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MAINTENANCE MANUAL

BENDIX/KING®

KA 51A

SLAVING ACCESSORY

MANUAL NUMBER 006-15626-0007
REVISION 7 JULY, 2001

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REVISION HISTORY

KA 51A Maintenance Manual

Part Number: 006-15626-XXXX

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

REVISION No. 7, July 2001

ITEM	ACTION
All pages	Full Reprint, new manual

Revision 7 creates a new stand-alone manual for the KA 51A which was extracted from revision 6 of the KCS 55/55A maintenance manual, (P/N 006-05111-0006). Any revisions to the KA 51A, 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 51A slaving accessory consists of three individual circuit functions; a slave meter, an auto-manual slave switching function, and a flux valve compensation circuit.

4.2 SLAVE METER DESCRIPTION

Slave meter current is generated in the KG 102A directional gyro and represents the difference between the existing aircraft heading and the heading displayed on the KI 525A indicator. A positive indication represents an actual heading that is greater than the displayed heading. See figure 4-1.

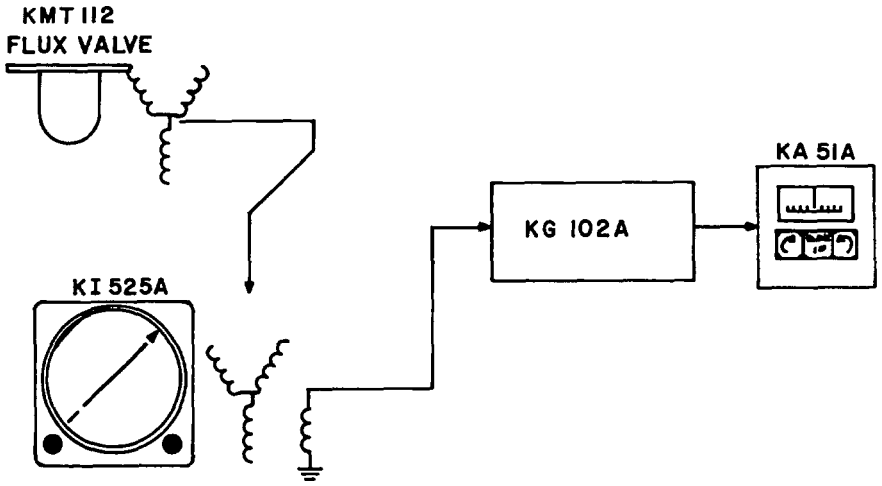

FIGURE 4-1 SLAVE METER SYSTEM DIAGRAM

4.3 AUTO-MANUAL SLAVE SWITCH OPERATION

The auto and manual slave switches located on the front panel of the KA 51 are normally grounded push button switches. Operation of the CW and CCW momentary buttons causes a 5 volts signal to be transmitted to KG 102A directional gyro. This signal results in a CW or CCW pulse train to be sent to the KI 525A display where the compass card rotates in response to the switching action. A third switch located between the other two, is an alternate action unit used to engage the auto slave function in the KG 102A. As with the CW and CCW switches a 5 volt signal is transmitted to the KG 102A whenever the switch is depressed.

4.4 FLUX VALVE COMPENSATION CIRCUIT

In addition to the slave meter and slave switching functions, the KA 51A also include the flux valve compensation circuit. This circuit operates in parallel with the flux valve to PNI connection as shown in Figure 4-2.

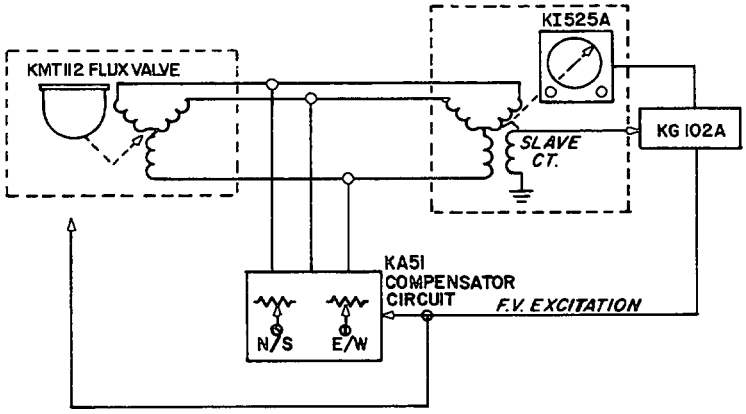

FIGURE 4-2 KA 51A COMPENSATOR SYSTEM DIAGRAM

The basic operational principle involves the summation of a low amplitude 800Hz signal, appropriately phased, with the 800Hz flux valve signal. This summation results in a shift of the magnetic direction vector and thus can compensate for "hard iron" effects in the aircraft fuselage and flight surfaces.

A full wave bridge rectifier consisting of diodes CR101 thru CR104, converts the 400Hz flux valve excitation waveform to 800Hz as shown in Figure 4-3. The DC component of this waveform is removed by capacitor C101, and the AC portion is used to drive transformer T101.

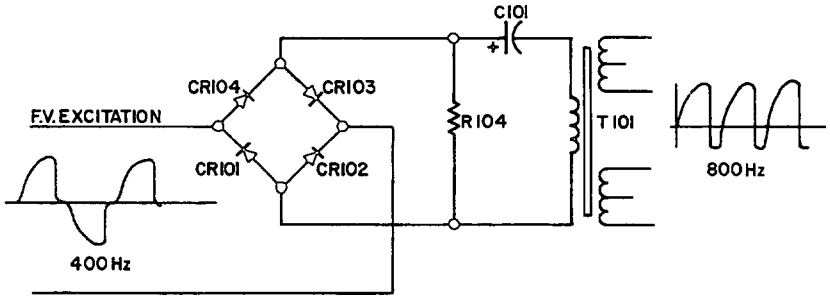

FIGURE 4-3 KA 51A 800HZ GENERATOR CIRCUIT

Two isolated secondaries of T101 provide the North-South and East-West correction voltages required to offset the magnetic vector in the flux valve. One of the secondaries is connected across the X and Y windings of the flux valve as shown in Figure 4-4. Adjustment of the E/W potentiometer, R106, will cause in-phase or out-of-phase 800Hz current to flow through resistor R103 and thence through the X-Y winding of the flux valve generating the desired east-west offset.

