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MAINTENANCE MANUAL

BENDIX/KING®

KA 52

AUTOPILOT ADAPTER

MANUAL NUMBER 006-15628-0007
REVISION 7 AUGUST, 2001

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REVISION HISTORY

KA 52 Maintenance Manual

Part Number: 006-15628-XXXX

For each revision, add, delete, or replace pages as indicated.

REVISION No. 7, August 2001

ITEM	ACTION
All pages	Full Reprint, new manual

Revision 7 creates a new stand-alone manual for the KA 52 which was extracted from revision 6 of the KCS 55/55A maintenance manual, (P/N 006-05111-0006). Any revisions to the KA 52, beginning with revision 7, will not be a part of the KCS 55/55A manual.

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SECTION IV
THEORY OF OPERATION

4.1 GENERAL

The KA 52 autopilot adapter is designed to interface between the DC course and heading select outputs from a KI 525 PNI and an autopilot that requires AC course and heading select inputs. This interface is achieved with the use of two independent synchronous modulators, phase locked to the reference AC supply voltage from the autopilot.

4.2 COURSE ANO HEADING INPUT CIRCUITRY

Each of the two inputs is connected to an isolation amplifier that performs the function of a voltage follower. This unity gain amplifier provides a low impedance output for the chopper circuit. Figure 4-1.

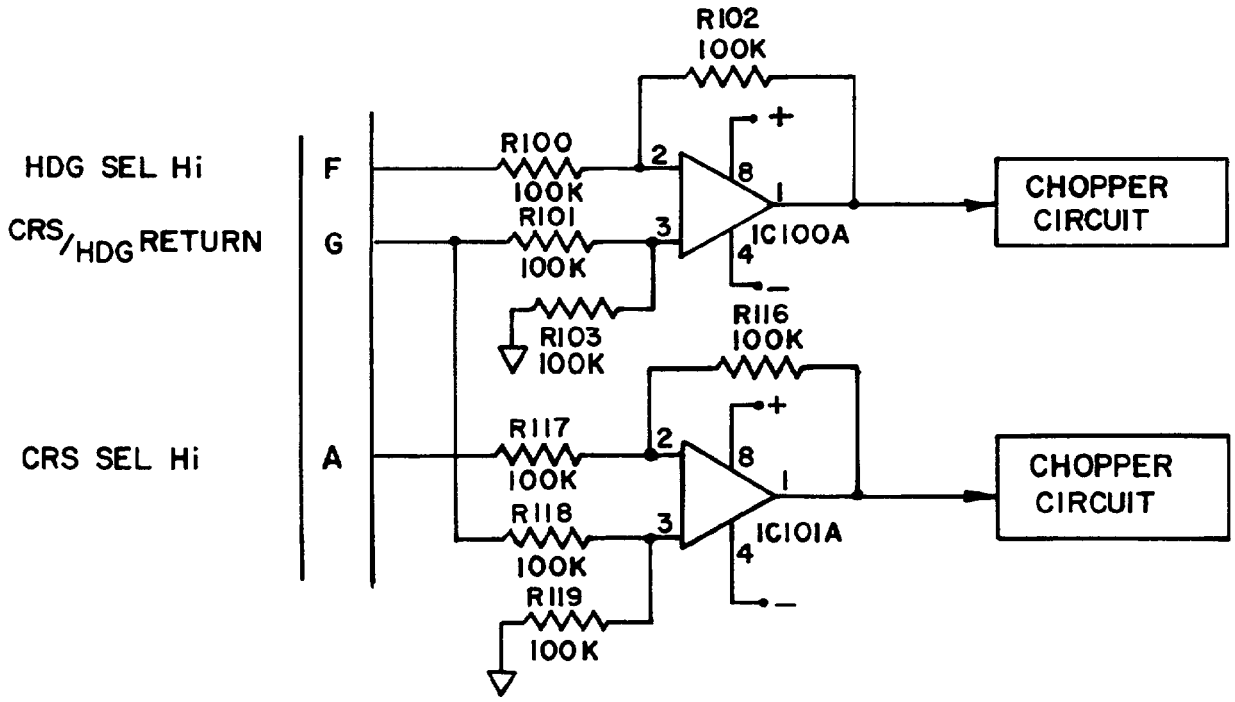

FIGURE 4-1 CRS AND HDG SEL INPUT ISOLATION CIRCUITRY

Pin G, is connected to the CRS/HDG return lead in the KI 525 and provides a reference potential for amplifiers IC100A and IC101A.

4.3 CHOPPER CIRCUITRY

From the output of the isolation amplifiers, the input DC signal is fed to a chopper circuit shown in Figure 4-2.

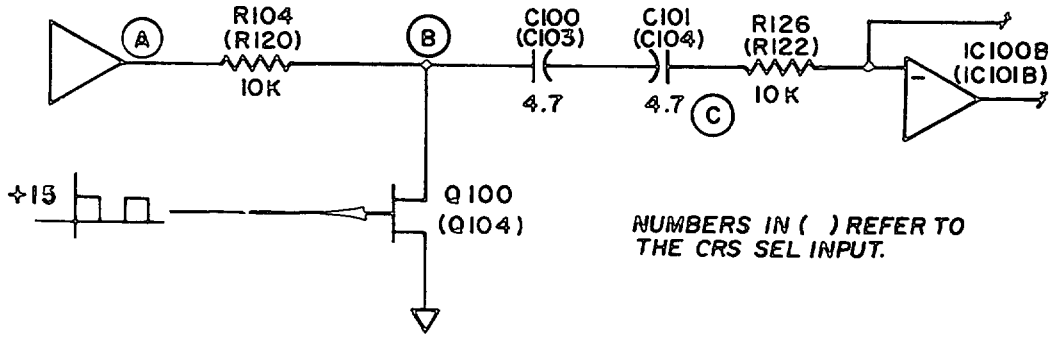

FIGURE 4-2 CHOPPER CIRCUIT DIAGRAM

The DC voltage appearing at point A is alternately shorted to ground through FET Q100 Q104) producing the waveform shown in Figure 4-3 (point B). Capacitors C100, (C103) and C101 (C104) removes the DC component of the resulting AC waveform (point C). This waveform drives amplifier IC 100B (IC10113) where waveform filtering and gain adjustment occurs.

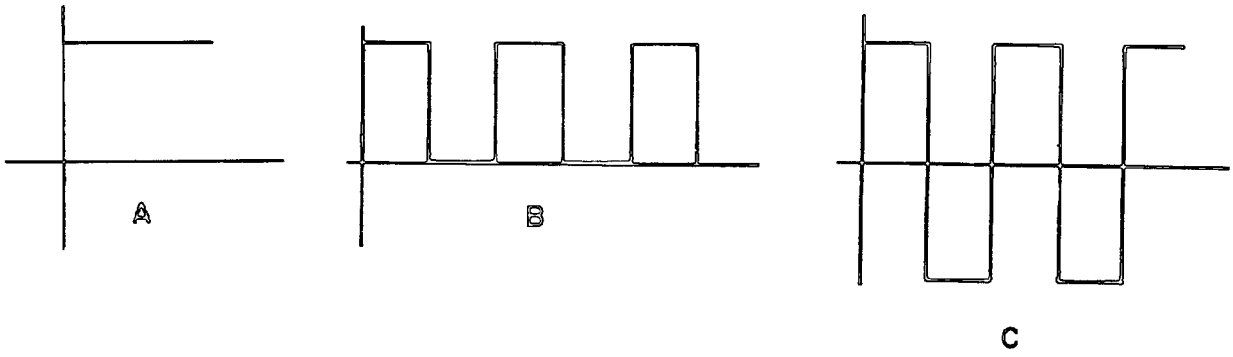

FIGURE 4-3 CHOPPER CIRCUIT WAVEFORMS

A common FET drive circuit supplies a 15V square wave at the autopilot reference frequency to the chopper circuits. Transformer T100 isolates the reference voltage from the autopilot and drives transistor Q103. Diode CR103 conducts during the negative hall cycle to protect the base emitter junction of the transistor. The collector voltages switches between ground and 15VDC at the frequency of the autopilot supply voltage and is connected to diode CR100 and CR102 and thence to the chopper FET's Q100 and Q104. These FETs are P-channel devices and are therefore turned off when the square wave voltage is at +15VDC, and turned ON or shorted when the square wave voltage is zero. (Figure 4-4.)

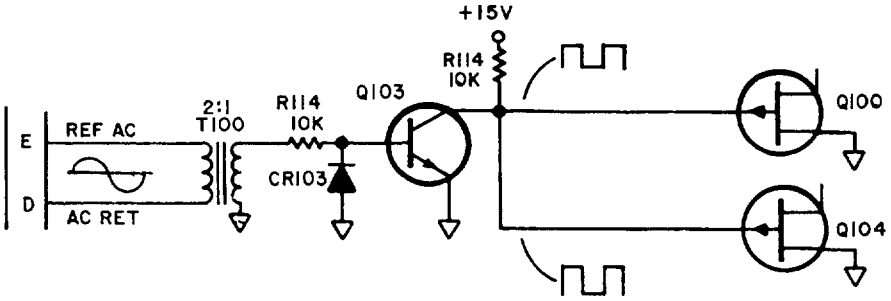

FIGURE 4-4 REFERENCE SQUAREWAVE GENERATOR

4.4 OUTPUT CIRCUITRY

After being amplified and filtered by amplifier IC100B (IC101B), the signal is sent to the power amp stage consisting of transistors Q101 Q105) and Q102 Q106). These transistors are connected in a totem pole arrangement and supply sufficient power to drive transformer T101 (T102) and a 1000 ohm load in the autopilot heading sel or course sel input channel. Transformers T101 and T102 provide complete isolation between the KA 52 and the autopilot input circuitry. (Figure 4-5)

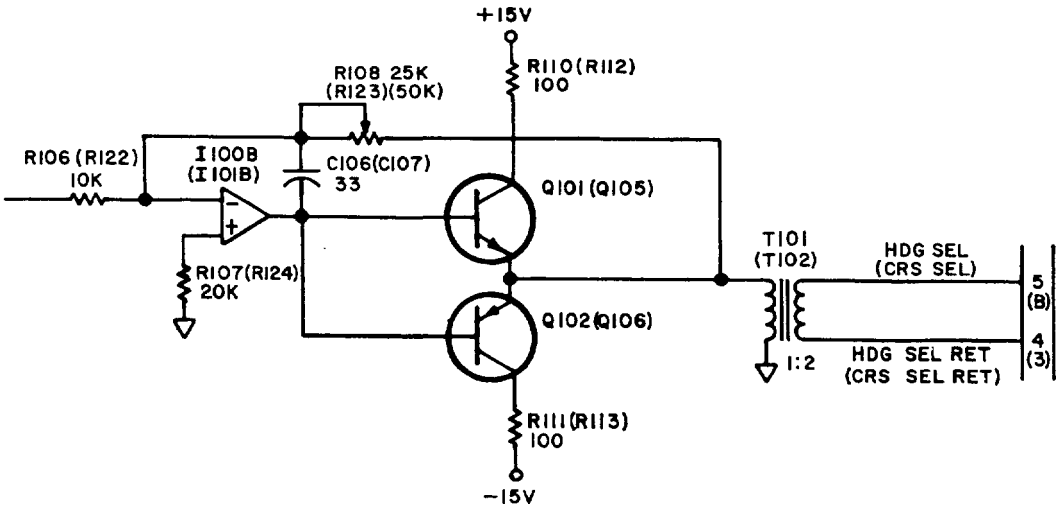

FIGURE 4-5 POWER AMPLIFIER OUTPUT DIAGRAM

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SECTION V
MAINTENANCE

5.1 GENERAL INFORMATION

This section deals with the testing, overhaul, and troubleshooting procedures for the KA 52 Autopilot Adapter.

