PULSE WIDTH CONTROL DC-TO-DC CONVERTERS 120- THROUGH 123-, 130- THROUGH 133-, AND 140- THROUGH 143-TYPE POWER UNITS SUMMARIZING SPECIFICATION

CONTENTS

1. GENERAL

1.01 This specification, together with the supplementary information listed herein, covers the equipment design requirements and ordering information for standardized pulse width control (PWC) dc-to-dc converters which are coded as power units.

1.02 This section is reissued to add the following dc-to-dc converters listed below. Since this reissue is a general revision, no revision arrows have been used to denote significant changes. This reissue does not affect the Equipment Test List.

(a) 121C1A, D1A, F1, G1, H1, J1, K, K1, L, M

(b) 131L1A, W1, Y1, AA1, AB1

(c) 133K

(d) 135A1

(e) 140L1

(f) 141J1, K1, L1, M1, N1

(g) 143B

1.03 These power units are designed to operate from standard battery input voltages of 24, 48, or 140 volts. The ambient operating temperature range is 0 through 65°C. The power units are available with multiple outputs within limitations based on input power capabilities of 35, 50, 80, 150, and 250 watts. (See Fig. 1 through 5.) This specification describes the 35-, 50-, 80-, 150-, and 250-watt power units.

1.04 This issue of the section is based on the following schematic drawings:

Schematic Drawing	Power Unit Code
SD-82260-01,(-02)*	120
SD-82261-01	121
SD-82262-01	122
SD-82270-01	130
SD-82271-01	131
SD-82272-01	132
SD-82273-01	133
SD-82280-01	140
SD-82281-01	141
SD-82282-01	142
SD-82283-01	143

*Designates 80 PA units; eg, 131G1 is controlled by SD-82271-02.

2. DESCRIPTION

2.01 These power units (PWC converters) are small plug-in apparatus designed to be inserted into system frames.

2.02 These power units utilize pulse width modulation techniques for output voltage control. This and other control functions are achieved with standard Bell System integrated circuits and discrete components.

2.03 The power unit basically consists of three electrical sections. One section consists of the circuitry for pulse width control and other operational features. The second section consists of base drive and power switching circuitry which changes the dc input into a rectangular ac wave, and the third section consists of a transformer, rectifiers, and filters for conversion back to dc for the output.

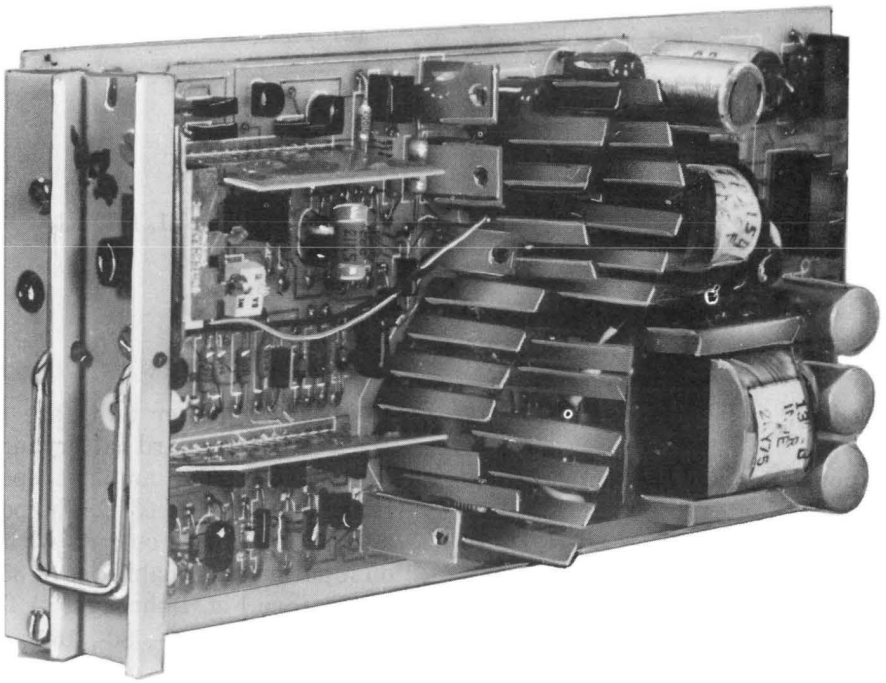


Fig. 1—35 PA Units (120-, 130-, and 140-Type Power Units)

