TRANSTECTOR
an INFINITE brand

Series 700 A/VS Power Conditioner

Designed for Varian's Accelerators with On Board Imager™

Input Voltages: 208 VAC, 240 VAC, 480 VAC or 600 VAC (60 Hz)
Output Voltages: 208/120 VAC, 480/277 VAC and 120 VAC (for peripherals)

- Integrated Input and Output Breakers
  - One Input Breaker - Three Output Breakers
- Intelligent Voltage Regulation (± 2.0% Output)
- Internal Bypass Switch
- Triple Shielded Isolation Transformer
- Internal TVSS
- Front Access "Zero Clearance" Cabinet

Triple Output Power Conditioner with Voltage Regulation

Submittal Package and Specifications

TRANSTECTOR SERIES 700A/VS

Specifications for Triple Output Power Conditioner, designed for the Varian Trilogy™ System, Clinac™ iX, or Silhouette™, with On Board Imager™.

1.0 SCOPE

This specification covers the electrical characteristics of the Transtector Power Conditioner which provides clean regulated power for the entire Trilogy™, IX, Silhouette System or Varian High Energy Linear Accelerators with On Board Imager™ (OBI).

2.0 GENERAL

The Power Line Conditioner consists of a front access power cabinet incorporating an all copper, multiple tapped, triple shield isolation/regulation transformer. The ultra low output impedance of the transformer in conjunction with the electrostatic shields assures precision hospital grade performance with excellent noise and transient attenuation. Independently controlled inverse parallel electronic switches for each of the 7 taps per phase provide tight regulation over a wide input range. Linear devices are used for line synchronization to prevent phase shift errors normally associated with simple CT zero current crossing acquisition. The microprocessor control accurately selects the correct tap to maintain the output no greater than ± 2.0 % of nominal in a typical installation, correcting for voltage disturbances within one cycle. Digital processing technique provides fast and accurate regulation without output voltage over or undershoots.

2.01 MODEL NUMBERS

MODEL INPUT VOLTAGE OUTPUT VOLTAGES

Model	Input Voltage	Output Voltages	Frequency
8BLNX-110 K (I)-700 A/VS	208 VAC nominal input	208/120, 480/277, 120 VAC	60 Hz
8CLNX-110 K (I)-700 A/VS	240 VAC nominal input	208/120, 480/277, 120 VAC	60 Hz
8DLNX-110 K (I)-700 A/VS	480 VAC nominal input	208/120, 480/277, 120 VAC	60 Hz
8ELNX-110 K (I)-700 A/VS-C	600 VAC nominal input	208/120, 480/277, 120 VAC	60 Hz

2.1 AGENCIES

2.1.1 STANDARDS

The systems shall be designed in accordance with:

- American National Standards Institute
- Institute of Electrical and Electronic Engineers
- National Electric Code (NEC)
- National Fire Protection Association (NFPA Article 70)
- Underwriters Laboratories (UL) 1449, 1012
- FCC Article 15, Section J, Class A
- ISO 9001

2.1.2 LISTINGS

- The system shall be listed to C-UL, UL standard UL1012
- The system shall comply to: FCC Article 15, Section J, Class A
- ANSI C62.14 (electromagnetic compatibility)

3.0 DYNAMIC ELECTRICAL CHARACTERISTICS

3.1 OPERATING VOLTAGE AND OUTPUTS

The input voltage shall be 208VAC, 240VAC, 480VAC or 600 VAC Delta, three phase, 60 Hz. The standard transformer design shall be capable of accepting one (1) of three (3) input voltages, 208 VAC, 240VAC or 480 VAC. Each unit will be pre-wired at the factory to accommodate the alternative nominal input voltage. The input voltage and input breaker can be changed in the field to accommodate an alternative input voltage.

3.2 LINE VOLTAGE REGULATION

Usable Input Line Voltage +15 %, -23 %.
Nominal Input Line Voltage +10 % to –15 %

The design of the system shall indicate that with an input voltage of -10 % of nominal, increasing the load to 1000 % shall cause the output voltage to fall no lower than -6 %.