5.2 PURPOSE

This following establishes the performance requirements that this unit must meet before it can be used as part of an operational system.

5.2.1 GENERAL REQUIREMENTS

Unless otherwise specified, all test shall be conducted with the unit in its normal operating position and at ambient room temperature (25 ±5 deg.C) and humidity not to exceed 80%.

5.2.1.1 ELECTRICAL OUTPUT SIGNALS

a) HDG SEL AC output, transformer isolated and phase locked to the reference input signal.

b) CRS DTM AC output, transformer isolated and phase locked to the reference input signal.

5.2.1.2 ELECTRICAL INPUT SIGNALS

a) HDG SEL DC input from the KI 525 scaled at 0. 6v/deg with positive voltages representing increasing heading commands.

b) CRS DTM DC input from the KI 525 scaled at 0. 3v/deg with positive voltages representing increasing course commands.

c) AC reference input from the aircraft autopilot system at 5Vrms minimum.

d) Power Input
+15VDC 100ma
-15VDC 100ma

5.2.2 SIGNAL TEST SOURCES AND TEST EQUIPMENT

a) Electronic test circuitry shown in Figure 5-1.

b) Test Equipment

DC voltmeter- -Similar to Hewlett Packard, model 412A

AC voltmeter--Similar to Ballantine Laboratories Inc., Model 300-G

Oscilloscope- -Similar to Tektronics, Model 516.

5.2.3 TEST REQUIREMENTS

1) Remove the cover from the unit and connect the device as shown in Figure 5-1. Switch the 26VAC and the ±15VDC ON, and adjust the HDG SEL and the course datum pots for zero volts at Pins F and A respectively. Rotate both PC board adjust pots fully CCW as viewed from the end away from the connector.

a) Pin 5 0. 0 ±0. 05 VPK Sq Wave

b) Pin B 0. 0 ±0. 05 VPK Sq Wave

2) Adjust the HDG SEL and course datum pots for +1.0VDC at Pins F and A respectively.
   a) Pin 5 0. 0 ±0.05 VPK Sq Wave
   b) Pin B 0. 0 ±0.05 VPK Sq Wave
3) Rotate the PC board adjust pots fully CW
   a) Pin 5 1. 7 ±0. 4 VPK Sq Wave
      In phase with ref AC
   b) Pin B 3. 3 ± 0. 8 VPK Sq Wave
      In phase with ref AC
4) Adjust the HDG SEL pot for +5. 2VDC at Pin F and the course datum pot for +3.0 VDC at Pin A.
   a) Pin 5 8. 3 ±2.0 VPK Sq Wave
      In phase with ref AC
   b) Pin B 10. 0 ±2.5 VPK Sq Wave
      In phase with ref AC
5) Adjust the HDG SEL pot for -5.0VDC at Pin F and course datum pot for -3.0VDC at Pin A.
   a) Pin 5 8.3 ±2. 0 VPK Sq Wave
      Out of phase with ref AC
   b) Pin B 10.0 ±2. 5 VPK Sq Wave
      Out of phase with ref AC
6) Adjust the HDG SEL and course datum pots for -1.0 VDC at Pins F and A respectively.
   a) Pin 5 1. 7 ± 0.4 VPK Sq Wave
      Out of phase with ref AC
   b) Pin B 3. 3 ±0.8 VPK Sq Wave
      Out of phase with ref AC
7) Adjust the HDG SEL PC board adjust pot, R108 for 0. 75 VPK Sq. Wave at Pin 5 and the course datum PC board adjust pot, R123 for 1. 5 VPK Sq. Wave at Pin B.
8) Disconnect power and place the cover on the unit as per instructions on Final Assembly Drawing Figure 6-2 and reapply power.
   a) Pin 5 0. 75 VPK Sq. Wave
      Out of phase with ref AC
   b) Pin B 1. 5 VPK Sq. Wave
      Out of phase with ref AC
9) Disconnect power and remove unit.

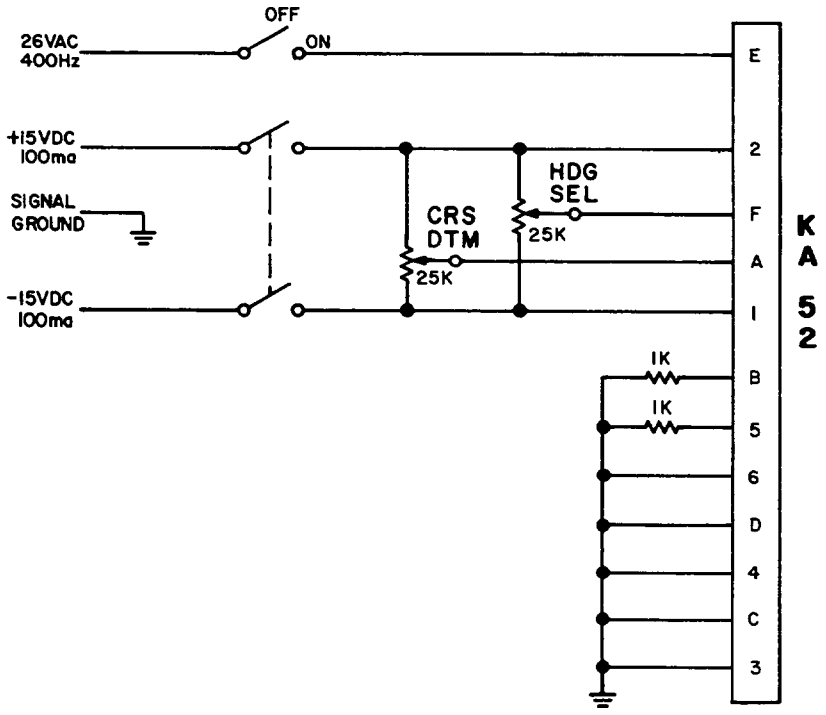


FIGURE 5-1 KA 52 TEST CIRCUIT

KA 52 TEST DATA SHEET

1) Power ON, HDG SEL and CRS DTM for 0.0VDC at Pins F and A. PC pots CCW	Pin 5	_____	0.0 ±0.05 VPK Sq. Wave
	Pin B	_____	0.0 ±0.05 VPK Sq. Wave
2) HDG and CRS for +1.0VDC at Pins F and A.	Pin 5	_____	0.0 ±0.05 VPK Sq. Wave
	Pin	_____	0.0 ±0.05 VPK Sq. Wave
3) PC pots CW	Pin 5	_____	1. 7 ± 0.4 VPK Sq. Wave
	Phase	_____	In phase
	Pin B	_____	3.3 ±0.8 VPK Sq. Wave
	Phase	_____	In phase
4) HDG SEL pot for +5.0VDC at Pin F CRS pot for 3.0VDC at Pin A.	Pin 5	_____	8.3 ±2.0 VPK Sq. Wave
	Phase	_____	In phase
	Pin B	_____	10.0 ±2.5 VPK Sq. Wave
	Phase	_____	In phase
5) HDG SEL pot for -5.0VDC at Pin F CRS pot for -3.0VDC at Pin A.	Pin 5	_____	8.3 ± 2.0 VPK Sq. Wave
	Phase	_____	Out of phase
	Pin B	_____	10.0 ±2.5 VPK Sq. Wave
	Phase	_____	Out of phase
6) HDG SEL and CRS pot for - 1.0VDC at Pins F and A.	Pin 5	_____	1. 7 ± 0.4 VPK Sq. Wave
	Phase	_____	Out of phase
	Pin B	_____	3. 3 ± 0.8 VPK Sq. Wave
	Phase	_____	Out of phase
8) Adjust PC pots and install cover.	Pin 5	_____	0.75 VPK Sq. Wave
	Phase	_____	Out of phase
	Pin B	_____	1.5 VPK Sq. Wave
	Phase	_____	Out of phase

Tested by _____ Date _____

Inspected by _____ Date _____

5.3 OVERHAUL

5.3.1 VISUAL INSPECTION

This section contains instructions and information to assist in determining, by visual inspection, the condition of the units major assemblies and subassemblies. These inspection procedures will assist in finding defects resulting from wear, physical damage, deterioration, or other causes. To aid inspection, detailed procedures are arranged in alphabetical order.

A. Capacitors, Fixed

Inspect capacitors for case damage, body damage, and cracked, broken, or charred insulation. Check for loose, broken, or corroded terminal studs, lugs, or leads. Inspect for loose, broken, or improperly soldered connections. On chip caps, be especially alert for hairline cracks in the body and broken terminations.

B. Capacitors, Variable

Inspect trimmers for chipped and cracked bodies, damaged dielectrics, and damaged contacts.

C. Chassis

Inspect the chassis for loose or missing mounting hardware, deformation, dents, damaged fasteners, or damaged connectors. In addition, check for corrosion or damage to the finish that should be repaired.

D. Circuit Boards

Inspect for loose, broken, or corroded terminal connections; insufficient solder or improper bonding; fungus, mold, or other deposits; and damage such as cracks, burns, or charred traces.

E. Connectors

Inspect the connector bodies for broken parts; check the insulation for cracks, and check the contacts for damage, misalignment, corrosion, or bad plating. Check for broken, loose, or poorly soldered connections to terminals of the connectors. Inspect connector hoods and cable clamps for crimped wires.

F. Covers and Shields

Inspect covers and shields for punctures, deep dents, and badly worn surfaces. Also, check for damaged fastener devices, corrosion and damage to finish.

G. Flex Circuits

Inspect flex circuits for punctures, and badly worn surfaces. Check for broken traces, especially near the solder contact points.

H. Front Panel

Check that name, serial, and any plates or stickers are secure and hardware is tight. Check that the handle is functional, securely fastened, and handle casting is not damaged or bent.

I. Fuse

Inspect for blown fuse and check for loose solder joints.

