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# TCR Series

## Single-Phase DC Power Supplies



# TCR Series Single-Phase AC Input SCR-Type DC Power Supplies



600 watt 3-1/2" Panel



1000 watt 3-1/2" Panel



1800 watt 5-1/4" Panel



2800 watt 7" Panel

## MAJOR FEATURES

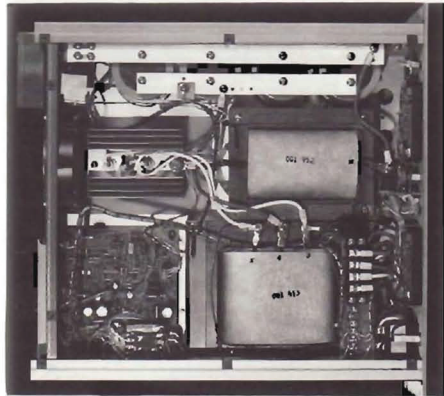
- Combine optimum performance and reliability.
- Highest power-per-cubic-inch in industry.
- Reduction in line-conducted RFI by 1000 times over previous SCR models. (Complies with VDE 875 Level N and VDE 871 Level A.)
- High dielectric withstand ratings primary to secondary and chassis (2500 V rms).
- Low output ripple and high operating efficiency.
- Input, output and programming terminals covered for operator protection.
- Series or parallel master/slave operation.
- Common programming with E/M's three-phase TCR models and its EMHP and HCR Series.
- Five-year warranty.

## APPLICATIONS

- Semiconductor aging racks
- CW lasers
- General industrial DC power
- Capacitor forming
- Focusing coils for accelerators
- Cryogenic magnet applications
- Electroplating
- Battery charging
- ARC lamp power supplies
- DC motor drive supplies

The new TCR Series of single-phase DC power supplies is the culmination of nearly two decades of E/M's pioneering work in SCR-type power supplies. The new models incorporate the best features of E/M's earlier SCR and EM Series power supplies, but include some outstanding improvements. And, because of all these years of intensive design and production experience, prices for the new TCR single-phase models are exceptionally low... in most cases 10% to 30% below their available SCR-type single-phase power supplies; yet the performance and reliability of these units is unsurpassed.

# Operational Ratings and RFI Characteristics



**Top View:** All control circuits, magnetic components, rectifiers and filter capacitors are accessible beneath top cover.



