Power Supply (635-9649-001)

Rockwell International

instructions

Collins Telecommunications Products Division

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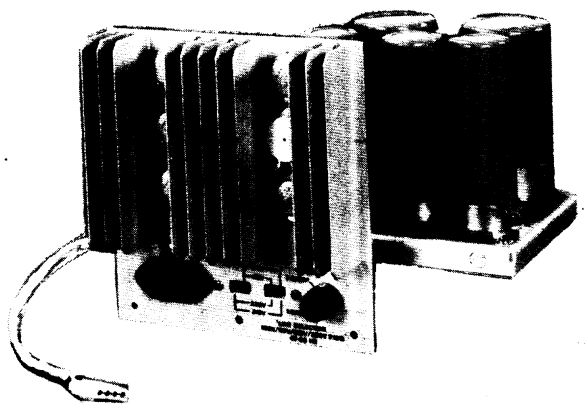
1. DESCRIPTION

Power Supply 635-9649-001, shown in figure 1, is a module that contains a power transformer, a 2-section input power strapping switch, six power regulators, and a planar circuit card with full-wave rectifiers and an output fault circuit.

The power supply module consists of four primary functional areas: input power switching, power transformer and rectifiers, regulators, and the output fault summary circuit. Refer to figure 2 for a block diagram of the power supply module.



Power Supply
Figure 1

2. PRINCIPLES OF OPERATION

2.1 General

This power supply is fuse protected (2 A for 100/115 V ac; 1 A for 215/230 V ac) and supplies a loss-of-output fault indication. The input power is switchable between 100-, 115-, 215-, and 230-V ac single phase. Output voltages supplied are +24, +18, +15, +8, +5, and -15 V dc.

2.2 Input Power Switching (Refer to figure 3.)

The input power circuit consists of a fuse protector, power on-off switch S2, power control switch S1, and power transformer T1.

Note that power control switch S1 is a dual switch having two 2-position switches. S1A (low pin numbers) selects between series connection (215, 230 V ac) and parallel connection (110, 115 V ac) of transformer T1. S1B (high pin numbers) selects between less-turns ratio (115, 230 V ac) and more-turns ratio (110, 215 V ac) of transformer T1.

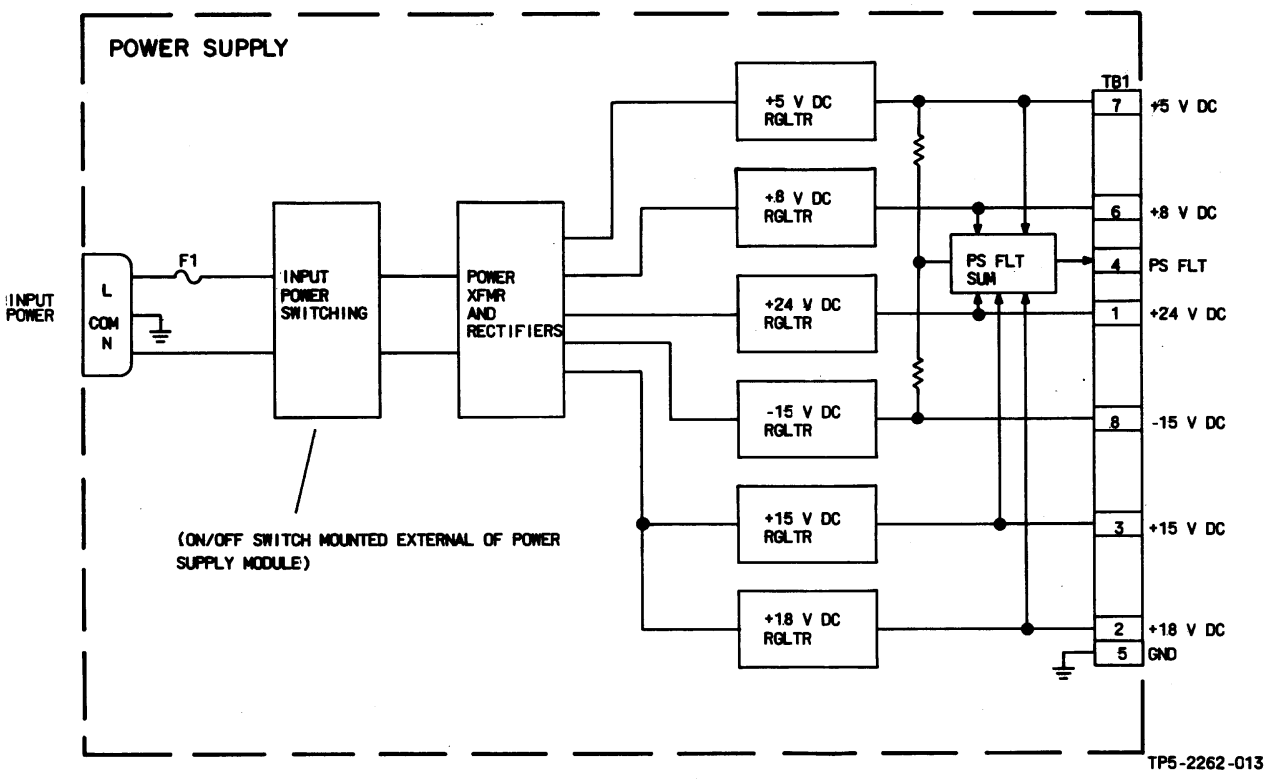
2.3 Power Transformer, Rectifiers, and Regulators (Refer to figure 4.)

