AIR CONDITIONING PRINTED CIRCUIT ASSEMBLY

21-09-05

BOEING P/N 65-57481-1

AIRLINE P/N

THE FOLLOWING DIRECTIVES APPLY TO THIS SUBJECT:

BOEING SERVICE BULLETIN	BOEING TEMPORARY REVISION	OTHER DIRECTIVES	DATE DIRECTIVE INCORPORATED INTO TEXT
21-1014		PRR 31298	Jun 10/70
21-1014		PRR 31298-1	Jun 10/70
21-1025			Jun 10/70

LIST OF EFFECTIVE PAGES

* Indicates pages revised, added or deleted in latest revision

F Indicates foldout pages - print one side only

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21-09-05					
* T-1	Jun 10/70				
T-2	BLANK				
* LEP-1	Jun 10/70				
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AIR CONDITIONING PRINTED CIRCUIT ASSEMBLY

Boeing Part Number: 65-57481-1

1. DESCRIPTION AND OPERATION

A. Description

(1) The air conditioning accessory unit assembly printed circuit assembly consists of relays and diodes mounted on an etched board.

B. Operation

(1) The printed circuit assembly has blocking diodes and performs relay switching functions in the air conditioning circuits. The assembly is used as plug-in modules in the air conditioning accessory unit assemblies.

C. Functional Description

(1) Relays K1 through K5 are energized by applying 28 volts dc to pin 38 and grounding pins 56 (K1), 4 (K2), 33 (K3), 46 (K4), and 28 (K5). When pin 36 is grounded, relays K1, K3 and K4 remain energized once activated until power is removed from pin 38 or the ground is removed from pin 36.

(2) On assemblies reworked per SB 21-1014, relay K5 is energized by applying 28 volts dc to pins 43 and 60 and grounding pin 28.

D. Leading Particulars

Length -- 5-1/2 inches (approximately)
Width -- 4-1/4 inches (approximately)
Thickness -- 1 inch (approximately)
Weight -- 8 ounces (approximately)
Operating Voltage -- 28 volts dc

2. DISASSEMBLY

A. Disassemble only as required for repair or replacement of components.

B. Instructions for the removal of components from printed circuit assemblies are contained in "Repair of Printed Circuit Assemblies and Component Board Assemblies," Subject 20-11-01.

3. CLEANING

A. Remove dust or foreign matter from printed circuit assembly using low pressure air suction.

B. Deposits that are not removable by suction, may be removed by careful wiping with a cloth moistened in aliphatic naphtha or isopropyl alcohol, followed by thorough drying with low pressure air.

WARNING: WHEN USING ISOPROPYL ALCOHOL OR ALIPHATIC NAPHTHA, AVOID PROLONGED OR REPEATED BREATHING OF VAPORS. USE ONLY WITH ADEQUATE VENTILATION. AVOID CONTACT WITH SKIN, EYES AND CLOTHING. KEEP AWAY FROM HEAT, SPARKS, OR OPEN FLAME.

C. Instructions for cleaning prior to soldering, or replacement of components, are contained in "Repair of Printed Circuit Assemblies and Component Board Assemblies," Subject 20-11-01.

4. INSPECTION/CHECK

A. Check printed circuit board, electrical components, and solder connections with a minimum of 5-power magnification.

(1) Visually check components for displacement, loose mounting, broken leads, and damaged solder connections.

(2) Check insulating sleeving for proper installation and evidence of damage.

(3) Examine circuit board and components for physical damage such as cracks, distortion, deterioration, oxidation, or overheating.

(4) Check plated contacts for dirt, wear, corrosion, and deterioration.

(5) Check circuit for damaged, lifted or open paths.

B. Check for legibility of reference designations, component outlines, diode orientation symbols, and terminal identifications.

5. REPAIR

A. Repair

(1) Repair damaged or lifted circuits per "Repair of Printed Circuit Assemblies and Component Board Assemblies," Subject 20-11-01.