3.3 OUTPUT VOLTAGES

Three (3) separate voltage outputs shall be provided. Output #1 voltage shall be 208/120 VAC and Output #2 voltage shall be 480/277 VAC, both derived from a WYE configuration. Output #3 shall be 120 VAC single phase.

3.4 OUTPUT CONNECTIONS

Output #1: 150 Amp, three (3) pole circuit breaker for the 208/120 VAC output.
Output #2: 60 Amp, three (3) pole circuit breaker for the 480/277 VAC output..
Output #3: 30 Amp, single (1) pole circuit breaker to power peripherals.

3.5 INPUT/OUTPUT WIRING

The input/output wiring sizes are dependant upon the terminals provided by the circuit breakers.

Input wiring sizes:

208 VAC	#1 AWG to #600 KCMIL
240 VAC	#4 AWG to #350 KCMIL
480 VAC	#4 AWG to #350 KCMIL
600 VAC	#14 AWG to #1/0 AWG

Output wiring sizes:

120 VAC	30 Amp breaker	#14 AWG to #2 AWG
208/120 VAC	150 Amp breaker	#4 AWG to 350 KCMIL
480/277 VAC	60 Amp breaker	#14 AWG to #1/0 AWG

The ILSCO TA-2/0 terminal allows wire sizes from #14 to #2/0 to be connected to the ground.

3.6 RESPONSE TIME

Response time is less than 1/2 cycle.

3.7 CORRECTION TIME

The output voltage is corrected within 1 cycle.

3.8 LOAD REGULATION

The output is maintained to within 2 % of nominal or less, from no load to full load.

3.9 IMPEDANCE

Output #1: impedance shall be less than 1.6 %, measured with linear accelerator in beam-on state @ 45 kVA and OBI @ 5 kVA continuous. Output #2: impedance shall be less than 3 %, measured with the linear accelerator in stand by state @ 3kVA and OBI @ 55 A momentary.

3.10 OPERATING FREQUENCY

60 Hertz ± 3 Hertz

3.11 HARMONIC DISTORTION

Less than 1 % THD added to the output waveform under any dynamic linear loading conditions presented to the line regulator.

3.12 TURN-ON CHARACTERISTICS

When energized the voltage overshoot is 5 % or less of the nominal voltage for less than 1 cycle.

3.13 OVERLOAD RATING

200 % for ten seconds.
1000 % for one cycle.

3.14 NOISE ATTENUATION

Common mode noise attenuation is typically 140 dB or greater.
Transverse mode noise attenuation is 3 dB down at 1000 Hertz, 40 dB down per decade to below 50 dB with a resistive load.

3.15 AUDIBLE NOISE

Not to exceed 55 dB measured @1 meter

3.16 EFFICIENCY

Efficiency shall be >96 % typical at full load. Excitation losses shall be less than 1.5 % of KVA rating.

3.17 BTU

The Power Line Conditioner shall generate no more than 7,355 BTU/hour in typical use.

3.18 POWER FACTOR

Input power factor shall be greater than .95 with a resistive load and reflect no triplen harmonics to the utility under non-linear loads.

3.19 LINE TO LINE BALANCE

The Power Line Conditioner shall not produce more than a 2 % phase to phase unbalance.

3.20 MEAN TIME BEFORE FAILURE

The system shall exhibit a MTBF > 10,000 hours.

3.21 ENHANCED TRANSIENT OVERVOLTAGE SURGE SUPPRESSION

The system shall incorporate a high energy Silicon Avalanche Suppressor Diode suppressor. The system shall incorporate a Transtector model MCP 120 Wye TVSS. The suppressor shall be 100 % silicon avalanche diode. The suppressor shall be installed parallel to the secondary output of the power line conditioner to provide bi-directional and bi-polar surge protection, eliminating line or load generated transient over voltages.

