



POWER SUPPLY

OPERATION AND MAINTENANCE

INSTRUCTION MANUAL

Service and Spare Parts

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Rectifier

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Standard Warranty Terms and Conditions

Rapid warrants to the first user of each new Rapid product or component that it is free from defect in material or workmanship. The obligations of Rapid under this warranty are expressly limited to the following:

- A. Rapid will repair or replace, at its option, any defective components for a period of twelve (12) months from the date of shipment. NO in-and-out charges are covered for removal or replacement of defective components.
- B. This warranty applies only if the product is defective under normal use. It does not apply to breakage or defect from accident, alteration, misuse, or abuse of the product or component. In addition, this warranty is effective only if the product or component is installed in a location and manner prescribed by Rapid's instructions and only if it is so maintained. This warranty becomes null and void if the product or component is altered by anyone other than Rapid or its assigned representative.
- C. Rapid will repair or replace any defective part within the unit at the discretion of Rapid. If Rapid should choose to supply a part to the customer as a no-charge warranty replacement, buyer assumes all costs of installation associated with the replacement part. Should the unit itself prove defective, it must be shipped to Rapid freight prepaid and the repaired or replaced item will be returned freight collect. If Rapid elects to send a serviceman to a customer site to repair a defect, the cost of transportation and/or living expenses will be paid for by the customer. Should the defect turn out to be the result of the customer's misuse, improper installation or maintenance of the product or component, the customer will be responsible for the full cost of the service call including labor rates at Rapid's standard rate as well as all costs of transportation and living expenses.
- D. THERE ARE NO IMPLIED WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE. THE ABOVE WARRANTY IS MADE IN LIEU OF ALL OTHER GUARANTEES OR WARRANTIES, EXPRESS OR IMPLIED. No person is authorized to assume any other obligation or liability for Rapid.
- E. RAPID WILL IN NO CASE AND UNDER NO CIRCUMSTANCE BE LIABLE FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES OF PROFIT OR COMMISSION OR FOR LOSS CAUSED BY (1) DELAY IN PRODUCTION, SHIPMENT OR DELIVERY, OR (2) DEFECT OF ANY KIND IN ANY PRODUCT OR COMPONENT COVERED BY THE SALE. Without limitation, Rapid will not be so liable with respect to furnishing of any product, or component, delay in such furnishing, use, resale or other cause. Rapid's liability arising out of the supply of any product or component, its use, resale or other disposition, or out of any warranty, express or implied, or any other cause, shall in no way exceed the cost to Rapid of the product or component which Rapid agrees above to repair or replace. Rapid's liability for any product or component terminates upon expiration of applicable repair or replacement period above.

SECTION I

RAPID POWER CORPORATION

SPARE PARTS

To insure proper operation of equipment furnished, exact factory replacement parts must be installed. Please refer to Rapid Power Corporation Shop Order number and Serial number listed on the Bill of Materials herein. These components have been specifically selected, tested and calibrated to meet the specification and requirements of the equipment and application for which it was intended. These parts should be purchased from RAPID POWER CORPORATION to ensure identical replacements.

UNITS IN WARRANTY

If parts other than those specified are used, the warranty will be invalidated.

SECTION II

2.1 SAFETY WARNING

BE SURE TO READ THIS INSTRUCTION MANUAL BEFORE ATTEMPTING OPERATION OF EQUIPMENT. THE OPERATOR SHOULD BECOME THOROUGHLY FAMILIAR WITH THE OPERATIONAL SEQUENCE OF THE CONTROLS.

2.2 SAFETY PRECAUTIONS

Before entering equipment, for such maintenance as fuse replacement, etc., be sure the external disconnect is in the "OFF" position.

In addition, when a circuit breaker or other disconnect means is provided with Rapid equipment, place unit's breaker (or disconnect means) in the "OFF" position, prior to entering unit.

2.2.1 CAUTION

All door covers shall be in place, that is "closed" before energizing starting devices, such as feed breakers.

2.2.2 GROUNDING

THE FOLLOWING REQUIRE GROUNDING:

- a. Main Rectifier Cabinet Enclosures
- b. High Voltage Cabinet
- c. Transformer Tank
- d. Heat Exchanger

2.3 ITEMS REQUIRED FOR SAFETY

2.3.1 A disconnect device, preferably a thermal magnetic circuit breaker, shall be installed by the end user in the input power line to each power supply. A circuit breaker is recommended because overloads of a single phase nature will trip all three input power lines. This provides maximum protection of personnel, equipment and facilities. It is further recommended that the breaker be equipped with a mechanical trip test mechanism to enable testing of the breaker trip mechanism. Periodic tripping of the breaker will provide additional assurance of proper operation of equipment as part of preventative maintenance.

2.3.2 Check equipment to be sure that proper grounding instructions have been followed as delineated under Section II "**Grounding**" in this manual.

- 2.3.3 Do not block the area around the periphery of the power supply. This may impede free access to equipment when service is required.
- 2.3.4 When output voltages are greater than 50 volts, provision shall be made to insulate the output bush, or to locate the output bus in such a manner as to prevent access to output bus.

SECTION III

3.1 RECEIVING

Rapid takes extreme care to insure safe arrival of our products to their final destination. However, we are dependent on the carrier for safe arrival of your equipment. To protect our customers against any financial loss, we strongly advise the following procedures:

- 3.1.1 Visually inspect crate or packing and determine whether it has been broken or in any way damaged.
- 3.1.2 Should there be visible damage, **DO NOT** uncrate or unpack unit (or parts) or in any way disturb its condition.
- 3.1.3 Notify carrier immediately. The carrier will then notify their insurance company and an adjuster will visit your plant for an appraisal of damage.

If no external damage is evident, the equipment can be opened and completely checked for possible damage; i.e., bent cabinet, parts broken, etc. If any damage is found, **DO NOT ATTEMPT TO REPAIR, FOLLOW INSTRUCTION IN ITEM #3.1.3 ABOVE.**

Since Rapid can not control the handling of any units or parts after loading on carriers, we can not in any way assume responsibility of cost for any damages resulting from shipping. Therefore, it is important that these instructions are followed.