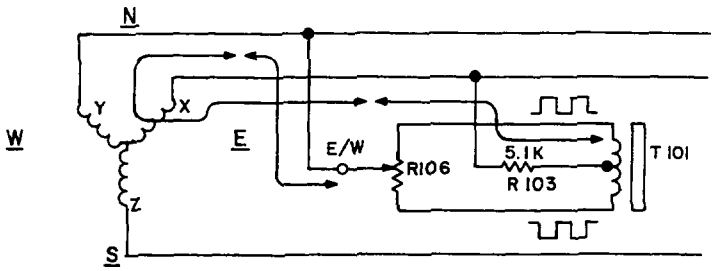

FIGURE 4-4 E/W COMPENSATION DIAGRAM

Likewise, the other secondary winding is connected across the Z leg and the parallel connected X and Y legs as shown in Figure 4-5. Adjustment of the N/S potentiometer, R105, will cause in-phase or out-of-phase 800Hz current to flow through the Z leg of the flux valve. This current is then equally divided by the X and Y legs as it flows through resistors R101 and R102 back to the transformer center top. By dividing the current in this way, North-South compensation will not affect the east-west adjustment and vice-versa.

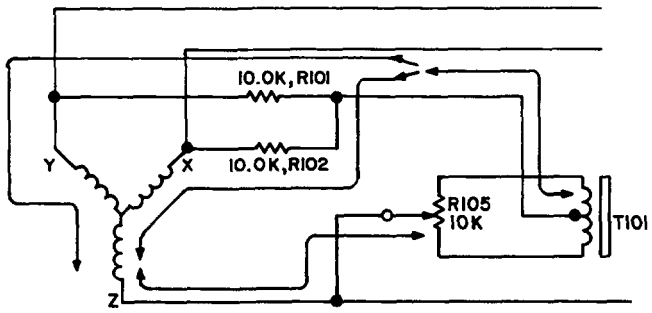

FIGURE 4-5 N/S COMPENSATION SCHEMATIC

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SECTION V
MAINTENANCE

5.1 GENERAL INFORMATION

This section deals with the testing, overhaul and troubleshooting procedures for the KA 51A Slaving Accessory.

5.2 TEST AND ALIGNMENT

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 tests 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) Autoslave switch Ground - OFF
+5VDC - ON

b) CW Manual slave Ground - OFF
+5VDC - ON

c) CCW Manual slave Ground - OFF
+5VDC - ON

d) Flux Valve Compensation outputs for N/S and E/W Correction.

5.2.1.2 ELECTRICAL

Input Signals

a) Flux valve excitation voltage from the KG 102A gyro.

b) Slave meter drive signal from the KG 102A gyro.

c) Power input - +5VDC

5.2.1.3 MECHANICAL

a) Autoslave switch - SPDT alternate action pushbutton switch.

b) Manual slave switches - SPDT momentary action pushbutton switches.

5.2.2 SIGNAL TEST SOURCES AND TEST EQUIPMENT

a) Electronic test circuitry shown in Figure 5-4.

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) Connect the unit as shown in Figure 5-4. Switch the 26VAC on and record the following voltages:

a) Pin B +5. 1 ±1VDC

b) Pin C 0. 0 ±0.05VDC
c) Pin A 0. 0 ±0.05VDC
d) Pin D 0. 0 ±0.05VDC
e) Pin 3 26 ±3VAC

2) Depress the SLAVE switch. The switch shall remain depressed.
   a) Pin C 5. 1 ± 1VDC
   b) Pin A 0. 0 ±0.05VDC
   c) Pin D 0. 0 ±0.05VDC

3) Depress the slave switch, the button shall release to the extended position. Manually depress the CCW slave button.
   a) Pin C 0. 0 ±0.05VDC
   b) Pin A 5. 1 ± 1VDC
   c) Pin D 0. 0 ±0.05VDC

   Release the CCW slave button. The button shall return to the extended position.

4) Depress the CW slave button.
   a) Pin C 0. 0 ±0.05VDC
   b) Pin A 0. 0 ±0.05VDC
   c) Pin D 5. 1 ±1VDC

   Release the CW slave button. The button shall return to the extended position.

5) Adjust the slave meter pot to position the slave meter needle over the neg full scale mark.

   Pin E -0. 88 ±0.15VDC

   Repeat for the positive full scale mark.

   Pin E +0. 88 ±0.15VDC.

6) Adjust the slave meter pot for 0.0VDC at Pin E. The slave meter shall be within 1/2 needles width of center scale.

7) Connect the scope from Pin 6(+) to Pin 4(-). Adjust both the N/S and the E/W pots fully CW or fully CCW to obtain the waveform shown in Figure A below. Observe the waveforms from Pin 6(+) to 2(-) and from Pin 2(+) to 4(-). They shall appear as shown in figure 5-1 below.

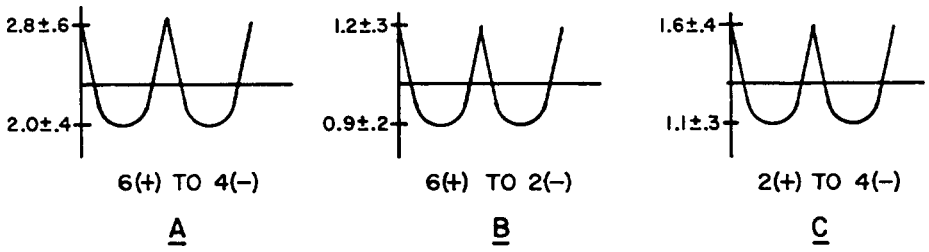

FIGURE 5-1

8) With the scope connected from Pin 2(+) to Pin 4(-), rotate the E/W wiper to the opposite end of the pot. The waveform shall decrease in amplitude smoothly and then increase out of phase as shown in figure 5-2 below.

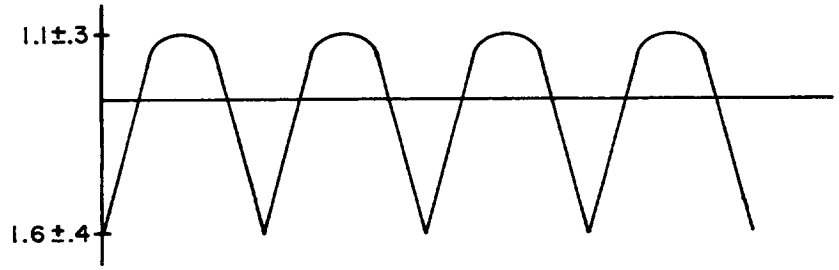

FIGURE 5-2

Rotate the E/W adjust pot to minimize the waveform amplitude.

