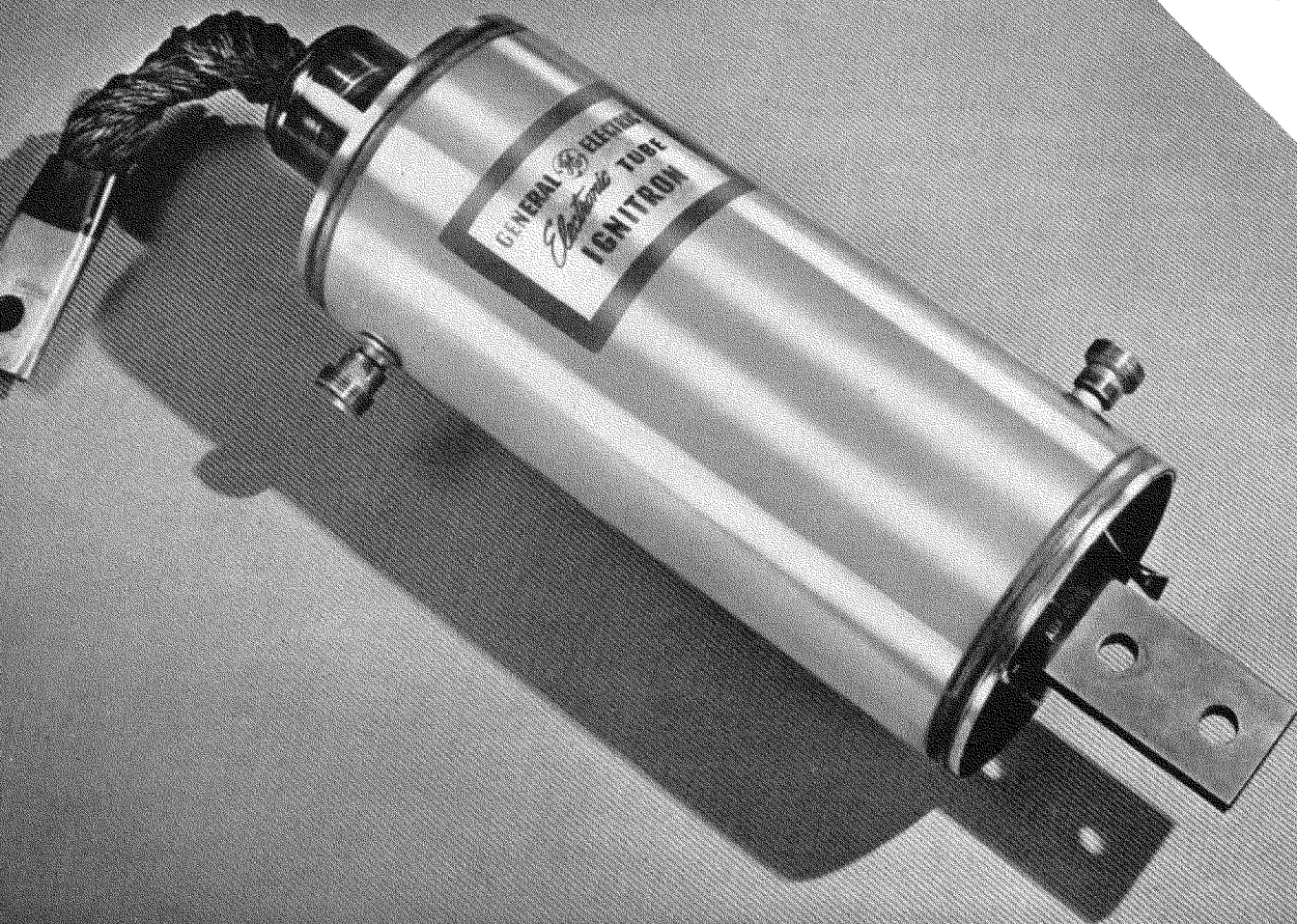




IGNITRON

SPECIAL DESIGN FEATURES

1. Stainless-steel, seam-welded construction
2. Uniform water cooling
3. Strong, compact design
4. Easy to install
5. Copper terminals
6. Flexible anode lead
7. Mercury-pool cathode allows extremely high instantaneous currents to be passed through the tube without damage.