Power supply outputs are generated by the dual secondary of T1, full-wave rectified by five rectifier circuits, and regulated by six micromodule regulators. Each regulator has its own input rectifier circuit, except the +18- and +15-V dc regulators share a rectifier.

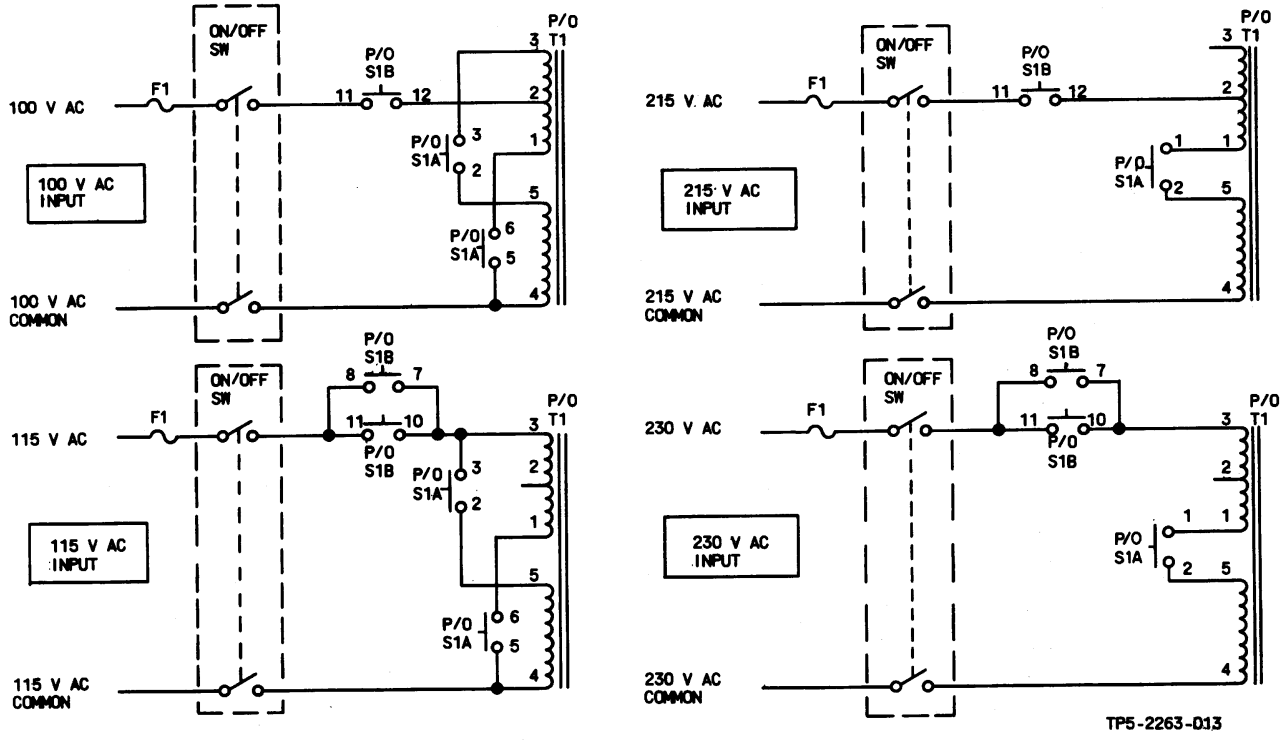
2.4 Fault Summary (Refer to figure 5.)

A fault summary circuit provides constant monitoring of power supply outputs and generates a fault output if any positive output drops below +5 V dc or if the negative output goes any more positive than -5 V dc.