9) Connect the scope between Pin 6 (+) and Pin 4 (-). Rotate the N/S wiper to the opposite end of the pot. The waveform shall decrease in amplitude smoothly and then increase out of phase as shown in figure 5-3 below.

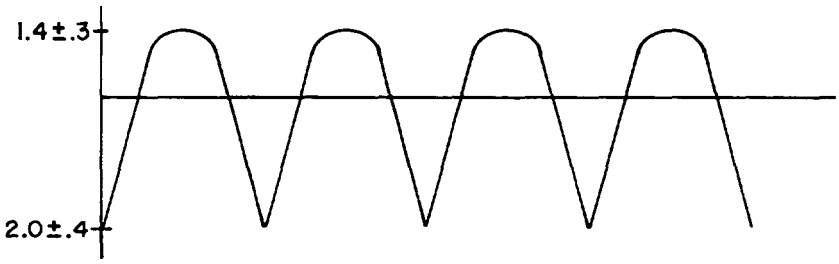

FIGURE 5-3

Return the N/S wiper to the original position and repeat this test with scope leads between Pins 6 (+) and Pin 4 (-). Rotate the N/S adjust pot to minimize the waveform amplitude, disconnect the 26VAC input power and remove the unit.

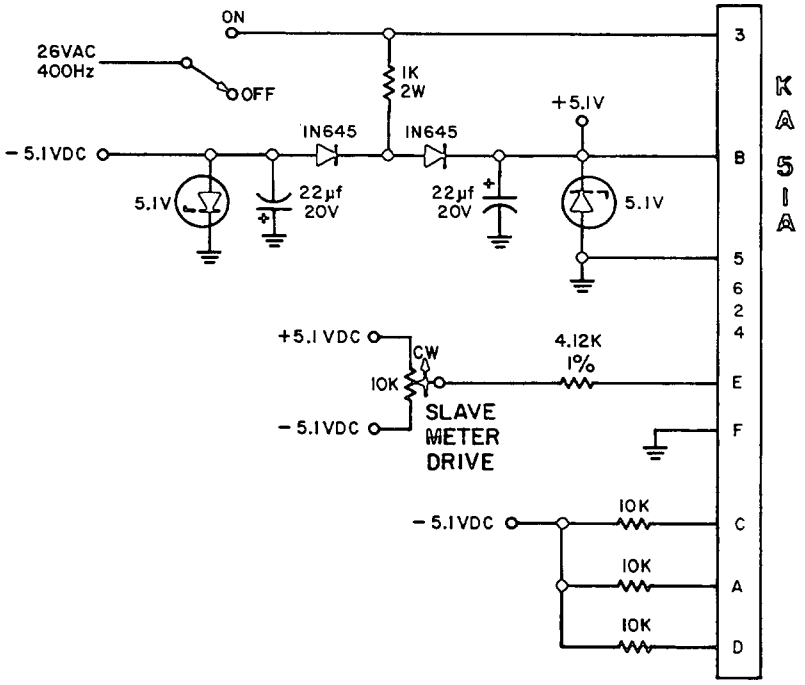

FIGURE 5-4 KA 51A TEST CIRCUIT

TEST DATA SHEET

1)	Power ON	Pin B	_____	+5.1 ± 1VDC
		Pin C	_____	0.0 ±0.05VDC
		Pin A	_____	0.0 ±0.05VDC
		Pin D	_____	0.0 ±0.05VDC
		Pin 3	_____	26 ±3VAC
2)	SLAVE switch ON	Pin C	_____	5.1 ± 1VDC
	Switch ON	Pin A	_____	0.0 ±0.05VDC
		Pin D	_____	0.0 ±0.05VDC
3)	Depress Slave SW	Pin C	_____	0.0 ±0.05VDC
	Depress CCW SW	Pin A	_____	5.1 ± 1VDC
		Pin D	_____	0.0 ±0.05VDC
		SLAVE SWITCH	_____	Extended
	Release CCW SW	CCW SW	_____	Extended
4)	Depress CW SW	Pin C	_____	0. 0 ±0.05VDC
		Pin A	_____	0. 0 ±0.05VDC
		Pin D	_____	5. 1 ±1VDC
	Release CW SW	CW SW	_____	Extended
5)	Slave meter pot for Neg full scale	Pin E	_____	-0. 88 ±0.15VDC
	Pos Full Scale	Pin E	_____	+0. 88 ±0. 15V DC
6)	Slave meter pot for 0.0VDC at E	Meter	_____	Center 1/2 needle
7)	Scope from 6(+) to 4(-)		_____	OK
	Scope from 6(+) to 2(-)		_____	OK
	Scope from 2(+) to 4(-)		_____	OK
8)	Scope from 2(+) to V-)		_____	OK
	E/W wiper to opposite end of pot.			
	E/W pot to minimize amplitude			
9)	Scope from 6(+) to 4(-)		_____	-OK
	N/S wiper to opposite end of pot.			
	N/S pot to original position			
	Scope from 6(+) to 2(-)			
	N/S wiper to opposite end of pot.		_____	OK
	N/S pot to minimize amplitude		_____	OK

10. Place the unit in a light box. Apply the appropriate voltage to lamp, (5, 14 or 28V) and actuate lamp test switch. Check that meter scale is evenly lit. And that the light shines through slot in housing and illuminates the white lines on the push buttons below.

Tested by _____

Inspected by _____

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5.3 GENERAL 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 51A.

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 station 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 51A 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. Snap the three pushbuttons off of the switch shafts by pulling out on the buttons.