3.21.1 TRANSIENT OVERVOLTAGE SURGE SUPPRESSOR (TVSS) ELECTRICAL PERFORMANCE

Breakdown Voltage Threshold……..Vbr 230 V @ 5 mA
Voltage Protection Level testing per ANSI 62.41-1991 and IEC 61643-1
8/20 µs Combination Wave……...Vpl 300 V @ 500 A 6000 V 8/20 µs
UL Rating …….SVR Rating 330 V UL 1449 2nd Edition
10/1000 µs Long Wave Stress Test....VPL 700 V @ 1.7 kA 10/1000 µs
Response Time…….< 1 nanosecond
TVSS shall have visual indication of status.

4.0 MAIN TRANSFORMER

4.1 BASIC CONSTRUCTION

The transformer windings are of all copper conductor construction with separate primary and secondary isolated windings.

4.2 MAGNETIC

Fully processed, low carbon, silicon transformer steel shall be used to minimize losses and provide high efficiency. Flux density shall not exceed 14K gauss.

4.3 INSULATION

Class N (200° C) insulation is utilized throughout.

4.4 SHIELDING

The transformer has multiple (three) copper shields to minimize inner winding capacitance, transient and noise coupling between primary and secondary windings. Inner winding capacitance is limited to .001 pf or less.

4.5 COOLING

The transformer is designed for natural convection cooling. Fans are inside the unit.

4.6 OPERATING TEMPERATURE

The system operating range: 0 to 40 degrees C, 32 to 104 degrees Fahrenheit

4.7 OPERATING HUMIDITY

0-95 % relative humidity non-condensing.

5.0 MAIN INPUT BREAKER

A main input molded case, thermal magnetic circuit breaker, rated at 125 % of the full load input current, is furnished as an integral part of the unit. For example, a 300 Amp breaker will be provided for 208 VAC input, a 150 Amp breaker will be provided for a 480 VAC input and a 100 Amp breaker will be provided for a 600 VAC input.

6.0 BY-PASS SWITCH

A manually operated rotary bypass switch provides bypassing of the SCR controlled voltage regulator portion of the Power Line Conditioner. The Power Line Conditioner can be operated in either the on-line or bypassed mode with one turn of the switch. The transformer and surge suppression circuitry remains in the circuit when in the bypass mode. Output # 1 will remain at 208/120 VAC three (3) phase 4 wire WYE and output # 2 will remain at 480/277 VAC three (3) phase 4 wire WYE. The bypass switch is located on the front of the unit.

7.0 MONITORING

7.1 ALERT LIGHT

An indicator light shall annunciate that the output has been disabled by one of the following conditions.

(1) Transformer over-temperature
(2) SCR thermal over-temperature

7.2 INDICATING LAMPS

Output “ON” indicating lamps shall provided for each phase.

8.0 CABINET

8.1 TERMINATION

Input and output terminations shall be front access. Input terminations shall be made directly to the main input cirucuit breaker and the input ground terminal provided. Output terminations shall be made directly to the output circuit breakers and neutral ground copper bus provided.

The unit is constructed using an isolation transformer and is considered to be a “separately derived system”. It should be grounded in accordance with the NFPA 70 article 250.20 “Alternating-Current Circuits and Systems to be Grounded”, article 250.20 (D) “Separately Derived Systems” and article 250.30 “Grounding Separately Derived Alternating-Current Systems”.

8.2 VENTILATION

Ventilation originates from the bottom of the cabinet, exiting through the top and/or sides.

8.3 MOBILITY

The Power Line Conditioner cabinets are equipped with angle iron supports that allow for transport by pallet jack or fork lift. These can be used for mounting unit to the floor in seismic zones.

8.4 ACCESSIBILITY

The Power Line Conditioner will have front access. Access to all wiring inputs, outputs, bypass and breakers will be accessible through the front access door or panels. The back of the unit may be set next to a wall without impeding access. It will also incorporate with lift off side panels.