3.2 UNCRATING

- 3.2.1 Make sure that all of the packing materials are removed internally and externally from the rectifier.
- 3.2.2 Remove all panels and inspect for any damages that may have occurred in shipment. Report all claims to the carrier as per item #3.1.3 above.
- 3.2.3 Check that all parts are bolted down securely. Check the possibility of loose connections caused by excessive truck or train vibration during transit.
- 3.2.4 Replace all panels.

3.3 RETURNS

Material requiring re-shipment to Rapid for repairs, credit or exchange will be returned according to the following:

- 3.3.1 Call Rapid for an R.M.A. number. Material will not be accepted without this number.

- 3.3.2 Material will be properly packaged so as to protect the contents from damage.
- 3.3.3 Material will be returned to Rapid on a freight prepaid basis at all times, unless otherwise authorized by our sales department.
- 3.3.4 Sales or Service departments are to be notified of all material being returned, so as to be properly prepared to accept material. This in turn will initiate a more initiate turnover of units returned for repairs. The Sales department issues the R.M.A. Traffic will advise on shipping and packing methods.
- 3.3.5 Material for return, weighting less than 50 lbs., will be shipped via UPS (where obtainable) or through the U.S. mail system.

Material over 50 lbs. will be returned by motor carrier and classified as follows:

- a. Quantity, crate or crates Rectifier (NOI) class 85, Item 62900, NMFC 100B.
 - b. Quantity, create or crates Transformer (NOI) weighting each 25 lbs. or more class 70, Item 63410, NMFC 100B.
- 3.3.6 Any questions that may arise as to proper methods, weights, etc., can be answered by our Traffic Department by calling (203) 775-0411.

SECTION IV

4.1 **MECHANICAL INSTALLATION**

- 4.1.1 No special foundation is required other than a level floor capable of withstanding the weight of the power supply. The overlapping doors are factory-fitted to meet evenly at the top and bottom. If the floor under the enclosure is not level, the doors will not close evenly. In this case, place metal shims under the corners of the enclosure. Shims under the right front corner will raise the right door; shims under the left front corner will raise the left door. It is important that the doors meet evenly to insure proper seal against liquids and dust.
- 4.1.2 The power supply is self supporting, and therefore, it is not necessary to bolt in place.
- 4.1.3 Be sure to mount the unit in a location that will permit a free flow of air into the bottom of the unit and out through the top. Clearance from surrounding walls and objects should be provided at the front and rear of the power supply. The clearance should allow full open swing of doors, if any, for maintenance purposes.
- 4.1.4 The power supply should be placed in an atmosphere free from corrosive fumes, excessive dust and foreign matter. The maximum ambient temperature should not exceed 40°C, unless the power supply is specifically designed for a higher ambient temperature.
- 4.1.5 Check to see that the louvers or other openings in the rectifier cubical are not blocked.
- 4.1.6 **FOR WATER COOLED UNITS ONLY**

4.1.6.1 DIRECT WATER COOLED

- a. The proper flow rate and pressure required at full load, should be provided as delineated in the unit's water cooled drawings and/or parts list.
- b. If specific requirements are not available, then the following minimum water cooling requirements should be adhered to.
 - 1. One gallon per minute per 1000 amperes at a maximum temperature of 85°F and an outside ambient of 104°F (40°C).
 - 2. A minimum pressure of 30 psi and a maximum of 60 psi, depending on the size (rating) of the power supply.

- c. To prevent system blockage on water cooled units, it is strongly recommended that a filter screen (no larger than 3/32" mesh) be installed between unit's water inlet and external water supply (with provisions for periodic inspection and/or cleaning).
- d. Water quality recommendation. The cooling water shall have the following quality (distilled water is adequate):
 - A neutral or slightly alkaline reaction, i.e., a pH between 7.0 and 9.0
 - A chloride content of not more than 20 parts per million; a nitrate content of not more than 10 parts per million; and a sulphate content of not more than 100 parts per million.
 - A total solids content of not more than 250 parts per million.
 - A total hardness, as calcium carbonate, of not more than 250 parts per million.
 - No chemical additives to be used.

4.1.6.2 CLOSED LOOP WATER COOLED

- a. For maximum heat transfer and protection from freezing, system should contain a mixture of 25% glycol and 65% water. The glycol should not have additives normally found in commercial anti-freeze. Where high resistance return to ground must be achieved, 100% pure glycol will significantly improve resistivity by eliminating water conductivity. However, heat transfer will be reduced.

4.2 **ELECTRICAL INSTALLATION**

- 4.2.1 Electrical installation should be performed by a qualified electrician and in accordance with The National Electrical Code and applicable codes.
- 4.2.2 The cabinet should be grounded either by metal conduit or by separate ground wire.
- 4.2.3 Install a disconnect between the equipment and the AC main, in accordance with The National Electrical Code.
- 4.2.4 The AC input source should be capable of supplying power at the voltage and current indicated on the Electrical Specification sheet of Section I and the nameplate on the unit. The proper cable size must be run to the power supply.
- 4.2.5 Use proper size cable to connect to the output terminals. Or, if bus is used, allow one (1) square inch cross section of copper per 1000 Amperes. Make sure connections are clean and tight.

- 4.2.6 On Remote Control Units, for wires, connecting to the ammeter only, use the following minimum interconnecting copper wire sizes for a given distance between the remote panel and main cabinet.

Distance	Wire Size
Up to 100 Feet	#14 AWG*
Up to 150 feet	#12 AWG*
Up to 250 feet	#10 AWG*

*See Note 2.

- 4.2.7 For all units which have fans:

Fans are to blow up-draft; i.e., air flowing from base of rectifier through the top of the cabinet.

- 4.2.8 All external wiring should be done according to the wiring diagram. See main electrical drawing also for any special shielded-wiring requirements.

Note #1: (For Remote Control Units) in order to minimize detrimental effects due to noise and stray pickup (either internal or external to the power supply), it is strongly recommended that all AC wiring be run in separate conduit. The DC should also be run in its own separate steel conduit between remote operator's panel and basic power supply.

Note #2. Interconnecting cables are to be either twisted pairs or two conductor twisted, shielded cables.

WARNING: DO NOT ATTEMPT STARTING EQUIPMENT BEFORE READING THE PORTIONS OF THE MANUAL CONTAINING CONTROLS AND INITIAL START-UP PROCEDURES.

