



# ***SYSTEM SUPPORT SERVICES***

## **FUNCTIONAL SPECIFICATION**

10-0020 Power Supply Assembly

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*11046 State Road 52  
Hudson, FL 34669*

*TEL (727) 379-0484  
FAX (727) 379-0831*

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### 1.0 SCOPE

This document describes a replacement for the Electrostatics Model 302 Power Supply that is currently used by COMPUTROL Multiplexing equipment.

This replacement supply will be form, fit and functionally compatible with the current Model 302 Power Supply. It will utilize the same mounting hole pattern. It will utilize the same terminal block layout for connection of external signal wires, such that NO CHANGES to existing drawings of the Security Multiplexer cabinets will be required.

It is not the intent of this specification to provide detailed specs on every aspect of the new supply. The complete specs have been included as an appendix for this purpose. This document will address the highlights of the new supply and discuss issues relating to its incorporation in the existing frame and connector block of the original supply.

The project is designed to retain the existing COMPUTROL  $\pm 12$  volt regulator assemblies.

### 2.0 GENERAL DESCRIPTION

The replacement power supply assembly will replace the current Electrostatics Model 302 Power Supply assemblies currently installed at the majority of sites using COMPUTROL Multiplexing equipment.

The new power supply will consist of a new, modern, switching power supply unit that is commercially available and has been warranted by the selected manufacturer to be current product for the foreseeable future. This unit will be mounted in the existing Electrostatics Model 302 power supply frame, and will utilize the existing terminal block.

The selected Power Supply is an Integrated Power Designs, Inc., Model CE-225-3002. The manufacturer-provided specifications of this supply are attached to this document. The supply will be supplied with the Overvoltage Protection Option. The optional cover will not be selected.

The replacement power supply will be mounted into the existing Model 302 frame. This modification will ensure that existing frame-mounting holes will be easily accessible for mounting purposes. A wiring harness will connect the new supply to the existing terminal block, such that external connections to existing wiring harnesses will be identical to those currently used for the Model 302. The new supply will also fit within the current supply's envelope, to ensure that no external components of the system will have to be relocated to accommodate the new assemblies.

The output power capacity of the replacement supply will be sufficient to supply the full rated current of the original Electrostatics Model 302 supply in a convection cooled mode.

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**3.0 MECHANICAL SPECIFICATIONS**

**3.1 Physical Specifications**

The physical dimensions of the replacement power supply assembly are actually less than those of the original Electrostatics Model 302 Supply. The reason for this is that, while we are retaining the 302's frame, the original supply contained a heat sink that was mounted on the outside rear of the frame. In the replacement version, we will remove this heat sink, as it is not needed. The replacement supply will fit entirely within the envelope of the Model 302's frame.

The physical specifications of the replacement power supply assembly are as follows:

Length (inches:)	10.45
Width (inches:)	6.00
Height (inches:)	4.00
Weight (lbs)	4.5

**3.2 Connectors**

A 10 position barrier block with 6/32 screw terminals is used for all inputs and outputs. The terminals mates with #6 Ring Tongue terminals.

The terminals are not numbered. Looking at the front of the terminal block, and reading from left to right, the connections are as follows:

<b>Terminal Designation</b>	<b>Signal Name</b>
GND	Earth Ground
115 N	AC Neutral Input
115 L	AC Line Input
+S	+5 Volt Sense Input
+	+5 Volt Output
-	-5 Volt Output
-S	-5 Volt Sense Input
+	+15 Volt Output
COM	Common (Ground)
-	-15 Volt Output

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### 3.3 Mounting Arrangement

The replacement supply will use the exact same mounting arrangement as the original Electrostatics Model 302 supply. The reason for this is of course because we are retaining the aluminum U-shaped frame with its mounting holes. The switching supply is just narrow enough that it will not interfere with the mounting holes. Access to mounting nuts or bolts can be obtained from either the side or from above with a wrench, screwdriver or socket wrench.

### 3.4 Environmental Specifications

The replacement supply is designed to operate in the temperature range from 0 to 70°C. While it does not cover the same operating range of the original Electrostatics supply, it is deemed adequate, because equipment heating and environmental conditioning of equipment cabinets will ensure that the operating temperature does not exceed the limits of the replacement supply. Further, the operating temperature range of the replacement supply meets or exceeds that of the remainder of the COMTROL 1 equipment which is housed in the same equipment cabinets. Please refer to Appendix B for other environmental specifications of the replacement supply.