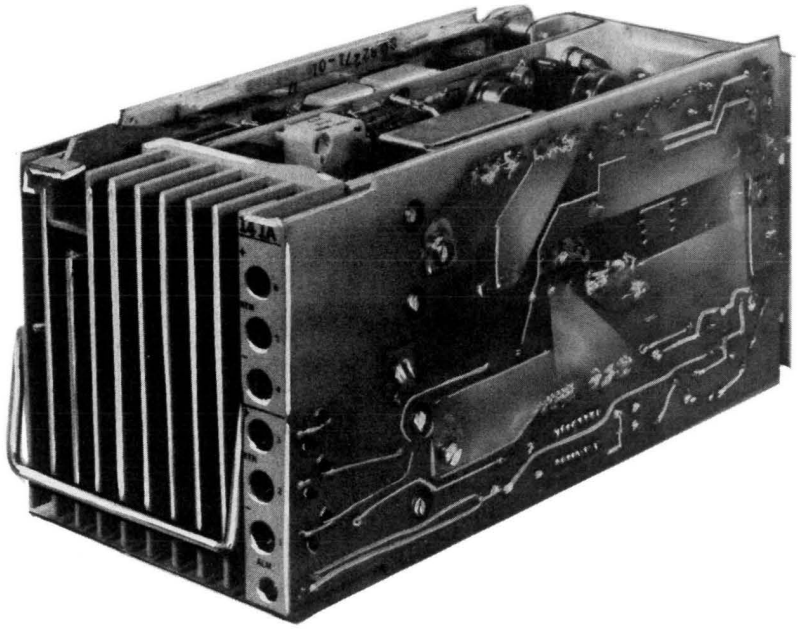


Fig. 2—50 PA Units (121-, 131-, and 141-Type Power Units)

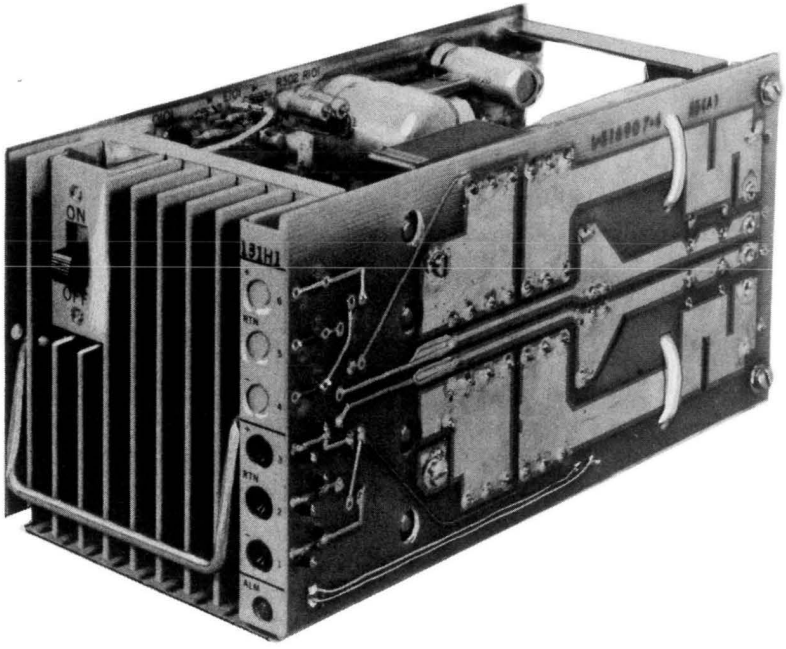


Fig. 3—80 PA Units (121( )1-, 131( )1-, and 141( )1-Type Power Units)