B. Remove the two screws that hold the back cover to the main housing.

C. Slide the printed circuit board and the meter mechanism out of the main housing.

D. When in this state of disassembly the components of the printed circuit board are readily accessible.

5.4 TROUBLESHOOTING

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

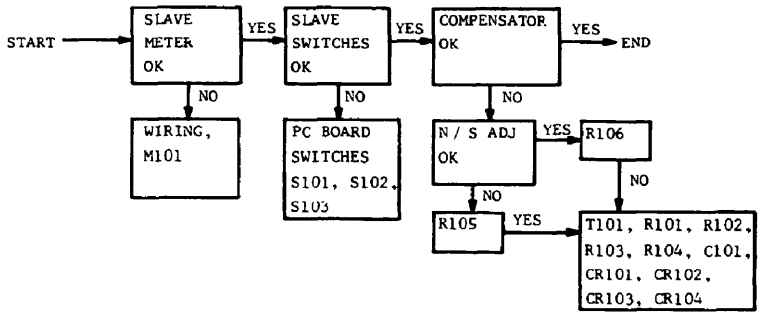


FIGURE 5-5 KA 51A TROUBLESHOOTING FLOW CHART

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

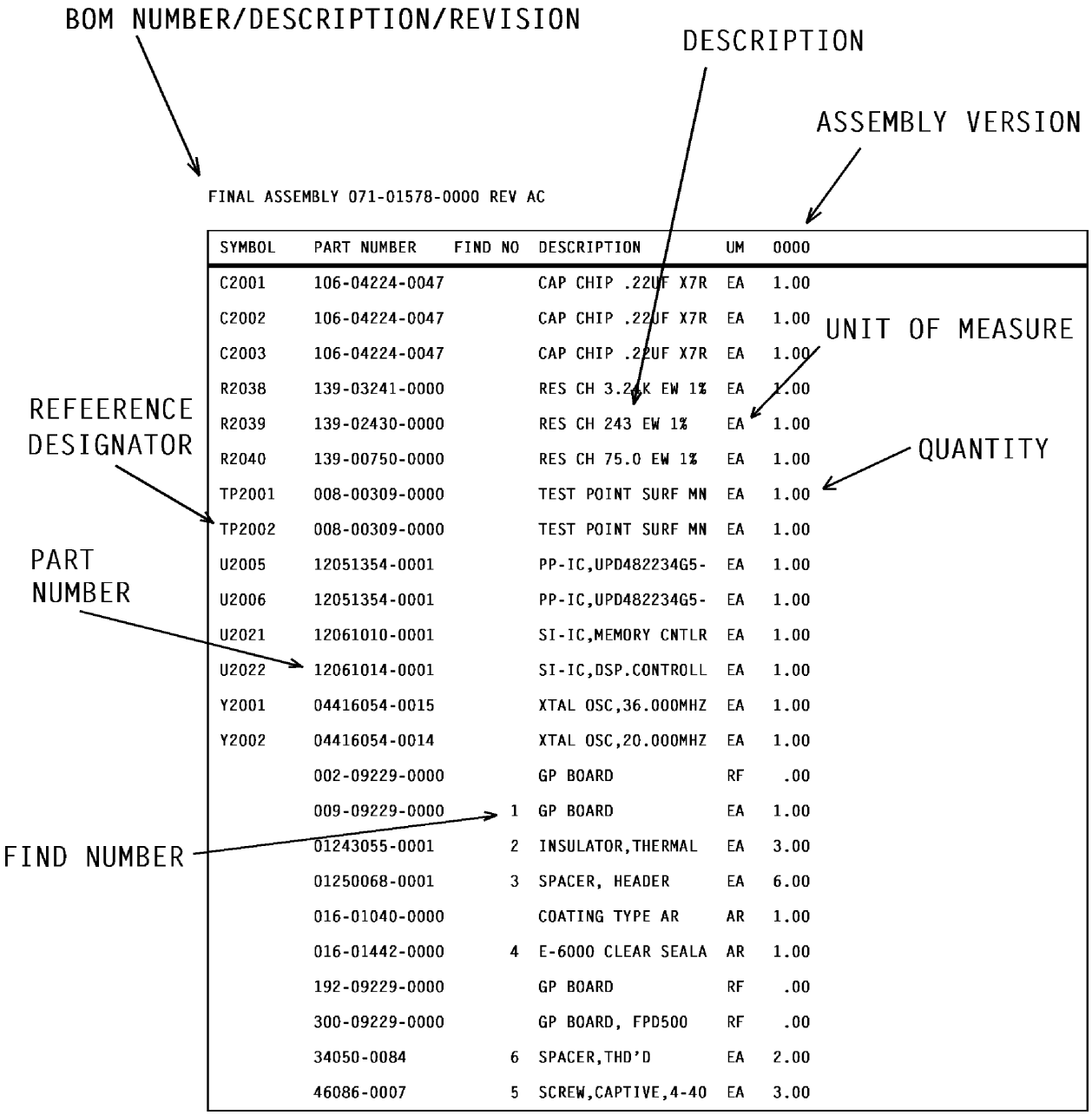
Abbreviation	Name
B	Motor or Synchro
C	Capacitor
CJ	Circuit Jumper
CR	Diode
DS	Lamp
E	Voltage or Signal Connect Point
F	Fuse
FL	Filter
FT	Feedthru
I	Integrated Circuit
J	Jack or Fixed Connector
L	Inductor
M	Meter
P	Plug

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

THIS PAGE IS RESERVED

6.5 KA 51A FINAL ASSEMBLY

071-01053-0001 Rev. 8
071-01053-0002 Rev. 8
071-01053-0003 Rev. 8
071-01053-0004 Rev. 8
071-01053-0005 Rev. 8
071-01053-0006 Rev. 8
071-01053-0007 Rev. 8
071-01053-0008 Rev. 8
071-01053-0009 Rev. 8
071-01053-0099 Rev. 1

SYMBOL	PART NUMBER	FIND NO	DESCRIPTION	UM	0001	0002	0003
	023-00096-0001		MTR SLAVE	EA	1.00	1.00	1.00
	025-00018-0033		WIRE 26 ORG	IN	3.60	3.60	3.60
	025-00018-0099		WIRE 26 WHT	IN	3.60	3.60	3.60
	035-01361-0008		PROTECTIVE COVER	EA	1.00	1.00	1.00
	037-00012-0001		LAMP MIN T-1 5V	EA	1.00	1.00	.
	037-00013-0000		LMP 7219 T1 12V	EA	.	.	1.00
	047-03141-0001		CLIP LAMP W/F	EA	2.00	2.00	2.00
	047-04505-0000		CVR SHLD	EA	1.00	1.00	1.00
	057-01583-0001		SERIAL NUMBER TAG	EA	1.00	1.00	1.00
	057-01764-0000		WRN TAG 5V LGT	EA	1.00	1.00	.
	057-01764-0001		WRN TAG 14V LGT	EA	.	.	1.00
	071-01053-0099		COMMON BOM	EA	1.00	1.00	1.00
	088-00084-0007		FLTR LAMP LT BLU	EA	1.00	1.00	1.00
	088-00393-0001		PLATE FACE	EA	1.00	.	1.00
	088-00393-0002		PLATE FACE	EA	.	1.00	.
	088-00406-0005		PSHBTN W/WHT LINE	EA	1.00	1.00	1.00
	088-00439-0000		COVER	EA	1.00	1.00	1.00
	091-00056-0001		INSUL FISHPAPER	EA	1.00	1.00	1.00
	200-01510-0000		COMPENSATOR BD	EA	1.00	1.00	1.00

