪ Solder Terminals ▪ Jumper-Selectable Input Voltage, 100-240V AC

Sola 1-877-999-7652 *www.sola-hevi-duty.com*	SLS-05-030-1T	4.9 x 2.1 x 4.0	▪ Open Frame ▪ Screw Terminals ▪ Jumper-Selectable Input Voltage, 100-240V AC ▪ Optional Cover

Manufacturer	**Model**	**Dimensions (h x w x d, inches)**	**Notes**
Kepco *1-718-461-7000* *www.kepcopower.com*	FAW5-3K	3.8 x 1.0 x 3.9	▪ Open Frame ▪ Optional Cover ▪ Optional DIN Bracket ▪ Screw Terminals ▪ Universal Input Voltage, 85-264V AC
Omron *1-800-556-6766* *www.omron.com*	S82K-00705	3.0 x 1.5 x 2.6	▪ 85-264v AC Input ▪ Enclosed ▪ DIN Mount ▪ Screw Terminals

Voltage Adjustment Procedure

Since the drive has a tight voltage requirement for its +5v power supply, 5.10v - 5.25v, it is critical that an external +5v power supply output voltage is adjusted properly so that the voltage at the drive is correct. The DC loss in the cable can be significant, as shown below.

Wire Gauge	**Voltage Drop at 20°C**	**Voltage Drop at 60°C**
18 AWG	0.06 Volts/meter	0.07 Volts/meter
20 AWG	0.09 Volts/meter	0.11 Volts/meter
22 AWG	0.17 Volts/meter	0.20 Volts/meter

The maximum current draw of 1.5A and will vary slightly for different wire stranding. The values represent losses for a pair of wires and account for DC voltage drops in the power wire and return wire.

Ideally, the external power supply will be adjusted while monitoring the DC voltage at the drive to achieve the proper levels. However, this is difficult on the Ultra3000 since a +5v terminal is not convenient and the cable must be plugged into the drive so that it is drawing current. Consider the following methods instead:

Method 1: Drive-Mounted Terminal Board

If a drive-mounted terminal board is used, the measurement of the voltage at the drive is trivial. In all other cases, the pins on the 44-pin D-shell connector are not accessible and Method 2 or 3 can be employed.

Method 2: Measuring the Drive Voltage at CN2

Disconnect the encoder cable from the drive and measure the drive power supply across CN2.6 and CN2.14. Since CN2 is a female connector this can be difficult.

Method 3: Estimating the Drive Voltage Remotely

Adjust the power supply down until the control board enters a reset mode. The control board has a reset generator that holds the processor in reset at a fairly precise voltage level of ~4.65v. This point can be determined and the voltage at the power supply can then simply be increased by 0.6v, (5.25v - 4.65v = 0.6v). This adjustment procedure is as follows:

1. Connect a voltmeter to the power supply terminals and set power supply voltage to 5.2v.
2. Connect power supply to drive.
3. Verify that the control board is operational. This is indicated by the 7-segment display showing a racetrack, blinking fault code, or SERCOS phase. If the 7-segment display is blank, the voltage on the control board is below 4.65v. Adjust the power supply voltage up slowly until the control board becomes operational.
4. Slowly adjust the power supply voltage down until the 7-segment display on the control board is blank and note the power supply voltage when this occurs.
5. Increase the power supply voltage by 0.6v.

www.rockwellautomation.com

Corporate Headquarters
Rockwell Automation, 777 East Wisconsin Avenue, Suite 1400, Milwaukee, WI, 53202-5302 USA, Tel: (1) 414.212.5200, Fax: (1) 414.212.5201

Headquarters for Allen-Bradley Products, Rockwell Software Products and Global Manufacturing Solutions
Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
Europe: Rockwell Automation SA/NV, Vorstlaan/Boulevard du Souverain 36-BP 3A/B, 1170 Brussels, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
Asia Pacific: Rockwell Automation, 27/F Citicorp Centre, 18 Whitfield Road, Causeway Bay, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Headquarters for Dodge and Reliance Electric Products
Americas: Rockwell Automation, 6040 Ponders Court, Greenville, SC 29615-4617 USA, Tel: (1) 864.297.4800, Fax: (1) 864.281.2433
Europe: Rockwell Automation, Brühlstraße 22, D-74834 Elztal-Dallau, Germany, Tel: (49) 6261 9410, Fax: (49) 6261 1774
Asia Pacific: Rockwell Automation, 55 Newton Road, #11-01/02 Revenue House, Singapore 307987, Tel: (65) 351 6723, Fax: (65) 355 1733

Publication 2098-AT003A-EN-P– July 2002