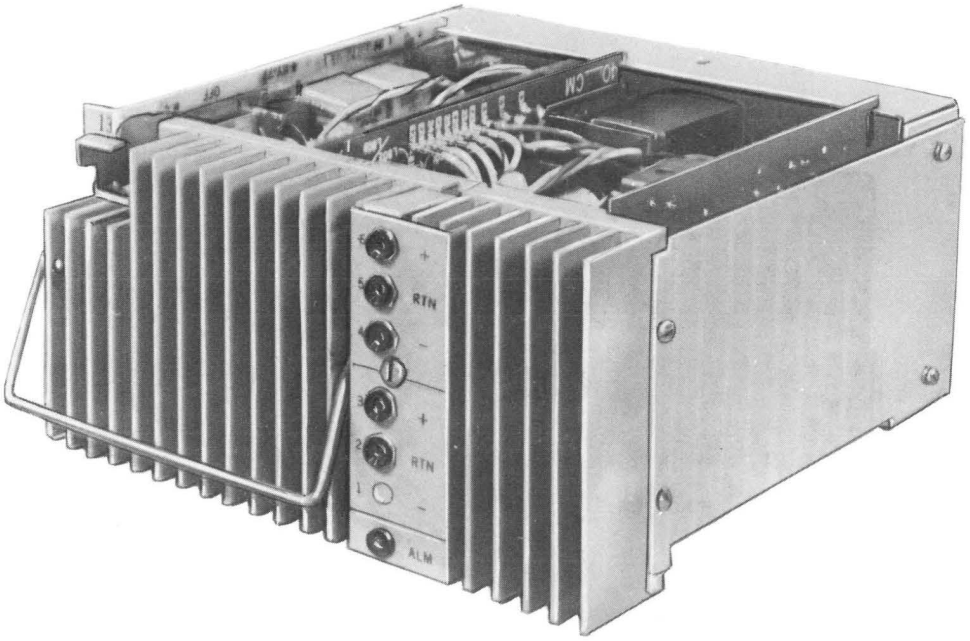


Fig. 4—150 PA Units (122-, 132-, and 142-Type Power Units)

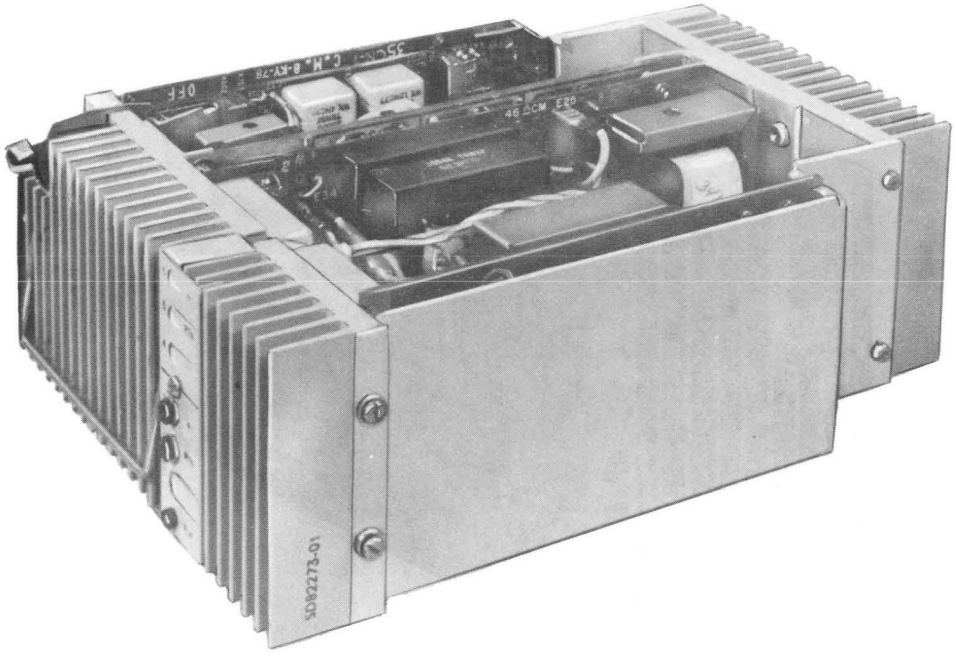


Fig. 5—250 PA Units (133- and 143-Type Power Units)

Note: The term power amplifier (PA) is used in this specification to identify the combination of the control, base drive, and switching circuitry. The PA level is approximately equal to the input power in watts.