**Rear View:** Input, output, and programming terminals are covered for operator safety.

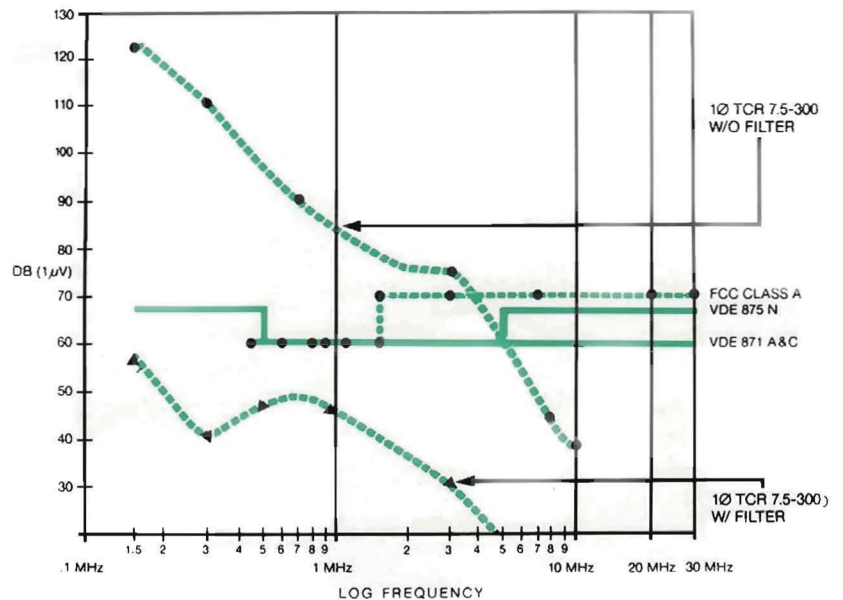


**Front View:** Units are available with analog or digital panel meters.

## OPERATIONAL RATINGS

OUTPUT RATINGS @ 40°C		OUTPUT RIPPLE VOLTAGE @ FULL LOAD	PANEL SIZE (HEIGHT)	MODEL TCR-
VOLTAGE (V)	CURRENT (A)	Or Worst Case, Whichever Is Greater (RMS)	19" WIDTH 18" DEPTH	
0-7.5	0-70	80MV	3.5"	7.5S70
0-7.5	0-115	75MV	3.5"	7.5S115
0-7.5	0-200	80MV	5.25"	7.5S200
0-7.5	0-300	80MV	7"	7.5S300
0-10	0-50	80MV	3.5"	10S50
0-10	0-90	75MV	3.5"	10S90
0-10	0-165	80MV	5.25"	10S165
0-10	0-240	80MV	7"	10S240
0-20	0-30	80MV	3.5"	20S30
0-20	0-50	60MV	3.5"	20S50
0-20	0-90	80MV	5.25"	20S90
0-20	0-135	80MV	7"	20S135
0-40	0-15	100MV	3.5"	40S15
0-40	0-25	60MV	3.5"	40S25
0-40	0-45	100MV	5.25"	40S45
0-40	0-70	100MV	7"	40S70
0-60	0-10	120MV	3.5"	60S10
0-60	0-18	70MV	3.5"	60S18
0-60	0-30	90MV	5.25"	60S30
0-60	0-45	90MV	7"	60S45
0-80	0-8	150MV	3.5"	80S8
0-80	0-13	80MV	3.5"	80S13
0-80	0-23	120MV	5.25"	80S23
0-80	0-34	100MV	7"	80S34
0-150	0-4	300MV	3.5"	150S4
0-150	0-7	150MV	3.5"	150S7
0-150	0-12	200MV	5.25"	150S12
0-150	0-18	200MV	7"	150S18
0-300	0-2	500MV	3.5"	300S2
0-300	0-3	250MV	3.5"	300S3
0-300	0-6	300MV	5.25"	300S6
0-300	0-9	300MV	7"	300S9
0-600	0-1	1000MV	3.5"	600S1
0-600	0-1.6	700MV	3.5"	600S1.6
0-600	0-3	700MV	5.25"	600S3
0-600	0-4.5	750MV	7"	600S4.5

## RFI CHARACTERISTICS (LINE CONDUCTED)



# TCR Series Single-Phase

## SPECIFICATIONS

### INPUT

#### STANDARD AC INPUT:

Standard AC input for 600, 1000 and 1800 watt models is 115 volts, 1  $\emptyset$ , 47 to 63Hz. The supply will function within full specification from 105 to 130V. Current draw is 9.5A maximum for 600W units, 16A maximum for 1000W units, and 28A for 1800W units. Standard AC input for 2800 watt models is 208/220 VAC (190–253V) at a maximum current draw of 22 amps.

#### OPTIONAL AC INPUTS:

The 600, 1000 and 1800 watt models are available with optional AC inputs of 100V, 200V and 208/220 at extra cost. The 2800 watt models are available with optional AC input of 200V at extra cost.

#### AC INRUSH:

All models are "soft-started" so that on turn-on or during power interruption and reapplication, the input SCRs slowly phase-in from non-conduction to a conduction mode. There is no magnetic inrush current.

#### RFI/EMI:

Contains internal RFI filter employing ferrite toroidal chokes and "X" and "Y" VDE listed capacitors.

### OUTPUT

#### OUTPUT RATINGS:

See rating table. Maximum voltage and current ratings for each model are available for operating ambient temperatures of 0°C to 40°C for output at 50°C. Derate 40°C current ratings by 10%.

### REGULATION

#### LOAD EFFECTS:

Constant voltage mode — variations in output current from 5 to 100% of maximum rating cause output voltage variations of less than 0.1% of the output voltage setting when output is 50 to 100% of maximum rating. Below 50% output voltage, output variation will not exceed 0.05% of maximum output.

Constant current mode — variations of output voltage from 5 to 100% of maximum rating will result in output current variations of less than 0.1% of the output current setting when output is 50 to 100% of maximum rating. Below 50% output current, output variations will not exceed 0.05% of maximum output.

#### LINE EFFECTS:

When operating in either constant voltage or constant current mode, variations in the regulated output will not exceed 0.1% of 50 to 100% of output. Below 50% output variations will not exceed 0.05% of maximum rating.

#### RIPPLE:

Output voltage ripple shown in rating table is worst-case under any resistive load condition with the power line within specification. The highest ripple typically occurs at 50% output voltage and current and is lower as maximum output voltage and current is approached.