8.5 WEIGHT

Unit weight: Approximately 1622 lbs (735.7 kg)

8.6 DIMENSIONS

29" W X 35.875" D X 66" H (73.6 cm x 91.4 cm x 167.6 cm)

9.0 CONTROLS

The control portion of the cabinet containing the circuit boards and connection to the semi- conductor devices is separate from the transformer and input/output termination.

10.0 WARRANTY

Units shall include a comprehensive warranty for the first year, covering all parts and workmanship, inclusive of on site labor and travel expenses in geographic areas covered. Consult factory for details. All units are provided with a standard two year warranty covering parts and workmanship.

11.0 SERVICE

Transtector shall provide immediate phone support/consultation and if possible, same day parts shipment. (Contact must be prior to 12:00 PM PST). If necessary, on site service shall be scheduled the same day for service to be conducted within 24 to 48 hours, based on customer requirements. Typical service hours are 8 AM to 5 PM Monday through Friday. All services outside the USA and Canada are subject to the availability of local service agents

12.0 CONTACT

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INPUT WIRE SIZE, GROUNDING AND OUTPUT WIRING

Input and Output Ratings

OUTPUT KVA	OUTPUT KVA CONTINUOUS	INPUT BREAKER SIZE	OUTPUT BREAKER SIZE	MAX OUTPUT CURRENT
110 K(I)	50 kVA	300 A for 208 V 250 A for 240 V 150 A for 480 V 100 A for 600 V	150 A, 3P for 208 V for Accelerator 60 A, 3P for 480 V for OBI 30 A 1P for 120 V for computer	120/208 = 125 A continuous 277/480 = 18 A continuous 55 A for 30 Sec. @ 4.2 % Duty Cycle

WEIGHT, BTU AND DIMENSIONS

UNIT SIZE IN KVA (I)	WEIGHT	OPERATIONAL BTU	MAXIMUM BTU/hour	DIMENSIONS
110 K(I)	1622 lbs	3,555	7,355	29" W x 35.875" D x 66" H 73.6 cm x 91.1 cm x 167.6 cm

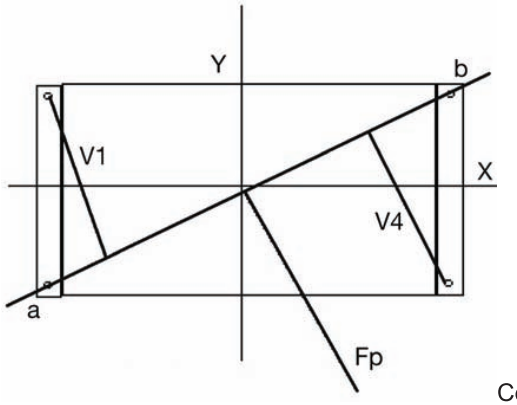
SEISMIC CALCULATIONS

Coastal California, Zone 4 — Z = 0.4
Equipment Anchorage — I = 1.5
Uniform Building Code, Table 160 — Cp = 0.75

Fp = Z x I x (Cp) x Wp = 0.45 x Wp

Cabinet Weight — 1622 lbs.
Center of Gravity Height — 30.00 in.
Wp(max) = 1865.3 lbs.
Wp(min) = 1378.7 lbs.

Vertical Force — Fp = 0.45 x 1865.3 = 839.4 lbs.
Moment — Fp = 0.15 x 1865.3 = 279.8 lbs.
Mo = 30 x 839.4 = 25181.6 in. lbs.