2.04 The 50-, 80-, 150-, and 250-watt power units are equipped with a low input voltage shutdown feature and an automatic restart when the input voltage returns to within its operating range. Also provided on the 50-, 80-, 150-, and 250-watt power units, is a high voltage shutdown feature, a current foldback, and a low output voltage monitor. The 35-watt power unit is equipped with a high output voltage limiter and low output voltage monitor. The low voltage monitor provides an external alarm indication and also lights a lamp on the front panel of the converter. The power unit efficiencies are in the range of 68 through 80 percent at full load depending on the number of outputs, load current ratings, and output voltages. They are provided with an "electronic shutdown" terminal for external on/off control.

2.05 The physical design of 35-, 50-, 80-, 150-, and 250-watt power units is based on the use of the 79B, 80C and 81B apparatus mountings. The apparatus mounting is furnished by the user. For application of apparatus mountings with power units, see Fig. 6.

Power Unit Coding

2.06 The two primary parameters for administering power unit codes are input voltage (three variations) and power amplifier capability (five variations). Letter suffixes are added to each base number to identify a specific power unit. If the letter suffix is followed by the numeral 1, the referenced converter has an input of approximately 80 watts.

2.07 Ten codes for each input have been reserved. The first four codes of each series have been assigned to the four present power ranges (ie, 120, 121, 122, and 123). The remaining six codes of each series are not described in this specification. (See Table A).

2.08 Each printed wiring board assembly in the 50-, 80-, 150-, and 250-watt units is coded as a circuit module and is a component part. Since the 35-watt unit is a single board assembly, parent module codes have not been assigned.

2.09 Common Language Equipment Codes (CLEC) have been assigned to the following power units:

UNIT	CLEC
130D	NTPU1COAAA
130G	NTPU1HOAAA
131F	NTPU1EOBAA
132M	NTPU1FOCAA
132L	NTPU1GOCAA
140A	DICPO51FAA
140E	DICPO52FAA
140F	DICPO53FAA

Connector Keying Arrangement

2.10 The purpose of connector keying is to protect both the power unit and the system apparatus. The key slots are placed between the contact fingers on the board which engage the frame connection (Fig. 7). The connector keys are furnished separately and provided by the system frame. For power unit protection, one key is used for the input voltage. Two key positions are available for this purpose, one for +140 volt (position 2 and 3) and one for the −48 volt (position 4 and 5) inputs. No key is required for the 24-volt input since the 140- and 48-volt units will not operate if plugged into a frame wired for 24-volt input battery.

2.11 Two additional key positions per unit are used to differentiate between output designs for system equipment protection. A total of ten output design positions are available for this purpose. This would allow up to 45 uniquely keyed output designs. After 45 designs, duplications will exist, but it is considered unlikely that the same using system will have duplicates. Table B shows the output design key positions to be assigned for the power unit letter codes.

POWER UNIT VERSUS APPARATUS MOUNTING

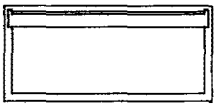
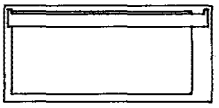
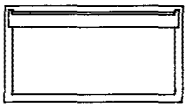
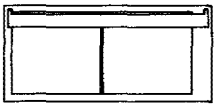
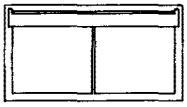
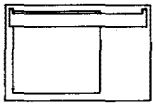
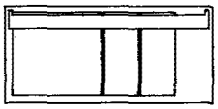
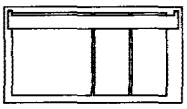
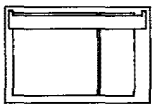
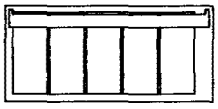
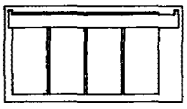
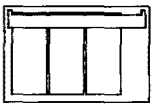
POWER UNIT	APPARATUS MOUNTING		
	81B	80C	79B
250 PA 123,133,143 TYPE	 250		
150 PA 122,132,142 AND 126,136,146 TYPE	 150	 150	
80 PA 121( ),131( )-1 AND 141( )-1 TYPE 50 PA 121,131, AND 141 TYPE	 50/80 50/80	 50/80 50/80	 50/80
80 PA/35 PA 50 PA/35PA	 50/80 35 35	 50/80 35 35	 50/80 35
35 PA 120,130,140 TYPE	 35 35 35 35 35	 35 35 35 35	 35 35 35

Fig. 6—Power Unit Versus Apparatus Mounting

Method of Latching

2.12 Each power unit has a switch-activator latch assembly. The latch assembly serves two functions: one is to hold the power unit in place and the other is to turn the power unit off while the unit is being inserted into or removed from an apparatus mounting.

