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## AUTOMATIC CURRENT REGULATOR

### INTRODUCTION

The Amperite automatic current regulator is a reliable current regulating device, which can maintain a constant current in a circuit over a very wide range of input voltages. It consists of a resistance wire with a positive temperature coefficient of resistance, hermetically sealed in a bulb containing hydrogen or helium gas. The resistance of this element will automatically increase or decrease in accordance with the change of temperature in the unit to maintain a very accurate current level. The circuit of Figure 1 shows how an Amperite current regulator is connected to the load.

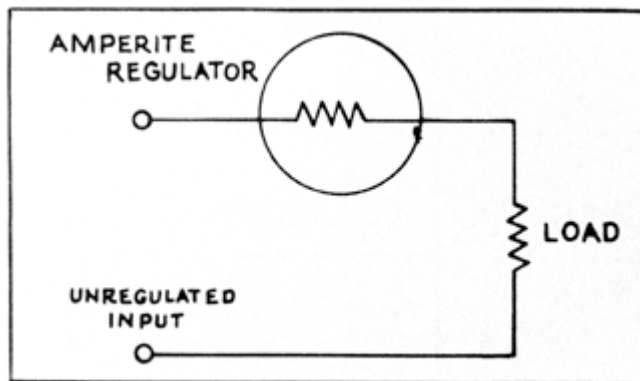


Figure 1 - Connecting the Amperite Regulator

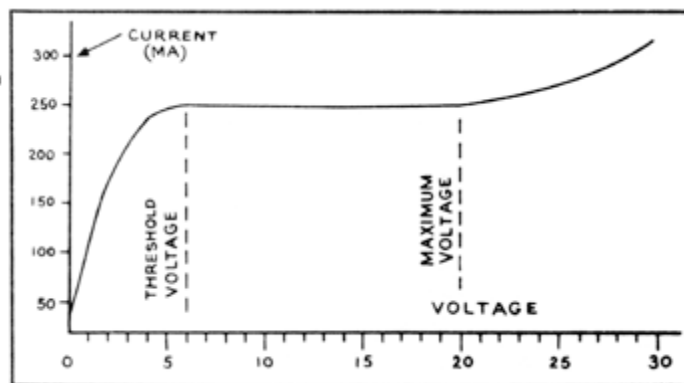



Figure 1a - Typical Voltage/Current Relationship of Ballast (No. 2HTF7)

Figure 1A is an illustration of a typical input voltage/current relationship of the current regulator. Note the extremely accurate current level over the wide range of input voltage, 6 to 20 volts in this case. Ballast regulators are designed to maintain a constant current with great efficiency, usually within + or -1%. Referring to Figure 1A, the most accurate current regulation will be obtained at the flat, mid-point section on the curve. As the voltage operating levels move up and down the curve the current will vary to some

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degree. Being a constant current device the current regulator can be used only to regulate a constant load - fixed wattage.

The Amperite current regulator is always connected in series with the load. The type number would depend upon the current requirement of the load. In addition, Amperite regulators can be connected in parallel with each other to handle any amount of current.

The Amperite voltage regulator will maintain both voltage and current regulation simultaneously when connected in series with the load; however, current regulators should never be connected in parallel with the load.

### HISTORY-PROVEN & RELIABLE

Amperite ballast regulators have been used successfully in countless control applications for over 79 years. Amperite provided current regulation for the early DC radio sets, and then were used for voltage regulation in generations of AC radios and equipment. Today, new Amperite current regulators are specified as current controllers in jet engines, regulators in air conditioning and scientific/industrial equipment and are used in precision instrumentation, communications equipment and military applications.

