

TYPE N2 CARRIER TELEPHONE SYSTEM POWER SUPPLY UNIT DESCRIPTION

1. GENERAL

1.01 This section describes the J87216A power supply unit which is one of the plug-in units of the N2 carrier terminal. It provides regulated -21 volt supply for one N2 carrier terminal.

1.02 The unit is 5 inches high, 6-1/2 inches wide, and 11 inches deep and occupies four module spaces in the N2 terminal. It weighs

6 pounds. A photograph of the unit is shown in Fig. 1.

1.03 The unit delivers an output of 1.2 to 2.0 amperes. With an output of 2.0 amperes, its efficiency is 75 per cent. It will regulate to within 1 per cent of the nominal 21 volts with a fixed ambient temperature and an input voltage range of -40 to -52 volts, or with a fixed voltage input and a temperature range of approximately 0 to +100 F.

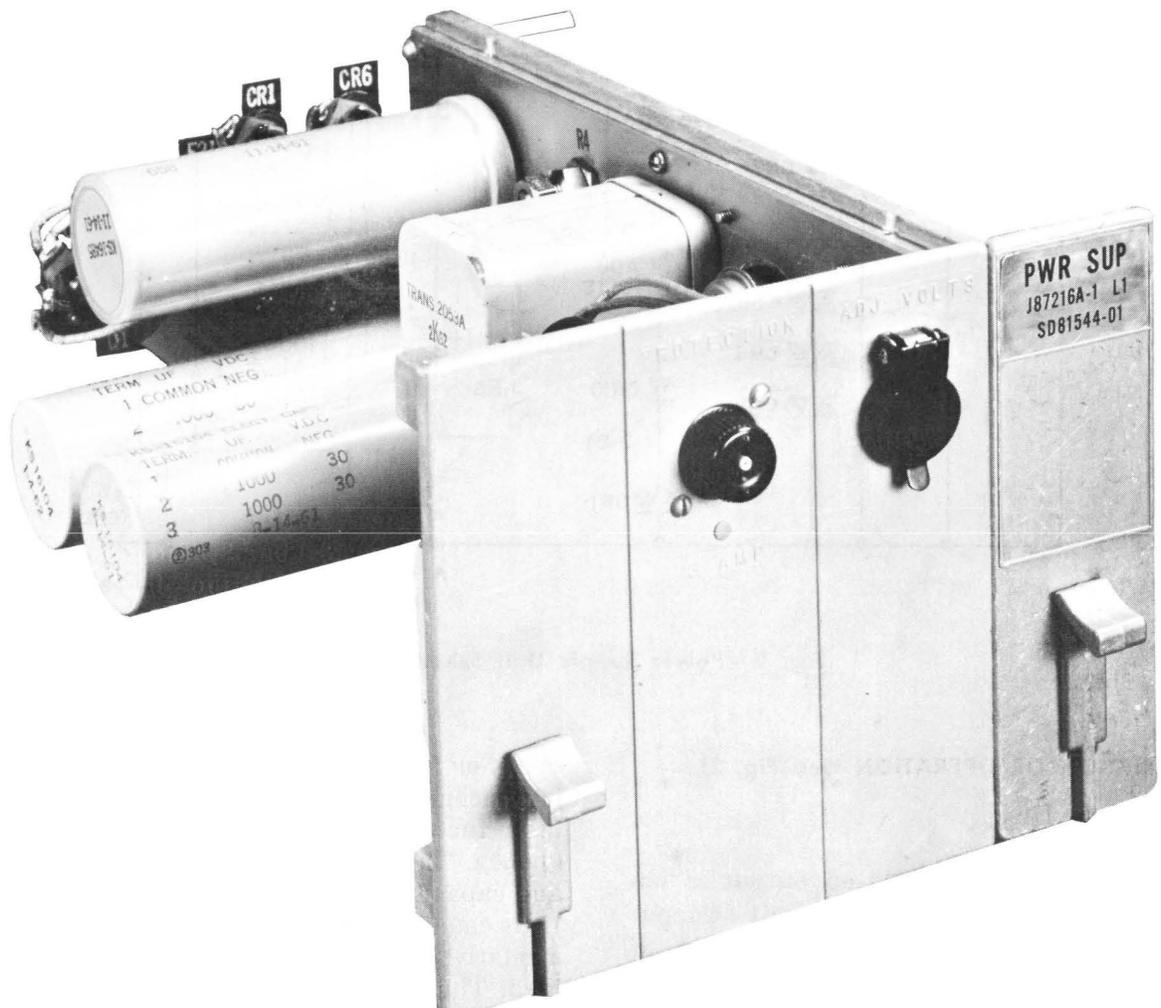


Fig. 1 - J87216A Power Supply Unit

B. Control of Switching Transistor Q1

2.02 Transistor Q1 is driven into saturation by current transformer T1 which provides a base drive from winding 5-6 proportional to the current in the collector of Q1. Once transistor Q1 is saturated, the base drive starts to diminish at a rate determined by the inductance of transformer T1 and the total resistance in the base circuit of Q1. This resistance consists of potentiometer R4, varistor CR5 in parallel with resistor R3, and the emitter to base resistance of Q1.