(2) Rubber stamp assembly part number prior to encapsulation, using 14-point characters per "Application of Stencils, Insignia, Silk Screen, Part Numbering and Identification Markings," Subject 20-50-10.

B. Refinish

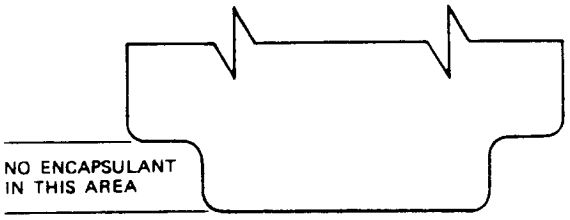
(1) Apply encapsulant over repaired areas as necessary per "Repair of Printed Circuit Assemblies and Component Board Assemblies," Subject 20-11-01. Do not encapsulate contact area shown in figure 1.

CAUTION: IF ENCAPSULANT IS APPLIED OVER THE ENTIRE ASSEMBLY, THE TOTAL THICKNESS, INCLUDING PREVIOUS COATINGS, SHOULD NOT EXCEED 0.006 INCH. EXCESSIVE ENCAPSULANT CAN ALTER THE HEAT DISSIPATION CHARACTERISTICS OF THE ASSEMBLY AND CAUSE PREMATURE FAILURE OF HEAT SENSITIVE COMPONENTS.

C. Replacement

(1) Replace all defective components per "Repair of Printed Circuit Assemblies and Component Board Assemblies," Subject 20-11-01.

(2) When installing new transistor and/or heatsink, apply thermal compound, type #120 (Wakefield Engineering Inc., 139 Foundry St., Wakefield, Massachusetts 01880) between transistor and heatsink. Mask off transistor and heatsink prior to encapsulation.



Refinish Diagram
Figure 1

6. TESTING

A. Test Equipment

NOTE: Equivalent test equipment may be substituted for the equipment listed below unless otherwise noted.

(1) Power Supply: 28 volts dc, 1 ampere

(2) Multimeter: Triplett 630 (or equivalent)

(3) Connector with pigtail leads: Part Number 582591-1 with 66143-2 terminals (AMP, Incorporated, Harrisburg, Pennsylvania)

B. Functional Test

(1) Insert assembly into connector so that component side matches pin number one side of connector. Identify and tag pigtail leads.

(2) Remove relays K1, K2, K3, K4, and K5 from printed circuit assembly.

(3) Verify forward and reverse diode resistances as indicated in figure 2.

Diode	Ohmmeter Leads between Pins	15 Ohms Max with + at Pin	15k Min with + at Pin
CR2	XK1-A1 and 36	XK1-A1	36
CR3	XK1-X2 and 38	XK1-X2	38
CR4	XK3-X2 and 38	XK3-X2	38
CR5	XK2-X2 and 38	XK2-X2	38
CR6	XK3-A1 and 36	XK3-A1	36
CR9	XK4-X2 and 38	XK4-X2	38
CR10	XK4-A1 and 36	XK4-A1	36
CR14	XK5-X2 and 38*[1]	XK5-X2	38
CR14	XK5-X2 and 43*[2]	XK5-X2	43

*[1] 65-57481-1 and assemblies reworked per SB 21-1025

*[2] Assemblies reworked per SB 21-1014

Diode Resistance Tests
Figure 2

(4) Install relays K1, K2, K3, K4, and K5 on printed circuit assembly.

(5) Verify forward and reverse diode resistances as indicated in figure 3.

Diode	Ohmmeter Leads between Pins	15 Ohms Max with + at Pin	15k Min with + at Pin
CR1	27 and 47	47	27
CR7	35 and 47	47	35
CR8	37 and 47	47	37
CR11	34 and 42*[1]	42	34
CR12	32 and 42*[1]	42	32
CR13	30 and 42*[1]	42	30
CR15	43 and 60*[2]	43	60
CR16	26 and 42*[1]	42	26

*[1] Verify open circuit on assemblies with CR11, CR12, CR13, and CR16 removed.