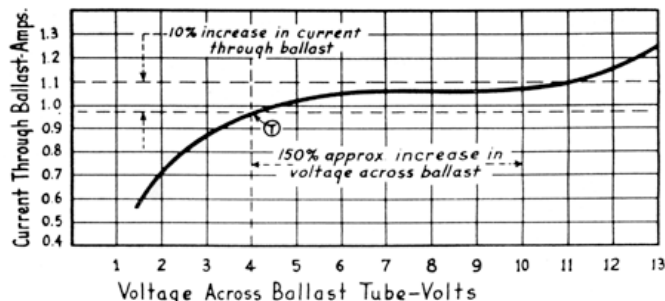
### CURRENT REGULATING RANGES

Most ballast tubes manufactured have been designed for specific applications over current ranges of 50 milliamperes to 6 amperes, and voltage ranges of 3.0 to 70 volts. Although any number of tubes may be connected in parallel to attain any desired current, it is possible that a unit, which will meet your requirements, has already been manufactured. Amperite ballast tubes are manufactured to meet military specification MIL-R-3080B. Please contact factory for specific requirements on your application.

### CAPACITIES AVAILABLE:

Current values of 60 ma. to 5 amps.


Threshold voltage (see Fig. 2) 0.4 to 40 V



Ⓣ = Threshold Current & Voltage

Figure 2 - Characteristic curve of a typical Amperite. Approximate curve of any other Amperite can be obtained by multiplying or dividing the current of voltage scale by any number.

Max. Dissipation per Amperite 40 W per tube (T-12 Bulb)

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Amperite can be used on AC, DC, or pulsating current.

Ballast tubes should not be operated in series.

Any number of Amperites with the same voltage range can be operated in parallel.

### **BASES AVAILABLE AND BASE WIRING**

Radio octal 8-pin, 9-pin miniature standard wiring prongs 2-7.

4 Prong Radio - for current over 3 amps. - wiring FF.

### **GENERAL ADVANTAGES**

... Light, compact... No moving parts

... Rugged, will stand vibration of 10G minimum

... Hermetically sealed; not affected by altitude or humidity changes

... Can be changed as easily as a radio tube

... Operates equally well on A.C. or D.C.

### **AMBIENT EFFECTS:**

Ambient temperature variation of -50 degrees to +70 degrees C - will change the current value of ballast regulating tubes approximately 2% on regulating portion of curve. Being hermetically sealed the Amperite is not affected by altitude or humidity changes.

### **TIME LAG CHARACTERISTICS:**

Time lag encountered in an Amperite Ballast Tube depends upon the wattage consumed by the ballast and the size of the bulb. Where the wattage is small for the size of the bulb, the action can be made practically instantaneous - less than 1 second. In such cases the bulb will remain at practically ambient temperature. When the wattage is high enough to heat the bulb to a temperature uncomfortable to the hand (160 degrees F) the lag might be as much as several minutes for final readings - but normally reaches within 90% of final readings within a few seconds.

### **LIFE EXPECTANCY:**

Average life if operated as recommended	2000 hrs.
If operated continuously at maximum voltage	1000 hrs.
If operated continuously at 80% maximum voltage	5000 hrs.
If filament is operated below glow point	5000 hrs. and up

In operation, the Amperite filament starts to glow at one point; as the voltage is increased, the glow spreads over the entire filament. Like incandescent lamps, turning the ballast tube on and off reduces its life, especially if operating near its maximum voltage.