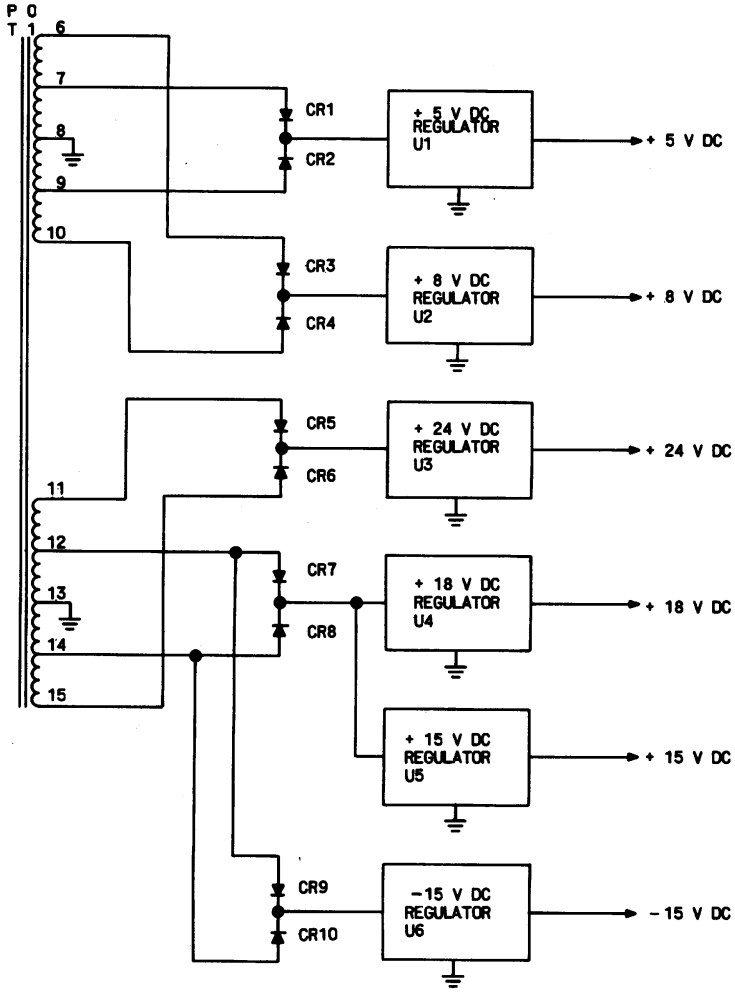
NOTICE: This section replaces first edition dated 1 June 1977.



Power Supply, Block Diagram
Figure 2



Input Power Transformer Switching
Figure 3



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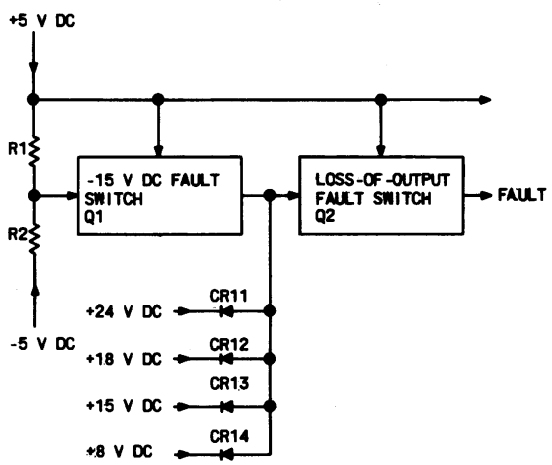
Power Transformer, Rectifiers, and Regulators
Figure 4



Fault Summary
Figure 5

With all outputs normal, Q1 is cut off and +5 V dc is supplied through R4 and R6 to switch on Q2. This provides a logic 0 (ground) fault summary output, indicating all supplies are operating.

If the +5-V dc output decreases to a level low enough to cut off Q2, the logic 0 (ground) fault signal is removed and a logic 1 (open circuit) fault signal is supplied.

With +5 V dc at normal, if the -15-V dc output goes positive to a level at approximately -5 V dc or less, Q1 switches on and supplies a ground signal through R6 to cut off Q2. The logic 0 (ground) fault signal is removed and a logic 1 (+5-V dc) fault signal is supplied.

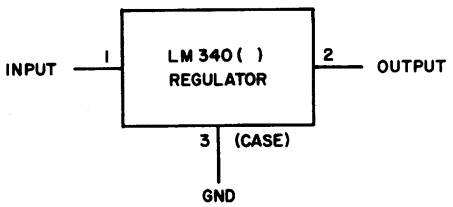
With +5 V dc at normal, if the +24-, +18-, +15-, or +8-V dc output falls below approximately +5 V dc, Q2 is cut off, the logic 0 (ground) fault signal is removed, and a logic 1 (+5-V dc) fault signal is supplied.