#### TRANSIENT RESPONSE:

A 30% step increase in power demanded by the load will cause a transient in the regulated output which will typically recover to within 2% of final value within 75ms.

#### STABILITY:

The stability of output voltage or current will remain within  $\pm 0.05\%$  of set point for 8 hours after warm-up under fixed line, load and temperature conditions.

#### TEMPERATURE COEFFICIENT:

The temperature coefficient of the output voltage set point is 0.02%/°C of the maximum output voltage rating of the supply.

The temperature coefficient of the output current set point is 0.03%/°C of the maximum output current rating of the supply.

#### OPERATING TEMPERATURE:

All models operate within specification at continuous duty from 0°C to 40°C. Units may be safely stored at temperatures of -40°C to +85°C. Critical circuitry is thermostat-protected. Cooling is provided by a fan and air is ducted horizontally to prevent adjacent unit heating.

#### CONTROLS AND INSTRUMENTS:

All models provide AC turn on/off and circuit protection by means of a UL-rated input circuit breaker. Output control is provided by a 10-turn voltage control and a one-turn current control. Output indication is by voltage and current panel meters, available as analog or optionally available digital displays.

#### OVER VOLTAGE PROTECTION:

Optional over voltage protection (OVP) is available to protect the load from output over voltage above an adjustable set point of 50 to 110% of rated output. OVP action includes crowbar output, down program unit and open input circuit breaker.

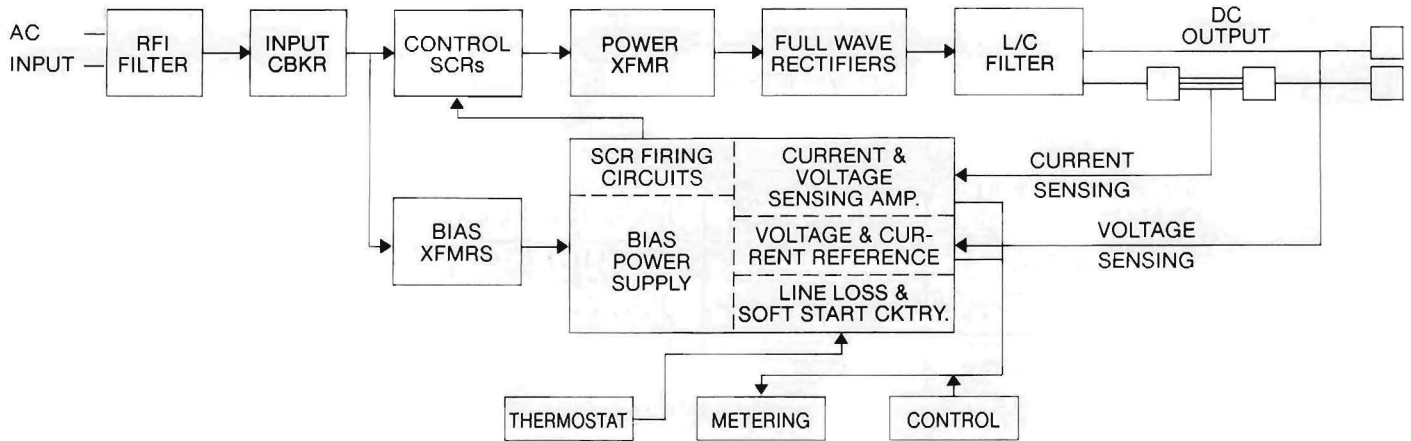
#### PROGRAMMING:

The supply may be controlled locally or remotely. In the remote programming mode, externally provided resistance voltage or current will control the supply output. Programming sensitivity is 5000 OHMS, 5 volts or 1mA for full scale voltage output or 100 OHMS, 100mV or 1mA for full scale current output.

#### REMOTE SENSING:

Separate output sensing terminals are provided to sense remotely the output at a distant load. This feature compensates for the voltage drop in the power distribution system and provides specified regulation at the point of load.