J. Insulators

Inspect insulators for evidence of damage, such as broken or chipped edges, burned areas, and presence of foreign matter.

K. Jacks

Inspect all jacks for corrosion, rust, deformations, loose or broken parts, cracked insulation, bad contacts, or other irregularities.

L. Potentiometers

Inspect all potentiometers for evidence of damage or loose terminals, cracked insulation or other irregularities.

M. Resistors, Fixed

Inspect the fixed resistors for cracked, broken, blistered, or charred bodies and loose, broken, or improperly soldered connections. On chip resistors, be especially alert for hairline cracks in the body and broken terminations.

N. RF Coils

Inspect all RF coils for broken leads, loose mountings, and loose, improperly soldered, or broken terminal connections. Check for crushed, scratched, cut or charred windings. Inspect the windings, leads, terminals and connections for corrosion or physical damage. Check for physical damage to forms and tuning slug adjustment screws.

O. Terminal Connections Soldered

(1) Inspect for cold-soldered or resin joints. These joints present a porous or dull, rough appearance. Check for strength of bond using the points of a tool.

(2) Examine the terminals for excess solder, protrusions from the joint, pieces adhering to adjacent insulation, and particles lodged between joints, conductors, or other components.

(3) Inspect for insufficient solder and unsoldered strands of wire protruding from the conductor at the terminal. Check for insulation that is stripped back too far from the terminal.

(4) Inspect for corrosion at the terminal.

P. Transformers

(1) Inspect for signs of excessive heating, physical damage to the case, cracked or broken insulation, and other abnormal conditions.

(2) Inspect for corroded, poorly soldered, or loose connecting leads or terminals.

Q. Wiring/Coaxial Cable

Inspect wiring in chassis for breaks in insulation, conductor breaks, cut or broken lacing and improper dress in relation to adjacent wiring or chassis.

5.3.2 CLEANING

A. General

This section contains information to aid in the cleaning of the component parts and subassemblies of the unit.

WARNING:
GOGGLES ARE TO BE WORN WHEN USING PRESSURIZED AIR TO BLOW DUST AND DIRT FROM EQUIPMENT. ALL PERSONNEL SHOULD BE WARNED AWAY FROM THE IMMEDIATE AREA.

WARNING:
OPERATIONS INVOLVING THE USE OF A CLEANING SOLVENT SHOULD BE PERFORMED UNDER A VENTILATED HOOD. AVOID BREATHING SOLVENT VAPOR AND FUMES; AVOID CONTINUOUS CONTACT WITH THE SOLVENT. WEAR A SUITABLE MASK, GOGGLES, GLOVES, AND AN APRON WHEN NECESSARY. CHANGE CLOTHING UPON WHICH SOLVENTS HAVE BEEN SPILLED.

WARNING:
OBSERVE ALL FIRE PRECAUTIONS FOR FLAMMABLE MATERIALS. USE FLAMMABLE MATERIALS IN A HOOD PROVIDED WITH SPARK-PROOF ELECTRICAL EQUIPMENT AND AN EXHAUST FAN WITH SPARKPROOF BLADES.

B. Recommended Cleaning Agents

Table 5-1 lists the recommended cleaning agents to be used during overhaul of the unit.

NOTE:
EQUIVALENT SUBSTITUTES MAY BE USED FOR LISTED CLEANING AGENTS.

TYPE	USED TO CLEAN
Denatured Alcohol	Various, exterior and interior
DuPont Vertrel SMT	Various, interior
PolaClear Cleaner (Polaroid Corp.) or Texwipe TX129 (Texwipe Co.)	CRT display filter, LCD displays, and general purpose lens/glass cleaner.
KimWipes lint-free tissue (Kimberly Clark Corp.)	Various
Cloth, lint-free cotton	Various
Brush, flat with fiber bristles	Various
Brush, round with fiber bristles	Various
Dishwashing liquid (mild)	Nylon, Rubber Grommets

TABLE 5-1 RECOMMENDED CLEANING AGENTS

C. Recommended Cleaning Procedures

CAUTION:
DO NOT ALLOW SOLVENT TO RUN INTO SLEEVES OR CONDUIT THAT COVERS WIRES CONNECTED TO INSERT TERMINALS.

1. Exterior
   (a) Wipe dust cover and front panel with a lint-free cloth dampened with denatured alcohol.
   (b) For cleaning connectors, use the following procedure.
      (1) Wipe dust and dirt from bodies, shells, and cable clamps using a lint-free cloth moistened with denatured alcohol.
      (2) Wipe parts dry with a clean, dry lint-free cloth.
      (3) Remove dirt and lubricant from connector inserts, insulation, and terminals using a small soft bristled brush moistened with denatured alcohol.
      (4) Dry the inserts with an air jet.
   (c) Remove cover(s).
   (d) If necessary, open any blocked ventilation holes by first saturating the debris clogging the apertures with denatured alcohol and then blowing the loosened material out with an air stream.
2. Interior

   The following solvents are no longer recommended for benchtop or rework cleaning of printed circuit boards, modules, or sub-assemblies.

FREON TF, IMC	TRICHLOROETHANE
CARBON TETRACHLORIDE	DETERGENT (ALL™ AND EQUIVALENTS)
CHLOROFORM	METHYLENE CHLORIDE
TRICHLOROETHYLENE	GENESOLV 2004/2010
PROPYL ALCOHOL	METHYL ALCOHOL
ETHYL ALCOHOL	BUTYL ALCOHOL
XYLENE	PRELETE (CFC-113)

TABLE 5-2 UNSAFE CLEANING AGENTS

CAUTION:
DO NOT USE SOLVENT TO CLEAN PARTS COMPOSED OF OR CONTAINING NYLON OR RUBBER GROMMETS. CLEAN THESE ITEMS WITH MILD LIQUID DISHWASHING DETERGENT AND WATER. USE DETERGENT FOR THIS PURPOSE ONLY.

CAUTION:
DUPONT VERTREL SMT DOES HAVE GENERAL MATERIAL COMPATIBILITY PROBLEMS WITH POLYCARBONATE, POLYSTYRENE, AND RUBBER. IT IS RECOMMENDED THAT THESE MATERIALS BE CLEANED WITH DENATURED ALCOHOL.

CAUTION:
DO NOT ALLOW EXCESS CLEANING SOLVENT TO ACCUMULATE IN ANY OF THE ADJUSTMENT SCREW CREVICES AND THEREBY SOFTEN OR DISSOLVE THE ADJUSTMENT SCREW EPOXY SEALANT.

CAUTION:
AVOID AIR-BLASTING SMALL TUNING COILS AND OTHER DELICATE PARTS BY HOLDING THE AIR NOZZLE TOO CLOSE. USE BRUSHES CAREFULLY ON DELICATE PARTS.

CAUTION:
IMPROPER CLEANING CAN RESULT IN SURFACE LEAKAGE AND CONDUCTIVE PARTICULATES, SUCH AS SOLDER BALLS OR METALLIC CHIPS, WHICH CAN CAUSE ELECTRICAL SHORTS. SEVERE IONIC CONTAMINATION FROM HANDLING AND FROM ENVIRONMENTAL CONDITIONS CAN RESULT IN HIGH RESISTANCE OR OPEN CIRCUITS.

CAUTION:
ULTRASONIC CLEANING CAN DAMAGE CERTAIN PARTS AND SHOULD GENERALLY BE AVOIDED.

NOTE:

Solvents may be physically applied in several ways including agitation, spraying, brushing, and vapor degreasing. The cleaning solvents and methods used shall have no deleterious effect on the parts, connections, and materials being used. If sensitive components are being used, spray is recommended. Uniformity of solvent spray flow should be maximized and wait-time between soldering and cleaning should be minimized.

NOTE:

Clean each module subassembly. Then remove any foreign matter from the casting.

Remove each module subassembly. Then remove any foreign matter from the casting.

(a) Casting covers and shields should be cleaned as follows:

(1) Remove surface grease with a lint-free cloth.

(2) Blow dust from surfaces, holes, and recesses using an air stream.

(3) If necessary, use a solvent, and scrub until clean, working over all surfaces and into all holes and recesses with a suitable non-metallic brush.

(4) Position the part to dry so the solvent is not trapped in holes or recesses. Use an air stream to blow out any trapped solvent.

(5) When thoroughly clean, touch up any minor damage to the finish.

(b) Assemblies containing resistors, capacitors, rf coils, inductors, transformers, and other wired parts should be cleaned as follows:

(1) Remove dust and dirt from all surfaces, including all parts and wiring, using soft-bristled brushes in conjunction with air stream.

(2) Any dirt that cannot be removed in this way should be removed with a brush (not synthetic) saturated with an approved solvent, such as mentioned above. Use of a clean, dry air stream (25 to 28 psi) is recommended to remove any excess solvent.

(3) Remove flux residue, metallic chips, and/or solder balls with an approved solvent.

(c) Wired chassic devices containing terminal boards, resistor and capacitor assemblies, rf coils, switches, sockets, inductors, transformers, and other wired parts should be cleaned as follows:

NOTE:

When necessary to disturb the dress of wires and cables, note the positions before disturbing and restore them to proper dress after cleaning.

(1) Blow dust from surfaces, holes, and recesses using an air jet.

(2) Finish cleaning chassis by wiping finished surfaces with a lint-free cloth moistened with solvent.

(3) Dry with a clean, dry, lint-free cloth.

(4) When thoroughly clean, touch-up any minor damage to the finish.

(5) Protect the chassis from dust, moisture, and damage pending inspection.

(d) Ceramic and plastic parts should be cleaned as follows:

(1) Blow dust from surfaces, holes, and recesses using an air jet.

(2) Finish cleaning chassis by wiping finished surfaces with a lint-free cloth moistened with solvents.

(3) Dry with a clean, dry, lint-free cloth.

5.3.3 REPAIR

A. General

This section contains information required to perform limited repairs on the unit. The repair or replacement of damaged parts in airborne electronic equipment usually involves standard service techniques. In most cases, examination of drawings and equipment reveals several approaches to perform a repair. However, certain repairs demand following an exact repair sequence to ensure proper operation of the equipment. After correcting a malfunction in any section of the unit, it is recommended that a repetition of the functional test of the unit be performed.

B. Repair Precautions

1. Ensure that all ESDS and MOS handling precautions are followed.
2. Perform repairs and replace components with power disconnected from equipment.
3. Use a conductive table top for repairs and connect table to ground conductors of 60Hz and 400Hz power lines.
4. Replace connectors, coaxial cables, shield conductors, and twisted pairs only with identical items.
5. Reference “component side” of a printed circuit board in this manual means the side on which components are located; “solder side” refers to the other side. The standard references are as follows: nearside is the component side; farside is the solder side; on surface mount boards with components on both sides, the nearside is the side that has the J#### and P#### connector numbers.
6. When repairing circuits, carefully observe lead dress and component orientation. Keep leads as short as possible and observe correct repair techniques.