2.13 To remove a power unit from an apparatus mounting, the latch assembly must be moved to the down position. The down position also turns the power unit off. When a 50-, 80-, 150-, or 250-watt power unit is fully inserted into an apparatus mounting, the designation strip designed for use with the mounting is placed down over the latch assembly; thereby protecting the power unit from accidentally being turned off. The 35-watt power unit switch-actuator latch is recessed and obscured by the designation strip and is protected from accidental turnoff.

Electrical and Physical Characteristics

2.14 These power units are designed to operate within a specified input voltage range. If they are operated from a source other than a central office battery plant, that source shall meet the requirements for ripple voltage and transients established for the battery plant. The 50-, 80-, 150-, and 250-watt power units are equipped with a low input voltage shutdown feature and will restart automatically when the input voltage returns to a specified range (see Table C). The 35-watt unit will continue to operate in the event of low input voltage, but at a reduced output. When the input voltage returns to the specified level, the output of the power unit will be restored. The physical dimensions of each preferred type power unit are shown in Table D.

3. PRODUCT

3.01 Power units which may be ordered are shown in Table E. The appropriate power unit may be selected by referring to the available outputs within each power input range.

TABLE A

POWER UNIT CODING

POWER UNIT BASE CODE	INPUT VOLTAGE	POWER AMPLIFIER CAPABILITY (INPUT POWER)
120	24V	35W
121	24V	50W/80W
122	24V	150W
123	24V	250W
124 thru 129	—	—
130	48V	35W
131	48V	50W/80W
132	48V	150W
133	48V	250W
134 thru 139	—	—
140	140V	35W
141	140V	50W/80W
142	140V	150W
143	140V	250W
144 thru 149	—	—