2.5 Voltage Regulators (Refer to figure 6 and to table 1.)

The LM340/320 series of three terminal regulators is available with several fixed output voltages, making them useful in a wide range of applications. One of these is local on-card regulation, eliminating the distribution problems associated with single-point regulation. The voltages available allow these regulators to be used in logic systems, instrumentation, and other solid-state electronic equipment. Although designed as fixed-voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

Table 1. Electrical Characteristics.

CHARACTERISTIC	LM340T-5/ 7805KC	LM340T-8/ 7808KC	LM340T-15/ 7815KC	LM320K-15	LM340T-18/ 7818KC	LM340T-24/ 7824KC
Max input voltage	35 V (except LM340T-24, 40 V)					
Operating temperature	0 to +70 °C (+32 to +158 °F)					
Storage temperature	-65 to +150 °C (-85 to +302 °F)					
Line regulation						
100 mA out	50 mV max	80 mV max	150 mV max	150 mV max	180 mV max	240 mV max
500 mA out	100 mV max	160 mV max	300 mV max	300 mV max	360 mV max	480 mV max
Output voltage	4.75 V min	7.6 V min	14.25 V min	14.25 V min	17.1 V min	22.8 V min
	5.25 V max	8.4 V max	15.75 V max	15.75 V max	18.9 V max	25.2 V max
Ripple rejection	60 dB typical	55 dB typical	50 dB typical	50 dB typical	48 dB typical	44 dB typical



Voltage Regulator
Figure 6

3. TESTING/TROUBLESHOOTING PROCEDURES

3.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the power supply module are listed in the maintenance section of this instruction book.

3.2 Testing

The test procedures in table 2 check total performance of the power supply module. These test procedures permit isolation of a fault to a specific component or circuit when the results are used with the schematic to circuit trace the fault.

Table 2. Power Supply, Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Setup	a. Remove bottom cover of unit containing power supply to be tested. *Note* For a quick check these loads need not be installed. Leave power supply connected in unit and perform all test procedures. b. Disconnect all output leads from A1TB1. c. Connect the following loads between A1TB1 pins indicated and A1TB1-5 (black wire). A1TB1- (WIRE COLOR) LOAD 7 (violet) 5 Ω 6 (blue) 10 Ω 1 (brown) 40 Ω 2 (red) 22 Ω 3 (orange) 15 Ω 8 (gray) 22 Ω		
2. LINE SELECTOR switch (Cont)	a. Connect power supply to 50-V ac source and set power on. b. Measure dc voltage at A1E5 with LINE SELECTOR switch set at each of the following positions: 100 V	 14.8 to 16.0 V dc	Check CR5, CR6, S1A, S1B, and T1.

Table 2. Power Supply, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2. (Cont)	115 V	13.0 to 14.0 V dc	
	215 V	6.9 to 7.5 V dc	
	230 V	6.5 to 7.0 V dc	
	c. Set power off and remove 50-V ac source.		
3. Output voltage	a. Connect power supply to 103-V ac source.		
	b. Set LINE SELECTOR switch to 115 V and set power on.		
	c. Measure dc voltage at each of the following outputs:		Check the following components and circuits associated with each:
	A1TB1-		
	7 (+5 V)	+4.8 to +5.2 V dc.	U1, CR1, CR2, and T1.
	6 (+8 V)	+7.6 to +8.4 V dc.	U2, CR3, CR4, and T1.
	1 (+24 V)	+23 to +25 V dc.	U3, CR5, CR6, and T1.
	2 (+18 V)	+15.5 to +18.7 V dc.	U4, CR7, CR8, and T1.
	3 (+15 V)	+14.4 to +15.6 V dc.	U5, CR7, CR8, and T1.
	8 (-15 V)	-14.6 to -15.4 V dc.	U6, CR9, CR10, and T1.
	d. Set power off. Disconnect 103-V ac source and connect power supply to 127-V ac source.		
	e. Set power on and measure dc voltage at each of the following outputs:		
	A1TB1-		
	7 (+5 V)	+4.8 to +5.2 V dc.	U1, CR1, CR2, and T1.
	6 (+8 V)	+7.6 to +8.4 V dc.	U2, CR3, CR4, and T1.
	1 (+24 V)	+23 to +25 V dc.	U3, CR5, CR6, and T1.
	2 (+18 V)	+17.3 to +18.7 V dc.	U4, CR7, CR8, and T1.
	3 (+15 V)	+14.4 to +15.6 V dc.	U5, CR7, CR8, and T1.
	8 (-15 V)	-14.6 to -15.6 V dc.	U6, CR9, CR10, and T1.
	f. Set power off and disconnect 127-V ac source.		