7. There are certain soldering considerations with surface mount components. The soldering iron tip should not touch the ceramic component body. The iron should be applied only to the termination-solder filet.
8. Observe cable routing throughout instrument assembly, prior to disassembly, to enable a proper reinstallation of cabling during reassembly procedures.

CAUTION

THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. EQUIPMENT MODULES AND ESDS DEVICES MUST BE HANDLED IN ACCORDANCE WITH SPECIAL ESDS HANDLING PROCEDURES.

C. Electrostatic Sensitive Devices (ESDS) Protection

1. Always discharge static before handling devices by touching something that is grounded.
2. Use a wrist strap grounded through a 1MΩ resistor.
3. Do not slide anything on the bench. Pick it up and set it down instead.
4. Keep all parts in protective cartons until ready to insert into the board.
5. Never touch the device leads or the circuit paths during assembly.
6. Use a grounded tip, low wattage soldering station.
7. Keep the humidity in the work environment as high as feasibly possible.
8. Use grounded mats on the work station unless table tops are made of approved antistatic material.
9. Do not use synthetic carpet on the floor of the shop. If a shop is carpeted, ensure that a grounded mat is placed at each workstation.
10. Keep common plastics out of the work area.

D. MOS Device Protection

MOS (Metal Oxide Semiconductor) devices are used in this equipment. While the attributes of MOS type devices are many, characteristics make them susceptible to damage by electrostatic or high voltage charges. Therefore, special precautions must be taken during repair procedures to prevent damaging the device. The following precautions are recommended for MOS circuits, and are especially important in low humidity or dry conditions.

1. Store and transport all MOS devices in conductive material so that all exposed leads are shorted together. Do not insert MOS devices into conventional plastic “snow” or plastic trays used for storing and transporting standard semiconductor devices.

2. Ground working surfaces on workbench to protect the MOS devices.
3. Wear cotton gloves or a conductive wrist strap in series with a 200KΩ resistor connected to ground.
4. Do not wear nylon clothing while handling MOS devices.
5. Do not insert or remove MOS devices with power applied. Check all power supplies to be used for testing MOS devices. and be sure that there are no voltage transients present.
6. When straightening MOS leads, provide ground straps for the apparatus for the device.
7. Ground the soldering iron when soldering a device.
8. When possible, handle all MOS devices by package or case, and not by leads. Prior to touching the device, touch an electrical ground to displace any accumulated static charge. The package and substrate may be electrically common. If so, an electrical discharge to the case would cause the same damage as touching the leads.
9. Clamping or holding fixtures used during repair should be grounded, as should the circuit board, during repair.
10. Devices should be inserted into the printed circuit boards such that leads on the back side do not contact any material other than the printed circuit board (in particular, do not use any plastic foam as a backing).
11. Devices should be soldered as soon as possible after assembly. All soldering irons must be grounded.
12. Boards should not be handled in the area around devices, but rather by board edges.
13. Assembled boards must not be placed in conventional, home-type, plastic bags. Paper bags or antistatic bags should be used.
14. Before removing devices from conductive portion of the device carrier, make certain conductive portion of carrier is brought in contact with well grounded table top.

E. PC Board, Two-Lead Component Removal (Resistors, Capacitors, Diodes, etc.)

1. Heat one lead from component side of board until solder flows, and lift one lead from board; repeat for other lead and remove component (note orientation).
2. Melt solder in each hole, and using a desoldering tool, remove solder from each hole.
3. Dress and form leads of replacement component; insert leads into correct holes.
4. Insert replacement component observing correct orientation.

F. PC Board, Multi-Lead Component Removal (IC's, etc.)

1. Remove component by clipping each lead along both sides. Clip off leads as close to component as possible. Discard component.
2. Heat hole from solder side and remove clipped lead from each hole.

3. Melt solder in each hole, and using a desoldering tool, remove solder from each hole.
4. Insert replacement component observing correct orientation.
5. Solder component in place from farside of board. Avoid solder runs. No solder is required on contacts where no traces exist.

G. Replacement of Power Transistors

1. Unsolder leads and remove attaching hardware. Remove transistor and hard-coat insulator.
2. Apply Thermal Joint Compound Type 120 (Wakefield Engineering, Inc.) to the mounting surface of the replacement transistor.
3. Reinstall the transistor insulator and the power transistor using hardware removed in step (1).
4. After installing the replacement transistor, but before making any electrical connections, measure the resistance between the case of the transistor and the chassis, to ensure that the insulation is effective. The resistance measured should be greater than 10MΩ.
5. Reconnect leads to transistor and solder in place.

H. Replacement of Printed Circuit Board Protective Coating

WARNING
CONFORMAL COATING CONTAINS TOXIC VAPORS! USE ONLY WITH ADEQUATE VENTILATION.

1. Clean repaired area of printed circuit board per instructions in the Cleaning section of this manual.
2. Apply Conformal Coating, Humiseal #1B-31 HYSOL PC20-35M-01 (Humiseal Division, Columbia Chase Corp., 24-60 Brooklyn Queens Expressway West, Woodside, N.Y., 11377) P/N 016-01040-0000.
3. Shake container well before using.
4. Spray or brush surfaces with smooth, even strikes. If spraying, hold nozzle 10-15 inches from work surface.
5. Cure time is ten minutes at room temperature.

I. Programmable Read Only Memory (PROM) Replacement

The read only memory packages are specially programmed devices to provide specific logic outputs required for operation in the unit. The manufacturer's part (type) number is for the un-programmed device, and cannot be used. The Honeywell part number must be used to obtain the correctly programmed device. Refer to the "Illustrated Parts List" (IPL).

5.3.3.1 REPLACEMENT OF COMPONENTS

This section describes the procedure, along with any special techniques, for replacing damaged or defective components.

A. Connectors

When replacing a connector, refer to the appropriate PC board assembly drawing, and follow the notes, to ensure correct mounting and mating of each connector.

B. Crystal

The use of any crystal, other than a Honeywell crystal, is considered an unauthorized modification.

C. Diodes

Diodes used are silicon and germanium. Use long-nose pliers as a heat sink, under normal soldering conditions. Note the diode polarity before removal.

D. Integrated Circuits

Refer to the applicable reference for removal and replacement instructions.

E. Wiring/Coaxial Cable

When repairing a wire that has broken from its terminal, remove all old solder, and pieces of wire from the terminal, re-strip the wire to the necessary length, and resolder the wire to the terminal. Replace a damaged wire or coaxial cable with one of the same type, size and length.

5.3.4 DISASSEMBLY/ASSEMBLY PROCEDURES

The following instructions included the procedures that are necessary to remove and disassemble the subassemblies of the KA 52.

It is assumed that the unit has been tested in accordance with Section 5.2 to locate the source of the malfunction. The unit should be disassembled only to the point where the malfunction can be corrected by repair, cleaning, or adjustment. Do not disassemble any parts or wiring unnecessarily as repeated tear downs can be detrimental to the life of the unit.

The KA 52 is comprised of a final assembly and one major subassembly. Disassembly instructions are provided to separate the subassembly from the basic unit. Reassembly can be accomplished by reversing the disassembly procedures. Refer to the subassembly drawings in Section VI during disassembly or assembly.

5.3.4.1 P.C. BOARD REMOVAL

A. Remove the two screws on the sides of the dust cover and remove the dust cover.

B. The printed circuit board and its components are accessible in this state of disassembly.

C. To remove the printed circuit board from the chassis, remove the four corner screws and separate the board from the chassis.

5.4 TROUBLESHOOTING

Refer to the troubleshooting flow chart, figure 5-2.

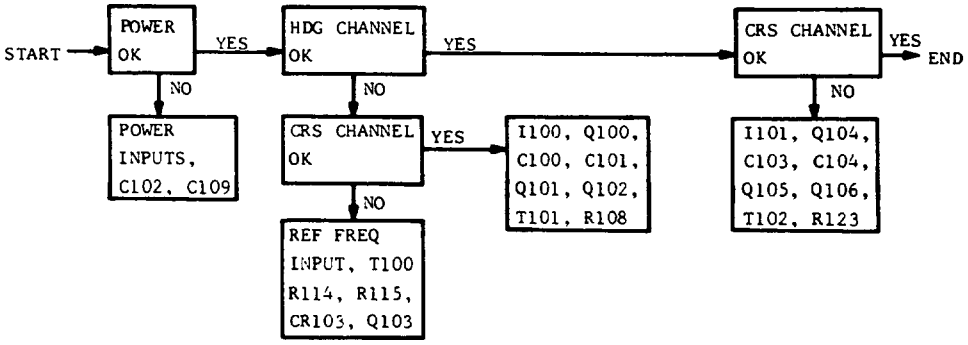


FIGURE 5-2 KA 52 TROUBLESHOOTING FLOW CHART

ILLUSTRATED PARTS LIST

6.1 General

The Illustrated Parts List (IPL) is a complete list of assemblies and parts required for the unit. The IPL also provides for the proper identification of replacement parts. Individual parts lists within this IPL are arranged in numerical sequence starting with the top assembly and continuing with the sub-assemblies. All mechanical parts will be separated from the electrical parts used on the sub-assembly. Each parts list is followed by a component location drawing.

Parts identified in this IPL by Honeywell part number meet design specifications for this equipment and are the recommended replacement parts. Warranty information concerning Honeywell replacement parts is contained in Service Memo #1, P/N 600-08001-00XX.

Some part numbers may not be currently available. Consult the current Honeywell catalog or contact a Honeywell representative for equipment availability.

6.2 Revision Service

The manual will be revised as necessary to reflect current information.