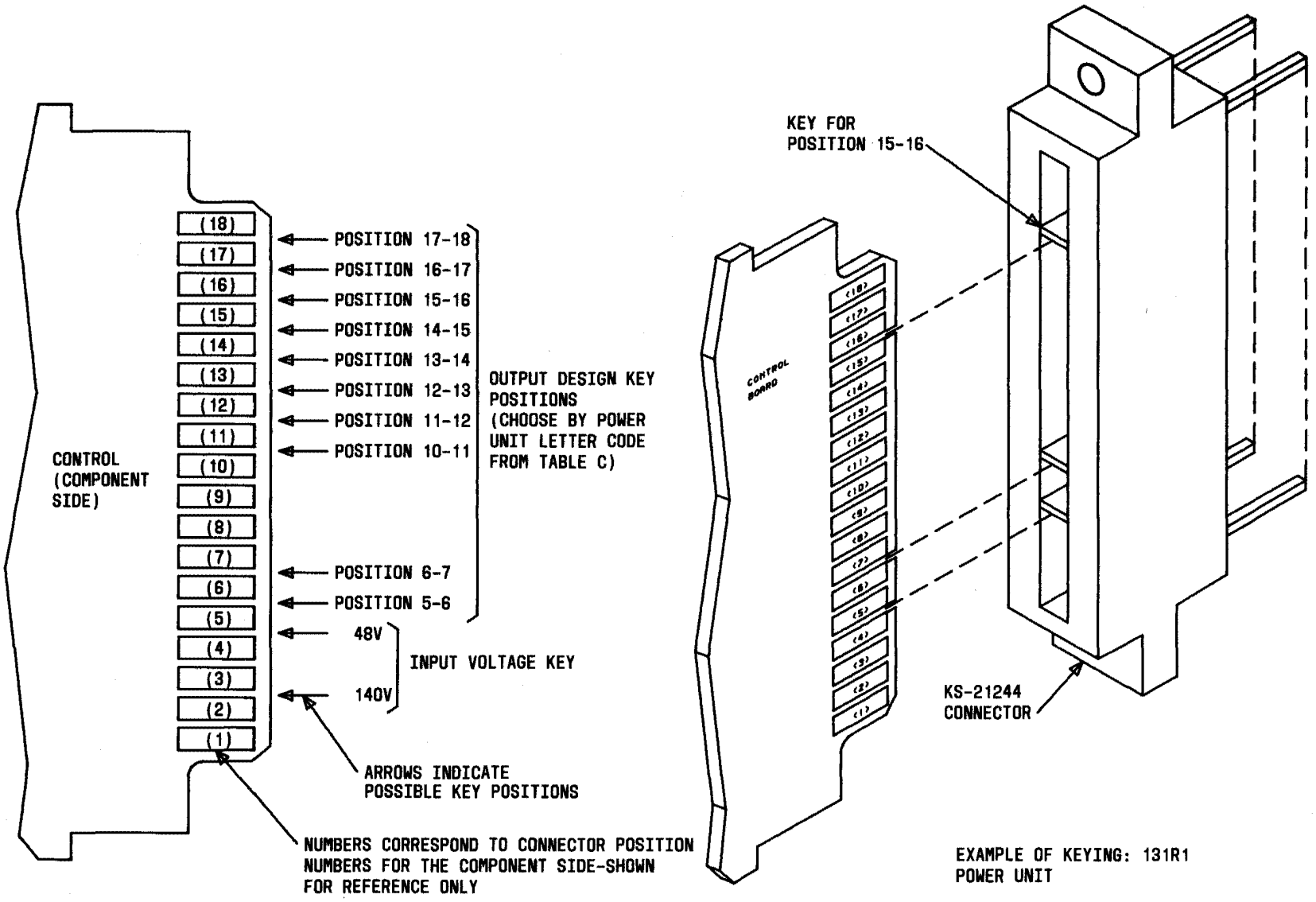


Fig. 7—Keying Arrangements for PWC Converters

TABLE B

ASSIGNED OUTPUT DESIGN KEY POSITIONS

POWER UNIT LETTER CODE	KEY POSITIONS (OUTPUT DESIGN KEYS)
A	5-6 and 6-7
B	5-6 and 10-11
C	5-6 and 11-12
D	5-6 and 12-13
E	5-6 and 13-14
F	5-6 and 14-15
G	5-6 and 15-16
H	5-6 and 16-17
J	5-6 and 17-18
K	6-7 and 10-11
L	6-7 and 11-12
M	6-7 and 12-15
N	6-7 and 13-14
P	6-7 and 14-15
R	6-7 and 15-16
S	6-7 and 16-17
T	6-7 and 17-18
U	10-11 and 11-12
W	10-11 and 12-13
Y	10-11 and 13-14
AA	10-11 and 14-15
AB	10-11 and 15-16
AC	10-11 and 16-17
AD	10-11 and 17-18
AE	11-12 and 12-13
AF	11-12 and 13-14
AG	11-12 and 14-15
AH	11-12 and 15-16
AJ	11-12 and 16-17
AK	11-12 and 17-18
AL	12-13 and 13-14
AM	12-13 and 14-15
AN	12-13 and 15-16
AP	12-13 and 16-17
AR	12-13 and 17-18
AS	13-14 and 14-15
AT	13-14 and 15-16
AU	13-14 and 16-17
AW	13-14 and 17-18
AY	14-15 and 15-16
BA	14-15 and 16-17
BB	14-15 and 17-18
BC	15-16 and 16-17
BD	15-16 and 17-18
BE	16-17 and 17-18
BF	5-6 and 6-7
BG	5-6 and 10-11
etc.	etc.

TABLE C

POWER UNIT INPUT INFORMATION

TYPE POWER UNITS	INPUT VOLTAGE	OPERATING VOLTAGE RANGE	TOLERABLE TRANSIENT VOLTAGE	INPUT VOLTAGE SHUTDOWN RANGE	INPUT VOLTAGE RESTART RANGE
120	24	20 - 28	30		
121, 122, 123	24	20 - 28	30	17.5 - 20.1	18.4 - 21.1
130	48	42.5 - 55	60	-	-
131, 132, 133	48	42.5 - 55	60	37.1 - 42.4	39 - 45
140	140	120 - 155	160	-	-
141, 142, 143	140	120 - 155	160	105 - 121	110 - 127

TABLE D

POWER UNIT DIMENSIONS

TYPE POWER UNITS	APPROXIMATE SIZE (INCHES)
120, 130, 140	3-1/2H X 1-1/2W X 8D
121, 131, 141	3-1/2H X 3-1/4W X 8D
122, 132, 142	3-1/2H X 7W X 8D
123, 133, 143	3-1/2H X 8-1/2W X 10-1/2D