4.3 STORAGE OF POWER SUPPLIES

If the power supplies are to be stored for any length of time, the following care should be taken:

- 4.3.1 Store in a clean, dry area.

- 4.3.2 Keep the unit covered, as much as possible, to prevent dirt or rust from entering the unit.

- 4.3.3 Temperature of storage area must not be greater than 60°C (140°F) or less than 5°C (40°F). Prior to using the power supply after prolonged storage, the following should be done:
- a. Inspect inside to be certain the power supply is clean.
 - b. Re-check all power connections to assure they are tight.
 - c. Blow water out of water cooled unit systems.
- 4.3.4 Perform insulation resistance check with a 500 Volt megger from input terminals and output bus to ground. Resistance should be greater than ten Megohms. If resistance is less than 10 Megohms, it will be necessary to dry out the transformer moisture content. This can be performed with one or more infra red lamps or a 1kW space heater, radiating on the transformers large surface area. The temperature on the surface should be measured to insure the maximum insulation temperature rating is not exceeded. For Class H, 220°C is the limit on temperature without changing insulation properties.

SECTION V

5.1 PREVENTIVE MAINTENANCE

Periodic preventive maintenance will extend the life of the equipment and reduce the necessity of shut down due to component failure. While high grade components are utilized, and operated in a conservative manner, environmental conditions vary in the various plants and the frequency of maintenance should be determined by the plant engineer. A minimum shutdown for total preventive maintenance every sixty (60) days for clean-up and inspection is recommended. This should be performed under the direct supervision of a qualified person designated by the plant engineer.

DO NOT SERVICE UNIT WITH POWER ON!

- 5.1.1 All electrical servicing should be performed by qualified personnel. No electrical change shall be made without prior written Rapid engineering approval.

Failure to do this may, at the manufacturer's option, result in cancellation of the product warranty as indicated in this manual.

- 5.1.2 Clean in careful manner the transformer, semiconductors, heat sinks and terminal board connections with an industrial type air blower or vacuum cleaner.
- 5.1.3 When plug in relays are used, visibly inspect contacts for sign of failure. Clean exposed relay contacts with non-abrasive commercial liquid contact cleaner. In corrosive atmospheres when contacts are tarnished, a burnishing tool may be used to remove accumulated oxidation.
- 5.1.4 On water cooled units, check all connections and hoses at least once per year. Change the glycol and water mixture in closed loop units every two years. Mixed distilled water with pure ethylene glycol (not anti-freeze) to make a 65% water, 35% glycol mixture.

5.2 DIODE TEST

- 5.2.1 In the event of a diode fuse failure, remove the blown fuse.
- 5.2.2 Before installing new fuses check each diode for continuity using an ohmmeter.
- 5.2.3 All diodes should be individually checked and tested to determine whether any are shorted or open.
- 5.2.4 Continuity tests must be made in both directions on all diodes, with one end of the diode isolated or disconnected from the unit.

- 5.2.5 Check "Arrow" of diode symbol stamped or imprinted on base or stud end of each diode to determine current flow direction of that diode before checking continuity.
- 5.2.6 The continuity of a "Forward Direction" diode should test good when the current flows in a direction from the diode tail to the threaded or stud end. In pressure pack diodes, test in direction of arrow (anode to cathode) for continuity.
- 5.2.7 The continuity of a "Reverse Direction" diode should test good when the current flows in a direction from the threaded stud end of the diode to the tail end. In pressure pack diodes, test in direction of arrow (anode to cathode) for continuity.
- 5.2.8 If current flows in both directions of any diode (either forward or reverse type), the condition of that diode is shorted and not good.
- 5.2.9 If there is no current flow in either direction of any diode, (forward or reverse), the condition of that diode is open and not good.
- 5.2.10 When checking the diodes with an ohmmeter, the resistance value should be approximately 5-20 ohms in the conducting (forward) direction and approximately 100 thousands ohms, or greater in the non-conducting (reverse) direction.

Note: When checking a flat-pack type diode, the device should be tested with sufficient mechanical interface pressure to insure that the device makes contact with its internal pressure contacts. This pressure is provided by the heat sink assembly. Testing a flat-pack type diode external to the equipment without interface pressure will not always locate a defective device.

5.3 REPLACING A DIODE IN A RECTIFIER UNIT

- 5.3.1 In the event that it is necessary to replace a diode, the following steps should be taken:
- Remove the diode and thoroughly clean the surface to which it has been attached.
 - IMPORTANT:** Apply a thin film of Burndy Penetrox A 13 compound to the surface of the new diode only! This is where the diode makes contact with the heat sink. Do not apply compound to the threads of the diode.
 - Holding the diode firmly, secure it to the heat sink by tightening the nut on the diode stud to a snug fit. Do not overtighten. Do not use a wrench longer than an 8" adjustable.
 - Where a torque wrench is available, and 3/4 inch stud diodes are utilized, a minimum of mounting torque of 275 inch lbs. with a maximum of 325 inch lbs. of torque is recommended.

- e. Be sure all connections have been put back on the AC standoff terminal, including the diode tail, and also make sure the nut for the standoff terminal is firmly secured.

SECTION VI

6.1 INITIAL START UP PROCEDURE – WITH OR WITHOUT FANS

- 6.1.1 Be sure that instructions of paragraph 4.2 on electrical installation have been properly followed.
- 6.1.2 Place the starting equipment in the OFF position and de-energize the circuit feeding the unit.
- 6.1.3 make all external connections to the unit per the wiring diagram.
- 6.1.4 Remove all output load from unit.
- 6.1.5 Set the OUTPUT VOLTAGE ADJUST CONTROL (if any) and the OUTPUT CURRENT ADJUST CONTROL (if any) to zero setting.
- 6.1.6 Place the unit in the “POWER ON” mode by operating the appropriate push button, circuit breaker or switch.
Note: (3 phase units only) If unit contains one or more fans, immediately check their rotation. Fan rotation should cause air flow from base of power supply up through power supply top. If the direction of the fan rotation is not correct, STOP unit and reverse polarity of any two (2) of the three phase input lines. Restart unit.
- 6.1.7 Read voltmeter for output load voltage by slowly adjusting voltage control clockwise (to the right). The voltage reading should be steady and current reading should be zero.
Note: (3 phase units only) If unit is water cooled and is phase rotation (sequence) sensitive and will not start, reverse polarity of any two (2) of the three phase input lines.
- 6.1.8 Place the starting equipment in the “OFF” position.
- 6.1.9 Put an appropriate load on the output which is within the rating of the unit.
- 6.1.10 Place the unit in the “POWER ON” mode.
- 6.1.11 Read meters for output load voltage and current.
- 6.1.12 If output voltage adjust or output current adjust controls are provided, adjust them appropriately.