SYMBOL	PART NUMBER	FIND NO	DESCRIPTION	UM	0004	0005	0006
	023-00096-0001		MTR SLAVE	EA	1.00	1.00	1.00
	025-00018-0033		WIRE 26 ORG	IN	3.60	3.60	3.60
	025-00018-0099		WIRE 26 WHT	IN	3.60	3.60	3.60
	035-01361-0008		PROTECTIVE COVER	EA	1.00	1.00	1.00
	037-00012-0001		LAMP MIN T-1 5V	EA	.	.	1.00
	037-00013-0001		LMP 6838 T1 28V	EA	1.00	1.00	.
	047-03141-0001		CLIP LAMP W/F	EA	2.00	2.00	2.00
	047-04505-0000		CVR SHLD	EA	1.00	1.00	1.00
	057-01583-0001		SERIAL NUMBER TAG	EA	1.00	1.00	1.00
	057-01764-0000		WRN TAG 5V LGT	EA	.	.	1.00
	057-01764-0002		WRN TAG 28V LGT	EA	1.00	1.00	.
	071-01053-0099		COMMON BOM	EA	1.00	1.00	1.00
	088-00084-0000		FILTER LAMP RED	EA	.	.	1.00
	088-00084-0007		FLTR LAMP LT BLU	EA	1.00	1.00	.
	088-00393-0001		PLATE FACE	EA	1.00	.	1.00
	088-00393-0002		PLATE FACE	EA	.	1.00	.
	088-00406-0005		PSHBTN W/WHT LINE	EA	1.00	1.00	1.00
	088-00439-0000		COVER	EA	1.00	1.00	1.00
	091-00056-0001		INSUL FISHPAPER	EA	1.00	1.00	1.00
	200-01510-0000		COMPENSATOR BD	EA	1.00	1.00	1.00

SYMBOL	PART NUMBER	FIND NO	DESCRIPTION	UM	0007	0008	0009
	023-00096-0001		MTR SLAVE	EA	1.00	1.00	1.00
	025-00018-0033		WIRE 26 ORG	IN	3.60	3.60	3.60
	025-00018-0099		WIRE 26 WHT	IN	3.60	3.60	3.60
	035-01361-0008		PROTECTIVE COVER	EA	1.00	1.00	1.00
	037-00012-0001		LAMP MIN T-1 5V	EA	1.00	.	.
	037-00013-0000		LMP 7219 T1 12V	EA	.	1.00	.
	037-00013-0001		LMP 6838 T1 28V	EA	.	.	1.00
	047-03141-0001		CLIP LAMP W/F	EA	2.00	2.00	2.00
	047-04505-0000		CVR SHLD	EA	1.00	1.00	1.00
	057-01583-0001		SERIAL NUMBER TAG	EA	1.00	1.00	1.00
	057-01764-0000		WRN TAG 5V LGT	EA	1.00	.	.
	057-01764-0001		WRN TAG 14V LGT	EA	.	1.00	.
	057-01764-0002		WRN TAG 28V LGT	EA	.	.	1.00
	071-01053-0099		COMMON BOM	EA	1.00	1.00	1.00
	088-00084-0000		FILTER LAMP RED	EA	1.00	.	1.00
	088-00084-0007		FLTR LAMP LT BLU	EA	.	1.00	.
	088-00393-0001		PLATE FACE	EA	.	.	1.00
	088-00393-0002		PLATE FACE	EA	1.00	1.00	.
	088-00406-0005		PSHBTN W/WHT LINE	EA	1.00	1.00	1.00
	088-00439-0000		COVER	EA	1.00	1.00	1.00
	091-00056-0001		INSUL FISHPAPER	EA	1.00	1.00	1.00
	200-01510-0000		COMPENSATOR BD	EA	1.00	1.00	1.00

SYMBOL	PART NUMBER	FIND NO	DESCRIPTION	UM	0099
	012-01088-0000		CUSHION	EA	1.00
	025-00018-0000		WIRE 26 BLK	IN	3.60
	025-00018-0022		WIRE 26 RED	IN	3.60
	088-00406-0001		PSHBTN W/MARKING	EA	1.00
	088-00406-0003		PSHBTN W/MARKING	EA	1.00
	089-06414-0004		SCR PHP 2-28X1/4	EA	2.00