2.03 When the base current is no longer sufficient to maintain transistor Q1 in saturation, the transistor is turned off by the energy stored in transformer T1 which reverse biases the transistor Q1. This energy diminishes with time at a rate determined by the effective resistance of transistor Q2.

2.04 When the energy stored in transformer T1 is no longer sufficient to reverse bias transistor Q1, transistor Q1 turns on again.

2.05 The effective resistance of transistor Q2 is determined by its base drive which is, in turn, controlled by transistor Q3. Transistor Q3 is the error detector, determining any departure of the output voltage from the desired value. It does so by comparing a portion of the output voltage, provided by resistor R6 and part of ADJ VOLTS potentiometer R7, with the reference voltage provided by voltage regulator diode CR12 and varistor CR13. The difference between these two voltages (error voltage) is amplified and fed to the base of transistor Q2. In this way transistors Q2 and Q3 control the off time and thus the dc output voltage. The ADJ VOLTS potentiometer is used to set the output to -21 volts.

2.06 When Q1 is on, the dotted terminals on transformer T1 are negative with respect to the undotted terminals. When Q1 is off, the polarities reverse and the dotted terminals are then positive.

2.07 Since the current in inductor L2 is continuous throughout the cycle, diode CR3 is needed to conduct this current when Q1 is off. When Q1 turns on, CR3 is reverse biased and thus nonconducting. The network composed of capacitor C3, diode CR2, and resistor R2 reduces

the turn-off switching losses of transistor Q1, since it prevents the voltage from building up appreciably across Q1 until the current through Q1 has fallen towards zero.

2.08 Resistor R1 provides base drive for Q1 to ensure that switching will commence when input power is connected to the unit. Diode CR1 protects transistors Q1, Q2, and Q3 by limiting the voltage across winding 1-2 of transformer T1 during the off time of transistor Q1. The network composed of diodes CR4 and CR17 and resistor R5 prevents conduction in the control circuit (winding 3-4 of transformer T1) during the on time of transistor Q1 and provides biasing current to transistors Q2 and Q3 during the off time of Q1. The network composed of diode CR5, in parallel with resistor R3, helps ensure that switching will start upon connection of input power and also improves the load regulation of the supply. Diode CR16, a germanium rectifier, provides a low-impedance path in the base of transistor Q1 to supply leakage current, I_{co} , at high ambient temperature and to supply reverse base current to reduce the turn-off switching time of Q1. Resistor R9 provides current to bias diode CR12 and varistor CR13 in a region of stable reference voltage. Resistor R8 limits the base current of transistor Q3. Diode CR10 and varistor CR11 increase the error signal fed to transistor Q3.

C. Regulating Action

2.09 Assume the output voltage exceeds its proper value. This will increase the emitter to base voltage of transistor Q3. Q3 will conduct more heavily, reducing the effective resistance of transistor Q2. This increases the time during which transistor Q1 is off and reduces the output voltage to its proper value. If the output voltage decreases below its proper value, it will be restored to normal by the above effects acting in reverse.

D. Protection Features

2.10 Overload and fault protection is provided by fuse F1 and by an external 2-ampere dc input fuse mounted on the bay cable terminating unit at the top of each N2 terminal bay.

2.11 Over voltage protection is provided by diodes CR6 and CR7 and varistors CR8, CR9, CR14, and CR15 to protect the connected

SECTION 362-802-100

equipment in the event of a fault internal to the power supply. The limiting string conducts and limits at a voltage between 24 and 28 volts. Sufficient conduction through these diodes or the connected equipment will open fuse F1. The limiting diodes also conduct to limit the output voltage in the event that the external load is accidentally removed. Fuse F1 will not open under this condition.

3. DRAWINGS

3.01 The following drawings (not attached) are listed for reference:

DESIGNATION	SUBJECT
SD-81544-01	Power Supply Unit
SD-97118-01	N2 Carrier Terminal Bay — Application Schematic