6.3 List of Abbreviations

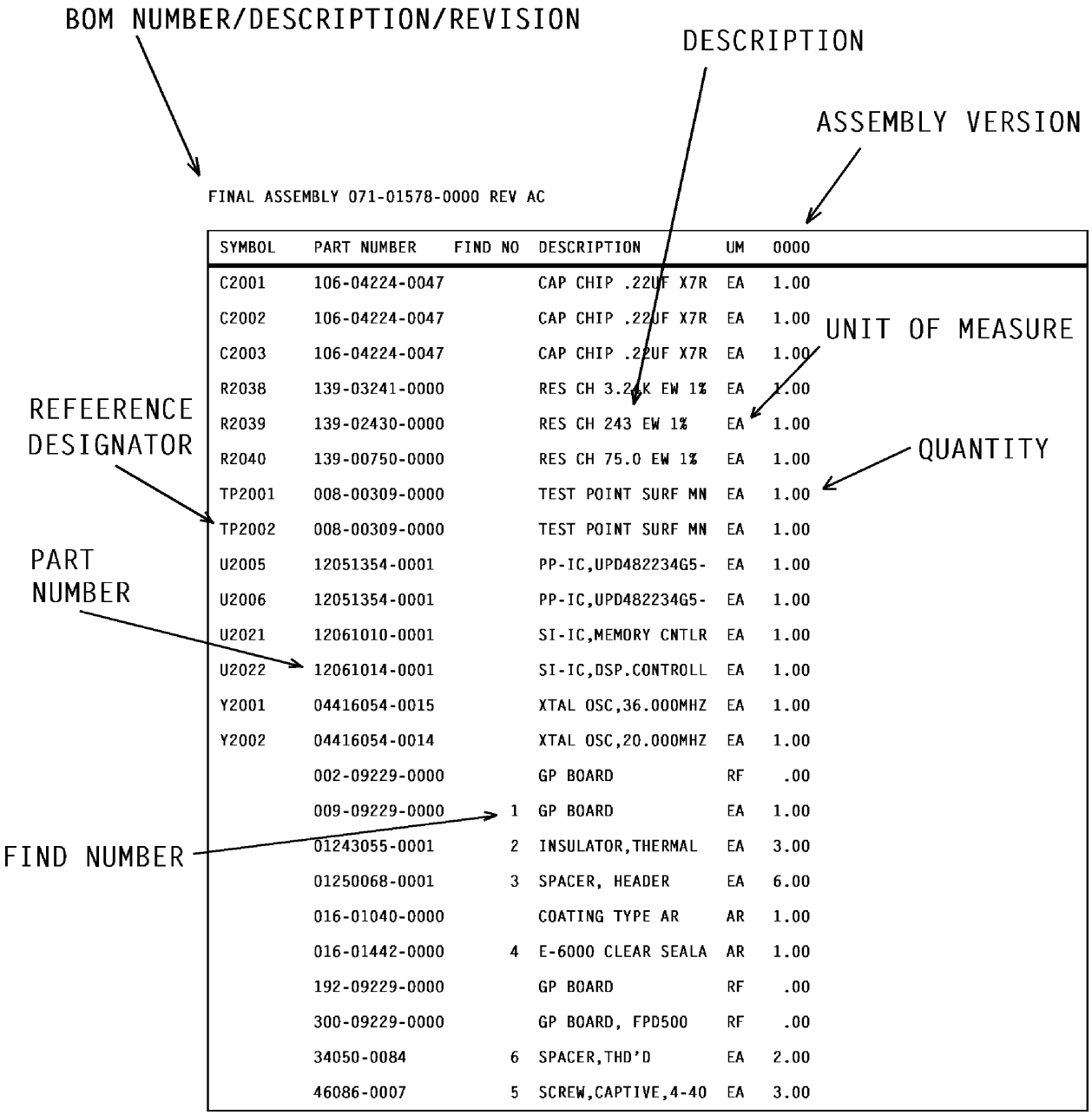
Abbreviation	Name
B	Motor or Synchro
C	Capacitor
CJ	Circuit Jumper
CR	Diode
DS	Lamp
E	Voltage or Signal Connect Point
F	Fuse
FL	Filter
FT	Feedthru
I	Integrated Circuit
J	Jack or Fixed Connector
L	Inductor
M	Meter
P	Plug

Table 1
Abbreviations

Abbreviation	Name
Q	Transistor
R	Resistor
RT	Thermistor
S	Switch
T	Transformer
TP	Test Point
U	Component Network, Integrated Circuit, Circuit Assembly
V	Photocell/Vacuum Tube
W	Waveguide
Y	Crystal

Table 1 (Continued)
Abbreviations

6.4 Sample Parts List



FINAL ASSEMBLY 071-01578-0000 REV AC

SYMBOL	PART NUMBER	FIND NO	DESCRIPTION	UM	0000
C2001	106-04224-0047		CAP CHIP .22UF X7R	EA	1.00
C2002	106-04224-0047		CAP CHIP .22UF X7R	EA	1.00
C2003	106-04224-0047		CAP CHIP .22UF X7R	EA	1.00
R2038	139-03241-0000		RES CH 3.24K EW 1%	EA	1.00
R2039	139-02430-0000		RES CH 243 EW 1%	EA	1.00
R2040	139-00750-0000		RES CH 75.0 EW 1%	EA	1.00
TP2001	008-00309-0000		TEST POINT SURF MN	EA	1.00
TP2002	008-00309-0000		TEST POINT SURF MN	EA	1.00
U2005	12051354-0001		PP-IC,UPD482234G5-	EA	1.00
U2006	12051354-0001		PP-IC,UPD482234G5-	EA	1.00
U2021	12061010-0001		SI-IC,MEMORY CNTLR	EA	1.00
U2022	12061014-0001		SI-IC,DSP.CONTROLL	EA	1.00
Y2001	04416054-0015		XTAL OSC,36.000MHZ	EA	1.00
Y2002	04416054-0014		XTAL OSC,20.000MHZ	EA	1.00
	002-09229-0000		GP BOARD	RF	.00
	009-09229-0000	1	GP BOARD	EA	1.00
	01243055-0001	2	INSULATOR,THERMAL	EA	3.00
	01250068-0001	3	SPACER, HEADER	EA	6.00
	016-01040-0000		COATING TYPE AR	AR	1.00
	016-01442-0000	4	E-6000 CLEAR SEALA	AR	1.00
	192-09229-0000		GP BOARD	RF	.00
	300-09229-0000		GP BOARD, FPD500	RF	.00
	34050-0084	6	SPACER,THD'D	EA	2.00
	46086-0007	5	SCREW,CAPTIVE,4-40	EA	3.00

The above is only a sample. The actual format and style may vary slightly. A 'Find Number' column, when shown, references selected items on the BOM's accompanying Assembly Drawing. This information does not apply to every BOM. Therefore, a lack of information in this column, or a lack of this column, should not be interpreted as an omission.

Figure 6-1
Sample Parts List

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6.5 KA 52 FINAL ASSEMBLY

071-01055-0000 Rev. 9
071-01055-0001 Rev. 4

SYMBOL	PART NUMBER	FIND NO	DESCRIPTION	UM	0000	0001
REF1	300-00904-0000		FINAL ASSEMBLY	RF	.00	.00
REF2	002-00325-0000		SCH AUTOPLT ADPTR	RF	.00	.00
REF3	000-00106-0000		FLOW CHT KA 0052	RF	.00	.00
REF4	004-00145-0000		MPS KA 52	RF	.00	.00
	047-02936-0002		PLATE MTG W/HDW	EA	1.00	1.00
	047-02937-0002		DUST COVER W/FNSH	EA	1.00	1.00
	057-01530-0001		S/N TAG, KA 52	EA	1.00	1.00
	057-02075-0000		ID TAG	EA	1.00	1.00
	057-02203-0000		FLAVOR STCKR	EA	1.00	.
	057-02203-0001		FLAVOR STCKR	EA	.	1.00
	057-03511-0001		DECAL, CAUTION	EA	1.00	1.00
	089-02154-0055		NUT LOCK 4-40	EA	4.00	4.00
	089-05903-0003		SCR PHP 4-40X3/16	EA	2.00	2.00
	089-05903-0007		SCR PHP 4-40X7/16	EA	4.00	4.00
	089-08025-0030		WSHR FLT STD #4	EA	4.00	4.00
	090-00991-0000		PROTECTIVE CLOSURE	EA	1.00	1.00
	091-00307-0000		SPACER INSUL .050	EA	4.00	4.00
	200-00691-0010		AUTOPILOT ADPT BD	EA	1.00	.
	200-00691-0011		AUTOPILOT ADAPTER	EA	.	1.00

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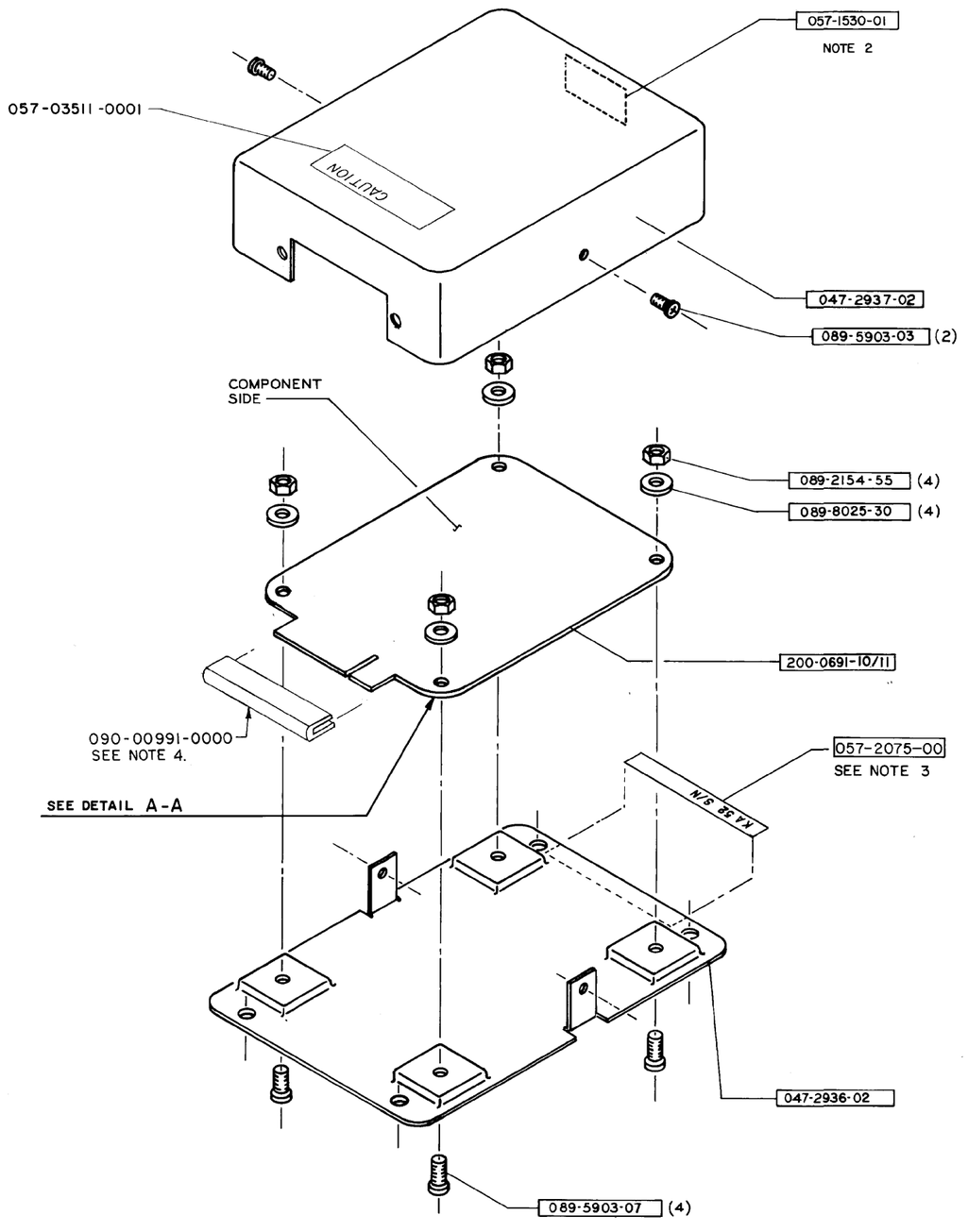
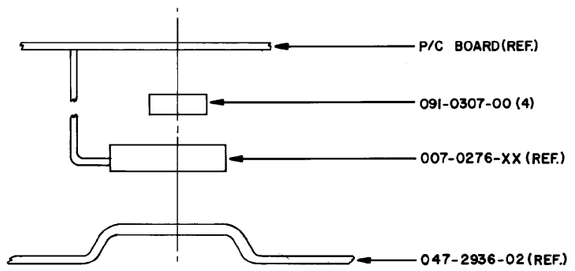




DETAIL A-A

NOTE:
1. FOR COMPLETE ITEM DESCRIPTION SEE B/M 071-1055-00/01.
2. APPLY TO OUTSIDE OF COVER.
3. SERIAL NO. SHOWN ON 057-1530-01 MUST MATCH SERIAL NO. ON 057-2075-00.
4. TRIM MATERIAL (090-00991-0000) TO 1.625 INCHES TO COVER THE P.C. BOARD CONNECTOR FINGERS.