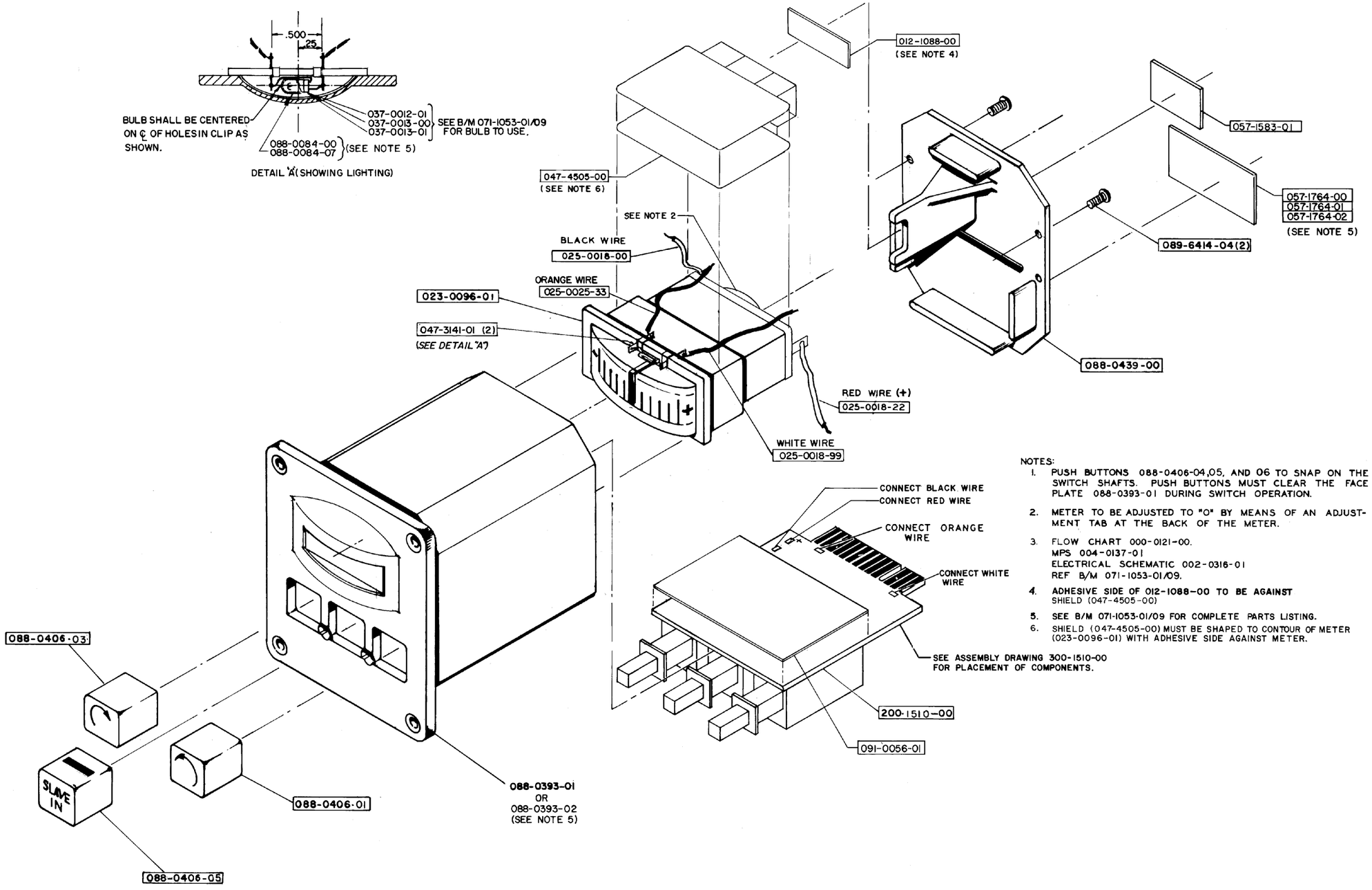
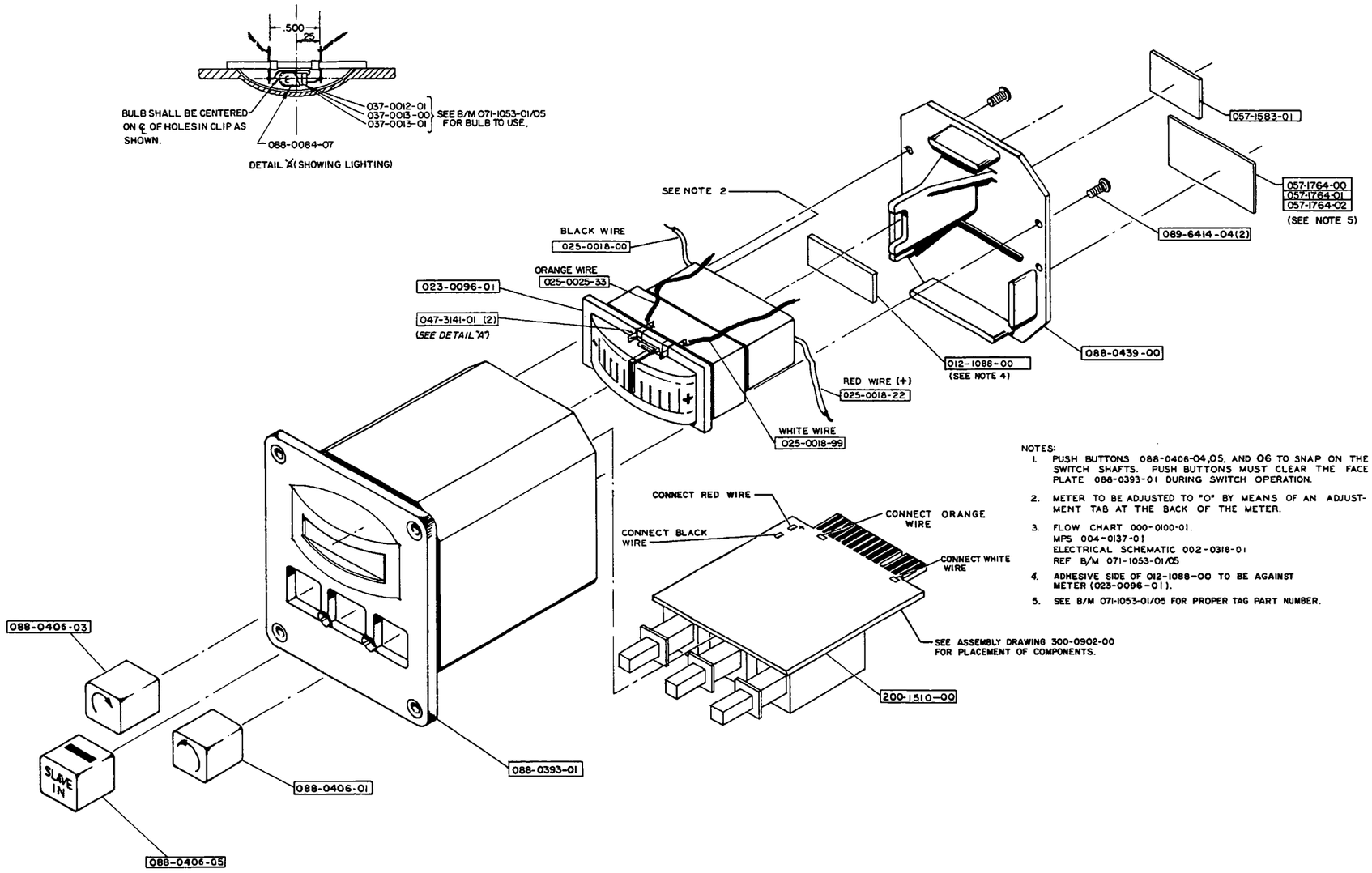