Table 2. Power Supply, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4. Output ripple	a. Connect power supply to 103-V ac source.		
	b. Set LINE SELECTOR switch to 115 V and set power on.		
	c. Measure ac ripple voltage at each of the following outputs:		Check the following components and circuits associated with each.
	A1TB1-		
	7 (+5 V)	NMT 5 mV.	C14, CR1, CR2, and T1.
	6 (+8 V)	NMT 5 mV.	C15, CR3, CR4, and T1.
	1 (+24 V)	NMT 5 mV.	C16, CR5, CR6, and T1.
	2 (+18 V)	NMT 350 mV.	C17, CR7, CR8, and T1.
	3 (+15 V)	NMT 5 mV.	C18, CR7, CR8, and T1.
	8 (-15 V)	NMT 5 mV.	C18, CR9, CR10, and T1.
	d. Set power off. Disconnect 103-V ac source and connect power supply to 127-V ac source.		
	e. Set power on and measure ac ripple voltage at each of the following outputs:		
	A1TB1-		
	7 (+5 V)	NMT 5 mV.	C14, CR1, CR2, and T1.
	6 (+8 V)	NMT 5 mV.	C15, CR3, CR4, and T1.
	1 (+24 V)	NMT 5 mV.	C16, CR5, CR6, and T1.
	2 (+18 V)	NMT 5 mV.	C17, CR7, CR8, and T1.
	3 (+15 V)	NMT 5 mV.	C18, CR7, CR8, and T1.
	8 (-15 V)	NMT 5 mV.	C19, CR9, CR10, and T1.
	f. Set power off and disconnect 127-V ac source.		

Table 2. Power Supply, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. Fault	a. Connect power supply to 103-V ac source. b. Set LINE SELECTOR switch to 115 V and set power on. c. Measure dc output voltage at A1TB1-4 (fault) as each of the following dc output voltages is shorted to A1TB1-5 (ground). **Note** Only one short applied at a time.	**Note** There is no +5-V dc output fault indication in the power supply. +5-V dc output fault indicated by associated control card circuits and front-panel indicator.	Check the following components and circuits associated with each.
	A1TB1-		
	7 (+5 V)	NMT 0.10 V dc.	R5, Q2, and Q1.
	6 (+8 V)	+4.5 to +5.5 V dc.	CR14.
	1 (+24 V)	+4.5 to +5.5 V dc.	CR11.
	2 (+18 V)	+4.5 to +5.5 V dc.	CR12.
	3 (+15 V)	+4.5 to +5.5 V dc.	CR13.
	8 (-15 V)	+4.5 to +5.5 V dc.	R1 and Q1.
	d. Measure dc output voltage at A1TB1-4 (fault) with no shorted outputs applied.	NMT 0.2 V dc.	R2, Q1, R4, R6, R3, and Q2.
	e. Check that all output voltages are restored when shorts are removed. f. Set power off and disconnect 103-V ac source.		
6. Transformer regulation	a. Remove all output loads. b. Connect power supply to 125-V ac source. c. Set LINE SELECTOR switch to 115 V and set power on.		
	d. Measure dc voltage at CR5 and CR6 cathode.	NMT 15.0 V dc.	Check T1 and associated circuits.
	e. Set power off and disconnect 127-V ac source.		

4. REPAIR

Repair of the power supply module is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

5. PARTS LIST/DIAGRAMS

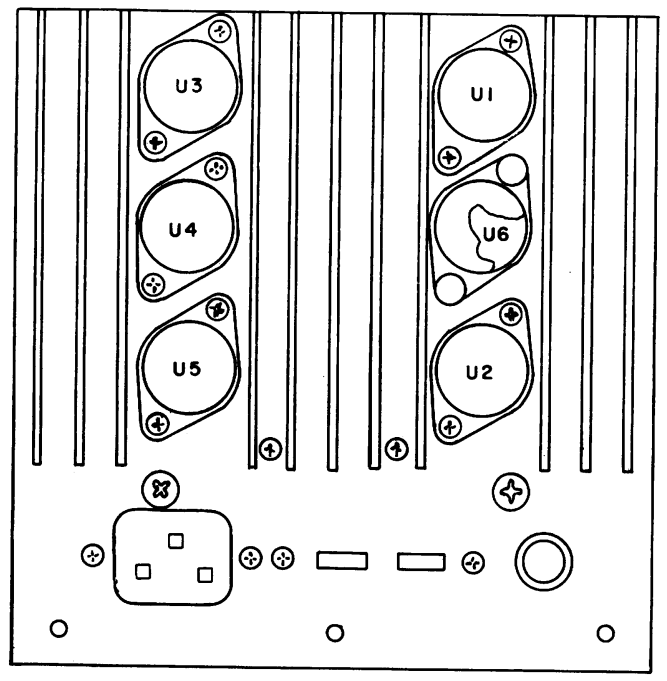
This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram figure 7. The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