DESCRIPTION

This steel-jacketed ignitron is designed for rectifier service in the 125-, 250-, 600-, and 900-volt d-c power fields. The FG-238-B is used for rectifiers rated up to 1000 kilowatts depending on the number of ignitrons used, the output voltage, and the circuit.

The FG-238-B is also rated for 2400-volt resistance-welder-control service and has a capacity of 2400 kilovolt-amperes in this service. The FG-

238-B has a continuous average current rating of 200 amperes per tube for use in rectifiers rated up to 1000 kilowatts.

Arc losses are low. Phase control of the ignitron impulses permits voltage control of the rectified output. Excitation of the small auxiliary anode stabilizes the cathode spot for very small anode currents. Two ignitrons, only one of which is used at a time, assure long life.

GENERAL  ELECTRIC


Electronic
TUBE

TECHNICAL INFORMATION

These data are for reference only. For design information refer to specifications.

GENERAL CHARACTERISTICS

Electrical

Voltage drop

At 100 amperes instantaneous anode current	12.6	volts
At 300 amperes instantaneous anode current	14.1	volts
At 600 amperes instantaneous anode current	16.2	volts
At 1200 amperes instantaneous anode current	19.1	volts

Mechanical

Cathode	pool type
Number of ignitors	2
Number of main anodes	1
Number of auxiliary anodes	1
Type of cooling	water
Typical flow	3 to 5 gallons per minute
Pressure drop at above flow	3 to 8 pounds per square inch
Temperature rise with lower rate of flow	
300 amperes per anode	7 centigrade
Net weight, approx	25 pounds
Shipping weight, approx	35 pounds

MAXIMUM RATINGS

Rectifier Service—For Power Supply—Frequency of 25 to 60 Cycles, Phase Retard = 0

Maximum inverse and forward anode voltage	900 volts	2100 volts
Maximum anode current		
Instantaneous	1800 amperes	1200 amperes
Average continuous current	200 amperes	150 amperes
2-hour-average current over any 2-minute period	300 amperes	225 amperes
1-minute-average current over any 1-minute period	400 amperes	300 amperes
Surge current, maximum duration 0.15 second	12000 amperes	9000 amperes
Maximum outlet water temperature	60 centigrade	45 centigrade
Minimum inlet water temperature	6 centigrade	6 centigrade
Minimum water flow		
At continuous average anode current	3 gallons per minute	3 gallons per minute
At no load*	1.0 gallon per minute	1.0 gallon per minute

*For Systems in which the flow of water is controlled by the Load.

Welder—Control Service—Ratings are for 2400 Volts Rms, Frequency of 25 to 60 Cycles

Maximum demand	2400 kva
Corresponding average anode current	135 amperes
Maximum average anode current	207 amperes
Corresponding demand	1105 kva
Maximum time of averaging anode current at 2400 volts, rms	1.66 seconds
Minimum water flow	3.0 gallons per minute
Maximum outlet water temperature	30 centigrade
Maximum surge current	6000 amperes
Maximum duration of surge current	0.15 second

Ignition Requirements (Ratings are the same for both Welder and Rectifier Service)

Ignitor voltage

Maximum allowed, ignitor positive—same as anode voltage	
Maximum instantaneous allowed, ignitor negative	5 volts

Ignitor current

Maximum instantaneous allowed	100 amperes
Maximum average allowed	2.0 amperes
Time of averaging current	10 seconds
Maximum ignition time	100 microseconds

TECHNICAL INFORMATION (CONT'D)

Anode firing (see elementary circuit K-9033528)