*[2] 65-57481-1 and assemblies reworked per SB 21-1025 only

Diode Resistance Tests
Figure 3

(6) With relays de-energized, make all continuity tests as listed in column I of figure 4.

NOTE: "Con" means that continuity exists and that the resistance must be less than 1 ohm. "No Con" means that the circuit is open (infinite resistance).

Relay	Ohmmeter Leads between Pins	Column I De-Energized	Column II Energized
K1	47 and 55	No Con	Con
K1, K2	2 and 59	Con	No Con
K1, K2	5 and 61	Con	No Con
K1, K2	29 and 59	No Con	Con
K2	1 and 3	Con	No Con
K2	1 and 27	No Con	Con
K3	37 and 53	Con	No Con

Relay Tests
Figure 4 (Sheet 1)

Relay	Ohmmeter Leads between Pins	Column I De-Energized	Column II Energized
K3	52 and 54	Con	No Con
K3	31 and 54	No Con	Con
K3	35 and 53	No Con	Con
K3	47 and 51	No Con	Con
K4	49 and 50	Con	No Con
K4	45 and 49	No Con	Con
K4	47 and 48	No Con	Con
K5	11 and 14	Con	No Con
K5	12 and 15	Con	No Con
K5	13 and 26	Con	No Con
K5	17 and 34	Con	No Con
K5	11 and 19	No Con	Con
K5	13 and 30	No Con	Con
K5	15 and 21	No Con	Con
K5	17 and 32	No Con	Con

Relay Tests
Figure 4 (Sheet 2)

(7) With each relay energized separately, make all continuity tests for energized relay as listed in Column II of figure 4. Energize relays as follows:

(a) Relay K1 -- Connect pin 56 to ground and pin 38 to +28 volts dc.

(b) Relay K2 -- Connect pin 4 to ground and pin 38 to +28 volts dc.

(c) Relay K3 -- Connect pin 33 to ground and pin 38 to +28 volts dc.

(d) Relay K4 -- Connect pin 46 to ground and pin 38 to +28 volts dc.

(e) Relay K5 -- Connect pin 28 to ground and pin 38 to +28 volts dc. (On assemblies reworked per SB 21-1014, connect pin 28 to ground, pin 43 to pin 60 and pin 60 to +28 volts dc.)

(8) Energize relay K1 by connecting pins 36 and 56 to ground and pin 38 to +28 volts dc. Remove ground from pin 56 and verify continuity from pin 47 to pin 55.

(9) Energize relay K3 by connecting pins 36 and 33 to ground and pin 38 to +28 volts dc. Remove ground from pin 33 and verify continuity from pin 31 to pin 54.