FIGURE 6-2 KA 52 FINAL ASSEMBLY DRAWING
(Dwg. 300-00904-0000 Rev. 7)

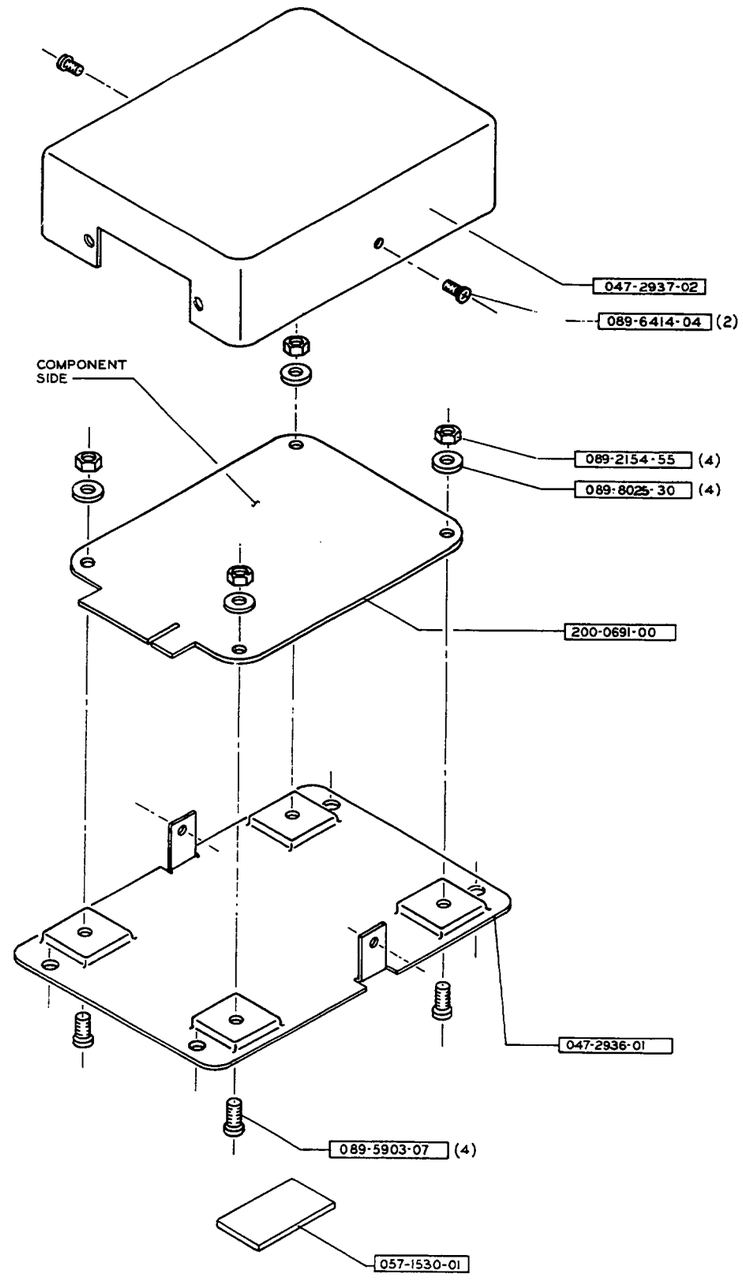
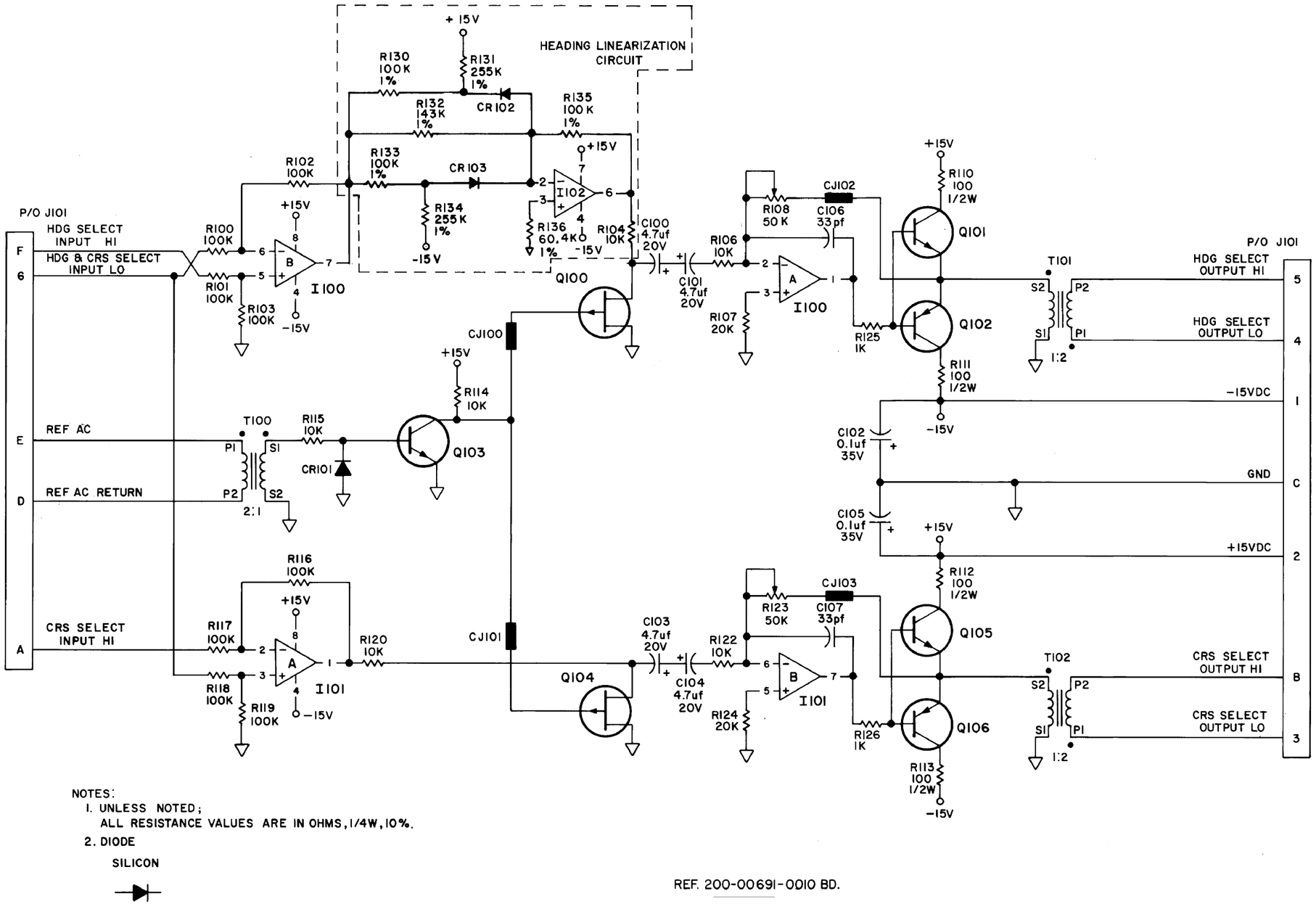


FIGURE 6-2A KA 52 FINAL ASSEMBLY DRAWING
(Dwg. 300-00904-0000 Original Manual Revision)