SECTION VII

7.1 THREE PHASE RECTIFIER, NO CONTROL

7.1.1 ON-OFF CONTROL

Place the unit in the "POWER ON" mode by operating the appropriate push button, circuit breaker or switch.

7.1.2 VOLTAGE OUTPUT

This unit is a "NO CONTROL" type. The output is nominally the DC voltage rating indicated in Section II.

7.1.3 METERS

Read the output voltage and current on the respective meters.

CAUTION: DO NOT OVERLOAD THIS RECTIFIER!

Overloading may cause a protective device to activate as indicated in trouble shooting section.

If this occurs, eliminate the cause of the overload or short circuit before restarting the unit or replacing fuse.

To reset a tripped circuit breaker, move its handle all the way to the "OFF" position and then bring it up to "ON" position.

SECTION VII

WARNING: BEFORE ATTEMPTING TO REPLACE FUSES OR BULBS OR BEFORE ENTERING CABINET, BE SURE THAT THE UNIT IS DISCONNECTED FROM ITS AC POWER SOURCE.

7.2 TROUBLE SHOOTING INFORMATION

<u>TROUBLE</u>	<u>POSSIBLE CAUSE</u>	<u>REMEDY</u>
1. Unit will not start	(a) Input fuse blown.	(a) Check all three input fuses in disconnect box. Check AC input voltage at rectifier terminals.
	(b) Circuit breaker tripped, (if supplied)	(b) Check that the circuit breaker is in the "OFF" position.
	(c) if equipped with overload, overload tripped.	(c) Push "RESET" button. Start unit.
	(d) if equipped with starter, starter overloads tripped.	(d) Push starter reset. See (a) above before restarting.
	(e) "STOP" circuit open.	(e) Check "STOP" circuit for any broken wires, etc.
2. Unit starts, then stops	(a) See paragraph 1(a) and (d) above.	(a) See paragraph 1(a) and (d) above.
	(b) "STOP" circuit intermittently open.	(b) Check for loose wires in "STOP" circuit.
	(c) If equipped with thermal switch, thermal switch open.	(c) Allow 5 minutes to cool. Check for obstructed air flow (or water flow, if water cooled unit). Re-start
3. Unit starts, no output	(a) DC fuse blown, (if supplied).	(a) Check Fuse
	(b) DC circuit breaker tripped, (if supplied).	(b) Check DC circuit breaker.

4.	Low DC output voltage.	(a)	Single phase condition.	(a)	See paragraph 1(a).
		(b)	Defective DC voltmeter.	(b)	With external DC voltmeter, check DC voltage at output terminals of unit. Replace voltmeter.
		(c)	Open silicon diode(s) or shorted silicon diode(s) and blown diode fuse(s).	(c)	Check diode by ohmmeter method. If resistance reading(s) improper, replace diode(s) and fuse(s) if blown.

5.	DC volts OK, no DC amps.	(a)	No load	(a)	Check load and load connections.
		(b)	DC Ammeter defective.	(b)	Check result at work load. Replace ammeter.

6.	DC amps OK, no DC volts	(a)	DC Voltmeter defective	(a)	See paragraph 4(b) above.
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7.	DC voltage incorrect (too high or too low).	(a)	Input connected to wrong transformer taps.	(a)	Check transformer input taps and reconnect as necessary.
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BILL OF MATERIAL

Cust# 32305000
S.O. No. D24837
Cust: TELEDYNE ENERGY SYSTEMS
User: SAME

Serial ~~281886~~ *W/A*
P.O.# 00017886 *11-18-02*
P.O.#

Eng. LZ
Rep. 08000
Sales AP
REV.
By

Qty 4 Model SCRX300275

Ordered 4/05/01 Due 12/31/01 Shipped 0/00/00

INPUT: 00480 Volts OUTPUT: 00275 Volts Edwg. D 20707-W542
00149 Amps 00300 Amps Mdwg. D 653434-279
3/50 Ph/HZ. DC Bus ELH 0060
Cntl: SCR/VL/ACC/CI/RC Cool: CONVECTION/BLOWERS

- 1) BUILD SAME AS D24860
- 2) DRAWING PACKAGE TO INCLUDE
- 3) INTERNAL LAYOUT-ALL UNITS TO
- 4) BE IDENTICAL INCLUDING WIRE
- 5) RUS, CUST-TO WITNESS TEST, CALL
- 6) (1) WEEK IN ADVANCE

Lev	Line	Symbol	Qty.	Item	Description/Comment
	0001	MODEL	.000	SCRX300275	SCR AIR 300A 275V 82.5KW
	0002		.000	*	SEE SHIPPING SCHEDULE
	0003		.000	*	HM-UNIVERSAL POWER SUPPLY
	0004		.000	*	ALL BUS TO BE SILVER PLATED
	0005		.000	*	50 DEGREE C AMBIENT
	0006		.000	*	ELECT COMP TO BE UL OR CSA
	0007		.000	*	LISTED WHERE POSSIBLE.
	0008		.000	*	USE CSA WIRE-COMP.ECT.
	0009		.000	*	PAINT:FINISH-(2)COATS OF ANSI-
	0010		.000	*	49 EPOXY-MIN. THICKNESS 4 TO
	0011		.000	*	5 MILLS. COLOR TO BE BEIGE
	0012		.000	*	VERIFY WITH CLIENT.(COLOR)
	0013		.000	*	ALL WIRES MIN 16GA-NUMBERED ON
	0014		.000	*	BOTH ENDS W/HEAT SHRINKABLE
	0015		.000	*	WIRE MARKERS. ENCLOSURE TO BE
	0016		.000	*	NEMA-1-WITH (2)1 1/2" & (1)2 1/2
	0017		.000	*	INCH CONDUIT HUBS THRU TOP OF