Maximum instantaneous ignitor potential required.....	150 volts
Maximum instantaneous ignitor current required.....	40 amperes
Typical resistance added to ignitor circuit for anode firing	
At anode voltage of 600 volts or less.....	4 ohms
At anode voltage of 601 volts to 1000 volts.....	10 ohms
At anode voltage of 1001 volts to 1500 volts.....	20 ohms
At anode voltage of 1501 volts to 2000 volts.....	35 ohms
At anode voltage of 2001 volts to 2400 volts.....	50 ohms

Separate excitation (see elementary circuit K-9033525)

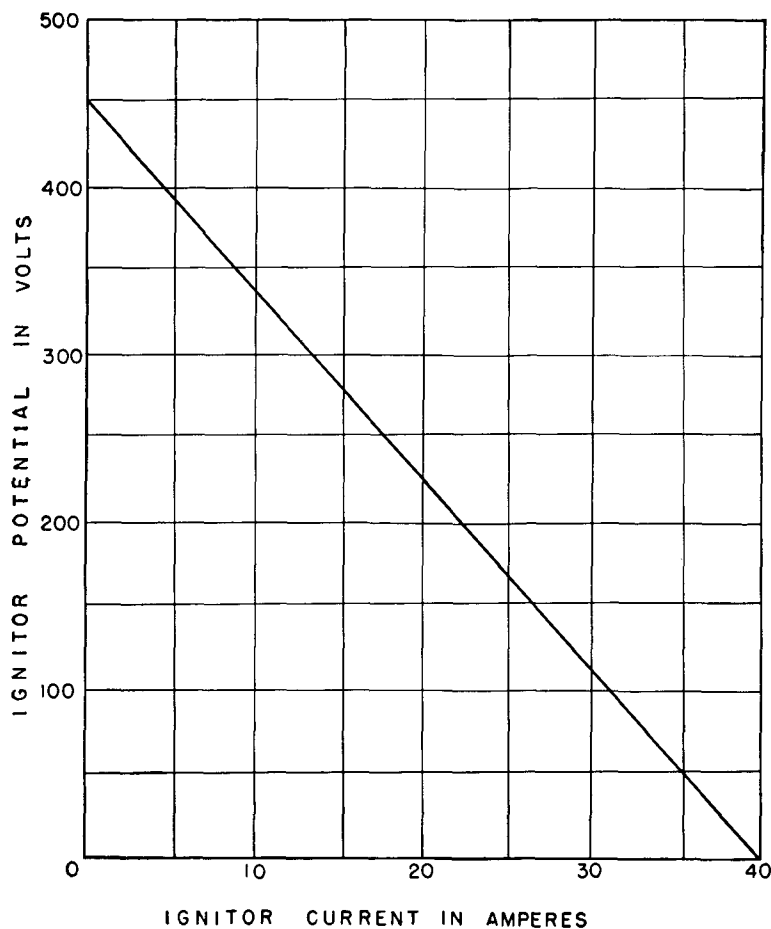
Minimum volt-ampere requirements for separate excitation
Firing systems are shown on K-9033529

Auxiliary Anode Requirements (Ratings are the same for both Welder and Rectifier Service)

Maximum average current.....	5 amperes
Maximum inverse voltage	
With main anode conducting.....	25 volts
With main anode not conducting.....	150 volts