### 3.5 Safety Specifications

The replacement supply adheres to numerous safety specifications, as follows:

Underwriter's Laboratories (File E137708)	UL 1950 Third Edition UL 2601-1 Second Edition CB Report Per IEC 950 (1991) Second Edition A1, A2, A3, A4 All EN 60950 Deviations CB Report Per IEC 601-1-1988 First Edition, A1, A2
UL Recognition Mark for Canada (File E137708)	CAN/CSA-C22.2 No. 950-M95 CAN/CSA-C22.2 No. 601-M90
TUV license B 98 07 30824 004	EN 60950/A4 (1997) EN 60601-1/A2 (1995)
CE	Low Voltage Directive
General	Protection Class: I Overvoltage Category: II Pollution Degree: 2

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### 4.0 ELECTRICAL SPECIFICATIONS

#### 4.1 Supply Voltages

The replacement supply will provide the same output voltages of +5V, +15V, and –15V as the original Electrostatics Model 302 supply.

The individual current output capabilities of the replacement supply meet or exceed those of the Electrostatics unit.

The replacement supply is capable of supplying up to 150 watts of output power under convection cooling conditions, up to the maximum operating temperature of the COMTROL 1 equipment, which is 50°C.<sup>1</sup> See page 2 of Appendix B for temperature derating chart. The original Electrostatics supply is capable of supplying 135 watts at full rated temperature. The replacement supply is designed to supply 135 watts output up to 55°C. This provides a margin of approximately 5°C over the maximum operating temperature of the COMTROL 1 equipment.

All outputs have overcurrent or overpower protection, and the optional overvoltage protection for Output 1 will be supplied.

The replacement supplies require that a minimum load of 10% of the rated capacity of Output 1, or 2.5 Amperes DC, be drawn at all times to maintain proper regulation. This load will be provided by a 2.0 ohm, 25 watt, 1% load resistor within the supply to ensure that the minimum load is guaranteed.

The replacement supplies are capable of load sharing via a diode-or network. The existing 30-0068 Load Sharing Module will be used for dual-supply applications. It will be mounted in the standard location and will be connected in the same manner as for original Electrostatics supplies.

Please refer to Appendix B for additional specifications relating to output voltages and regulation.

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<sup>1</sup> Source – Instruction Manual for COMTROL 1 High-speed Multiplexing System, Document Number 90-0020, December, 1981, Specifications, Page 1.

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### 4.2 Control Signals

The original Electrostatics Model 302 supply had two sense inputs for Output 1 (+5V.) The replacement supply will provide these sense lines at the terminal block as in the original unit.

Additionally, this supply has options for a power fail signal, and for remote turn on and turn off. If desired, the units can be ordered with these options if it is desired to implement these functions in the system at a later time.

### 4.3 Input Specifications

The replacement supply can accept a continuous input voltage of between 85 and 264 VAC. This exceeds the original supply's specifications.

The replacement supply's frequency range is not as great as the original Electrostatics supply. However, the frequency range of the replacement supply is expected to be adequate for this application. Caution should be taken when operating the equipment from a generator, for example, such that the generator frequency does not exceed the maximum of 63 Hz.

The source current is specified at 4.25A max at 85 Volts. Input current on the original supply is not specified, but since switching supplies are more efficient than linear supplies, it is expected that the replacement supply will draw less current for the same load as the original supply did.

The replacement supply includes a line fuse on the input circuit, which the original did not. Users of the replacement supply should be aware of this when troubleshooting power problems with the new unit. This fuse is not field replaceable.

### 4.4 Other Electrical Specifications

Please refer to Appendix B for information on Efficiency, Power Factor, Dielectric Strength, Leakage Current, and Electromagnetic specifications.

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**5.0 COMPARISON OF SPECIFICATIONS**

This section will compare and contrast the specifications of the new power supply with the original Electrostatics Model 302 Power Supply. Copies of both OEM specification documents are appended to this specification for reference. Where the new power supply specification meets or exceeds the original specifications, “Compliant” will appear in the “Compliance” column. Where the original specification is not met, “Non-compliant” will appear, along with a footnote number. Non-compliant specifications will be discussed individually in the footnotes. In cases where the information is not available to compare the new power supply’s specifications to the original supply, the term “Not Available” will appear in the Compliance column. If a specification item for the original supply does not apply to the new supply because of design differences between the two units, “Not Applicable” will appear. Non-applicable specification items will be discussed in more detail later on in this section as well.

Physical Specifications such as dimensions and weight are not discussed, as these attributes of the replacement power supply will be discussed with regard to the unit’s ability to fit within the original supply’s frame.

<b>Specification Item</b>	<b>Electrostatics 302</b>	<b>IPD Model CE-225-3002</b>	<b>Compliance</b>
Input Voltage	105-125 VAC	85-264 VAC	Compliant
Input Frequency	47-420 Hz	47-63 Hz	Non-Compliant <sup>2</sup>
Input Current	Not Available	4.25A RMS maximum (85 VAC)	Not Available <sup>3</sup>
Line Regulation	0.005% or 2 mV MIN (10 Volt Change)	±0.5% maximum at full load	Non-Compliant <sup>4</sup>
Output 1 Ratings	+5V @ 15A	+5V @ 20A (derated)	Compliant
Output 2 Ratings	+15V @ 2A	+15V @ 6.4A (derated)	Compliant

<sup>2</sup> The anticipated frequency range used in this application will not exceed 63 Hz; therefore the higher frequency range of the original supply is not required in this case.