BILL OF MATERIAL

Model SCRA300275

S.O. No. D25837

Lev	Line	Symbol	Qty.	Item	Description/Comment
	0018		.000	*	ENCLOSURE W/REMOVABLE COVER
	0019		.000	*	PLATE FOR INPUT/OUTPUT CABLES.
	0020	CABINET	1.000	F1-65343NF	65X34X34 FAN COOLD W/KNOCKOUTS
	0021		1.000	F3-362707001	36X27X7 SIDE BOX WITH COVER
	0022		1.000	F5-3525001	34.25X25 CONTL MNTG PNL TYPE A
	0023		.000	*	GND PAD W/COMPRESSION LUGS FOR
	0024		.000	*	GROUND CABLE MOUNT NEAR BOTTOM
	0025	CB-1	1.000	04-0122	CB 2A 480V 3P 273-K2 ABB
	0026	CB-2	1.000	04-0611-ABB	CB 20A 480VAC 3P S273-K20 ABB
	0027	CB-4	1.000	04-0009	CB 3A 240VAC 1P S271-K3 ABB
	0028	CB-5	1.000	04-0082	CB 16A 240VAC 1P S271-K16 ABB
	0029	CB6-7	2.000	04-0021	MOUNT ON DIN RAIL CB 10A 240VAC 1P S271-K10 ABB
	0030	CB-8	1.000	04-0538-ABB	MOUNT ON DIN RAIL CB 20A 240VAC 1P S271-K20 ABB
	0031	OL-1	1.000	48-30555	MOUNT ON DIN RAIL O/L RLY 120V 1-16A CTA3-0.16
	0032	*T-1	1.000	XM6-4K2	PRI:480/380V/S:115V C/1/50
	0033	T-2,T4-7	5.000	XM0-34K2	PRI:480/380V/SEC:115V C/1/50
	0034	*T-8	1.000	XM110A11	P:480V/S:127V W/4 TAPS C1/50
	0035	SCR1-6	6.000	58-00935	SCR T7SD-12-75
	0036	SCR H/S	3.000	80-911	HS ASS'Y 2SCR/1DIODE D18014-48
	0037	F1-6	6.000	22-250-TF	FUSE 400A250V A25X400-4TA GLD
	0038	MS1-6	6.000	24-1826LD	PRICING MICR SW GOULD#AOS-2 SP DT
	0039	B1-3	3.000	FV-080	MUFFIN FAN 4 INCH 120V
	0040		3.000	46-0771	MOUNT UNDER SCR H/S
	0041	F13-15	3.000	14-010	FAN CORD NEWARK #90F1259 36"LG
	0042	F-21	1.000	14-061	FUSE-600V-01.0A-TM/DL
					FUSE 600V 05.0A TM/DL

BILL OF MATERIAL

S.O. No. D29A37

Model SCRA300275

Lev	Line	Symbol	Qty.	Item	Description/Comment
	0043	F22-23	3.000	14-010	FUSE-600V-01.0A-TM/DL
	0044	F-12	1.000	16-250	FUSE 250V60.0A DUAL/ELEM T/DLY
	0045		2.000	24-195	FUSE BLOCK 3P 600V 8M60332SQ
	0046		1.000	24-193	FUSE BLOCK 1P 600V 8M6031SQ
	0047		1.000	24-030	FUSE BL 31-60A 1P250V GLD20601
	0048	R1-6	6.000	FA-1880	RES CARBON 2.00W 100.0
	0049	R7-12	2.000	AB-4440	PC169 480V DUAL SNUBBER ASS'Y
	0050	R-13	1.000	FA-3570	RESISTOR RN60D 1% 3.92K OHM
	0051	R-14	1.000	FA-3545	RESISTOR RN60D 1% 2.00K OHM
	0052	R-15	1.000	FA-3530	RESISTOR RN60D 1% 1.62K OHM
	0053	R-16	1.000	FA-3520	RESISTOR RN60D 1% 1K OHM
	0054	R-16A	1.000	FA-3060	RESISTOR RN55C 1% 316 OHM SERIES WITH R16
	0055	R-17	1.000	FA-3520	RESISTOR RN60D 1% 1K OHM
	0056	R-18	1.000	FA-2385	RESISTOR 10 WATT 50K OHM
	0057	R-21	1.000	FA-3590	RESISTOR RN60D 1% 5.11K OHM
	0058	R-22	1.000	FA-3050	RESISTOR RN55C 1% 267 OHM
	0059	R-23	1.000	FA-3630	RESISTOR RN60D 1% 10K OHM
	0060	TS1-3	3.000	60-190	THERMO SW 180°C N/C PEPI-C (WOUND IN T-1)
	0061	TS4-6	3.000	60-110	THERMO SW 075°C N/C A/R THER D (MOUNT ON SCR H/S)
	0062	LT1-4	4.000	40-220	PILOT LIGHT RED 125V 1/2"
	0063	LT-5	1.000	40-210	PILOT LIGHT ASSY GREEN 125VAC
	0064	C1-6	1.000	AB-4440	PC169 480V DUAL SNUBBER ASS'Y
	0065	C1A-6A	6.000	FL-180	CAP.FILM 1.0 MF 50V
	0066	C-7	1.000	FL-210	CAP-ELEC 4.70 MF 50V
	0067	C-8	1.000	FL-140	CAP-ELEC 22.0 MF 35V