FG-238-B

MINIMUM VOLT-AMPERE REQUIREMENTS FOR SEPARATE-EXCITATION FIRING SYSTEMS

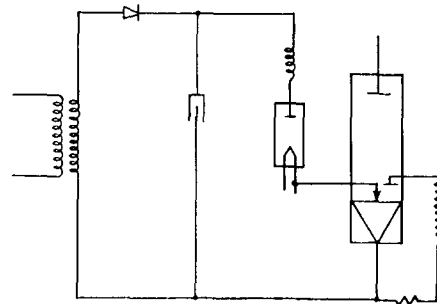


K-9033529

FIG. 2

11-15-44

FG-238-B
ELEMENTARY CIRCUIT FOR CAPACITOR FIRING

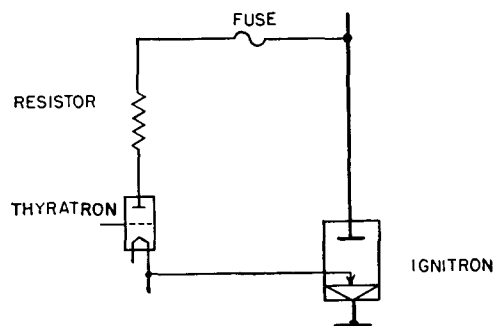


K-9033525

FIG. 1

11-15-44

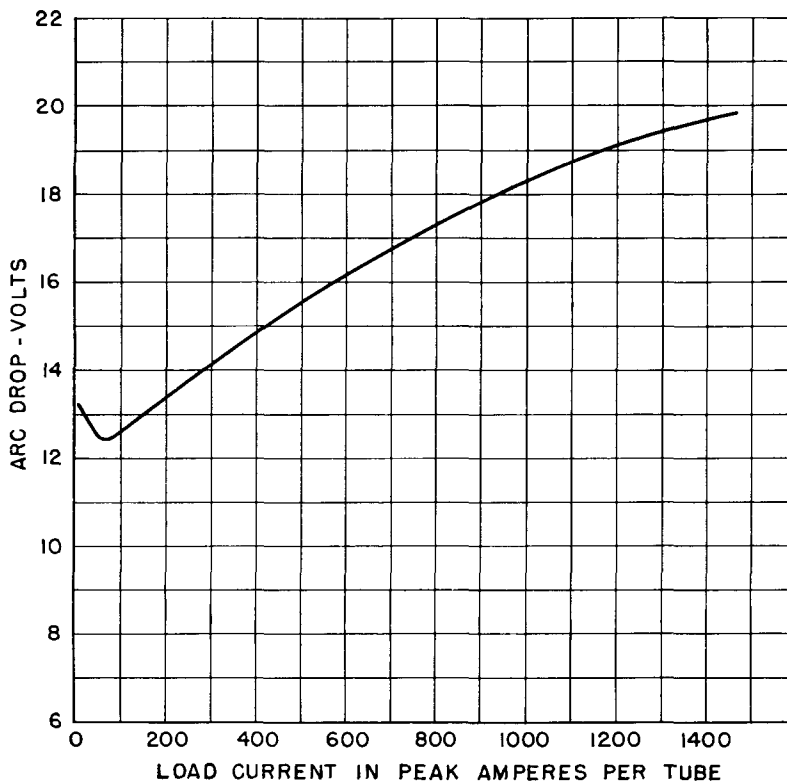
FG-238-B
ELEMENTARY CIRCUIT FOR ANODE FIRING