TABLE E

POWER UNIT VERSUS OUTPUT

POWER UNIT CODE	OUTPUTS (NOMINAL)					
	1		2		3	
	VOLTS	AMPS	VOLTS	AMPS	VOLTS	AMPS
120A	+15.0	0.1 - 0.8	−15.0	0.1 - 0.8		
120B	+12.0	0.1 - 1.0	−12.0	0.1 - 1.0		
120C	+5.0	0.2 - 5.0				
120D1	−5.3	0 - 5.0				
120E	−11.5	0 - 2.1				
120F	−11.5	0 - 2.1	+136.0	0 - 0.04		
120G1	+2.2	0 - 5.0				
121A	−14.7	0 - 2.3				
121A1	−14.7	0 - 4.2				
121B1	+15.4	0 - 4.0				
121C1	+136.0	0 - 0.5				
121D1	+136.0	0 - 0.17	−11.5	0 - 3.15		
121C1A	+136.0	0 - 0.6				
121D1A	+130.0	0 - 0.17	−11.5	0 - 3.15		
121E1	+5.1	0 - 11.0				
121F1	−5.45	0 - 11.0				
121G1	−2.1	0 - 15.0				
121J1	+12.0	0 - 2.75	−12.0	0 - 2.75		
121K1	−2.5	0 - 12.0				
122A	−6.6	0 - 12.0				
122B	+12.5	0 - 6.0				
122C	−12.5	0 - 6.0				
122D	+14.7	0 - 7.0				
122E	−14.7	0 - 7.0				
122F	+5.3	0 - 17.5				
122G	−5.4	1.5 - 6.0	+ 5.4	1.5 - 2.5		
122H	−5.4	0 - 16.0				
122J	−5.5	0 - 12.0	+12.1	0.3 - 1.5	−12.1	0.3 - 1.5
122K	+15.4	0 - 7.0				
122L	+15.0	0 - 1.0	−15.0	0 - 5.5	+5.2	0.3 - 2.0
122M	−48.0	0 - 2.2				

TABLE E (Contd)

POWER UNIT VERSUS OUTPUT

POWER UNIT CODE	OUTPUTS (NOMINAL)					
	1		2		3	
	VOLTS	AMPS	VOLTS	AMPS	VOLTS	AMPS
130A	−5.0	0 - 5.0				
130B	−12.0	0 - 2.0				
130C	+15.0	0.1 - 0.8	−15.0	0.1 - 0.8		
130D	+12.0	0 - 0.9	−12.0	0 - 1.1		
130G	+5.0	0 - 5.0				
130H	+6.0	0 - 2.0	−6.0	0 - 2.0		
130J	+28.0	0 - 1.0				
130K	+15.8	0 - 0.65	−12.0	0 - 1.25		
130L	−48.0	0 - 0.5				
130M	−5.2	0 - 5.0				
130N1	−5.3	0 - 5.0				
130P1	−5.5	0 - 5.0				
130R1	−2.2	0 - 4.0				
130S1	+70.0	0 - 0.14				
131A	+6.3	0 - 3.0	−6.3	0 - 3.0		
131B	−2.1	0 - 15.0				
131B1	−2.1	0 - 15.0				
131C	−5.4	0 - 6.5				
131D	+5.4	0 - 6.5				
131E	+24.0	0 - 0.5	+48.0	0 - 0.5		
131F	+5.1	0 - 7.0				
131F1	+5.1	0 - 13.0				
131G	+5.0	0 - 0.85	−5.0	0 - 0.10	−24.0	0 - 0.22
131H1	+12.0	0 - 2.75	−12.0	0 - 2.75		
131J1	+12.2	0 - 4.5				
131K1	−12.2	0 - 4.5				
131L1	+5.1	0 - 12.0				
131L1A	+5.1	0 - 11.7				
131N1	+25.0	0 - 2.5				
131P1	+130.0	0 - 0.5				
131R1	+15.0	0 - 2.2	−15.0	0 - 2.2		
131S1	+150.0	0 - 0.4				
131T1	−5.45	0 - 12.0				
131U1*	+5.0	0 - 13.0				
131W1	−5.4	0 - 12.0				
131Y1	+5.4	0 - 12.0				
131AA1	−48.0	0 - 1.3				
131AB1	-2.5	0 - 12.0				

* 131U1 — Programmable to +12 percent with an external resistor (1 ohm/mV) in the positive (+) sense lead.