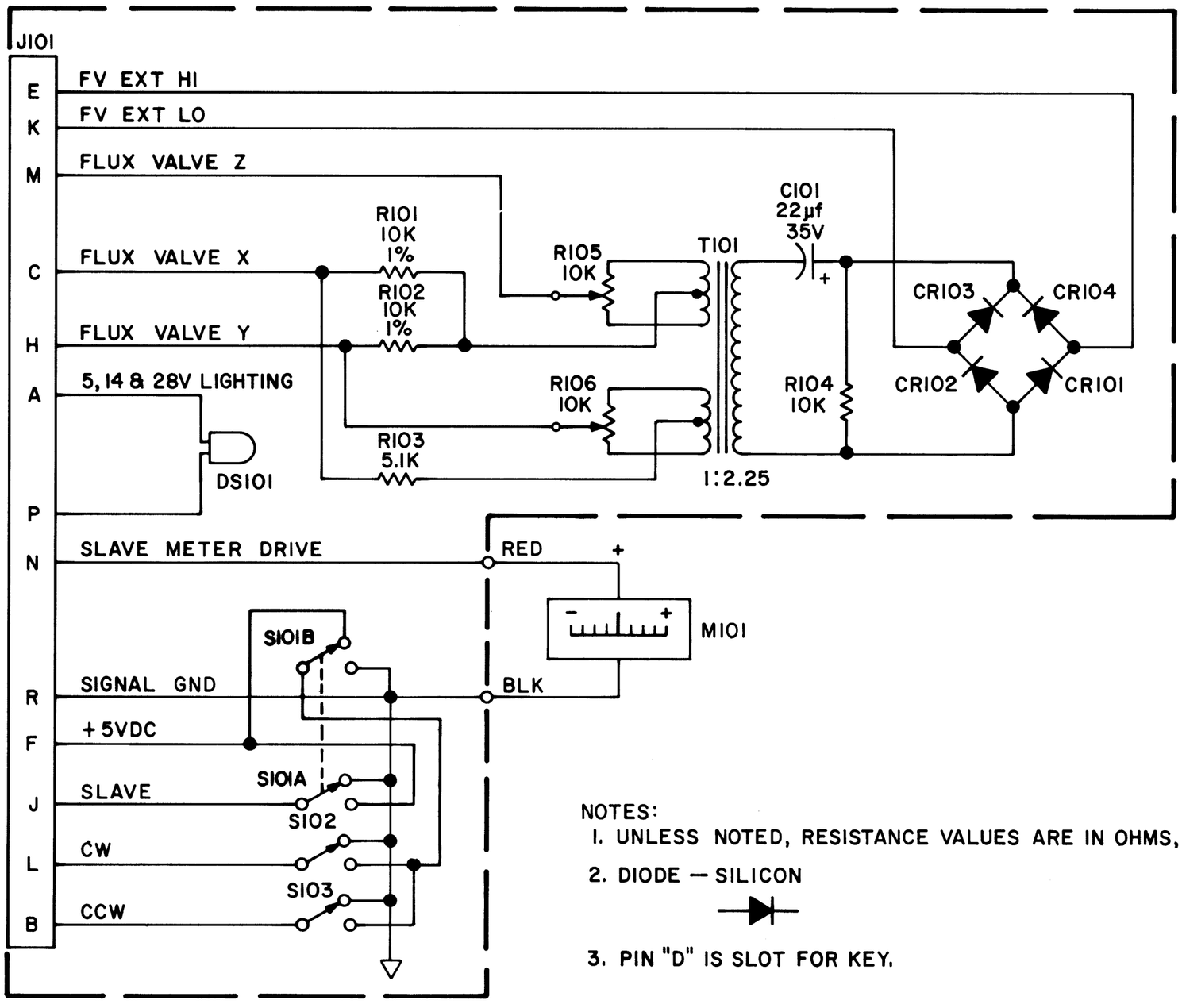
FIGURE 6-2 KA 51A FINAL ASSEMBLY DRAWING
(Dwg. 300-00855-0001 Rev. 8)



NOTES:

1. PUSH BUTTONS 088-0406-04,05, AND 06 TO SNAP ON THE SWITCH SHAFTS. PUSH BUTTONS MUST CLEAR THE FACE PLATE 088-0393-01 DURING SWITCH OPERATION.
2. METER TO BE ADJUSTED TO "0" BY MEANS OF AN ADJUSTMENT TAB AT THE BACK OF THE METER.
3. FLOW CHART 000-0100-01.
   MPS 004-0137-01
   ELECTRICAL SCHEMATIC 002-0316-01
   REF B/M 071-1053-01/05
4. ADHESIVE SIDE OF 012-1088-00 TO BE AGAINST METER (023-0096-01).
5. SEE B/M 071-1053-01/05 FOR PROPER TAG PART NUMBER.

FIGURE 6-2A KA 51A FINAL ASSEMBLY DRAWING
(Dwg. 300-00855-0001 Original Manual Revision)



NOTES:
1. UNLESS NOTED, RESISTANCE VALUES ARE IN OHMS, QW, 10%.
2. DIODE — SILICON

3. PIN "D" IS SLOT FOR KEY.

FIGURE 6-3 KA 51A SCHEMATIC
(Dwg. 002-00316-0001 Rev. 2)

6.6 KA 51A COMPENSATOR PC BD

200-01510-0000 Rev. 1

SYMBOL	PART NUMBER	FIND NO	DESCRIPTION	UM	0000
	007-06029-0000		DIO S 1N457A	EA	4.00
	009-05542-0000		PC BD SLVG ACC	EA	1.00
	016-01082-0000		DC RTV 3145	AR	.00
	019-05069-0000		XFMR	EA	1.00
	031-00226-0000		SW MOM DPDT	EA	2.00
	031-00226-0002		SW MOM DPDT	EA	1.00
	096-01030-0030		CAP TN 22UF10%35V	EA	1.00
	130-00103-0023		RES FC 10K QW 5%	EA	1.00
	130-00512-0023		RES FC 5.1K QW 5%	EA	1.00
	133-00045-0005		RES VA 10K QW 30%	EA	2.00
	136-01002-0072		RES PF 10K QW 1%	EA	2.00
	150-00004-0010		TUBING TFLN 22AWG	IN	1.20