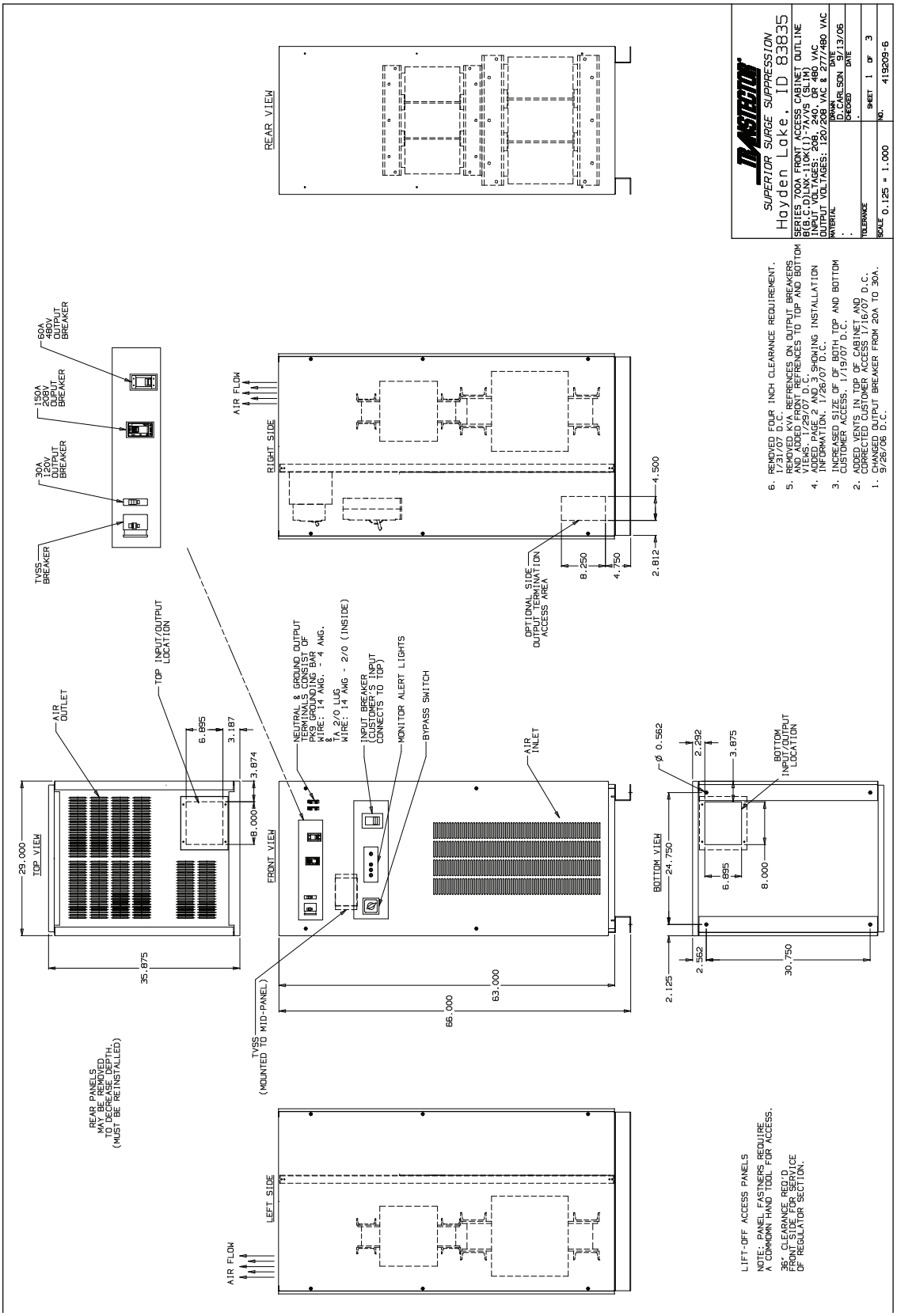


Corners (a,b) 39.5 in.
V1 =V4 = 19.3 in.
Tension = Fp x Cg /V4 = 2523.8 lbs
Shear = Wp(max)Fp/4 lbs., each anchor = 466.3 lbs.

EXAMPLE: <Rawl Power Bolt # 6913>
3/8” embedded 2.5” in minimum 2000psi concrete
Tension Rating of bolt: 5200 lbs.
Shear Rating of bolt: 7270 lbs.

Interaction = (T/Tbolt) + (S/Sbolt)
Interaction = .55
Interaction = < 1 (OK)

COMPONENT LOCATION DIAGRAM I



COMPONENT LOCATION DIAGRAM II