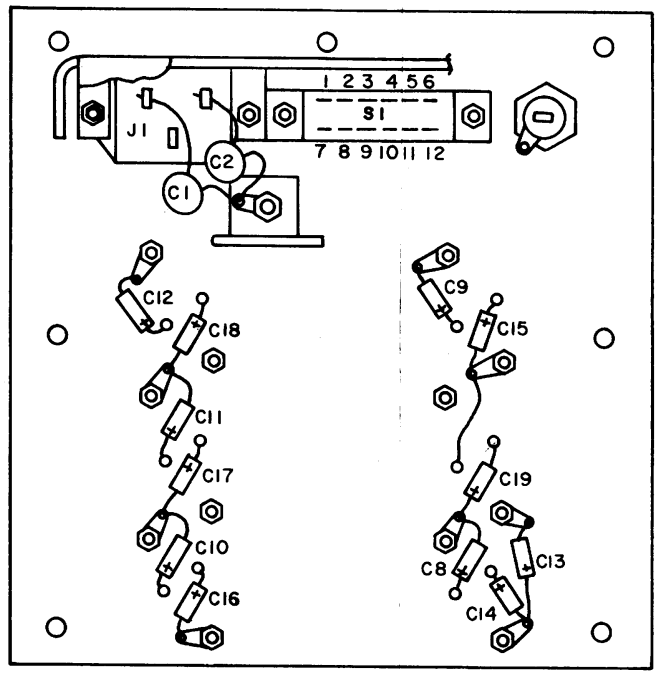
Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number and description is listed for each reference designator.

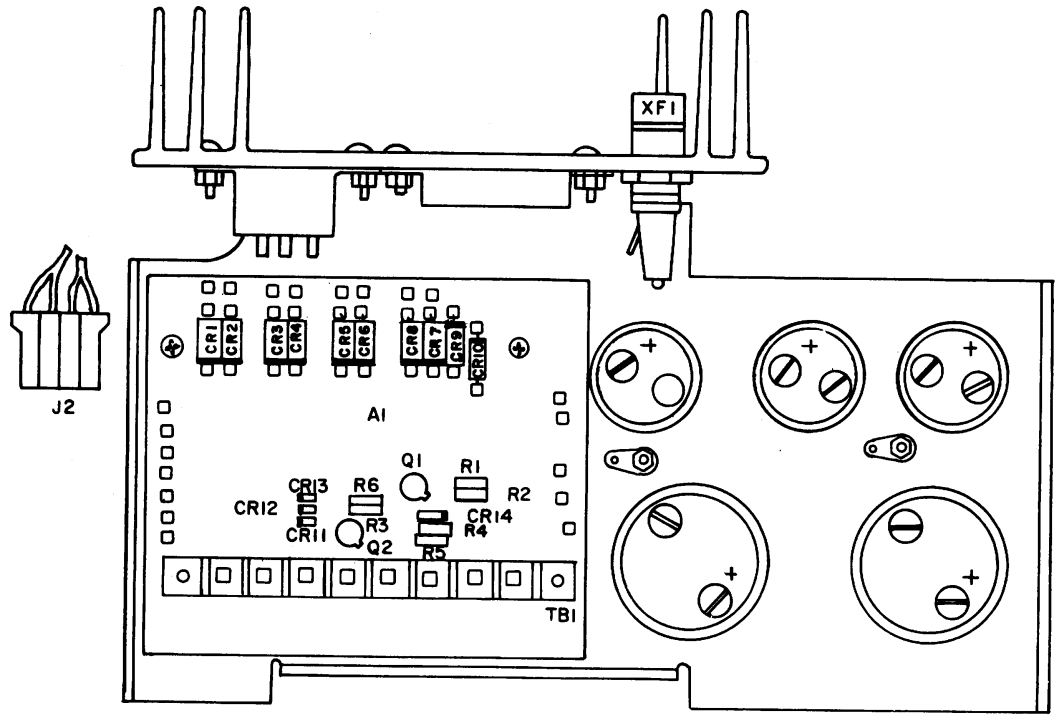
Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points at the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history.