# Theory of Operation

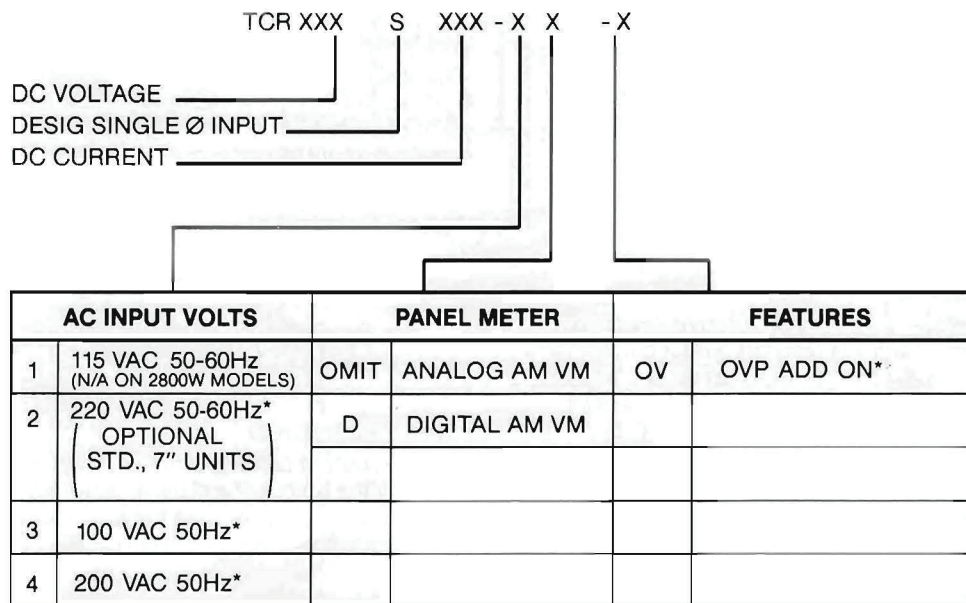


In an SCR phase-controlled DC Power Supply, output is controlled by modulating the conduction angle of the controlling SCRs. In the TCR Series, input AC is applied to a pair of bi-directionally connected SCRs placed within the primary circuit of the main power transformer. The secondary voltage of this transformer is rectified and L/C filtered to provide a low ripple DC output. Both

output voltage and current are sensed and compared against internal references or externally applied control levels so the supply provides either constant voltage or constant current regulation with automatic crossover depending on control level. Additional circuitry provides bias levels, circuit protection and metering functions.

# How to Order

The following chart explains the model numbers for the TCR Single-Phase Power Supply family.