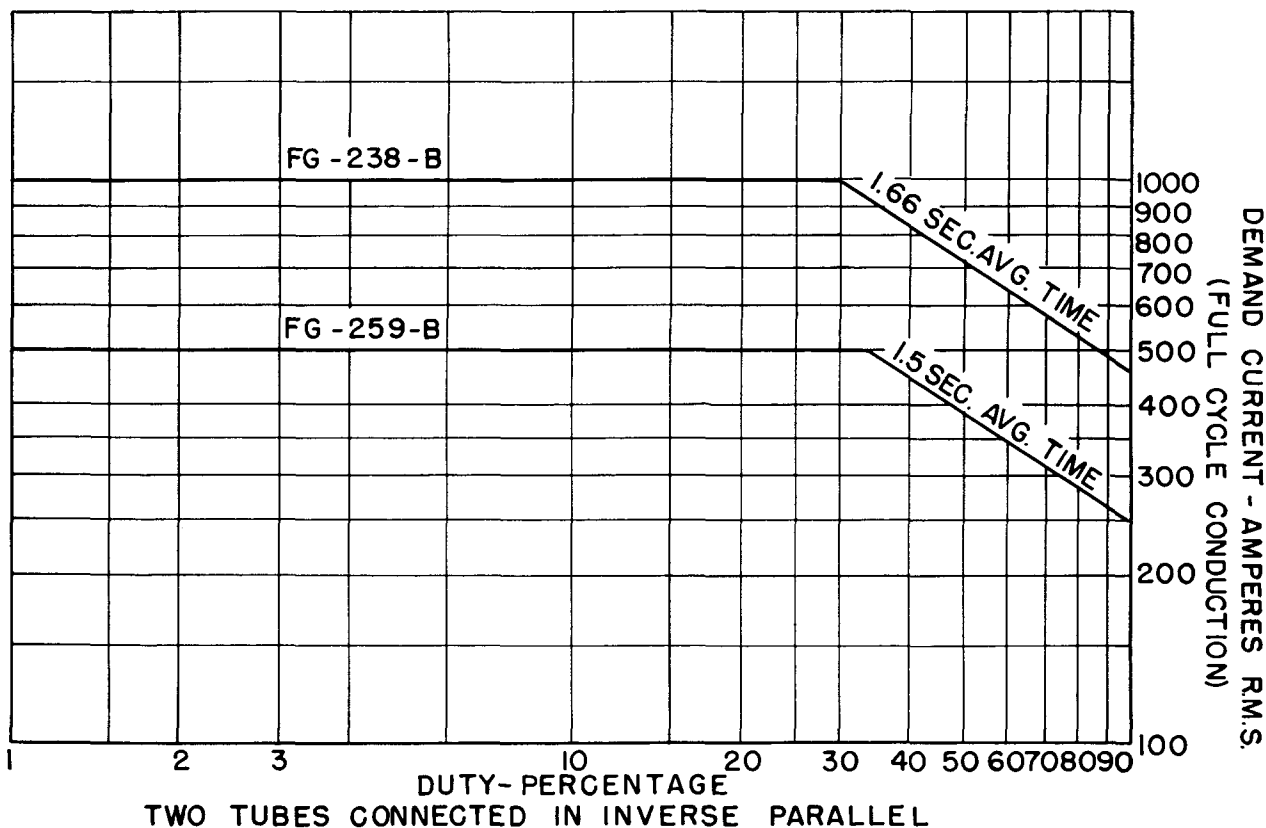
K-9033528

FIG. 3

12-16-44



FG-238-B ARC DROP, OUTLET WATER TEMPERATURE—40 C TO 60 C, WATER FLOW—3 GPM
K-6917495 FIG. 4 8-25-44



TWO TUBES CONNECTED IN INVERSE PARALLEL
FG-238-B IGNITRON; DEMAND CURRENT VS PERCENTAGE DUTY AT 2400 VOLTS RMS, MAX. OUTLET WATER TEMP 30 C, MIN WATER RATE 3 GAL/MIN, WELDER CONTROL SERVICE
K-8074661 FIG. 5 9-26-44

9" MAX. DIA.
 SERIAL NO.
 3 1/2 ± 1/8
 ANODE CONNECTION
 2 1/2 ± 1/4 DIA.
 WATER OUTLET CONNECTION
 1" 1/4 SEMI-FINISHED BRASS UNION, CRANE CO. #522 OR EQUIV.
 FURNISHED WITH MALE PART ONLY
 2' 3 3/8 ± 1/2
 17 7/16 ± 1/2
 14 1/16 ± 1/8
 5 1/2 ± 1/4 DIA.
 12 9/16 ± 1/4
 4 1/2 ± 1/16
 INLET
 1" MAX.
 1" MAX.
 1/8
 1/4 MAX.
 1/4 DIA. MAX.
 1 3/4 MAX.
 3 5/16 ± 3/32
 3/4 MAX.
 9/16 DIA.
 IGNITOR CONN. #1
 CATHODE CONNECTION
 1 3/4 ± 1/16
 1/2 MAX.
 MAX. VARIATION ± 3°
 5 1/16 ± 3/32
 AUXILIARY ANODE CONN.
 1/2 MAX.
 NOTE: ONE IGNITOR USED AT A TIME