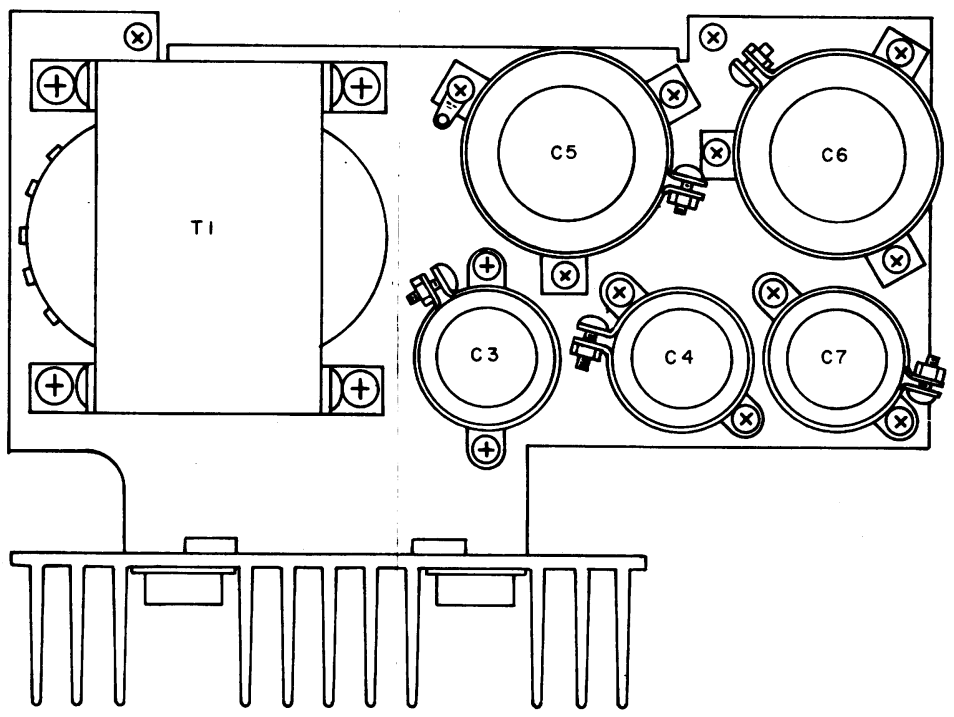
Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

CIRCUIT CARD/ SUBASSEMBLY	COLLINS PART NUMBER	LATEST EFFECTIVITY
Power Supply Module	635-9649-001	REV C
Circuit Card A1	635-0903-001	REV A