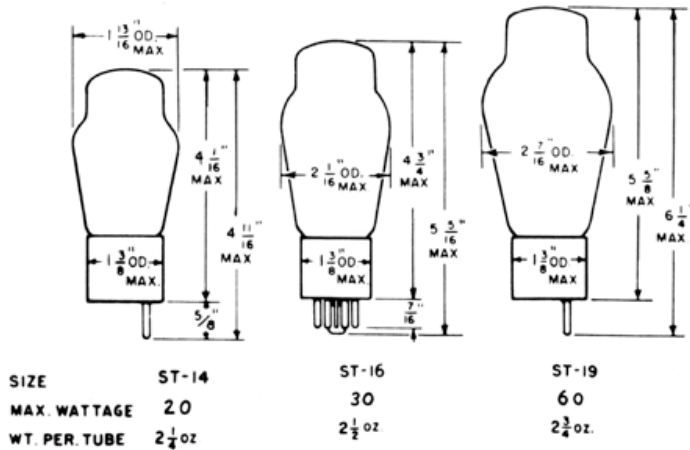
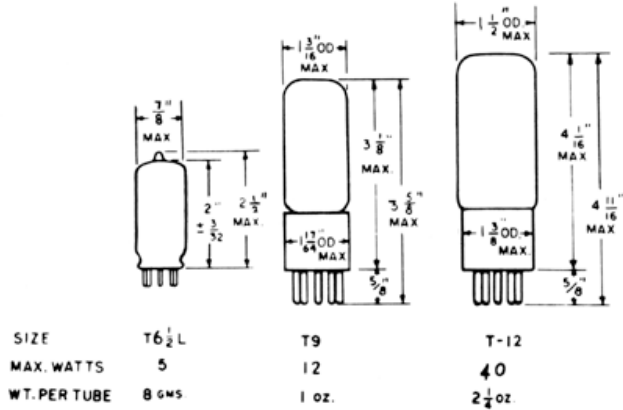
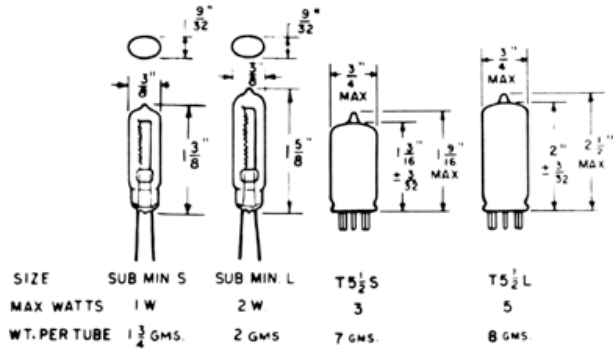



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**STANDARD SIZES of AMPERITE  
CURRENT-VOLTAGE REGULATORS (BALLAST)**

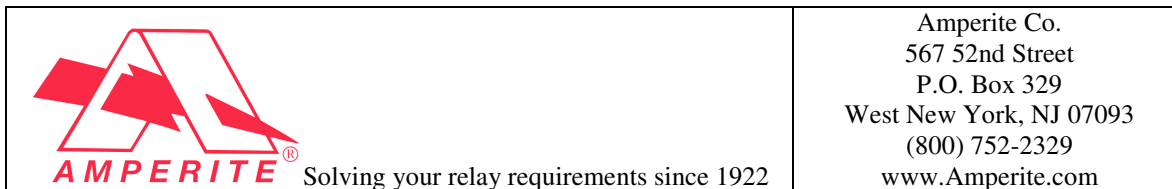
Available for various wattage consumption . . .  
For good regulation, a bulb should not be  
required to dissipate more than 50% of  
maximum voltage.




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**RESISTOR CURRENT REGULATOR (BALLAST) PART NUMBERS STILL AVAILABLE:**


1-1	2-20-30	3TF3B	6H-16	D9T1
1-15	20-1H	3TF4	6H-4	EW23B
1-16	20-3	3TF4A	6H-6	F4120A
1-1E	20-4	3TF4B	6H10	GL522-B25
1-3	20A10	3TF7	6HTF4	GL5621/B6
1-30	21-2A	3TF7A	6T1H	GL5624/B46
1-4	210511-A	3TF7B	6T4	K26J218
10-11	22-4	3TF7/H	6T4A	KS14595
10-21	23-6	3TFB	6T4D	KS16479
10-25	24-1H	3TFV4	6T4E	KS19056
10-2A	24-6A	3TFV4B	6T4F	L55B
10-3	26-4A	3TK2	6TF2	R1900
10-4	26T4A	3V4	6TF4	R2D4
10-40	27-7	3W5	6TF4A	R3000
10-4A	2A10	4-12	6TF4B	R3003A
10-4B	2A12	4-25	6TF7	TJ102L01
10-4C	2A20	4-8TF1	7-4	TJ311M01
10-4D	2A21	4-B	7-7	TJ601K01
10-4E	2B14	40-4	7-7A	TJ791K01
10-4G	2H-4M	40-5	7-A	W72-43
10-7	2H-8	40-6E	77-127	W72-69