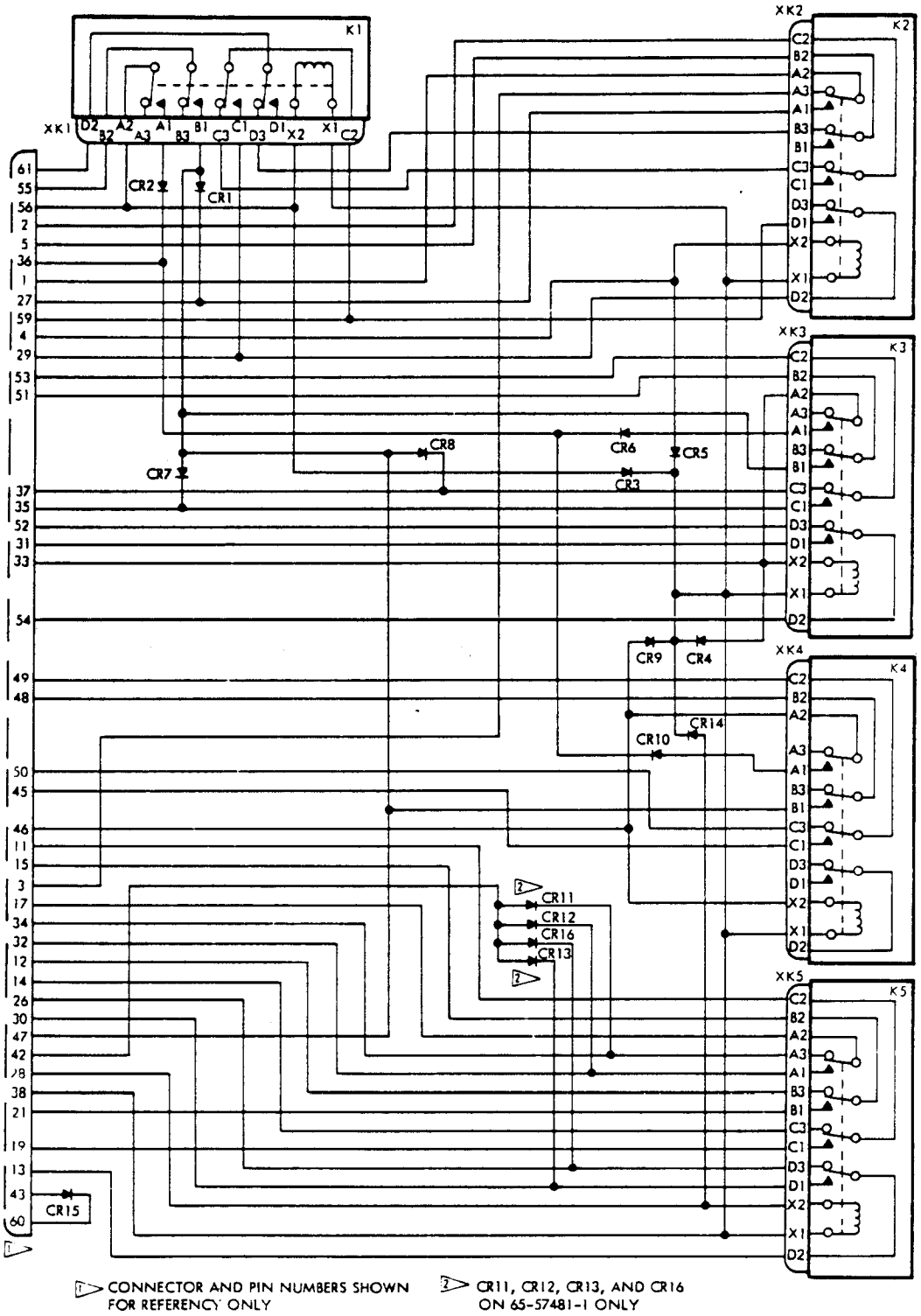
(10) Energize relay K4 by connecting pins 36 and 46 to ground and pin 38 to +28 volts dc. Remove ground from pin 46 and verify continuity from pin 45 to pin 49.