BILL OF MATERIAL

S.O. No. D29A37

Model SCRA300275

Lev	Line	Symbol	Qty.	Item	Description/Comment
	0068	C-9	1.000	FL-180	CAP.FILM 1.0 MF 50V
	0069	C10-11	2.000	FL-250	CAP.ELEC 100.0 MF 50V AXAIL
	0070	VR1-3	3.000	65-020	VARISTOR, GE#V150PA20A
	0071	VR-4	14.000	AL-850	SELENIUM PLATES 4 X 5-25
	0072	SHUNT	1.000	FT-084	SHUNT 300 AMP 50 MV
	0073	MC-1	1.000	06-080-A88	CONT ABB EH210 3P 190A AC3
	0074	K-1	1.000	48-3598	RLY 120AC DP/DT ID RY2SU-GDPLT
	0075		1.000	48-370	RLY SOCKET 08PIN ID SY2S-05
	0076		1.000	48-480	RLY HOLD DOWN SPRING 2Y2S-02F1
	0077	K-4	1.000	48-130	RLY 120AC DP/DT 0MRON MK2P-I
	0078		1.000	48-250	RLY SOCKET 08PIN ID SR2P-06
	0079		1.000	48-489	RLY HOLD DOWN SPRING SR2B-02F1
	0080	CAT	1.000	A3-290605	CAT91 STD PREC NO ENAB 50/60SW
	0081	DVR	1.000	A8-100	PC77 DRIVER BD W/BRIDGE LOGIC
	0082	DIS0-1	1.000	A9-VV413VV012	DIS0/0-10V=-58-5V/0-50MV=0-10V
	0083		.000	*	CAL:10VDC IN=-58-5VDC OUT
	0084	DIS0-2	1.000	A9-VV401VV002	CAL:0-50MV IN=0-10VDC OUT
	0085		.000	*	DIS0 0-5/6=0-5/6,0-45/65M=0-50
	0086	SIS0-1	1.000	A9-H1VV403	CAL:0-5.3VDC IN=0-6VDC OUT
	0087	PH MON	1.000	48-7122	CAL:0-50MV IN=0-6VDC OUT
	0088		1.000	48-710	DIS0 HALF SL 0-5/6V=0-8/12V
	0089	U/D RAMP	1.000	48-840	CAL:0-6VDC IN=0-10VDC OUT
	0090		1.000	48-841	PH MON 50-60/190-480V 253 T/M
	0091	S-1	1.000	52-330	RLY 480AC SOCKET TM FOR 48-712
	0092	R-50,R-53	2.000	42-05175	U/D RAMP-RLY AP4831 120V/20VDC
					20 PIN SOCKET BTS-20 FORAP4831
					TOGGLE SWITCH SP/DT 3/4 HP
					POT 002W 0010K 0HM AB TYPE-J

BILL OF MATERIAL

S.O. No. D29837

Model SCRA300275

Lev	Line	Symbol	Qty.	Item	Description/Comment
	0093		1.000	42-055V	POT DIAL 0-100% VOLTAGE ADJ
	0094		1.000	42-055C	POT DIAL 0-100% CURRENT ADJ.
	0095		3.000	42-056	POT KNOB 2WPOT MY MD336-1
	0096	R-51	1.000	42-05147	POT 002W 0005K OHM AB TYPE-J
	0097	M-1	1.000	35-2905	VM 0-300VDC 4.5 CR 23701VARXR
	0098	M-2	1.000	36-3355	AM 4.5 050MV 300A 237-02AAE2RX
	0099	T8-1	1.000	59-068	TERM STRIP 20A, 24 POS.
	0100	OUTPUT	2.000	CB-031	1/4 X 2 COPPER BUS SILVER (1)PCS EA TERMINAL (INTERNAL)
	0101	LEGEND	1.000	*	- CONTROL AC POWER ON, SCR FUSE
	0102	LEGEND	1.000	*	- FAIL, SCR 0/T, TRANS 0/T, PHASE
	0103		.000	*	- LOSS, AUTO-MANUAL, DC POWER ON,
	0104		.000	*	- VOLT LIMIT ADJ, ENABLE ON,
	0105		.000	*	- 3 AMP CONTROL POWER, 3 AMP
	0106		.000	*	- CONTROL NEUT, 15 AMP KOH PUMP
	0107		.000	*	- POWER, 15 AMP PUMP POWER NEUT.
	0108		.000	*	- 10 AMP FEEDWATER PUMP POWER,
	0109		.000	*	- 10 AMP PUMP POWER NEUT., 10 AMP
	0110		.000	*	- DRYER HEATER POWER, 10 AMP
	0111		.000	*	- DRYER NEUT., 10 AMP AUX POWER,
	0112		.000	*	- 10 AMP AUX NEUT., ALARM CONTACT
	0113		.000	*	- 0-10VDC CURRENT REF., 0-10VDC
	0114		.000	*	- CURRENT REF. COMMON, 0-50MV
	0115		.000	*	- CURRENT SIGNAL (+), 0-50MV
	0116		.000	*	- CURRENT SIGNAL (-), 0-75VDC
	0117		.000	*	- VOLTAGE SIGNAL (+), 0-75VDC

BILL OF MATERIAL

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S.O. No. D29837 Model SCRAX300275

Lev	Line	Symbol	Qty.	Item	Description/Comment
	0118		.000	*	- VOLTAGE SIGNAL (-),POWER
	0119		.000	*	- SUPPLY CONTACTOR,POWER SUPPLY
	0120		.000	*	- INHIBIT/ENABLE.