TP5-1021-029

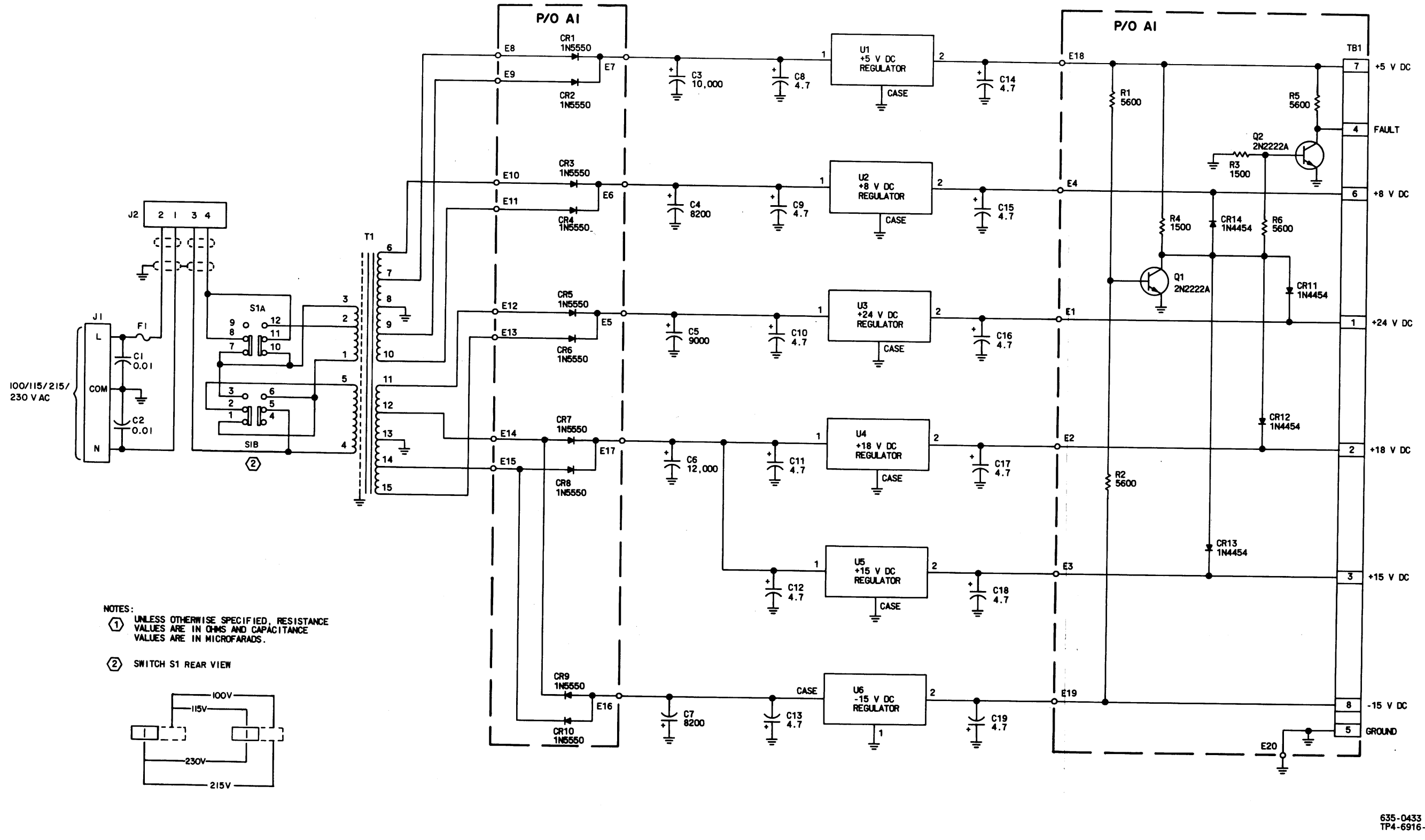
TP5-1021-029

Power Supply, Schematic Diagram
Figure 7 (Sheet 1 of 3)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NO	USABLE ON CODE
	POWER SUPPLY 635-9649-001		
A1	POWER SUPPLY CARD	635-0903-001	
C1,C2	CAPACITOR,FXD,CER DIEL,10000pF,20%,500V	913-3013-000	
C3	CAPACITOR,FXD,ELCTLT,10000μF,-10%+100%,15V	183-1278-030	
C4	CAPACITOR,FXD,ELCTLT,8200μF,40%,50V	183-1278-580	
C5	CAPACITOR,FXD,ELCTLT,9000μF,-10%+100%,50V	183-1278-380	
C6	CAPACITOR,FXD,ELCTLT,12000μF,-10%+100%,40V	183-1278-190	
C7	CAPACITOR,FXD,ELCTLT,8200μF,40%,50V	183-1278-580	
C8-C19	CAPACITOR,FXD,ELCTLT,4.7μF,20%,50V	184-9087-560	
J1	CONNECTOR,RCPT,ELEC	368-0385-010	
J2	HOUSING,SOCKET	372-5884-490	
S1	SWITCH,SLIDE	266-0217-030	
T1	TRANSFORMER,PW	662-0605-010	
U1	INTEGRATED CKT,7805KC	351-1120-080	
U2	INTEGRATED CKT,7808KC	351-1120-100	
U3	INTEGRATED CKT,7824KC	351-1120-140	
U4	INTEGRATED CKT,7818KC	351-1120-130	
U5	INTEGRATED CKT,7815KC	351-1120-120	
U6	INTEGRATED CKT,LM320K15	351-1124-030	
XF1	FUSEHOLDER	265-1171-000	
	POWER SUPPLY CARD A1 635-0903-001		
CR1-CR10	SEMICOND DEVICE, 1N5550	353-3718-040	
CR11-CR14	SEMICOND DEVICE, 1N4454	353-3644-010	
Q1,Q2	TRANSISTOR,2N2222A	352-0661-020	
R1,R2	RESISTOR,FXD,CMPSN,5.6kΩ,10%,1/4W	745-0776-000	
R3,R4	RESISTOR,FXD,CMPSN,1.5kΩ,10%,1/4W	745-0755-000	
R5,R6	RESISTOR,FXD,CMPSN,5.6kΩ,10%,1/4W	745-0776-000	
TB1	TERMINAL BOARD	367-1599-070	

Power Supply, Schematic Diagram
Figure 7 (Sheet 2)



NOTES:

1. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN MICROFARADS.

2. SWITCH S1 REAR VIEW

635-0433
TP4-6916-014

Power Supply, Schematic Diagram
Figure 7 (Sheet 3)