7. TROUBLE SHOOTING

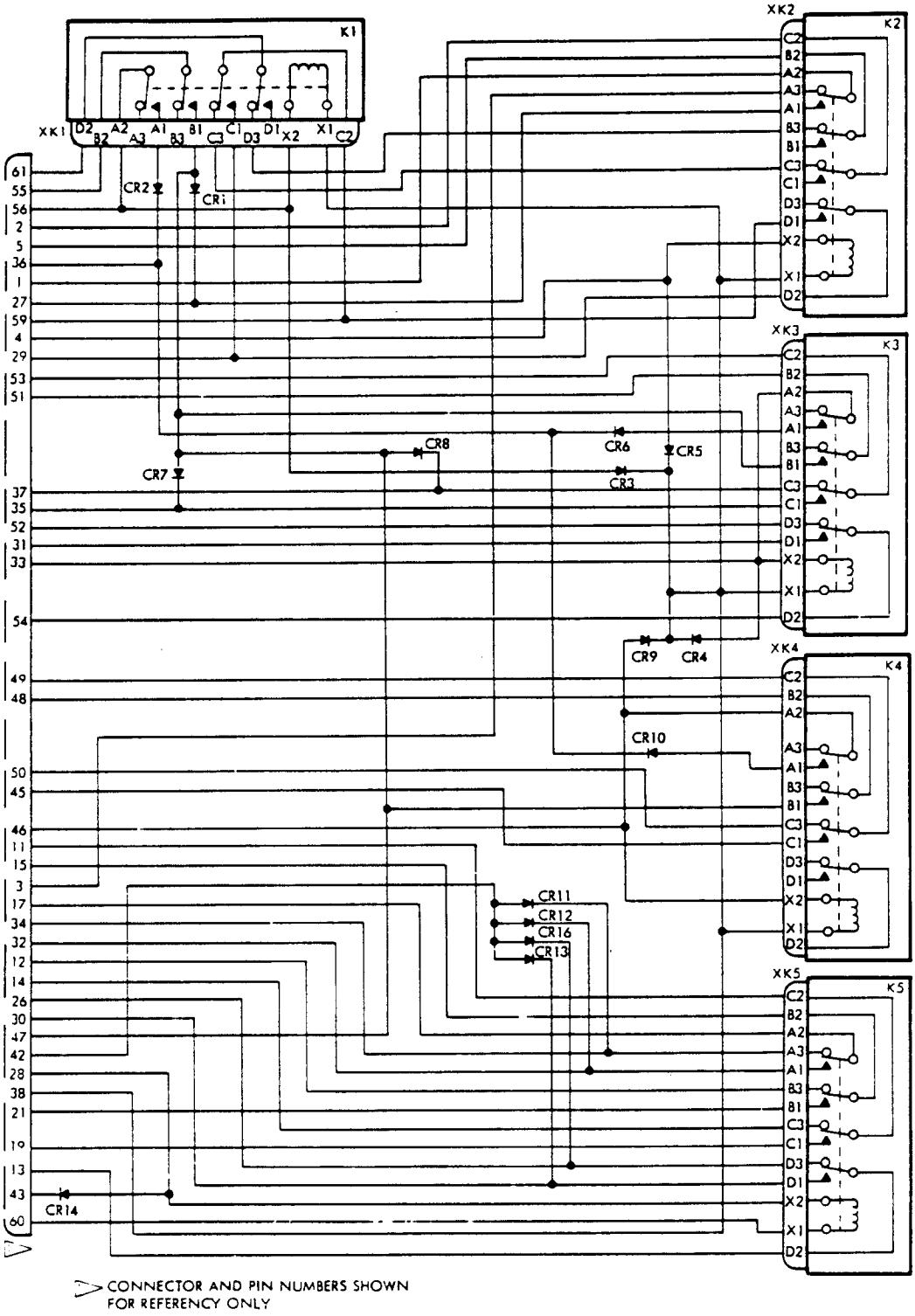
A. If failure of a test occurs, check for defective connections, incorrect wiring connections, and damaged conductor pattern.

NOTE: Trouble shooting is keyed to steps of functional test procedure. Trouble shooting is written with the assumption that all previous steps of the functional test were satisfactorily completed.

Trouble	Possible Cause and Corrective Action
Figures 2 and 3	Diode noted in figure 2 or 3.
Figure 4	Relay noted in figure 4.
Paragraph 6.B.(8)	K1
Paragraph 6.B.(9)	K3
Paragraph 6.B.(10)	K4



Schematic Diagram, Assembly 65-57481-1 and Assemblies
Reworked from 65-57481-1 per SB 21-1025
Figure 5



Schematic Diagram, Assemblies Reworked from
65-57481-1 per SB 21-1014
Figure 6

8. STORAGE INSTRUCTIONS

A. Protect assembly from dust, moisture, and atmospheric conditions. Place assembly in plastic bag and insert in protective carton, padded sufficiently to ensure against damage during storage and handling. Close, tape, and mark carton with assembly identity and date of overhaul.