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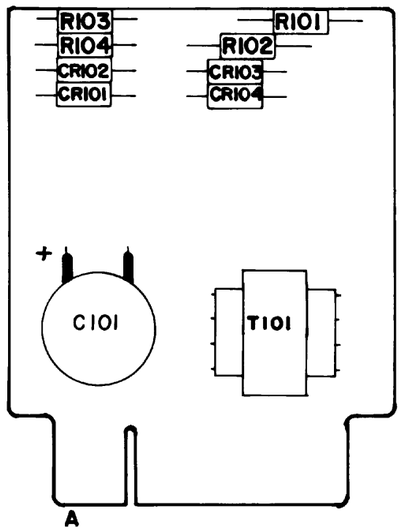
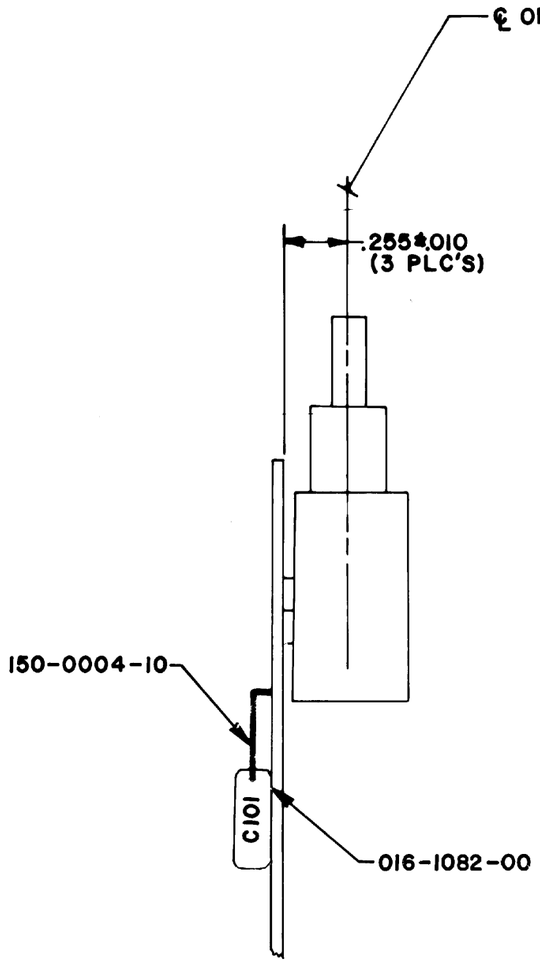
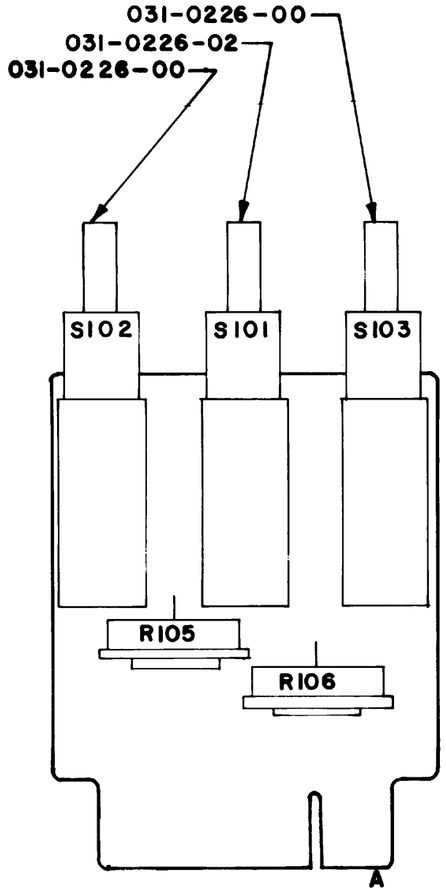


TOP OF THE BOARD

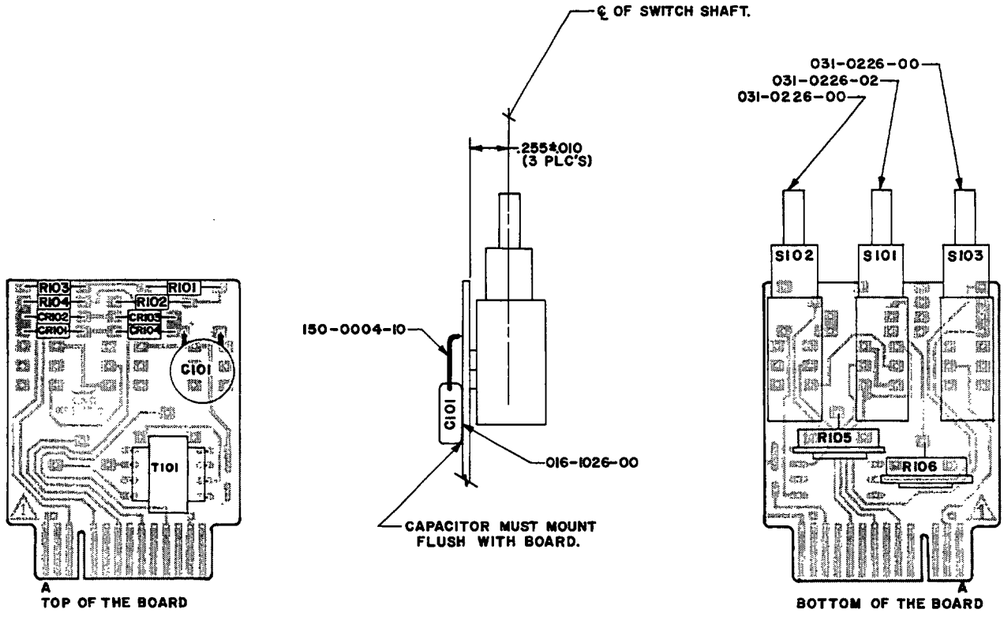




BOTTOM OF THE BOARD

NOTE:
1. FOR COMPLETE ITEM DESCRIPTION SEE B/M 200-1510-00.

FIGURE 6-4 KA 51A COMPENSATOR PC BOARD ASSEMBLY DRAWING
(Dwg. 300-01510-0000 Rev. 3)



NOTE:
1. FOR COMPLETE ITEM DESCRIPTION SEE B/M 200-1510-00.

FIGURE 6-4A KA 51A COMPENSATOR PC BOARD ASSEMBLY DRAWING
(Dwg. 300-01510-0000 Original Manual Revision)