***** END OF BOM DETAIL *****

TELEDYNE

Recommended Spare Parts List

Seq	Symbol	QTY	Item	Description	Rec. Spares
1	MODEL	0	SCRAX300275	SCR AIR 300A 275V 82.5KW	
2		0	*	SEE SHIPING SCHEDULE	
3		0	*	HM-UNIVERSAL POWER SUPPLY	
4		0	*	ALL BUS TO BE SILVER PLATED	
5		0	*	50 DEGREE C AMBIENT	
6		0	*	ELECT COMP TO BE UL OR CSA	
7		0	*	LISTED WHERE POSSIBLE.	
8		0	*	USE CSA WIRE,COMP,ECT.	
9		0	*	PAINT:FINISH-(2)COATS OF ANSI-	
10		0	*	49 EPOXY,MIN. THICKNESS 4 TO	
11		0	*	5 MILLS. COLOR TO BE BEIGE	
12		0	*	VERIFY WITH CLIENT.(COLOR)	
13		0	*	ALL WIRES MIN 16GA,NUMBERED ON	
14		0	*	BOTH ENDS W/HEAT SHRINKABLE	
15		0	*	WIRE MARKERS. ENCLOSURE TO BE	
16		0	*	NEMA-1,WITH (2)11/2" & (1)21/2	
17		0	*	INCH CONDUIT HUBS THRU TOP OF	
18		0	*	ENCLOSURE W/REMOVABLE COVER	
19		0	*	PLATE FOR INPUT/OUTPUT CABLES.	
20	CABINET	1	F1-653434F	65X34X34 FAN COOLD W/KNOCKOUTS	
21		1	F3-362707001	36X27X7 SIDE BOX WITH COVER	
22		1	F5-3525001	34.25X25 CONTL MNTG PNL TYPE A	
23		0	*	GND PAD W/COMPRESSION LUGS FOR	
24		0	*	GROUND CABLE,MOUNT NEAR BOTTOM	
25	CB-1	1	04-0122	CB 2A 480V 3P 273-K2 ABB	
26	CB-2	1	04-061-ABB	CB 20A 480VAC 3P S273-K20ABB	
27	CB-4	1	04-0009	CB 3A 240VAC 1P S271-K3 ABB	
28	CB-5	1	04-0082	CB 16A 240VAC 1P S271-K16ABB	
29	CB6-7	2	04-0021	CB 10A 240VAC 1P S271-K10ABB	
30	CB-8	1	04-0538-ABB	CB 20A 240VAC 1P S271-K20ABB	
31	OL-1	1	48-306S	O/L RLY 120V .15-.24A CTA3-.24	
32	OL-2	1	48-3515S	OL RLY 120V 12-17.5A CTA3-17.5	
33	OL-3	1	48-350S	S&S OL/RV 120V 6.0-9.5A	
34	*T-1	1	XM6.4K2	PRI:480/380V/S:115V C /1/50	
35	T-2,T4-7	5	XM0.34K2	PRI:480/380V/SEC:115V C /1/50	
36	*T-8	1	XM110A11	P:480V/S:127V W/4 TAPS C1/50	
37	SCR1-6	6	58-00935	SCR T7S0-12-75	2
38	SCR H/S	3	B0-911	HS ASS'Y 2SCR/1DIODE D1B014-48	
39	F1-6	6	22-250-TF	FUSE 400A250V A25X400-4TAGLD	4
40	MS1-6	6	24-182GLD	MICR SW GOULD#AOS-Q SP D T	
41	B1-3	3	FV-080	MUFFIN FAN 4 INCH 120V	
42		3	46-0771	FAN CORD NEWARK #90F1259 36"LG	
43	F13-15	3	14-010	FUSE-600V-01.0A-TM/DL	
44	F-21	1	14-061	FUSE 600V 05.0A TM/DL	
45	F22-23	3	14-010	FUSE-600V-01.0A-TM/DL	

Recommended Spare Parts List

Seq	Symbol	QTY	Item	Description	Rec. Spares
46	F-12	1	16-250	FUSE 250V60.0A DUAL/ELEM T/DLY	
47		2	24-195	FUSE BLOCK 3P, 600V BM6033SQ	
48		1	24-193	FUSE BLOCK 1P 600V BM6031SQ	
49		1	24-030	FUSE BL 31-60A 1P250V GLD20601	
50	R1-6	6	FA-1880	RES CARBON 2.00W 100.0	
51	R7-12	2	A8-4440	PC169 480V DUAL SNUBBER ASS'Y	
52	R-13	1	FA-3570	RESISTOR RN60D 1% 3.92K OHM	
53	R-14	1	FA-3545	RESISTOR RN60D 1% 2.00K OHM	
54	R-15	1	FA-3530	RESISTOR RN60D 1% 1.62K OHM	
55	R-16	1	FA-3520	RESISTOR RN60D 1% 1K OHM	
56	R-16A	1	FA-3060	RESISTOR RN55C 1% 316 OHM	
57	R-17	1	FA-3520	RESISTOR RN60D 1% 1K OHM	
58	R-18	1	FA-2385	RESISTOR 10 WATT 50K OHM	
59	R-21	1	FA-3590	RESISTOR RN60D 1% 5.11K OHM	
60	R-22	1	FA-3050	RESISTOR RN55C 1% 267 OHM	
61	R-23	1	FA-3630	RESISTOR RN60D 1% 10K OHM	
62	TS1-3	3	60-190	THERMO SW 180°C N/C PEPI-C	
63	TS4-6	3	60-110	THERMO SW 095°C N/C A/R THER D	
64	LT1-4	4	40-220	PILOT LIGHT RED 125V 1/2"	
65	LT-5	1	40-210	PILOT LIGHT ASSY GREEN 125VAC	
66	C1-6	1	A8-4440	PC169 480V DUAL SNUBBER ASS'Y	
67	C1A-6A	6	FL-180	CAP.FILM 1.0 MF 50V	
68	C-7	1	FL-210	CAP.ELEC 4.70 MF 50V	
69	C-8	1	FL-140	CAP.ELEC 22.0 MF 35V	
70	C-9	1	FL-180	CAP.FILM 1.0 MF 50V	
71	C10-11	2	FL-250	CAP.ELEC 100.0 MF 50V AXAIL	
72	VR1-3	3	65-020	VARISTOR, GE#V150PA20A	
73	VR-4	14	AL-850	SELENIUM PLATES 4 X 5.25	
74	SHUNT	1	FT-084	SHUNT 300 AMP 50 MV	
75	MC-1	1	06-080-ABB	CONT ABB EH210 3P 190A AC3	
76	K-1	1	48-3598	RLY 120AC DP/DT ID RY2SU-GDPLT	
77		1	48-370	RLY SOCKT 08PIN ID SY2S-05	
78		1	48-480	RLY HOLD DOWN SPRING 2Y2S-02F1	
79	K-4	1	48-095OMR-8	RLY 4PDT W/LED 10A 120VACCOIL	
80	K5,K7-9	4	48-3598	RLY 120AC DP/DT ID RY2SU-GDPLT	
81		4	48-370	RLY SOCKT 08PIN ID SY2S-05	
82		4	48-480	RLY HOLD DOWN SPRING 2Y2S-02F1	
83		1	48-095SOCK4P	SOCKET OMRON 4P	
84		1	48-095OMRCLIP	RELAY CLIP OMRON	
85	CAT	1	A3-290605	CAT91 STD PREC NO ENAB 50/60SW	1
86	DVR	1	A8-100	PC77 DRIVER BD W/BRIDGE LOGIC	1
87	DISO-1	1	A9-VV413VV012	DISO/0-10V=.58-5V/0-50MV=0-10V	1
88		0	*	-	
89	DISO-2	1	A9-VV401VV002	DISO 0-5/6=0-5/6,0-45/65M=0-50	1
90		0	*	-	
91	SISO-1	1	A9-H1VV403	DISO HALF S1 0-5/6V=0-8/12V	1
92	PH MON	1	48-712-50HZ	RLY 480VAC PH/MR TNA258B 50HZ	
93		1	48-710	RLY 480AC SOCKT TM FOR 48-712	