<sup>3</sup> The input current of the Electrostatics Model 302 supply is not specified; however, since switching supplies are more efficient than linear supplies, it is expected that the input current for the replacement supply will be less than the original supply, given equal load on the outputs.

<sup>4</sup> The Line Regulation specifications of switching supplies in general are not as strict as linear supplies. This supply is on par with other switching supplies on the market.

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Specification Item	Electrostatics 302	IPD Model CE-225-3002	Compliance
Output 3 Ratings	-15V @ 2A	-15V @ 2A	Compliant
Load Regulation	0.05% or 10 mV MIN (Full Load Change)	Outputs 1 and 2: 0.5% (10-100% load change)	Non-Compliant <sup>5</sup>
Ripple	Less than 500 $\mu$ V	1% peak-to-peak Maximum	Non-Compliant <sup>6</sup>
Impedance	Less than 0.1 Ohms	Not Available	Not Available <sup>7</sup>
Recovery Time	25 microseconds	500 microseconds	Non-Compliant <sup>8</sup>
Overshoot	None on turn-on or turn-off	None	Compliant
Operating Temperature	-20 to +71 °C	-0 to +70 °C	Non-Compliant <sup>9</sup>
Storage Temperature	-65 to +85 °C	-40 to +85 °C	Non-Compliant <sup>10</sup>
Relative Humidity	Not Available	5% to 95% Non-condensing	Not Available <sup>11</sup>
Temperature	0.01%/°C maximum	0.02%/°C maximum	Non-Compliant <sup>12</sup>

<sup>5</sup> The Load Regulation specifications of switching supplies in general are not as strict as linear supplies.

<sup>6</sup> Total ripple and noise for the switching supply is less than the maximum ripple specification of 2% for the Computrol Multiplexer equipment.

<sup>7</sup> The impedance specification for the replacement supply is not available. We don't anticipate impedance to be a factor in the COMTROL 1 system because the system is operated with load sharing diodes in some cases which significantly increase impedance.

<sup>8</sup> This specification is related to load regulation. In the intended application, large load step changes are not anticipated. The only load step changes which will be occurring in normal use is the occasional removal or insertion of a FIM. This will cause at most a 40% load step, not 100% (50% load to 100% load) as in the manufacturer's specification. This smaller load step change causes a voltage deviation of less than 2%, which is within the specifications for the COMTROL 1 equipment. Therefore the Recovery Time of the replacement supply is not an issue.

<sup>9</sup> The operating temperature range for the replacement supply is within the operating temperature specifications of the COMTROL 1 equipment. This temperature range is expected to be met with no problems in all applications due to intrinsic equipment heating within the equipment cabinets.

<sup>10</sup> The storage temperature range for the replacement supply is expected to be met with no problems in all anticipated situations.

<sup>11</sup> The Relative Humidity Specifications for the original supply are not available, but the replacement supply's specification of 5% to 95% non-condensing exceeds the COMTROL 1 equipment's specification of 5% to 90% non-condensing.

<sup>12</sup> While the temperature coefficient of the replacement supply is higher, derating does not begin until a temperature of 50°C is reached, which is the maximum operating temperature of the COMTROL 1 equipment. Therefore this is not an issue.

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Specification Item	Electrostatics 302	IPD Model CE-225-3002	Compliance
Coefficient			
Current Limiting	Fixed Foldback Type	All Outputs protected to short circuit conditions	Compliant
Floating Outputs	YES	YES	Compliant
Semiconductors	Silicon	Silicon	Compliant
Capacitors	Computer Grade – 10 year life	Not Available	Not Available
Overvoltage Protection	Optional Output 1 only	Set at 112 to 150%. Shuts down all outputs Cycle input to restart.	Compliant

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### 6.0 WARRANTY AND RELIABILITY

The replacement supply used in this assembly is warranted by the manufacturer for 2 years. This warranty will be passed to the customer by System Support Services.

The Mean Time Between Failures is specified at 100,000 hours minimum, according to MIL-HDBK-217F, 25°C, GB.

The CE-225-3002 is the only active component of the assembly. System Support Services is not adding any electrical components other than a load resistor. The design does not interfere with the convection cooling capabilities of the supply, and it is not being used beyond its ratings, we expect that this MTBF figure is valid for the entire replacement supply assembly.

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**APPENDIX A: ELECTROSTATICS MODEL 302 SPECIFICATIONS**

(See enclosed file “Appendix A ES 302.pdf.”)

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**APPENDIX B: INTEGRATED POWER DESIGNS MODEL CE-225-3002  
SPECIFICATIONS**

(See enclosed PDF file “Appendix B CE-225.pdf”)