B. For further information, refer to "Protection, Storage, and Handling of Airplane Components," Subject 20-70-01.

9. SPECIAL TOOLS, FIXTURES, AND EQUIPMENT

A. Tools used for repair of printed circuit assemblies and component board assemblies are listed in Subject 20-11-01.

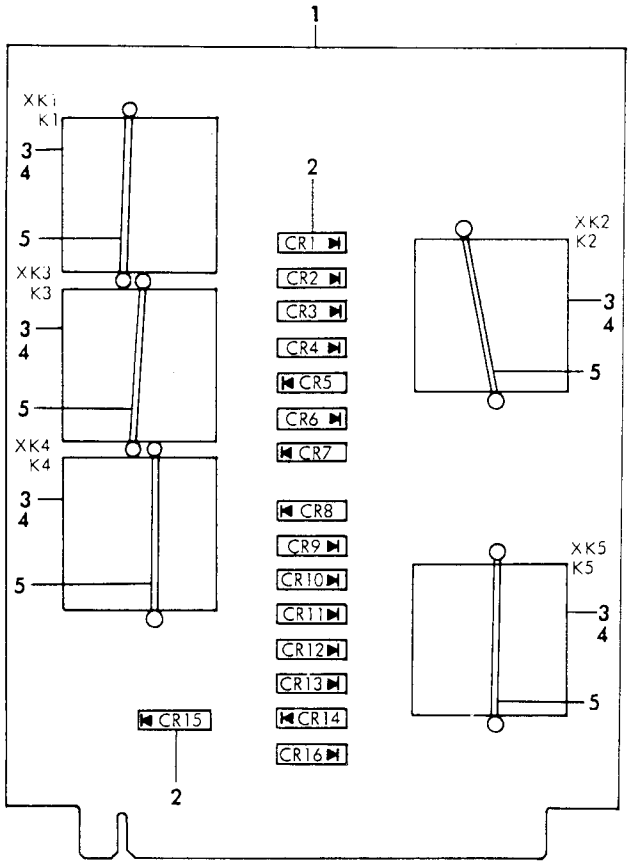
B. Tools used for repair of electrical terminations are listed in Subject 20-11-03.

C. Tools used for soldering electrical connections are listed in Subject 20-12-01.

NOTE: For additional equipment required for testing, refer to TESTING.

10. ILLUSTRATED PARTS LIST

A. Exploded View



Air Conditioning Printed Circuit Assembly, 65-57481-1
Figure 7

B. Group Assembly Parts List

FIG. & ITEM NO.	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USE CODE	QTY PER ASSY
7-	65-57481-1		PRINTED CIRCUIT ASSEMBLY		
	*[1]		PRINTED CIRCUIT ASSEMBLY (reworked from 65-57481-1 per SB 21-1014)		
	*[1]		PRINTED CIRCUIT ASSEMBLY (reworked from 65-57481-1 per SB 21-1025)		
1	65-57481-2		. ETCHED BOARD.		1
2	1N4384		. DIODE, V14936		16
2	1N4384		. DIODE, V14936	*[2]	15
2	1N4384		. DIODE, V14936	*[3]	12
3	BACR13CG1		. RELAY (preferred)		5
3	KA4A		. RELAY, V35344 (optional).		5
4	18-0009-0000		. RELAY SOCKET, V05574.		5
5	BACS38C200C4		. RUBBER STRAP.		5

*[1] No Boeing assigned part number
*[2] Denotes use on assemblies per SB 21-1014
*[3] Denotes use on assemblies per SB 21-1025

Reference Designation Index (See Schematic Diagram)		
Reference Designation	Part Number	Item No.
CR1 thru CR16	1N4384	2
K1 thru K5	*BACR13CG1	3
K1 thru K5	KA4A	3
XK1 thru XK5	18-0009-0000	4

*Preferred part

VENDOR CODE

Code	Name and Address
V05574	Viking Industries, Incorporated 21001 Nordhoff Chatsworth, California 91311
V14936	General Instrument Corporation Semi-Conductor Division 600 West John Street Hicksville, L.I., New York 11802
V35344	Leach Corporation Relay Division 5915 Avalon Boulevard Los Angeles, California 90003