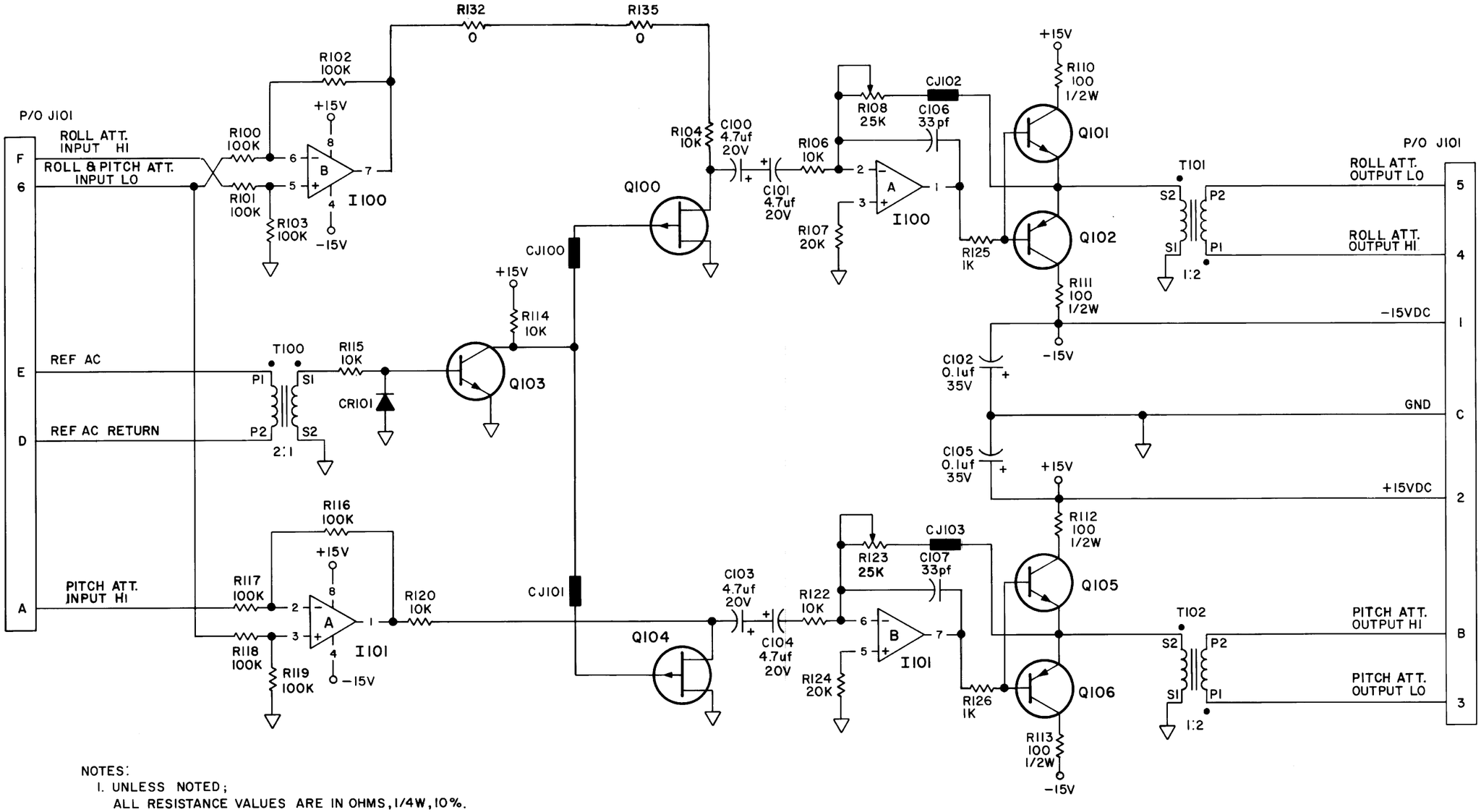


NOTES:
1. UNLESS NOTED;
   ALL RESISTANCE VALUES ARE IN OHMS, 1/4W, 10%.
2. DIODE

   SILICON

REF. 200-00691-0010 BD.

FIGURE 6-3 KA 52 SCHEMATIC
(Dwg. 002-00325-0000 Rev. 8, Sheet 1 of 2)

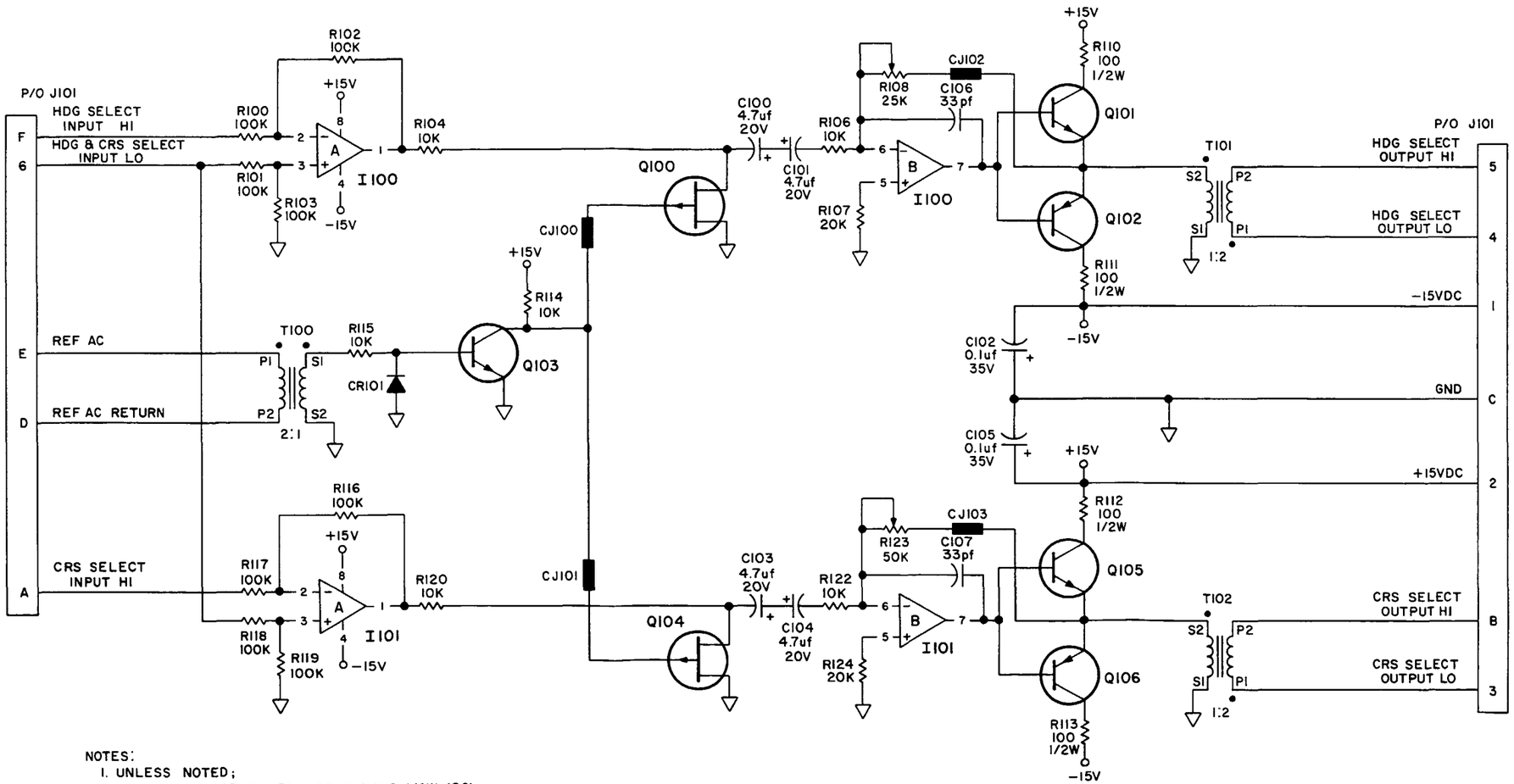


NOTES:
1. UNLESS NOTED;
   ALL RESISTANCE VALUES ARE IN OHMS, 1/4W, 10%.
2. DIODE

   SILICON

REF. 200-00691-0011 BD.

FIGURE 6-3 KA 52 SCHEMATIC
(Dwg. 002-00325-0000 Rev. 8, Sheet 2 of 2)



NOTES:
1. UNLESS NOTED;
   ALL RESISTANCE VALUES ARE IN OHMS, 1/4W, 10%.
2. DIODE

SILICON

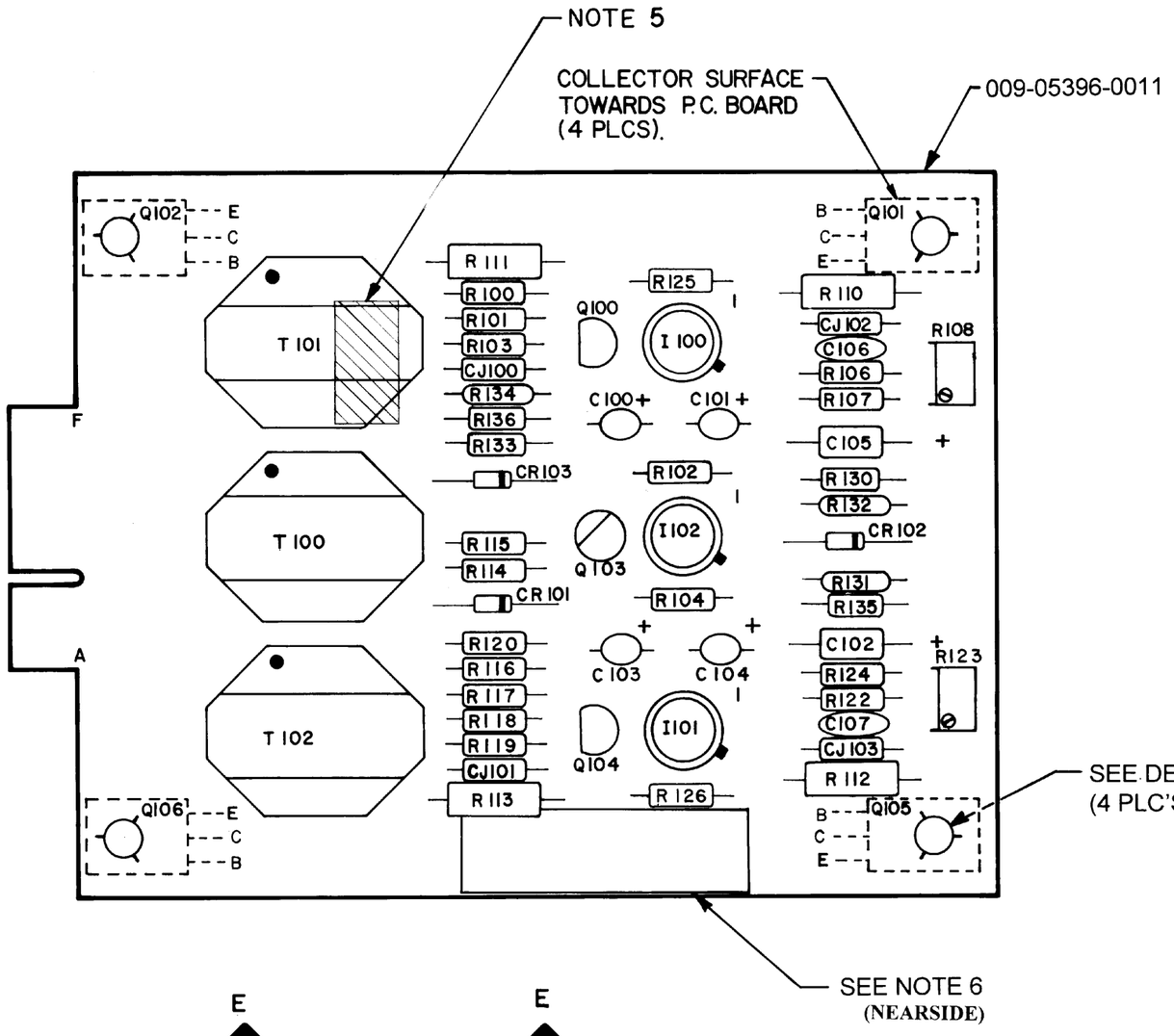
FIGURE 6-3A KA 52 SCHEMATIC
(Dwg. 002-00325-0000 Rev. 3)