TABLE E (Contd)

POWER UNIT VERSUS OUTPUT

POWER UNIT CODE	OUTPUTS (NOMINAL)					
	1		2		3	
	VOLTS	AMPS	VOLTS	AMPS	VOLTS	AMPS
132A	+8.5	0 - 2.5	−8.5	0 - 2.5	−5.4	0 - 10.0
132B	−5.6	0 - 17.5				
132C	+12.0	0 - 6.0	+30.5	0 - 1.0		
132D	+6.2	0 - 10.0				
132H	+5.3	0 - 16.5	+16.0	0 - 0.16	-16.0	0 - 0.16
132J	−9.3	0 - 10.75				
132K	−5.2	0 - 17.5				
132L	+5.4	0 - 20.0				
132M	+5.2	0 - 17.5				
132P	+5.05	5.0 - 15.0	−5.0	0.08 - 0.2	−24.0	0 - 1.0
132R	+25.0	0 - 4.4				
132S	+5.3	0 - 16.5	+12.0	0 - 0.25	12.0	0 - 0.25
132T	+5.3	3.0 - 13.5	+15.0	0.3 - 0.85	−15.0	0.3 - 0.85
132U	−5.4	1.5 - 6.0	+5.4	1.5 - 2.5		
132W	−5.4	0.05 - 16.0				
132Y	−24.0	0 - 4.4				
132AA	+5.3	0 - 11.0	+15.0	0 - 1.3	−15.0	0 - 1.3
132AB	+5.2	0 - 20.0				
132AC	+5.1	0 - 17.0	−5.0	0 - 0.5		
132AD	+49.0	0 - 2.3				
132AE	−55.0	0 - 2.0				
132AF	+12.5	0 - 8.0				
132AG	+12.15	0 - 10.0	−5.0	0 - 0.25		
133A	+5.1	0 - 40.0				
133B	+130.0	0 - 1.6				
133C	−130.0	0 - 1.6				
133D	+120.0	0 - 0.75	−120.0	0 - 0.75		
133E	+130.0	0 - 0.75	−130.0	0 - 0.75		
133F	+25.0	0 - 8.0				
133G	−25.0	0 - 8.0				
133K	+18.5	0 - 11.0				
135A1	+26.0	0 - 2.75	−24.0	0 - 2.75		
140A	+5.0	0.1 - 5.0				
140B	+12.0	0.1 - 2.0				
140C	+9.25	0.1 - 0.3	+5.0	0.1 - 0.5	−5.0	0.15 - 0.8
140D	−3.12	0.9 - 1.8	+5.0	0.4 - 1.0	−5.0	0.05 - 0.2
140E	+12.0	0 - 0.7	−5.22	0.2 - 1.0		
140F	−5.2	0 - 5.0				
140G1	−2.2	0 - 4.0				
140H1	−5.3	0 - 5.0				
140J1	+15.0	0 - 1.6				
140L1	+5.1	0 - 5.0				

TABLE E (Contd)

POWER UNIT VERSUS OUTPUT

POWER UNIT CODE	OUTPUTS (NOMINAL)					
	1		2		3	
	VOLTS	AMPS	VOLTS	AMPS	VOLTS	AMPS
141A	+6.3	0.25 - 3.0	−6.3	0.25 - 3.0		
141B	−2.1	0 - 15.0				
141C1	+5.1	0 - 13.0				
141E1†	−5.0	0 - 13.0				
141F1	+12.0	0 - 5.4				
141G1	+12.2	0 - 4.5				
141H1	−12.2	0 - 4.5				
141J1	+5.1	0 - 11.7				
141K1	−2.4	0 - 2.7				
141L1	+5.1	0 - 12.0				
141M1	-5.45	0 - 11.0				
141N1	−2.5	0 - 12.0				
142C	+5.0	0 - 18.0	−5.2	0.25 - 2.4		
143A	+5.31	0 - 40.0				
143B	+17.0	0 - 12.0				

† 141E1 — Programmable to +6 percent with an external resistor (1 ohm/mV) in the positive (+) sense lead.