10A10	2H10	41-2	77-128	WL-788
10A12	2H10R	41-7E	7A10	WL712
10A20	2H20	42-2H	7A10B	
10T1	2H30	42-3	7A20	
10TF2	2H4	43-4	7H-10	
11-11	2HT7	46-2	7H-11	
11-3	2HT7B	4A1	7H-12	
11-4	2HTF11	4A10	7H-20	
11A10	2HTF4	4A10S	7H-7B	
12-11	2HTF7	4H-1	7H4	
12-1H	2HTK2	4H-12	7H4B	
12-2	2M2	4H-12A	7H7	
12-2A	2R67	4H-25	7HTF2	
12-3	2TF10	4H-30	7HTF3	
12-3H	2TF11	4H10	7HTF3D	
12-4	2TK7	4H11	7HTF4	
120A	3-11	4H3	7TF4	
121B	3-112	4H4C	7TF4A	
12A10	3-11B	4H7	7TK3	
12T1	3-14	4HM3	8-11	
13-3H	3-14B	4HT1	8-3B	
13-4	3-15	4HT11	8-4	
13-7	3-16	4HTF11	8-4A	

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13A10	3-38	4HTF4	8-4D
14A10	3-38A	4HTF4A	8-7
14A20	3-38B	4HTF4B	8A10
14T1	3-4	4T2	8A10A
15-11	3-40	4T2B	8H-8H-3
15-2	3-4A	4TF4	8HTF3
15-4	3-4B	4TF7	8TF2
15A10	3-4D	5-11	8TF3
15A20	3-5	5-16	8TF4
15T1	3-50A	50-4	9-11
15TF2	3-7	5324-2	9-3
16-4	30-11	55-1	9-4
16A10	30-7	55-1H	9-4A
16N2	3008040B	55-4	9-4C
16T1	3014055A	5A10	9-4D
17-3	30R4	5A10S	9-6
17-7	31-4	5A20	9-7
17G2	33-11B	5H-10	9-7B
18-3	34-2	5H-11	9-8
18A10	35-4	5H-12	9A10
1A10	36-11	5H-3	9A22
1A20	37-4	5H-4	9H4
1F1	3A10	5H1	9H9

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1H-10	3A10B	5HA20	9HTF1H
1H-11	3A20	5HT3	9TF2
1H-20	3F3B	5HT4	9TF4
1H-25A	3H-1-7	5HTF1	A19A
1H-46	3H-10	5HTF2	AP1260
1H-4B	3H-10B	5HTF4	D5TF10
1H-50	3H-11	5M1	D5TF30
1HM2B	3H-12	5T1A	D6-10
1HM4	3H-20	5TF11	D6HT3
1HT11	3H-20B	5TF2	D6M1
1HT2	3H-25	5TF4	D6M2
1HT9K	3H-4	5TF40	D6M3
1HTF10	3H-4B	5TF4D	D6T11
1HTF10A	3H-7	6-11	D6T1H
1HTF10B	3HTF11	6-11B	D6T20
1HTF10C	3HTF4	6-12	D6T7
1HTF10D	3HTF4A	6-13	D6TF20
1HTF11	3HTF4B	6-13B	D6TF30
1HTF11A	3HTF7	6-1H	D6TF4
1HTF11B	3M2	6-3	D6TF9
1HTF11C	3M4	6-36	D6TK6
1HTF4	3T1	6-4	D6TK7
1HTK11	3T11	6-4A	D7-20

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1M2	3T2	6-4B	D7H-6
1S10	3T4	6-4C	D7H20
1TF10	3T4A	6-7	D7H4
1TF11	3T7	6-8B	D7HT4
1TF2	3TF11	6A10	D7T11
1TF20	3TF11B	6A15	D7T4
1TF20A	3TF12	6A25	D7TF10
1TF7	3TF3	6G-12	D7TF7