6.6 KA 52 AUTOPILOT ADAPTER P.C. BOARD

200-00691-0010 Rev. AA
200-00691-0011 Rev. AA

SYMBOL	PART NUMBER	FIND NO	DESCRIPTION	UM	0010	0011
C100	096-01030-0011		CAP TN 4.7UF20%20V	EA	1.00	1.00
C101	096-01030-0011		CAP TN 4.7UF20%20V	EA	1.00	1.00
C102	096-01008-0000		CAP TN 0.1UF 35V	EA	1.00	1.00
C103	096-01030-0011		CAP TN 4.7UF20%20V	EA	1.00	1.00
C104	096-01030-0011		CAP TN 4.7UF20%20V	EA	1.00	1.00
C105	096-01008-0000		CAP TN 0.1UF 35V	EA	1.00	1.00
C106	113-03330-0000		CAP DC 33PF 500V	EA	1.00	1.00
C107	113-03330-0000		CAP DC 33PF 500V	EA	1.00	1.00
CJ100	026-00018-0000		WIRE CKTJMPR 22AWG	EA	1.00	1.00
CJ101	026-00018-0000		WIRE CKTJMPR 22AWG	EA	1.00	1.00
CJ102	026-00018-0000		WIRE CKTJMPR 22AWG	EA	1.00	1.00
CJ103	026-00018-0000		WIRE CKTJMPR 22AWG	EA	1.00	1.00
CR101	007-06029-0000		DIO S 1N457A	EA	1.00	1.00
CR102	007-06029-0000		DIO S 1N457A	EA	1.00	.
CR103	007-06029-0000		DIO S 1N457A	EA	1.00	.
I100	120-03022-0001		DUAL OP AMP, CAN,	EA	1.00	1.00
I101	120-03022-0001		DUAL OP AMP, CAN,	EA	1.00	1.00
I102	120-03012-0010		OP AMP, UA741	EA	1.00	.
Q100	007-00143-0002		XSTR FET 2N5462	EA	1.00	1.00
Q101	007-00276-0000		XSTR MJE180	EA	1.00	1.00
Q102	007-00276-0001		XSTR MJE170	EA	1.00	1.00
Q103	007-00026-0003		XSTR S NPN 2N3416	EA	1.00	1.00
Q104	007-00143-0002		XSTR FET 2N5462	EA	1.00	1.00
Q105	007-00276-0000		XSTR MJE180	EA	1.00	1.00
Q106	007-00276-0001		XSTR MJE170	EA	1.00	1.00
R100	131-00104-0023		RES CF 100K QW 5%	EA	1.00	1.00
R101	131-00104-0023		RES CF 100K QW 5%	EA	1.00	1.00
R102	131-00104-0023		RES CF 100K QW 5%	EA	1.00	1.00
R103	131-00104-0023		RES CF 100K QW 5%	EA	1.00	1.00
R104	131-00103-0023		RES CF 10K QW 5%	EA	1.00	1.00
R106	131-00103-0023		RES CF 10K QW 5%	EA	1.00	1.00
R107	131-00203-0023		RES CF 20K QW 5%	EA	1.00	1.00
R108	133-00100-0041		RES VA 25K QW 10%	EA	.	1.00
R108	133-00100-0042		RES VA 50K QW 10%	EA	1.00	.
R110	131-00101-0033		RES CF 100 HW 5%	EA	1.00	1.00
R111	131-00101-0033		RES CF 100 HW 5%	EA	1.00	1.00
R112	131-00101-0033		RES CF 100 HW 5%	EA	1.00	1.00
R113	131-00101-0033		RES CF 100 HW 5%	EA	1.00	1.00
R114	131-00103-0023		RES CF 10K QW 5%	EA	1.00	1.00
R115	131-00103-0023		RES CF 10K QW 5%	EA	1.00	1.00
R116	131-00104-0023		RES CF 100K QW 5%	EA	1.00	1.00
R117	131-00104-0023		RES CF 100K QW 5%	EA	1.00	1.00
R118	131-00104-0023		RES CF 100K QW 5%	EA	1.00	1.00
R119	131-00104-0023		RES CF 100K QW 5%	EA	1.00	1.00
R120	131-00103-0023		RES CF 10K QW 5%	EA	1.00	1.00

SYMBOL	PART NUMBER	FIND NO	DESCRIPTION	UM	0010	0011
R122	131-00103-0023		RES CF 10K QW 5%	EA	1.00	1.00
R123	133-00100-0041		RES VA 25K QW 10%	EA	.	1.00
R123	133-00100-0042		RES VA 50K QW 10%	EA	1.00	.
R124	131-00203-0023		RES CF 20K QW 5%	EA	1.00	1.00
R125	131-00102-0023		RES CF 1K QW 5%	EA	1.00	1.00
R126	131-00102-0023		RES CF 1K QW 5%	EA	1.00	1.00
R130	136-01003-0072		RES PF 100K QW 1%	EA	1.00	.
R131	136-02553-0072		RES PF 255K QW 1%	EA	1.00	.
R132	026-00018-0000		WIRE CKTJMPR 22AWG	EA	.	1.00
R132	136-01433-0072		RES PF 143K QW 1%	EA	1.00	.
R133	136-01003-0072		RES PF 100K QW 1%	EA	1.00	.
R134	136-02553-0072		RES PF 255K QW 1%	EA	1.00	.
R135	026-00018-0000		WIRE CKTJMPR 22AWG	EA	.	1.00
R135	136-01003-0072		RES PF 100K QW 1%	EA	1.00	.
R136	136-06042-0072		RES PF 60.4K QW 1%	EA	1.00	.
REF1	002-00325-0000		SCH AUTOPLT ADPTR	RF	.00	.00
REF2	300-00903-0010		AUTOPILOT ADAPTER	RF	.00	.00
REF3	192-00691-0010		KA 52 AUTOPILOT AD	RF	.00	.
T100	019-05060-0000		XFMR 400HZ	EA	1.00	1.00
T101	019-05060-0000		XFMR 400HZ	EA	1.00	1.00
T102	019-05060-0000		XFMR 400HZ	EA	1.00	1.00
	009-05396-0011		PC BOARD	EA	1.00	1.00
	012-01005-0003		TAPE MYLAR .250 W	AR	1.00	1.00
	016-01040-0000		COATING TYPE AR	AR	.00	1.00



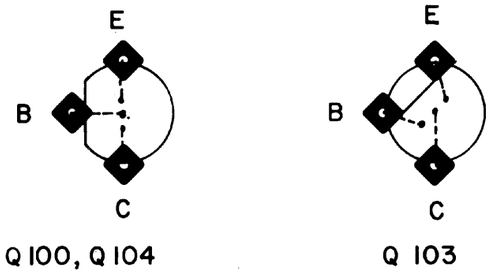
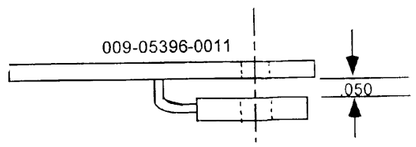


FIGURE 6-4 KA 52 P.C. BOARD ASSEMBLY DRAWING (Dwg. 300-00903-0010 Rev. AA)

NOTES:

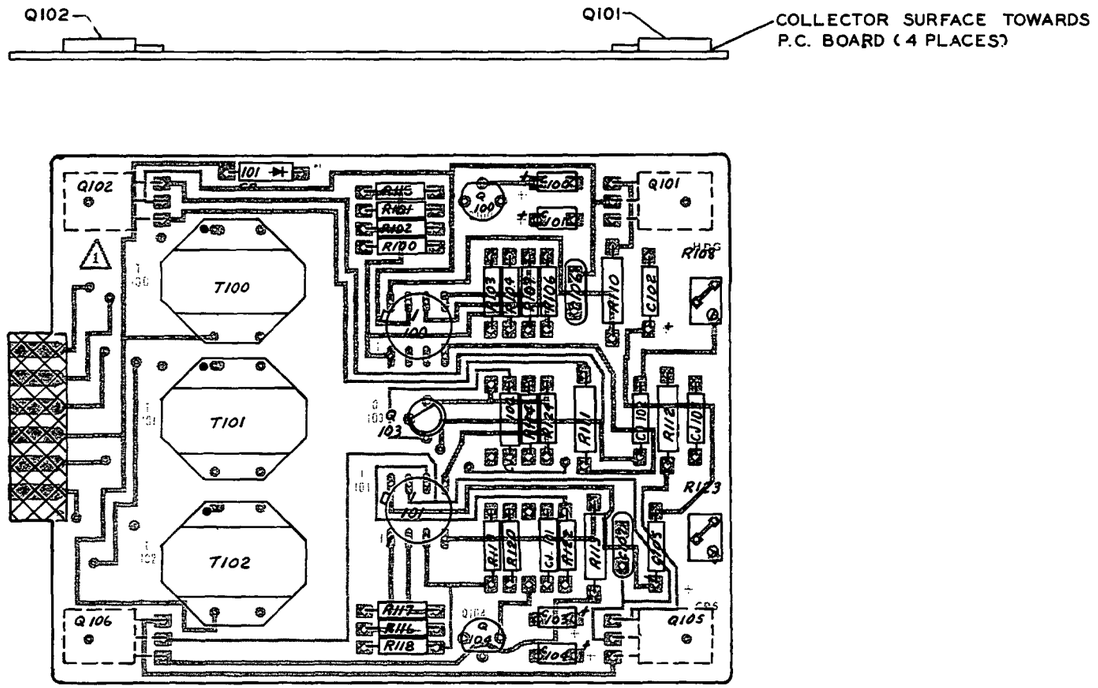
1. **FOR COMPLETE ITEM DESCRIPTION SEE B/M 200-0691-10/11.**
2. **AFTER P.C. BOARD ASSEMBLY TEST IN ACCORDANCE WITH MPS 004-0145-00.**
3. **SPRAY BOTH SIDES OF BOARD WITH CLEAR URETHANE SEAL COATING 016-01040-0000. DO NOT APPLY TO CONNECTOR FINGERS, R108, R123 & MOUNTING SURFACES.**
4. **NOTE DELETED**
5. **ADD 012-01005-0003 APPROXIMATELY ½" LONG TO P.C. BOARD UNDER T 101. DO NOT COVER TRANSFORMER LEAD AND MOUNTING HOLES.**
6. **PRINTED CIRCUIT ASSEMBLY IDENTIFICATION MUST BE IN ACCORDANCE WITH SPEC. 001-01101-0000.**



Q101, Q102, Q105 AND Q106

DETAIL A

NOTE: THIS DRAWING NOT COMPLETE WITHOUT PARTS LIST 200-00691-001X



NOTE

1. FOR COMPLETE ITEM DESCRIPTION SEE B/M 200-0691-00
2. AFTER P.C. BOARD ASSEMBLY TEST IN ACCORDANCE WITH MPS 004-0145-00.
3. SPRAY BOTH SIDES OF BOARD WITH CLEAR URETHANE SEAL COAT.
   DO NOT APPLY TO CROSS-HACKED AREAS (BOTH SIDE OF BOARD).

FIGURE 6-4A KA 52 P.C. BOARD ASSEMBLY DRAWING
(Dwg. 300-00903-0000 Rev. 3)