Recommended Spare Parts List

Seq	Symbol	QTY	Item	Description	Rec. Spares
94	U/D RAMP	1	48-840	U/D RAMP-RLY AP4831 120V/20MA	1
95		1	48-841	20 PIN SOCKET BTS-20 FORAP4831	
96	S-1	1	52-330	TOGGLE SWITCH SP/DT 3/4 HP	
97	R-50,R-53	2	42-05175	POT 002W 0010K OHM AB TYPE-J	
98		1	42-055V	POT DIAL 0-100% VOLTAGE ADJ	
99		1	42-055C	POT DIAL 0-100% CURRENT ADJ.	
100		3	42-056	POT KNOB 2WPOT MY MD3 36-1	
101	R-51	1	42-05147	POT 002W 0005K OHM AB TYPE-J	
102	M-1	1	35-2905	VM 0-300VDC 4.5 CR 23701VARXR	1
103	M-2	1	36-3355	AM 4.5 050MV 300A 237-02AAE2RX	1
104	TB-1	1	59-068	TERM STRIP 20A, 24 POS.	
105	OUTPUT	2	CB-031	1/4 X 2 COPPER BUS SILVER	
106	LEGEND	1	*	CONTROL AC POWER ON,SCR FUSE	
107	LEGEND	1	*	FAIL,SCR O/T,TRANS O/T,PHASE	
108		0	*	LOSS,AUTO,MANUAL,DC POWER ON,	
109		0	*	VOLT LIMIT ADJ,ENABLE ON,	
110		0	*	3 AMP CONTROL POWER,3 AMP	
111		0	*	CONTROL NEUT,15 AMP KOH PUMP	
112		0	*	POWER,15 AMP PUMP POWER NEUT.	
113		0	*	10 AMP FEEDWATER PUMP POWER,	
114		0	*	10 AMP PUMP POWER NEUT.,10 AMP	
115		0	*	DRYER HEATER POWER,10 AMP	
116		0	*	DRYER NEUT.,10 AMP AUX POWER,	
117		0	*	10 AMP AUX NEUT.,ALARM CONTACT	
118		0	*	0-10VDC CURRENT REF.,0-10VDC	
119		0	*	CURRENT REF.COMMON,0-50MV	
120		0	*	CURRENT SIGNAL (+),0-50MV	
121		0	*	CURRENT SIGNAL (-),0-75VDC	
122		0	*	VOLTAGE SIGNAL (+),0-75VDC	
123		0	*	VOLTAGE SIGNAL (-),POWER	
124		0	*	SUPPLY CONTACTOR,POWER SUPPLY	
125		0	*	INHIBIT/ENABLE.	
126	OL-2	1	48-3517S	O/L RELAY 120 VAC 16-23A CTA3-23	
127	OL-3	1	48-3515S	O/L RELAY 120 VAC 12-17.5A CTA3-17.5	
128	CB-3	1	04-0036	CB 480V 16A 2-PL K ABB S282K16	



- DC and AC Power Supplies
- Dry and Liquid Filled Transformers
- Process Control Systems

1020 Hinesburg Road (05403) PO Box 2264 South Burlington, VT 05407-2264 USA
INTERNATIONAL: 802 652 1300 USA: 800 332 1111 FAX: 802 652 1387
www.rapidpower.com

CERTIFICATE OF COMPLIANCE

Date: November 18, 2002

To: Teledyne Energy Systems
10707 Gilroy Road
Hunt Valley, Maryland 21031

RE: Quantity: 1
Customer PO#: 00017886
Rapid Shop Order #: 29836
Rapid Serial #: 43076-001-003
Rapid Model #: SCRAX300275
Equipment Name: Rectifier
Gross Weight: N/A
Type of Package: Crate

This is to certify that equipment provided as noted by the above order number(s) have been inspected, tested and found to within tolerances as to workmanship and published specifications.

This equipment is in conformance with the contract and/or purchase order, drawings, specifications and other applicable documentation.



Arnold Steffen
Engineering Manager

RAPID POWER CORPORATION

SCR POWER SUPPLY TESTS

Tester	Aral Lupu	App'd By	<i>AK</i>	Date	10/16/02
Shop Order	D29836	Serial No.	43706-001-003	Dwg No.	20172-W542

INPUT RATING				OUTPUT RATING			
Volts	380-480	Amps	149	Volts min.	75	Volts Max	275
Phase	3	Hz	60	Amps Min		Amps Max	300
Control Type	AVS ACC			IPT	No	% Ripple	N/A

NO LOAD	A	B	C		
AC Line Voltage	482.5	482.5	489.3	Set Output DCV	275
AC Line Current	2.0	2.1	2.2	Fan Amps	.21
Phasing Sequence	9	7	8	O/L Set @	.16

V Range Resistor	DISO	I Range Resistor	DISO	Water Cooled			
Ramp Time Set	2-5 s	Ramp Voltage	5Vdc	PSI	N/A	GPM	N/A

FULL LOAD	A	B	C		
AC Line Voltage	480.7	480.3	487.1	Output DCV	283.5
AC Line Current	114.3	114.7	114.8	Output Current	301.8
Phasing Voltage	114.3	114.7	114.8	RMS Full:40 ½: 69 ¼: 62	

Sec. L-N VAC	R1	129	R3	129	R5	130	R2	---	R4	---	R6	---
Sec. Phase Amps	246		to	248			SCR Amps		N/A	to	N/A	
Ref Volts	4.8		Control Volts		110	Open Circuit		V	300	A	310	

REGULATION										
Voltage	Full	275	VDC	240	IDC	To	275	VDC	240	IDC
	Half	137.5	VDC	118	IDC	To	135	VDC	118	IDC
Current	Full	300	IDC	237.8	VDC	To	300	IDC	235	VDC
	Half	150	IDC	119.1	VDC	To	150	IDC	120	VDC