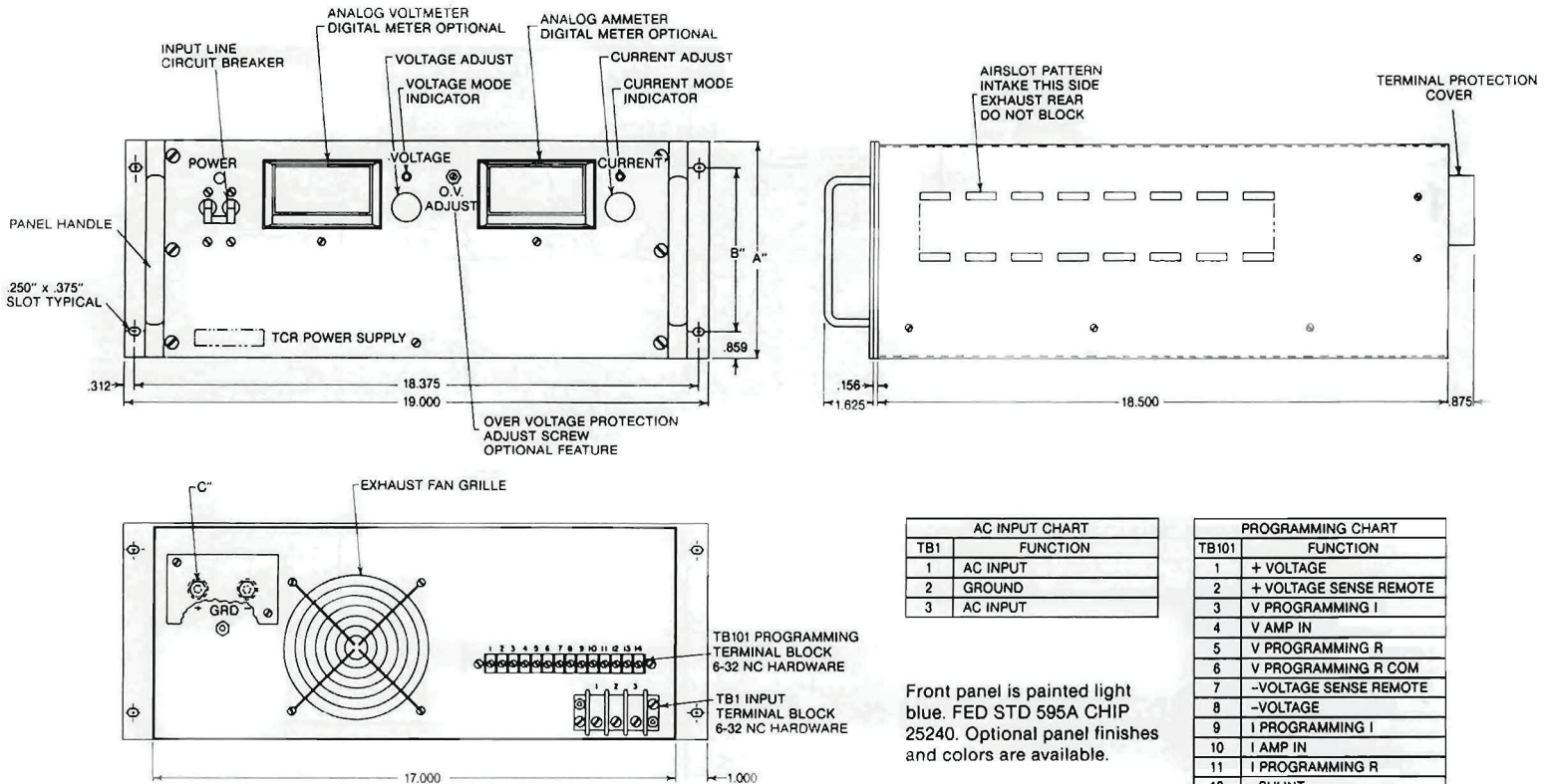


\*Option available at extra charge

For example, consider Model TCR 20S50-2D-OV. This model provides 0 to 20 VOLTS output, 0 to 50 AMPS output, 220 V 1Ø input, digital panel meters and OVP add-on.

When ordering a particular model by this system it is urged that the required AC input be separately stated.

# TCR Series Single-Phase Power Supplies



AC INPUT CHART	
TB1	FUNCTION
1	AC INPUT
2	GROUND
3	AC INPUT

PROGRAMMING CHART	
TB101	FUNCTION
1	+ VOLTAGE
2	+ VOLTAGE SENSE REMOTE
3	V PROGRAMMING I
4	V AMP IN
5	V PROGRAMMING R
6	V PROGRAMMING R COM
7	-VOLTAGE SENSE REMOTE
8	-VOLTAGE
9	I PROGRAMMING I
10	I AMP IN
11	I PROGRAMMING R
12	-SHUNT
13	INVERTER AMP IN
14	+ SHUNT

Front panel is painted light blue. FED STD 595A CHIP 25240. Optional panel finishes and colors are available.

#### STANDARD FEATURES:

1. U/L RECOGNIZED INPUT CIRCUIT BREAKER.
2. ANALOG VOLTMETER AND AMMETER.
3. VOLTAGE AND CURRENT ADJUST.
4. VOLTAGE AND CURRENT MODE LAMP INDICATORS.
5. INTERNAL AC LINE FILTER.
6. SCR PHASE CONTROL.

#### OPTIONAL FEATURES:

1. OVER VOLTAGE PROTECTION WITH FRONT PANEL ADJ.
2. DIGITAL VOLTMETER AND AMMETER.
3. CHOICE OF INPUT VOLTAGE:
  - 115V 50-60 HZ
  - 208-220V 50-60 HZ
  - 100V 50 HZ
  - 200V 50 HZ

MODEL PANEL CURRENT	DIMENSIONS			WEIGHT
	A	B	C	
TCR 600W 3.5" NOMINAL 1 TO 70 AMPS	3.468"	1.750"	1/4-20	58-60 lbs.
TCR 1000W 3.5" NOMINAL 1.6 TO 115 AMPS	3.468"	1.750"	1/4-20	59-64 lbs.
TCR 1800W 5.25" NOMINAL 3 TO 200 AMPS	5.218"	3.500"	3/8-16	92-98 lbs.
TCR 2600W 7" NOMINAL 4.5 TO 300 AMPS	6.968"	5.250"	3/8-16	124-127 lbs.



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Printed in U.S.A.  
5M-TCR-1 Rev. 1/89